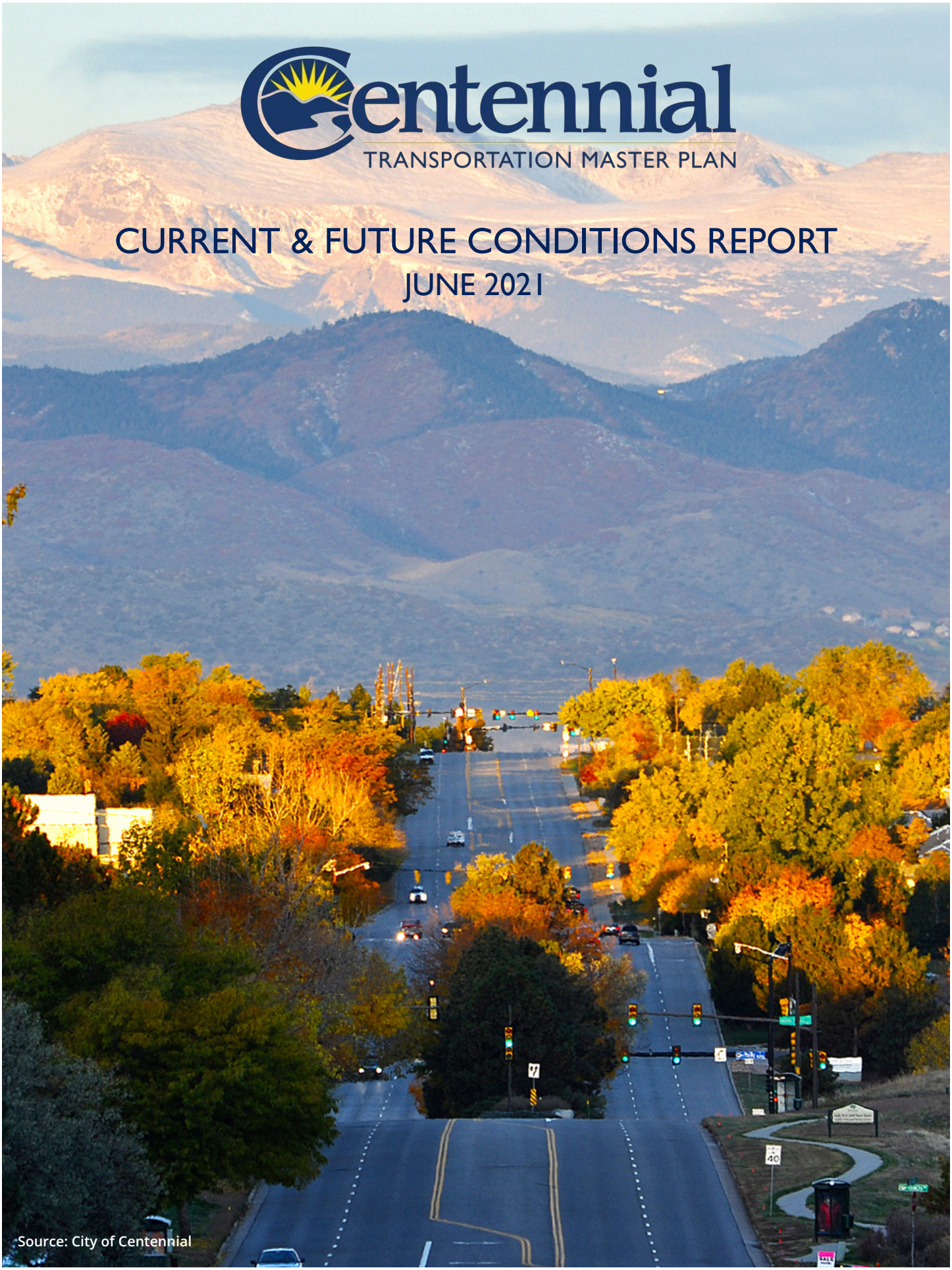
Centennial

TRANSPORTATION MASTER PLAN

CURRENT & FUTURE CONDITIONS REPORT

JUNE 2021



Source: City of Centennial

TABLE OF CONTENTS

PREPARED BY:

FELSBURG HOLT & ULLEVIG
connecting & enhancing communities

LIST OF MAPS

LIST OF TABLES

INTRODUCTION

CENTENNIAL TRANSPORTATION MASTER PLAN UPDATE

Following the successful completion of the City's first Transportation Master Plan (TMP) in 2013, Centennial is now in the initial stages of updating the Transportation Master Plan. This effort will ensure residents, employees, commuters, and visitors have access to a safe and reliable transportation system to connect people to employment, schools, health and human services, shopping and other destinations across the City and region.

Since the development of the previous Transportation Plan, the range of mobility options, how transportation is used, and the need for more interconnected and responsive options have changed. It is important that the City of Centennial is prepared to adapt with changing transportation needs and priorities, and is prepared to adapt to and leverage new transportation technologies.

To do this it is vital that there is a comprehensive understanding of conditions for the current state of transportation in the City. This enables identification of gaps and needs in the roadway, pedestrian, bike and trail, and transit networks to then provide greater freedom of mobility and a more inclusive transportation network where people walking, rolling, biking, driving, and riding transit can safely and comfortably utilize the options that best meet their needs.

Previous work done in the City's Comprehensive Plan - Centennial NEXT outlines a set of forward-looking strategies that encourage more work on the development of multimodal infrastructure, transit-oriented development, and greater collaboration with regional organizations like the Denver Regional Council of Governments (DRCOG). The City's Capital Improvement Program (CIP) (2019) guides the schedule and funding for public improvements to be designed and constructed over a ten year time frame. These documents will be evaluated through the TMP process to determine if projects or strategies should be advanced and/or updated.

This report serves as the foundation for identifying the gaps in transportation options and opportunities for mobility option growth, and will serve as a resource to inform the development of near-and long-term transportation recommendations in the TMP. Information regarding the City's demographic and land use data and transportation focused information like travel patterns, safety, and roadway, transit bicycle/pedestrian networks, as well as advanced mobility data are presented. For some data sets, current and future information (year 2040) is provided.

FUTURE OF TRANSPORTATION & CHANGES DUE TO COVID-19

The TMP was developed during a unique time for transportation. Not only has there been a rapid acceleration of transportation technology in recent years that is adding new mobility options and changing the way people travel, but the COVID-19 pandemic caused significant changes to people's everyday routines, including travel. The current conditions are based on available data from various resources and in most cases were recorded prior to changes occurring as a result of COVID-19. Future updates to the TMP and will use most recent data available to ensure we plan for a resilient transportation system that can address emerging concerns.

LAND USE & DEMOGRAPHICS

POPULATION & EMPLOYMENT

To understand the current gaps and needs in the transportation system, an assessment of the different communities that make up the City of Centennial is a critical first step in recognizing how and who uses different elements of the transportation system, and how it can be adjusted and expanded to better meet the needs of current and future residents.

This section provides an overview of Centennial's population composition, including present and anticipated population and employment growth, and a summary of frequently underserved communities such as older adults (65 and older), children (under 18), people with disabilities, communities of color, low-income households, and zero-vehicle households. Providing a focused lens for underserved communities is important in being able to plan for an equitable and accessible transportation system moving forward and will ensure community members of all ages and abilities can utilize transportation options throughout the City. The demographic information provided in this section is sourced from the Census Bureau (American Community Survey 2014-2019 data) and Denver Regional Council of Governments (DRCOG) base year 2020 and forecast year 2040 land use estimates. The DRCOG land use forecasts were adjusted for the Arapahoe County Transportation Master Plan and were further adjusted to align with Centennial's Comprehensive Plan. The the growth forecasts shown in the following sections are within the City of Centennial, however, the travel demand model accounts for growth in the surrounding region, including areas that may be annexed into the City in the future.

Planning for and developing a resilient transportation system that is well-equipped to handle a growing population and employment sector is one of the primary purposes of a transportation plan. This information will aid in the development of thoughtful transportation and related infrastructure investments and improvements.

2020 POPULATION, HOUSEHOLD, & EMPLOYMENT OVERVIEW

111,100 **40,400** **68,500**

Household & Employment Growth	2020	2040
Household Estimates	40,400	49,900
Employment Estimates	68,500	106,500

Source: U.S. Census Bureau American Community Survey 2015-2019, DRCOG Focus Model 2.2, 2019

Population

The Census Bureau's American Community Survey shows the estimated population of Centennial is a little over 111,000 in 2020. Looking at population trends from 2010 shows the City experienced a larger increase in population growth from 2010 to 2015, with approximately 7,900 new residents. From 2015 to 2019 there was a much smaller increase of just a little over 2,000 residents.

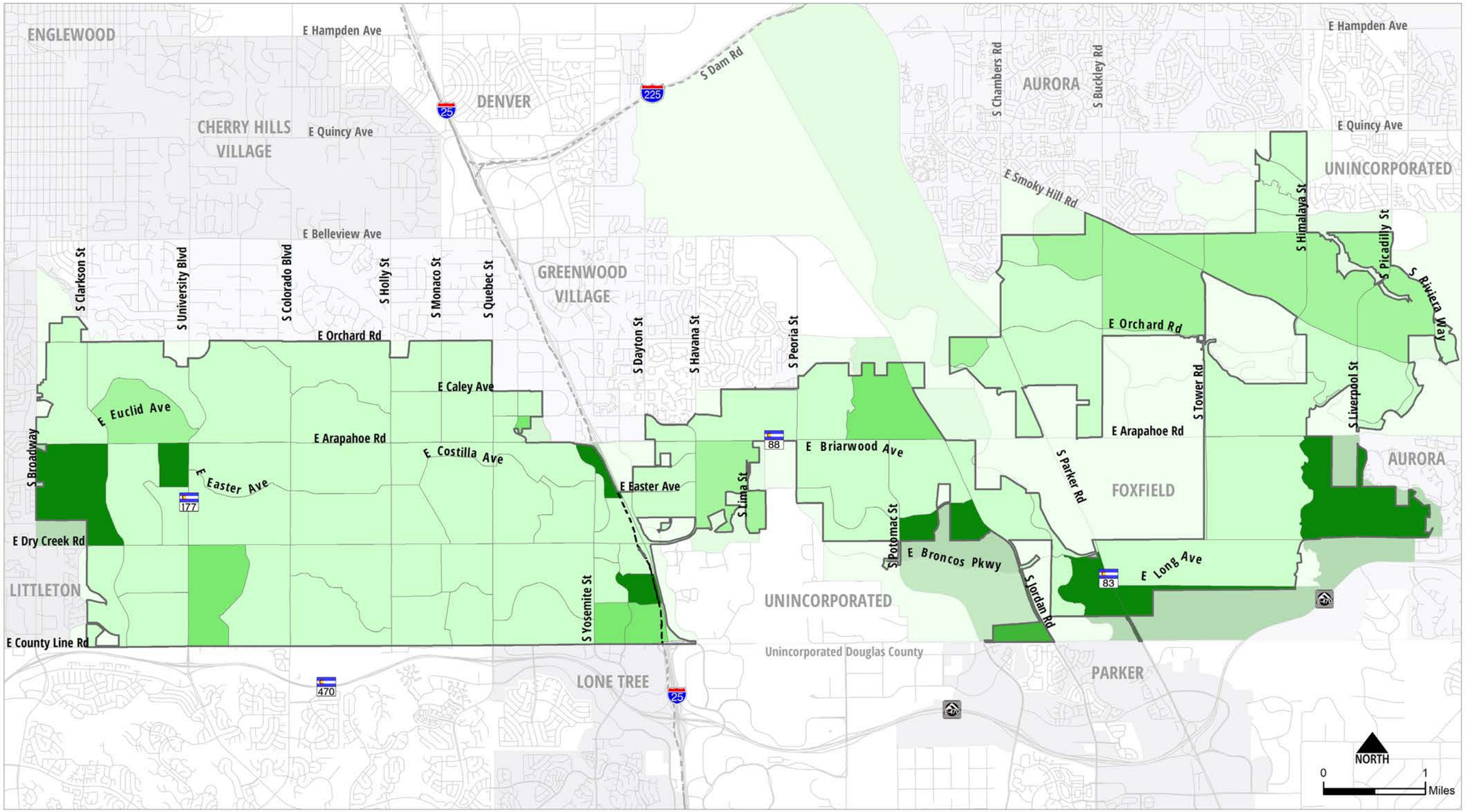
Household

It is estimated that there are approximately 40,400 households within Centennial. **Figure 1** shows household growth estimates over the next twenty years, displaying the highest rate of growth in small pockets on the eastern and western most parts of the City.

Employment

Currently, there are approximately 68,500 jobs in the City. This number is expected to grow substantially over the next two decades as shown in **Figure 2**. The central area between Yosemite Street and Jordan Road is expected to see the highest growth in employment.

FIGURE 1: HOUSEHOLD GROWTH ESTIMATES (2020 - 2040)



DRCOG Focus Model 2.2, 2019

Legend

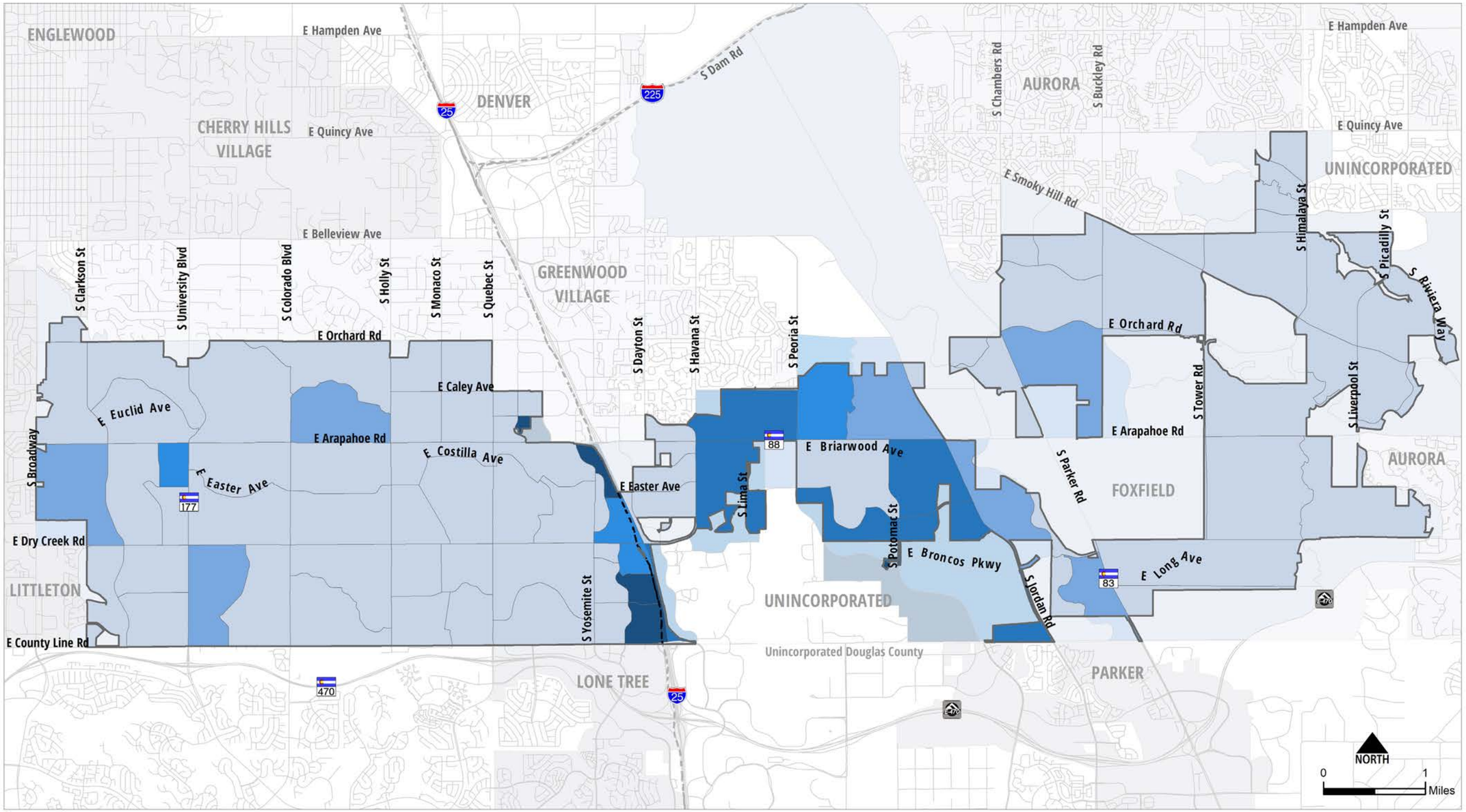
2020 - 2040 Household Growth Estimates

- 0 - 30 Households
- 31 - 100 Households
- 101 - 300 Households
- 301 - 600 Households
- 601 - 1,243 Households

- Roads
- Light Rail
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

FIGURE 2: EMPLOYMENT GROWTH ESTIMATES (2020 - 2040)



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2020 - 2040 Employment Growth Estimates

- 0 - 100 Jobs
- 101 - 500 Jobs
- 501 - 1,000 Jobs
- 1,001 - 2,500 Jobs
- 2,501 - 5,940 Jobs

- Roads
- Light Rail
- Centennial City Boundary

DRCOG Focus Model 2.2, 2019

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DEMOGRAPHICS

Planning for a transportation system that is able to accommodate and address the needs of community members requires that historically and frequently underserved communities are given particular attention to develop an inclusive and universally designed multimodal network.

Older Adults

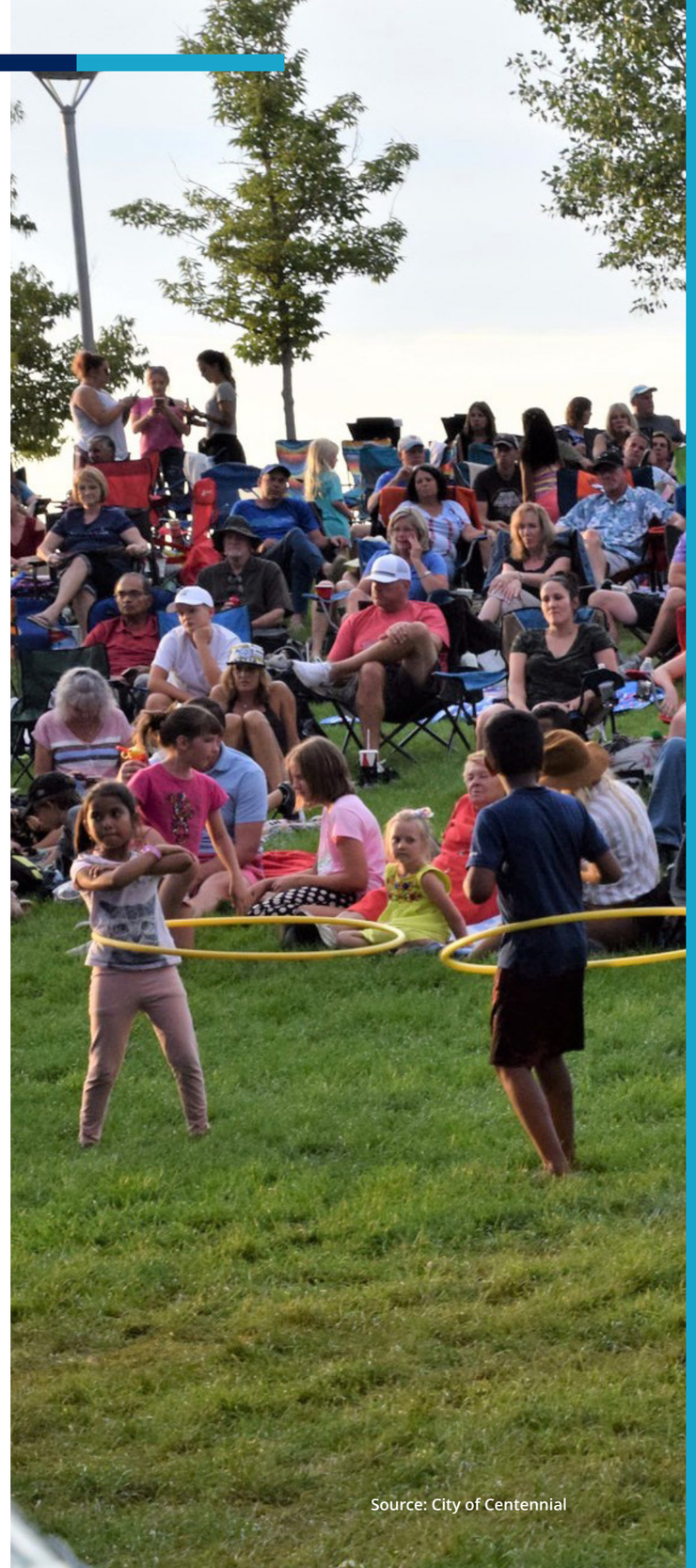
Figure 3 shows a higher number of older adults reside in western Centennial. Overall, a little over 15 percent of Centennial residents are over the age of 65. The number of older adults living in the City is gradually increasing every year and these changing demographic compositions should be considered for transportation planning improvements to have a transportation system that is able to meet the needs of older adults. Focusing improvements and increased accessibility for mobility options to support more aging in place and active older adult lifestyles will be important in the update to the TMP. Relatedly, access to and convenience of different modes beyond single-occupancy vehicles will be considered alongside other important built environment factors, like existing infrastructure and proximity to essential services and recreational destinations.

Children

Children (people under the age of 18) make up approximately 23 percent of the City's population, as shown in **Figure 4**. Ensuring children and young adults have access to safe modes of transportation to reach schools, community facilities, and social/recreational destinations is vital in developing a transportation system that values and prioritizes the safety and well-being of their youngest residents. Recently, the City has been focusing on the walkability of different school routes. This work, along with other data collection efforts and analysis will inform recommendations put forth to improve safety and accessibility of different modes, such as bicycling, walking, and riding transit. Encouraging children to bike and walk for transportation at a young age can result in life-long users of active transportation modes.

People with Disabilities

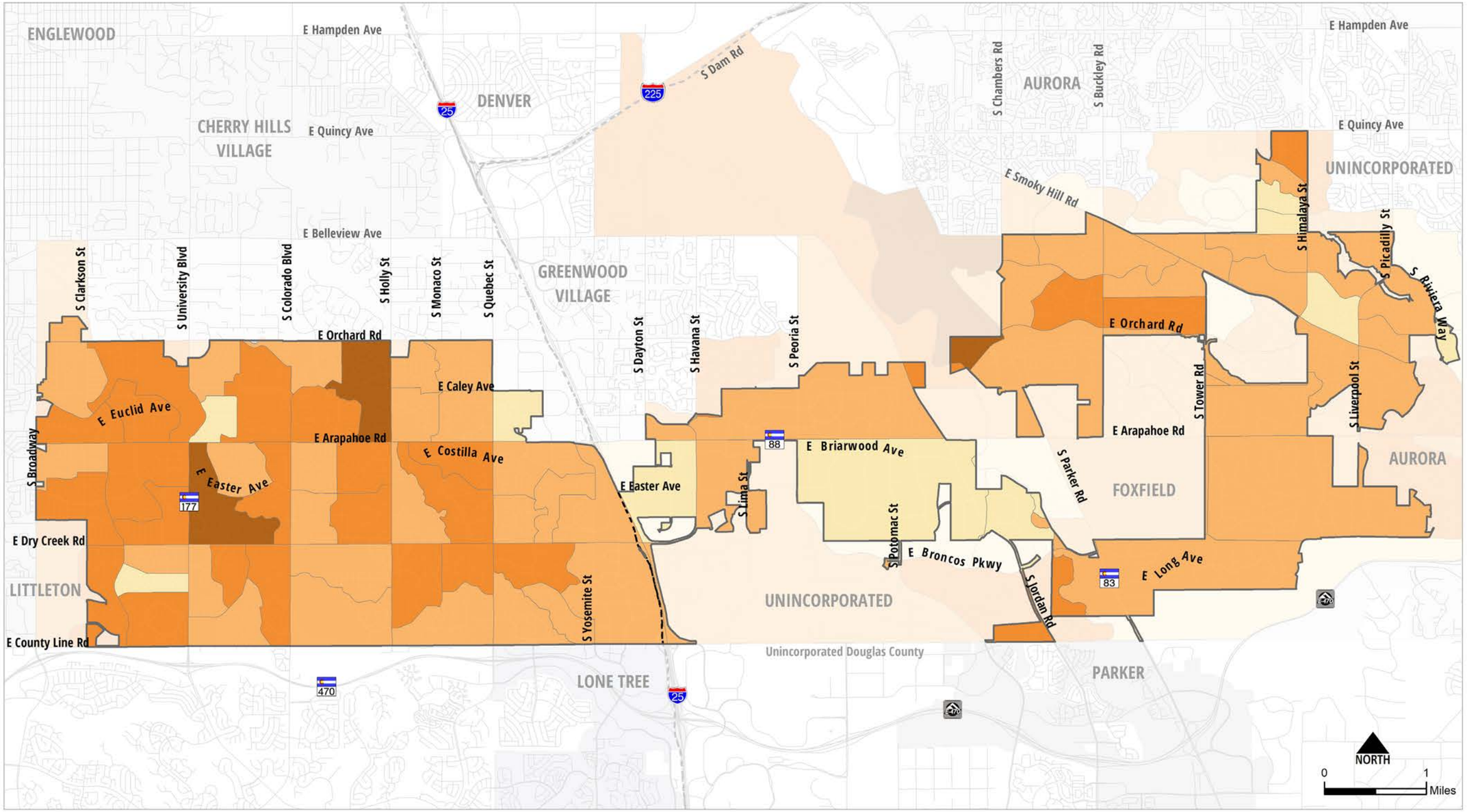
Approximately 7 percent of Centennial's population are people with disabilities, represented in **Figure 5**. Disabilities can include a vision or hearing impairment, a cognitive or learning disability, or mobility or physical impairment, or other type of disability. When disaggregating these data by age range, almost 22 percent of people with disabilities in the City are older adults. Creating an equitable and inclusive transportation system means that all modes of transportation and the infrastructure that connects these networks can be accessed by people who may rely on walking (who may also use mobility devices), bicycling, and/or transit as their primary mode of transportation.



Source: City of Centennial

Source: City of Centennial

FIGURE 3: OLDER ADULTS (AGE 65 AND OVER)



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Population Age 65 & Older

- 0 - 100 People
- 100 - 250 People
- 250 - 500 People
- Greater Than 500 People
- Roads
- Light Rail
- Centennial City Boundary

Population 65 or older extracted by block groups from the U.S. Census Bureau/ American Community Survey 2015-2019, Table B01001 - Age

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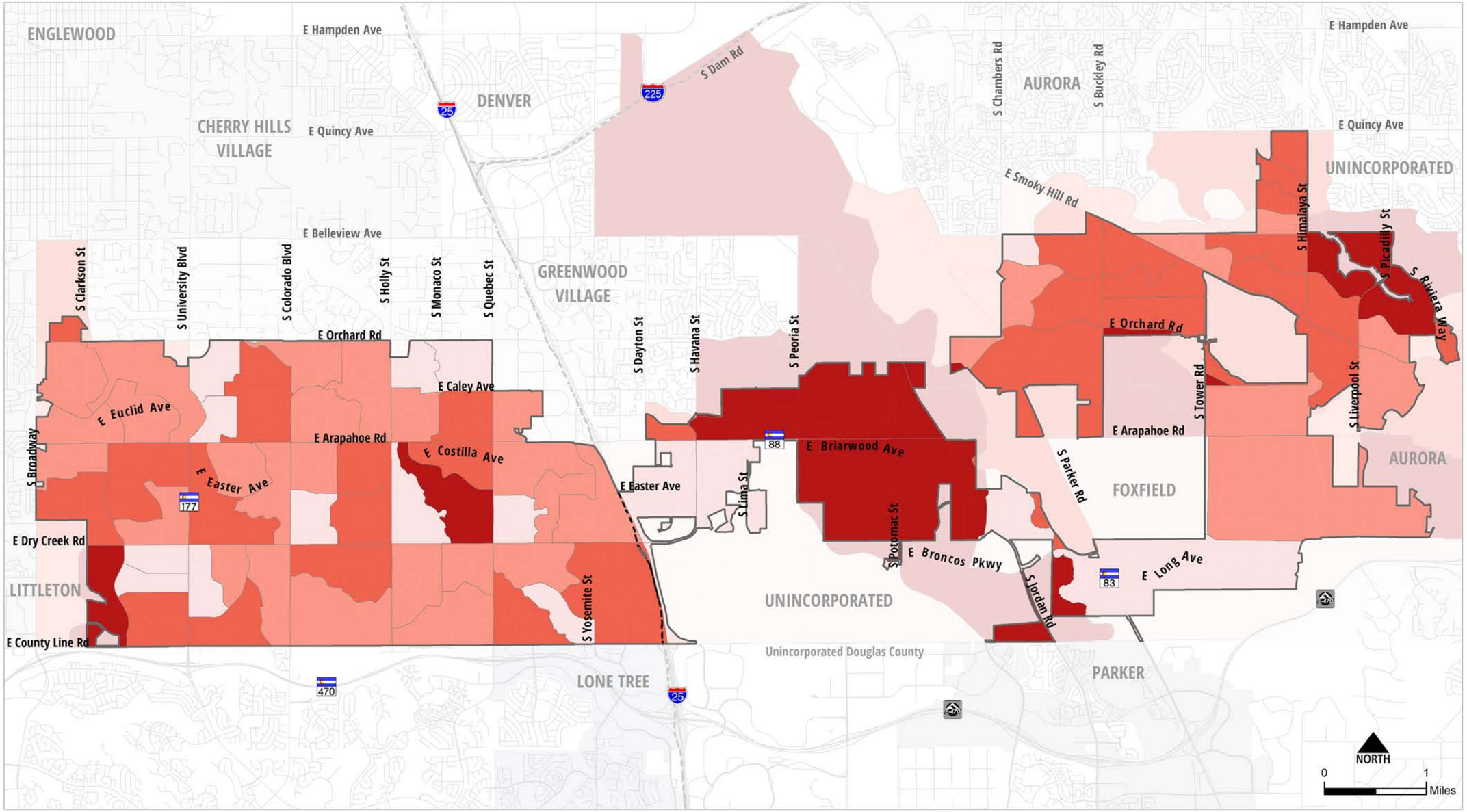
FIGURE 4: CHILDREN (UNDER 18)



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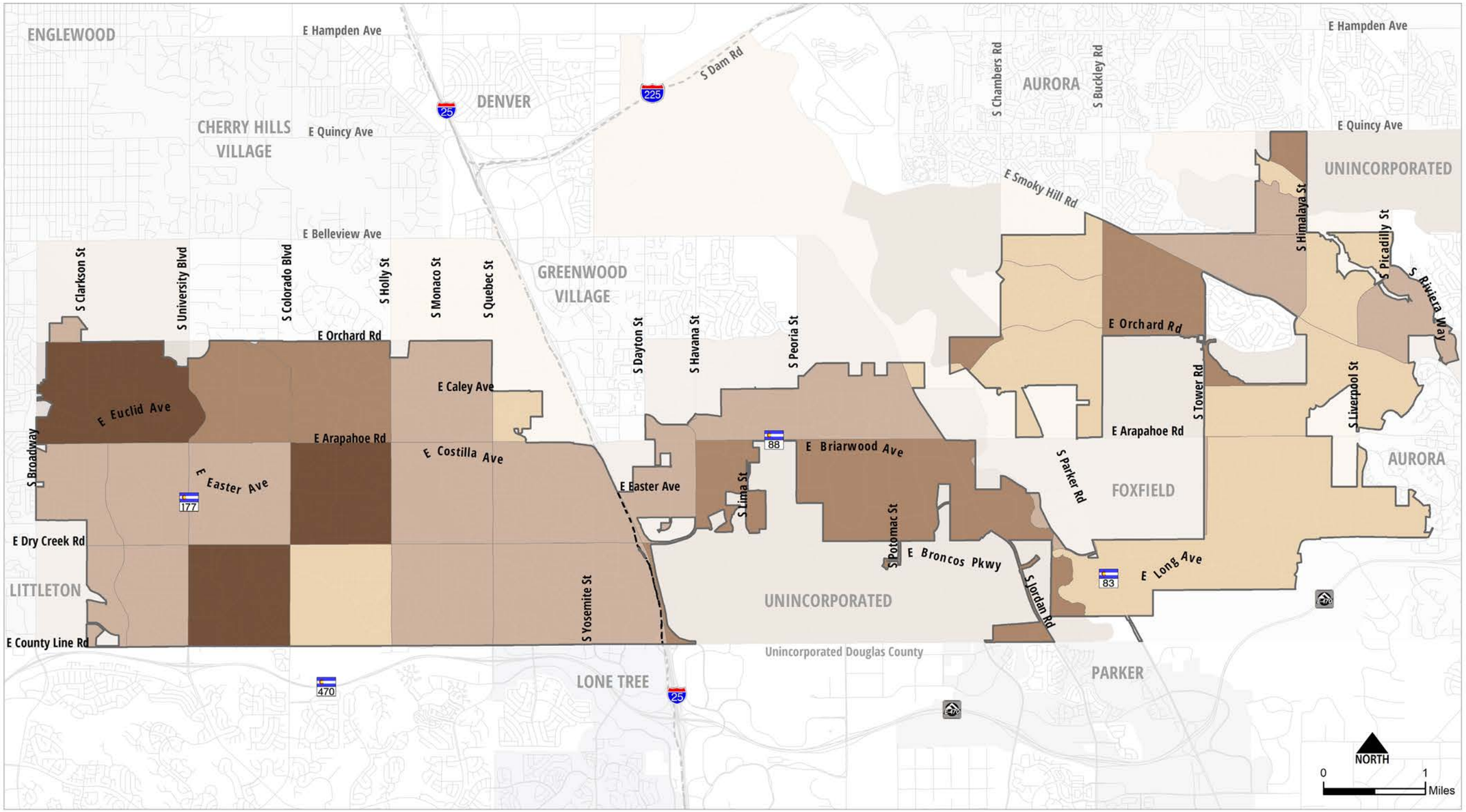
Population Under Age 18

- 0 - 200 People
- 200 - 400 People
- 400 - 600 People
- Greater Than 600 People
- Roads
- Light Rail
- Centennial City Boundary

Population under age 18 extracted by block groups from the U.S. Census Bureau/ American Community Survey 2015-2019, Table B01001 - Age

Centennial TRANSPORTATION MASTER PLAN

FIGURE 5: PEOPLE WITH DISABILITIES



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Population With Disabilities

- 0 - 200 People
- 200 - 350 People
- 350 - 500 People
- Greater Than 500 People
- Roads
- Light Rail
- Centennial City Boundary

Population with disabilities extracted by census tracks from the U.S. Census Bureau/ American Community Survey 2015-2019, Table B18101-Disabilities

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Communities of Color

Communities of Color, which includes people who identify as Black and/or African American, non-white Hispanic/Latinx, Asian, American Indian or Native Alaskan, Native Hawaiian or Pacific Islander, or mixed race have historically been underserved by transportation systems, and have often been overburdened with the negative consequences of higher pollution and emissions, inadequate and lacking infrastructure, and disinvestment. Creating an inclusive transportation system offers convenient and affordable access to housing, jobs, medical services, education, grocery shopping, and social/recreational activities. Approximately 20 percent of the City's population identifies as a Person of Color. To ensure the City plans for equitable mobility access, it is important that there is an understanding of the different communities that are a part of the City of Centennial **(Figure 6)**.

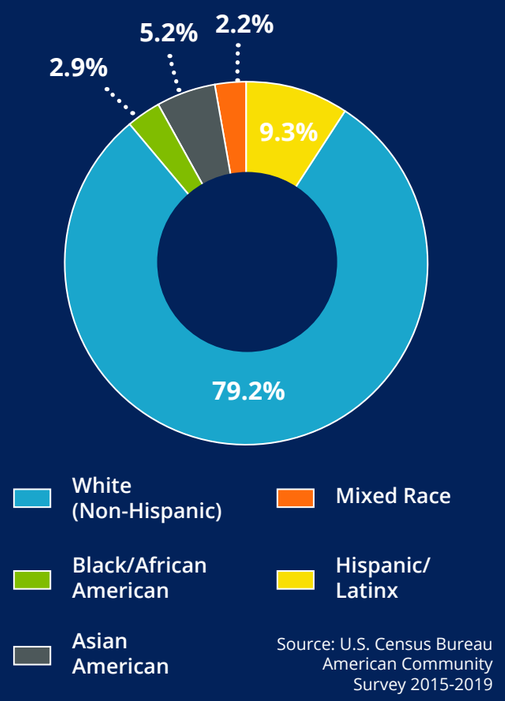
Low-Income Populations

Low-income populations include people whose median household income is below the federal poverty guidelines, shown in **Figure 7**. Understanding the transportation gaps and needs that exist for some community members who may not have the same reliable access to a vehicle, disposable income, or flexibility in time is vital for developing a more efficient and responsive multimodal network. Ensuring walking, bicycling, and riding transit can be done reliably, affordably, and safely is necessary to better meet the needs of every community member in the City.

Zero-Vehicle Households

Vehicle access across Centennial is more prevalent on the eastern half of the City, with more zero-vehicle households shown on the western side, as seen in **Figure 8**. Information about vehicle accessibility provides an understanding of how people are travelling within the City and across the Denver Metro Region, and can provide a more complete picture of where other modes of transportation may be used at higher frequencies. Zero-vehicle households can encompass a variety of communities, including households that cannot afford a vehicle, choose to not have a vehicle, or have a disability which makes driving inaccessible.

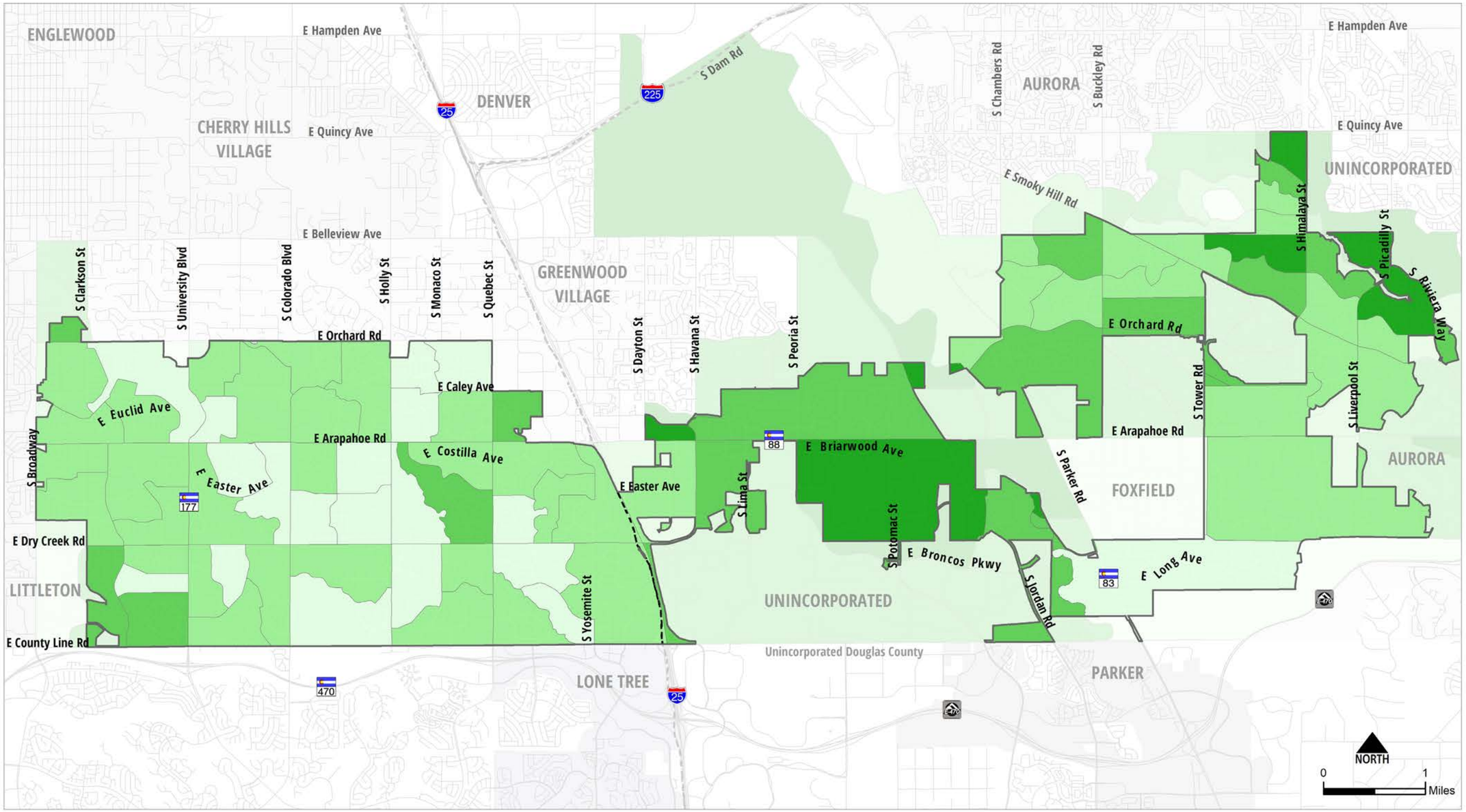
RACE & ETHNICITY IN CENTENNIAL



Source: U.S. Census Bureau American Community Survey 2015-2019

Source: City of Centennial

FIGURE 6: COMMUNITIES OF COLOR



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Minority Population

- 0 - 200 People
- 200 - 500 People
- 500 - 1,000 People
- Greater Than 1,000 People
- Roads
- Light Rail
- Centennial City Boundary

Minority Population extracted by block groups from the U.S. Census Bureau/ American Community Survey 2015-2019, Table B03002 Hispanic/Latino Origin by Race.

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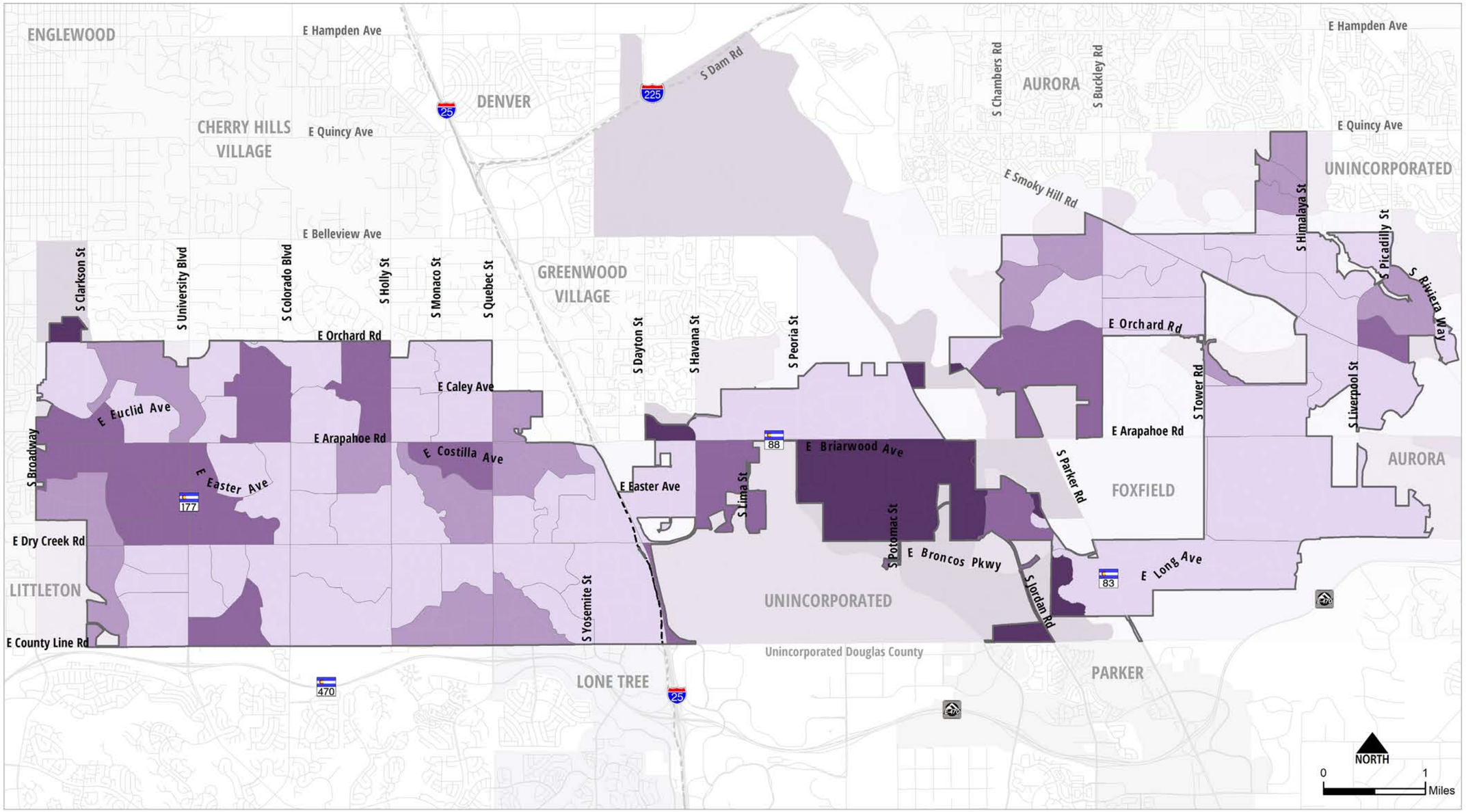
FIGURE 7: LOW-INCOME HOUSEHOLDS



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Low Income Households

- 0 - 20 Households
- 20 - 40 Households
- 40 - 80 Households
- Greater Than 80 Households
- Roads
- Light Rail
- Centennial City Boundary

Low Income Households extracted by block groups from the U.S. Census Bureau/ American Community Survey 2015-2019, Table B17017 - Poverty Status

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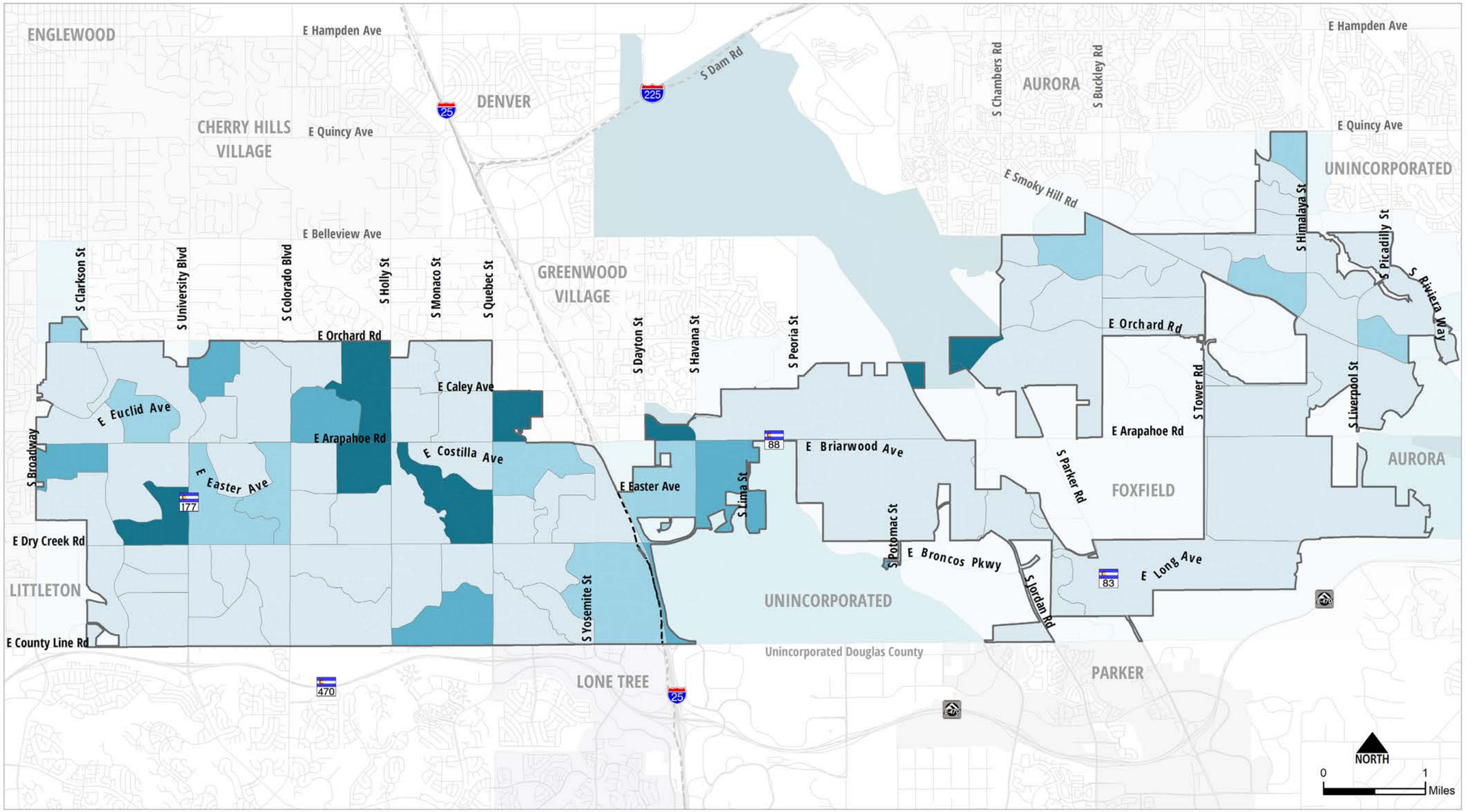
FIGURE 8: ZERO VEHICLE HOUSEHOLDS



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Zero Vehicle Households

- 0 - 10 Households
- 10 - 25 Households
- 25 - 50 Households
- Greater Than 50 Households
- Roads
- Light Rail
- Centennial City Boundary

Zero Vehicle Households extracted by block groups from the U.S. Census Bureau/ American Community Survey 2015-2019, Table B25044 - Vehicles Available

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TRAVEL PATTERNS

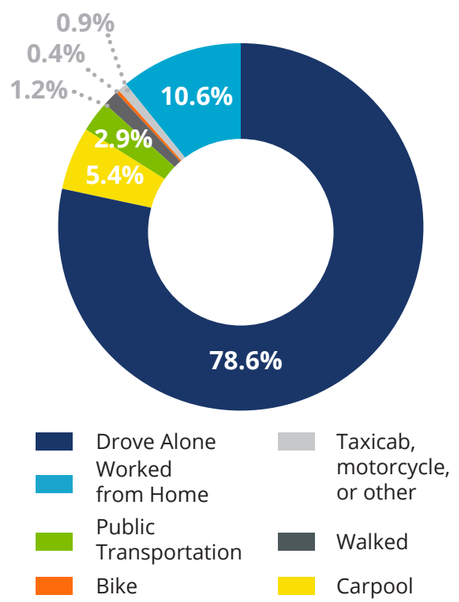
COMMUTING TRAVEL PATTERNS

The experience community members have with the transportation system in their cities, particularly in how they commute to work, the travel time spent getting to and from destinations, and general travel patterns tell an important story about the choices, convenience, and accessibility of different mobility options. This section provides an overview of how Centennial residents commute to work, to which cities, and the daily changes in the city's population from people commuting in for work.

Transportation to Work (Mode Share)

Almost 80 percent of Centennial residents drive to work alone. A substantial number (10.6 percent) of community members work from home. This number has significantly increased over the past year due to COVID-19 restrictions and is likely to remain higher than the 2019 numbers in the coming years as employers allow more flexibility in remote working. Other transportation options such as carpooling (5.4 percent) and public transportation (2.9 percent) had much smaller utilization rates. Walking and other means, like bicycling, were the least used modes for getting to work.

How Centennial Residents Commute to Work



Although, the data represented here only highlights mode share rates for getting to work and not other destinations, it does provide a snapshot of how residents evaluate and make decisions about accessibility and convenience of transportation in their city. Through the development of the TMP, a mode share goal for Centennial will be considered as a citywide target to shift single-occupancy vehicle trips to more bike, walk, and transit trips. This shift in mode use supports a number of other citywide goals outlined in Centennial NEXT, like developing a sustainable multimodal transportation system and a greater focus on public health and wellness.


Source: City of Centennial

Travel Time

Commuting to work is shaped by the level of traffic and congestion in and around cities. For Centennial residents, the average commute time is a little over 26 minutes. Although Centennial's average commute time aligns with the statewide average, there are aspects of the commute that could be improved for residents. The TMP will identify transportation recommendations that will help improve the efficiency and reliability of the street network and transportation options.

Mean Travel Time to Work

Approximately
26 minutes

Commuter Inflow/Outflow

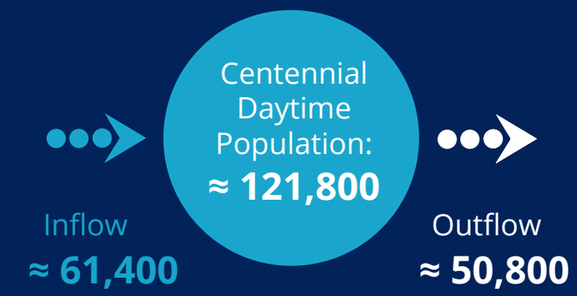
Inflow and outflow travel patterns show that Centennial experiences a population increase on a daily basis as a result of people commuting to the City for work. In total, almost 51,000 people commute out of Centennial, and over 61,000 people commute in from neighboring communities. This results in a daily population increase of approximately 10,700 people. Consistent traffic patterns such as these, and the growth seen in both population and employment in the City demonstrate the need for thoughtful planning and investment and regional collaboration to ensure transportation infrastructure and different mobility options meet current and future needs.

Where do Centennial Residents Commute?

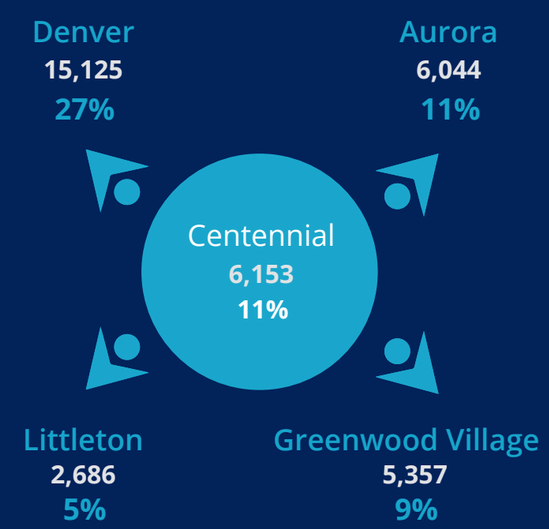
Centennial residents work across the Denver Metro Region. Almost 30 percent work in Denver, while a substantial number work in the neighboring cities of Aurora (11 percent) and Greenwood Village (9 percent). Approximately 11 percent of residents stay in Centennial for work. Littleton rounds out the employment destinations with 5 percent of residents commuting there for work.

Commuter Inflow/Outflow Daily Population Change

Total Population: **111,100**
Daily Increase: ≈ **10,700**



Top Locations Centennial Residents Commute to:



Source: U.S. Census Bureau; American Community Survey, 2019 5-Year Estimates, Longitudinal-Employer Household Dynamics Program

SHORT-TRIP ANALYSIS

Using the DRCOG regional travel model, a short-trip analysis was completed to identify corridors with a high portion of short-distance trips in 2020. While these short trips are likely currently being made by automobile, it is useful to identify corridors with a lot of short trips because these represent trips that could potentially be converted to bicycle or pedestrian trips. **Figures 9 and 10** show the short trips in 2020 and 2040, respectively. The three color bandwidths reflecting trips less than 1 mile (yellow), trips 1 to 2 miles in length (orange), and trips 2 to 3 miles in length (red). The wider the band, the more short-distance trips occur along the corridors.

The short-trip analysis results can be overlaid with the map of the existing and future bicycle and pedestrian network to identify areas to add or improve facilities to accommodate current and new biking and walking trips. For example, Yosemite Street and sections of Arapahoe Road, Dry Creek Road, and University Boulevard have a high number of short-distance trips. While many of these arterials may have sidewalks they also have constraints such as long street crossings distance and close proximity to high vehicle volumes and travel speeds that results in an uncomfortable walking or bicycling environment.

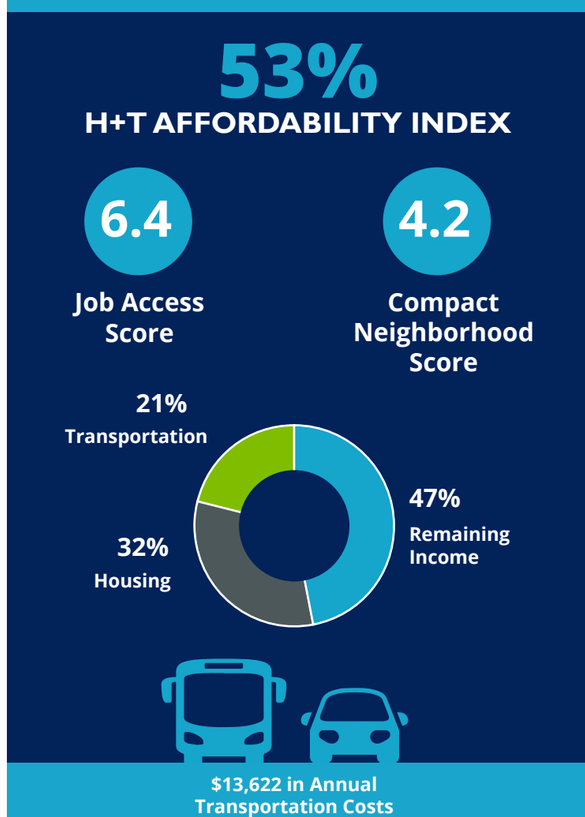
HOUSING & TRANSPORTATION (H+T) AFFORDABILITY INDEX

The Housing and Transportation (H+T) Affordability Index presents information regarding the often overlooked expenditures that come with driving and owning a vehicle or utilizing public transportation. This information helps provide a clearer picture for how housing and transportation interact and ultimately impact the affordability of a community. It is important to consider how different parts of the built environment influence the livability of a place to inform recommendations for developing a more affordable and accessible multimodal transportation system for the City of Centennial.

The H+T Index measure defines affordability as both housing and transportation costs totaling no more than 45 percent of household income. Centennial residents, on average, spend 32 percent of their household income on housing and 21 percent of their household income on transportation. Combined the H+T index is 53 percent, almost 10 percent higher than what is considered affordable by the Center for Neighborhood Technology (CNT). Owning a personal vehicle is the single biggest transportation cost factor for households, followed by insurance and repairs. Location efficient neighborhoods that are compact, mixed use communities with a balance of housing, density of jobs, and stores, as well as easy access to transit, generally have lower household transportation costs. In such situations, residents may access daily needs with fewer cars and car trips, potentially reducing household transportation costs. Typically, the annual transportation cost for a Centennial resident is $13,622.

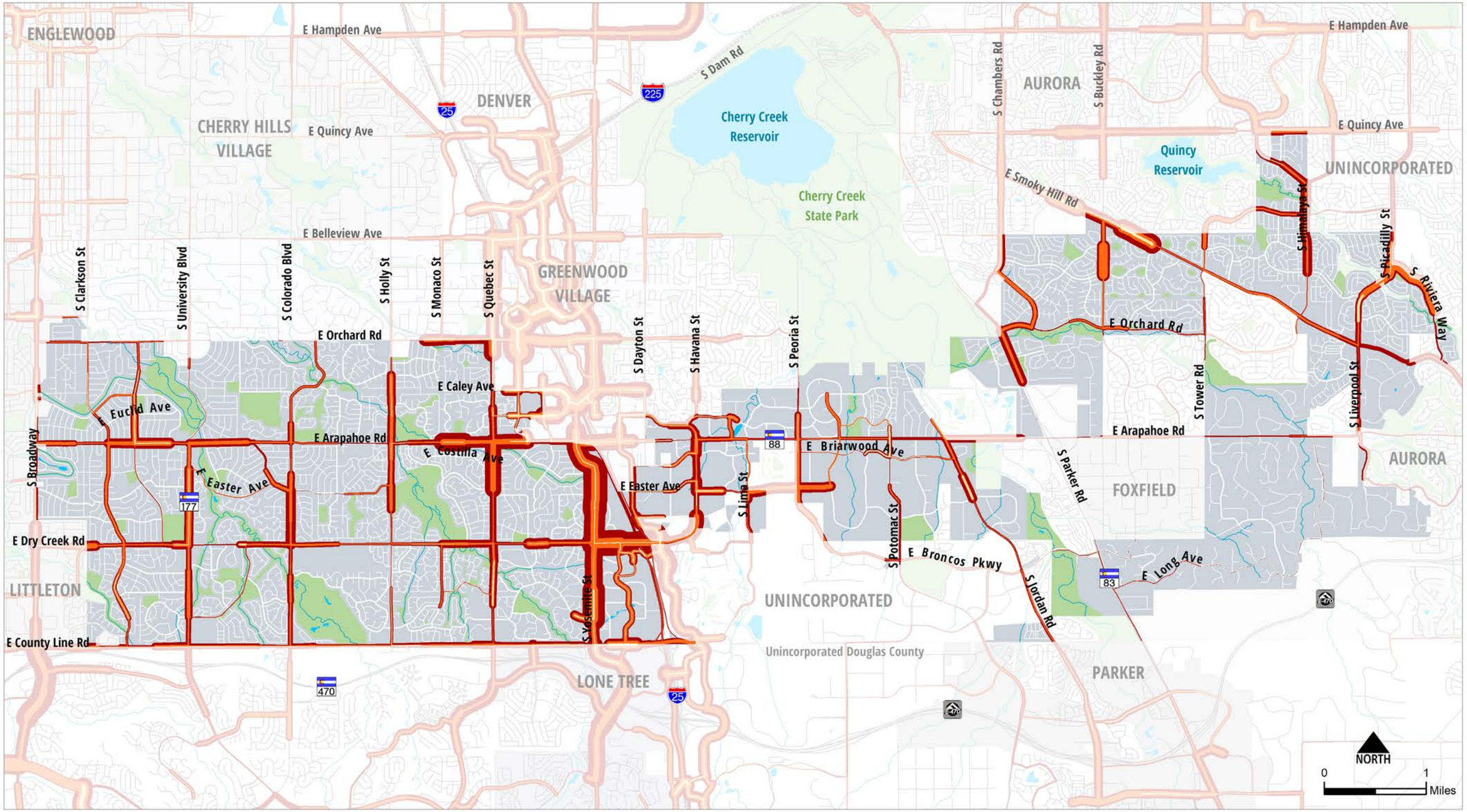
Another valuable set of metrics provided by the CNT is neighborhood characteristic scores which provide scores measuring accessibility to a variety of jobs and the average density of neighborhoods. These scores are provided on a scale from 1 to 10. Currently, the City has a recorded job access score of 6.4 and a compact neighborhood score of 4.2, indicating a need for greater investment in a more compact built environment that can offer accessible connections to multimodal transportation options.


Source: City of Centennial




Source: City of Centennial

FIGURE 9: SHORT TRIP ANALYSIS (2020)



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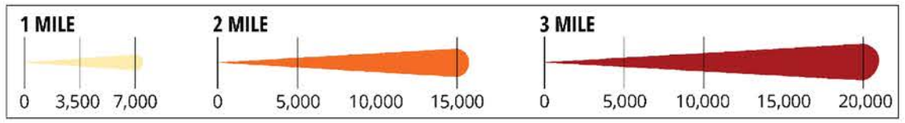


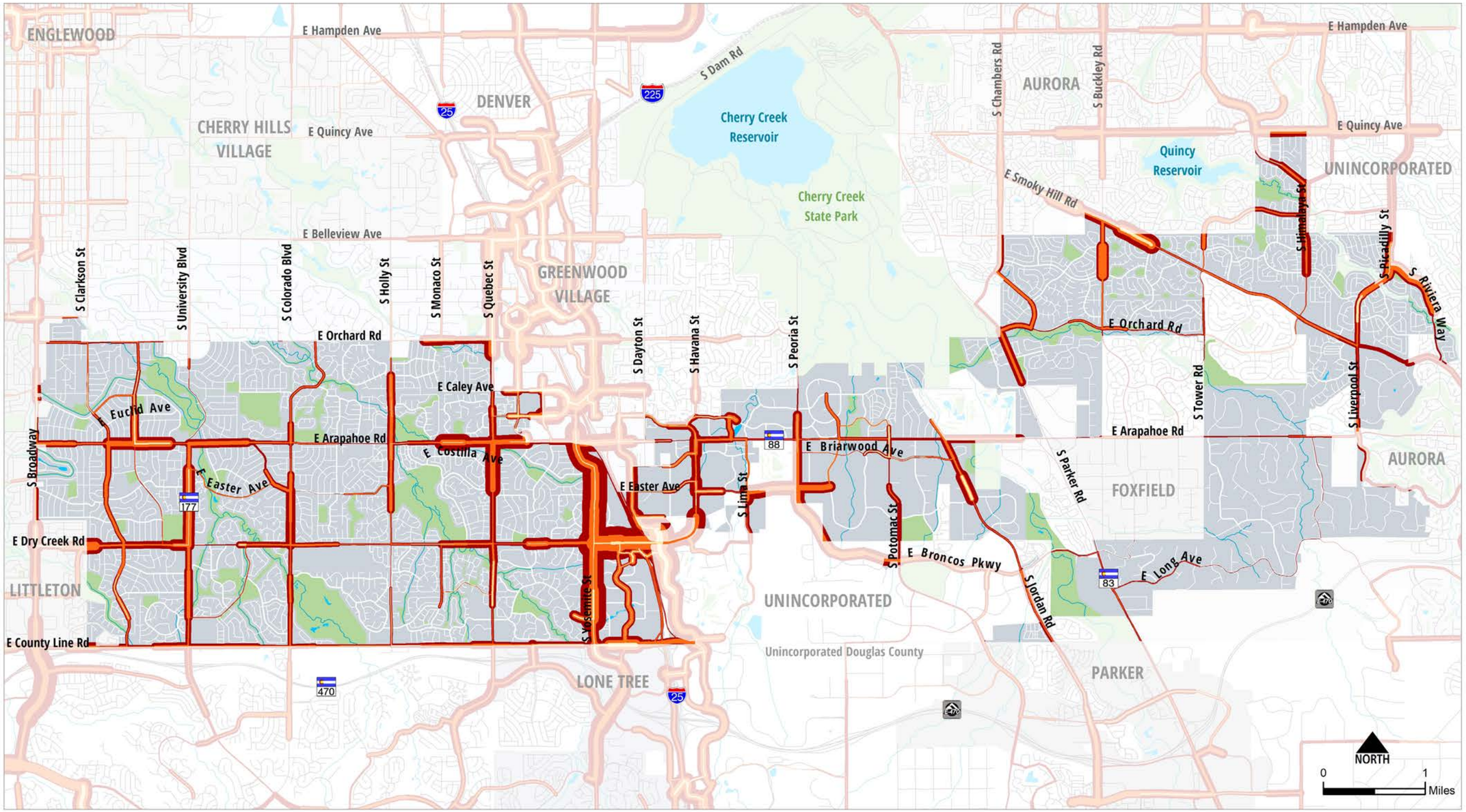
Note:
Daily volume of short distance trips

Source: DRCOG Focus Model 2.2, February 2019

Note:
This figure shows the short trip volumes for the DRCOG model base year, however, it is based on pre-COVID-19 travel patterns

Centennial TRANSPORTATION MASTER PLAN

FIGURE 10: SHORT TRIP ANALYSIS (2040)



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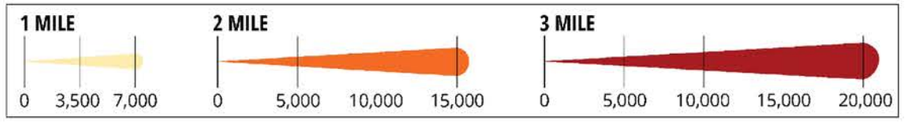


Note:
Daily volume of short distance trips

Source: DRCOG Focus Model 2.2, February 2019

Note:
This figure shows the short trip volumes for the DRCOG model base year, however, it is based on pre-COVID-19 travel patterns

Centennial TRANSPORTATION MASTER PLAN

SAFETY

CRASH HISTORY

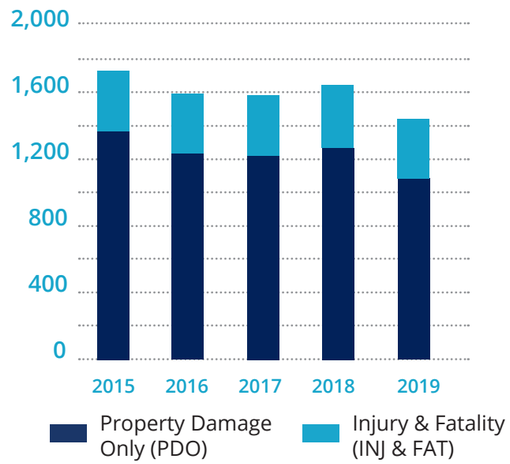
Roadway safety can be characterized by the ability of a person to travel along a roadway network freely without injury or death. It is usually assessed through a qualitative and quantitative evaluation of crash histories by mode of travel. This evaluation sheds light on crucial information such as locations with an overrepresentation of crashes, crash types and crash severity issues. Under programs such as Vision Zero, severity concerns involving vulnerable users are of special concern and are often subject to formal safety evaluations such as Road Safety Audits (RSA) after the initial identifications of areas of concern.

Crash patterns in the COVID-19 period have changed significantly as compared to the pre-COVID period with a marked increase in crash severity despite a decrease in the total number of crashes. In order to eliminate such crash data outliers, only the pre-COVID crash data (2015 through 2019) are presented in this section.

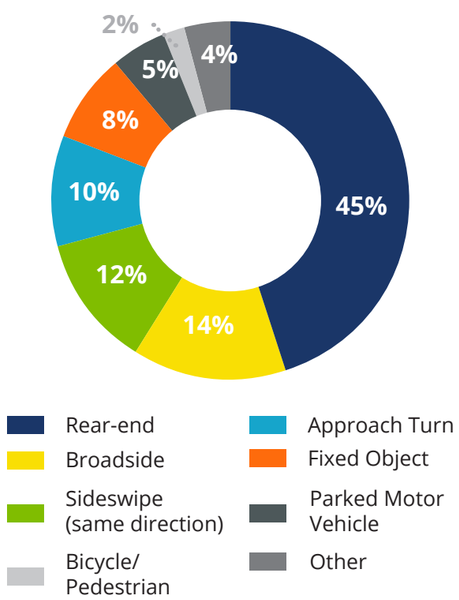
During the five-year period of 2015 through 2019, there were 8,019 crashes reported on streets and highways including I-25 within the City of Centennial. The yearly distribution and severity of crashes are presented in the charts here. Over the five year period, there is a general downward trend in total crashes.

The crash patterns suggest a high number of congestion related crashes, such as Rear End and Sideswipe crashes. Broadside and Approach Turn crashes constitute a high percentage of crashes at intersections during both peak and off-peak periods. Vulnerable user crashes (bicycles and pedestrians) constitute two percent of the total crashes but 33% of the fatalities – as discussed later in this section.

CRASHES PER YEAR



CRASH TYPES

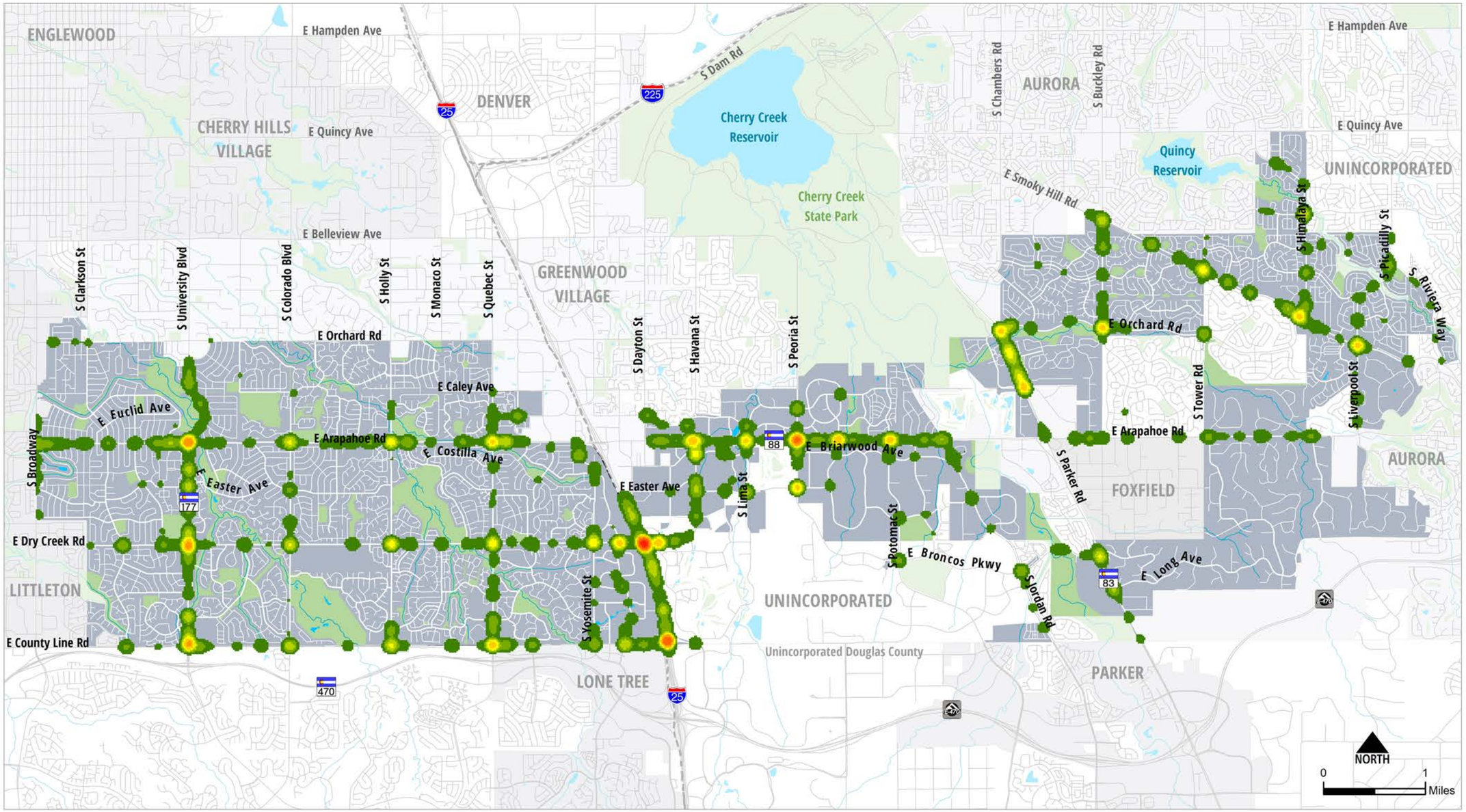


HIGH CRASH LOCATIONS

A Citywide crash picture is provided in **Figure 11**, the crash heat map. It provides insights into the corridors with safety issues and possible correlation with high-speed segments of major arterials. Intersections of concern, discussed later in this section, are also highlighted in this map.

Source: The Denver Post

FIGURE 11: HIGH CRASH LOCATIONS (2015 - 2019)



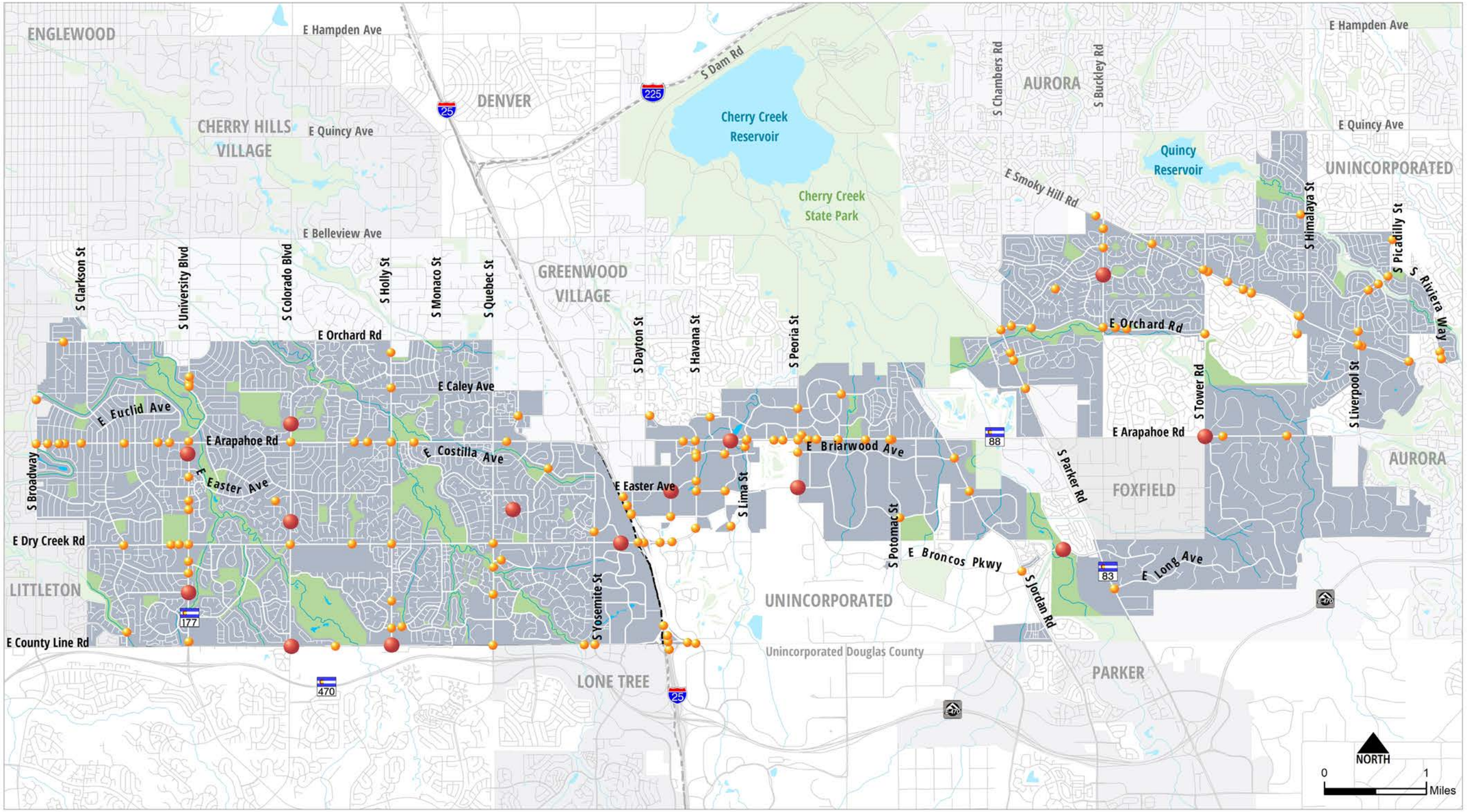
City Of Centennial, 2021

Legend

- Highest Crash Density
- Lowest Crash Density
- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

FIGURE 12: HIGH INJURY & FATAL CRASHES



City Of Centennial, 2021

Legend

High Injury Crashes (2015 - 2019)

- Fatal (14)
- Severe Injury (178)

- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

HIGH CRASH LOCATIONS

Table 1 provides a further breakdown of these crashes with an emphasis on severity, specifically, Killed and Severely Injured (KSI) crashes. The spatial distribution of these KSI (total) crashes is shown in **Figure 12** while the distribution of vulnerable user crashes (bicycles and pedestrians) is shown in **Figure 14** later in this section.

Elimination of KSI crashes is a priority for Vision Zero, which is a strategy and safety approach that seeks to eliminate all traffic fatalities and severe injuries through a safe systems approach, while increasing safe, healthy, equitable mobility for all road users.

TABLE 1: Property Damage Only, Injury, & Killed or Seriously Injured Crashes by Year (2015-2019)

Year	Property Damage Only	Injured	Serious Injury	Fatality	Total Crashes
2015	1,372	339	27	1	1,739
2016	1,243	315	31	4	1,593
2017	1,228	324	32	3	1,587
2018	1,275	333	35	3	1,646
2019	1,088	325	40	1	1,454
Total	6,206	1,636	165	12	8,019

TABLE 2: Top 15 Crash Locations

Rank	Intersection	Crashes per Year	PDO	INJ	FAT	Total	LOSS (Total)	LOSS (Severe)
1	Arapahoe Road & Peoria Street*	27.4	97	40	0	137	III	IV
2	County Line Road & University Blvd*	23	89	26	0	115	III	III
3	Arapahoe Road & University Blvd*	22.6	97	16	0	113	III	II
4	Dry Creek Road & University Blvd*	22.2	94	17	0	111	III	II
5	Arapahoe Road & Havana Street*	16.6	64	19	0	83	II	II
6	Arapahoe Road & Revere Parkway*	16.2	60	21	0	81	II	II
7	Smoky Hill Road & Himalaya Street	15.6	52	26	0	78	III	III
8	Arapahoe Road & Potomac Street*	14.2	55	16	0	71	II	II
9	Easter Avenue & Peoria Street	14	49	20	1	70	IV	III
10	Orchard Road & Buckley Road	14	48	22	0	70	II	II
11	County Line Road & Quebec Street	13.8	59	10	0	69	II	I
12	Arapahoe Road & Lima Street*	13.6	55	13	0	68	II	II
13	Arapahoe Road & Quebec Street	11.8	45	14	0	59	II	II
14	Smoky Hill Road & Tower Road	11.2	41	15	0	56	II	II
15	Orchard Road & Parker Road*	11.4	44	13	0	57	I	I

* These intersections are on State Highways owned and operated by CDOT

LEVEL OF SERVICE SAFETY (LOSS) reflects a roadway segment or intersection's safety performance compared to similar segments or intersections.

LOSS I: indicates a low potential for crash reduction

LOSS II: indicates a low to moderate potential for crash reduction

LOSS III: indicates a moderate to high potential for crash reduction

LOSS IV: indicates a high potential for crash reduction

The top fifteen intersections based on crash frequency and the LOSS are Tabulated in **Table 2** with locations shown in **Figure 13**. This figure along with the City-wide crash heat map (**Figure 11**) show the crash issues as combination of the following:

1.
Most crashes occur at intersections, many of which are along Arapahoe Road.

2.
Segment safety issues as illustrated by the heat map. Roadway segments along Arapahoe Road, Smoky Hill Road, and University Boulevard show clustering of crashes associated with congestion, and high posted speeds.

3.
There are KSI crash clusters on Arapahoe Road east of University Boulevard and in the central segment (between Havana Street and Potomac Street). There are additional clusters along the Dry Creek Road to Havana Street segment and the University Boulevard segment near Dry Creek Road.

4.
Vulnerable user (pedestrian and bicycle) crashes are mostly high severity crashes with over 80 percent of such crashes resulting in injuries or fatalities.

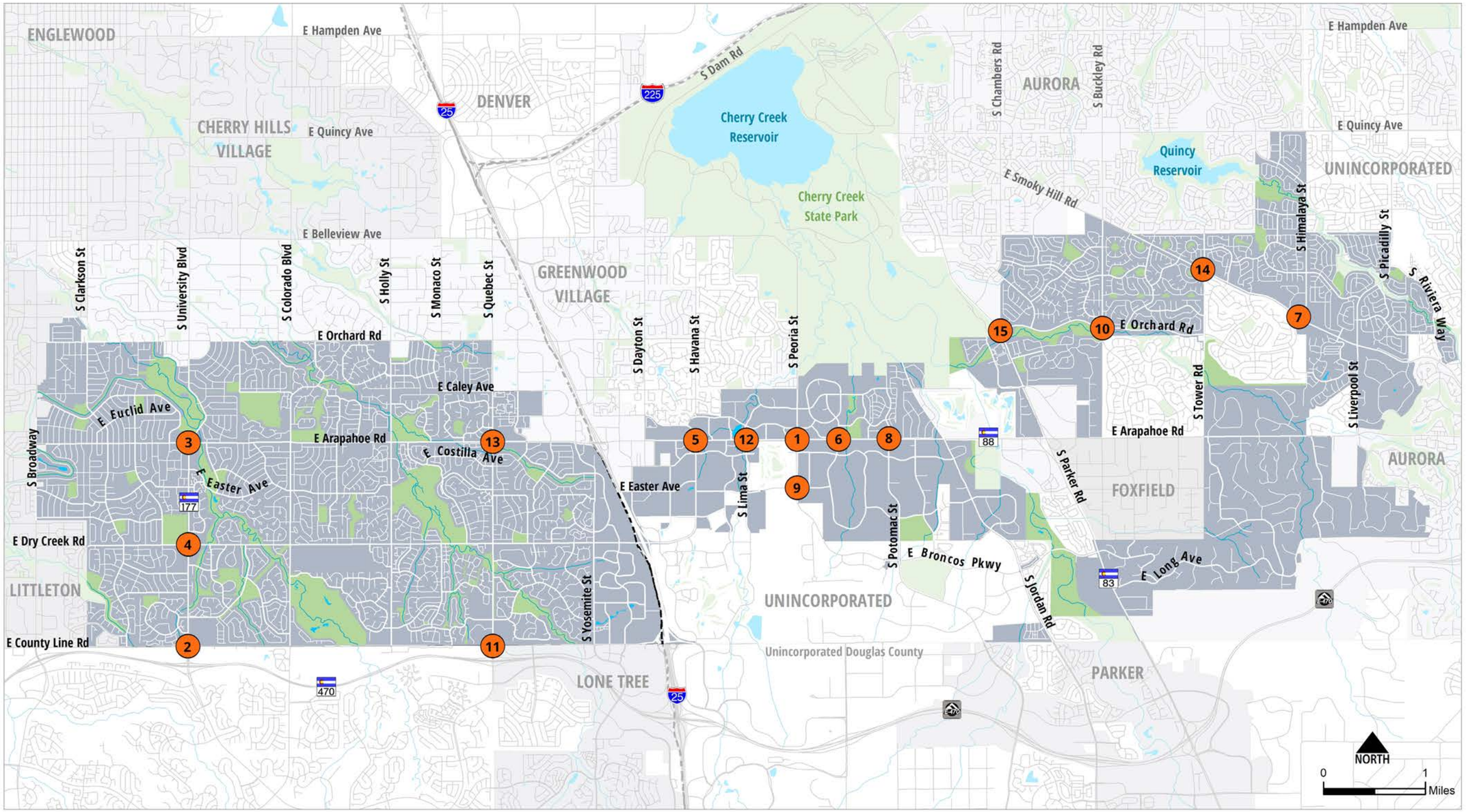
BICYCLE & PEDESTRIAN INVOLVED CRASHES

There were 163 vulnerable user crashes between 2015 and 2019, of which 128 were injury and 4 were fatal crashes (**Figure 14** shows the location of these crashes). The number of crashes and severity are divided nearly equally between bicyclists and pedestrians through the City. It should be noted that even though bicycle and pedestrians constitute only 2% of the total crashes, they are 33% of the fatalities in the City. This is a familiar nationwide trend that has led to the emphasis on vulnerable user safety.

Bicycle and pedestrian trips are expected to increase as more people chose active transportation options in the region. This growth emphasizes the critical importance in assessing safety issues for vulnerable users and the application of strategies such as crosswalk visibility, lighting, pedestrian refuge, reduced crossing distances (where possible) and reduced speeds in support of safe, comfortable, and connected facilities.

Source: City of Centennial

FIGURE 13: TOP 15 INTERSECTION CRASH LOCATIONS



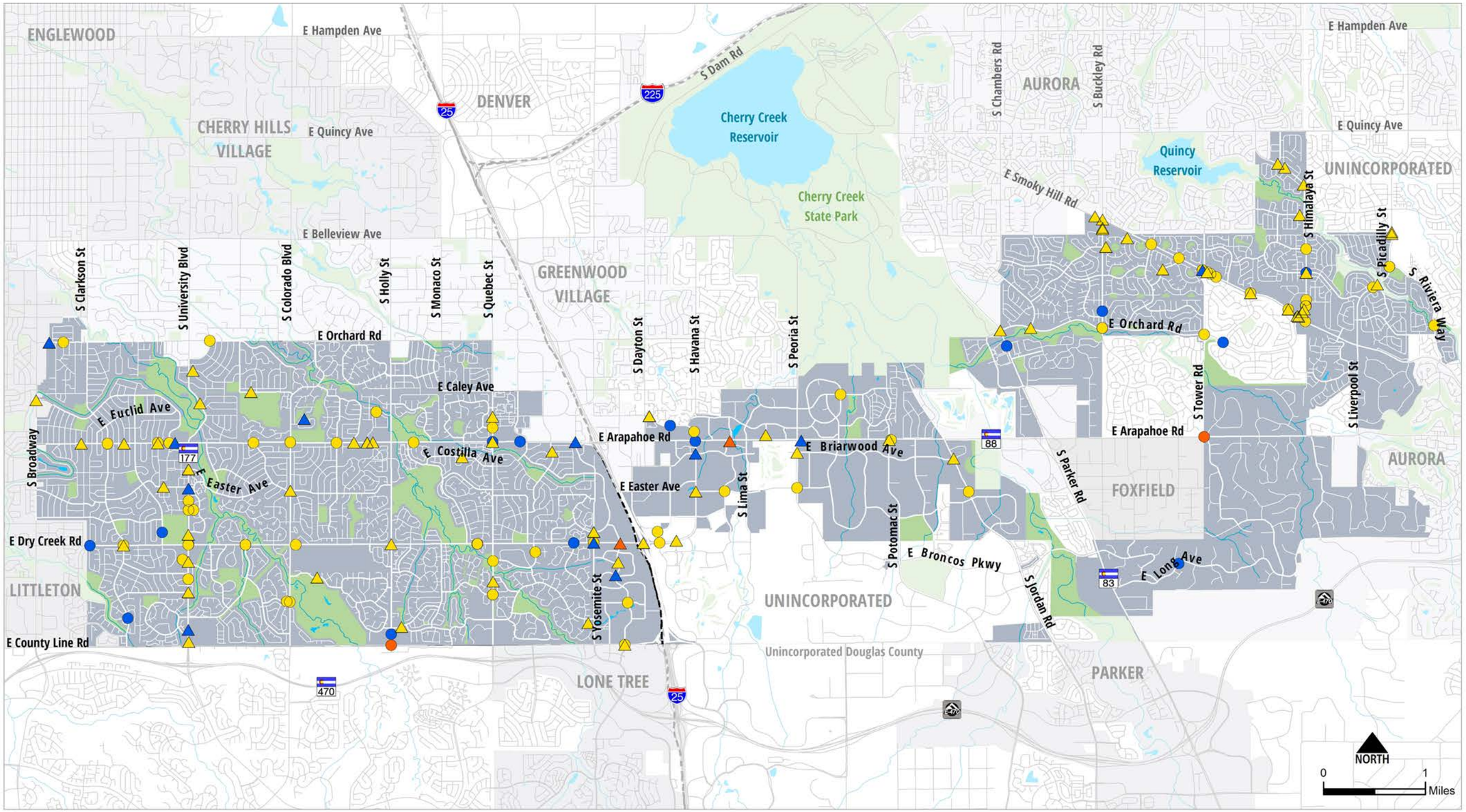
City Of Centennial, 2021

Legend

- # Intersection Rank
- Top 15 Intersection Crash Locations
- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

FIGURE 14: VULNERABLE USER CRASHES (2015-2019)



City Of Centennial, 2021

Legend

Bicycle Crashes (2015 - 2019)
- Fatalities (2)
- Injury (61)
- Property Damage (17)

Pedestrian Crashes (2015 - 2019)
- Fatalities (2)
- Injury (68)
- Property Damage (13)

- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

ROADWAY NETWORK

CURRENT CONDITIONS

Functional Classification

Streets generally provide two important functions: access and mobility. Each street type is specifically designed to operate with certain characteristics based on the adjacent land uses, level of continuity, transportation modes served, and proximity and connections to other facilities. The functional classification of a street describes these characteristics and reflects its role in the street network and relationship with adjacent land use. A street's classification also forms the basis for access management (e.g., driveways), corridor right-of-way preservation, multimodal facility types, and street design guidelines and standards. The functional classification is typically viewed as the desired condition for a street. Centennial's streets are classified as local, collector (minor and major), arterial (minor and major) arterial, or interstate, as shown on **Figure 15**. The number of through travel lanes on each street segment is also shown.

Local Streets

Local Streets serve the highest level of access, providing direct driveway access to adjacent properties and carrying traffic to collector streets. Local streets may be limited in continuity and may be designed to discourage through traffic. Local streets are usually the most comfortable streets for walking and biking as the amount of interaction with vehicular traffic is minimal and travel speeds are low.

Collectors

Collectors gather traffic from local streets and connect travelers to the arterial network. Minor and Major Collectors provide a balance between access and mobility and retain continuity through neighborhoods. Collector streets can play a critical role in increasing connectivity of the bicycle and pedestrian network. Collector streets are usually comfortable streets for walking and biking as the amount of vehicular traffic is minimal and traffic speeds are moderate.

Minor Arterials

Minor Arterials provide for trips of moderate length and offer connectivity to streets of higher functional classification. Minor arterials provide intra-community continuity and a higher degree of land access than major arterials. With higher posted speed limits and a greater amount of vehicular traffic, minor arterials can present more stressful environments for bicyclists and pedestrians. Colorado Boulevard and Orchard Road are examples of minor arterials providing intra-community continuity in Centennial.

Major Arterials

Major Arterials provide a high degree of mobility and serve corridor movements with longer trip lengths. While adjoining land uses can be served directly, access to adjacent properties is limited to emphasize mobility of vehicles. Some of the major arterials in Centennial are owned and operated by the Colorado Department of Transportation (CDOT) including University Boulevard (CO 177), Arapahoe Road east of I-25 (CO 88) and Parker Road (CO 83). Examples of major arterials with regional connectivity that are owned and operated by the City of Centennial include Dry Creek Road, and Smoky Hill Road.

Interstates

Interstates have the highest level of mobility, with the goal of providing unimpeded high-speed regional and interstate connections and are under the jurisdiction of the CDOT. I-25 is a limited access divided highway that links major urban areas and extends through the middle of Centennial.

VISION ZERO

DRCOG, in partnership with jurisdictions, agencies, and advocates, is developing a regional Vision Zero Action Plan to create a shared regional vision, implementable action plan, and strategies needed to move the region toward zero deaths and serious injuries. Centennial is one of a number of agencies throughout the region participating on the Vision Zero Stakeholder Committee, to help inform the development of a plan that will:

- Reduce and eventually eliminate fatalities and serious injuries in the Denver region
- Support DRCOG's safety performance measures and targets
- Increase awareness of Vision Zero to influence safer behaviors on streets
- Provide tools and strategies to local jurisdictions and other stakeholders to encourage safety in planning and design of the regional transportation system

Vision Zero is a safety approach with the core principle that "it can never be acceptable that people are killed or seriously injured when moving within the road transport system." Vision Zero switches safety from being solely the responsibility of street users to a shared responsibility of system designers and street users. It is inevitable that street users will make mistakes, so streets should be designed to ensure these mistakes do not result in severe injuries or fatalities (Source: DRCOG).

DRCOG VISION ZERO NETWORK

The DRCOG's Taking Action on Regional Vision Zero identifies Regional High Injury Network and Critical Corridors with the highest density of killed and serious injury crash cases.

CRITICAL CORRIDORS

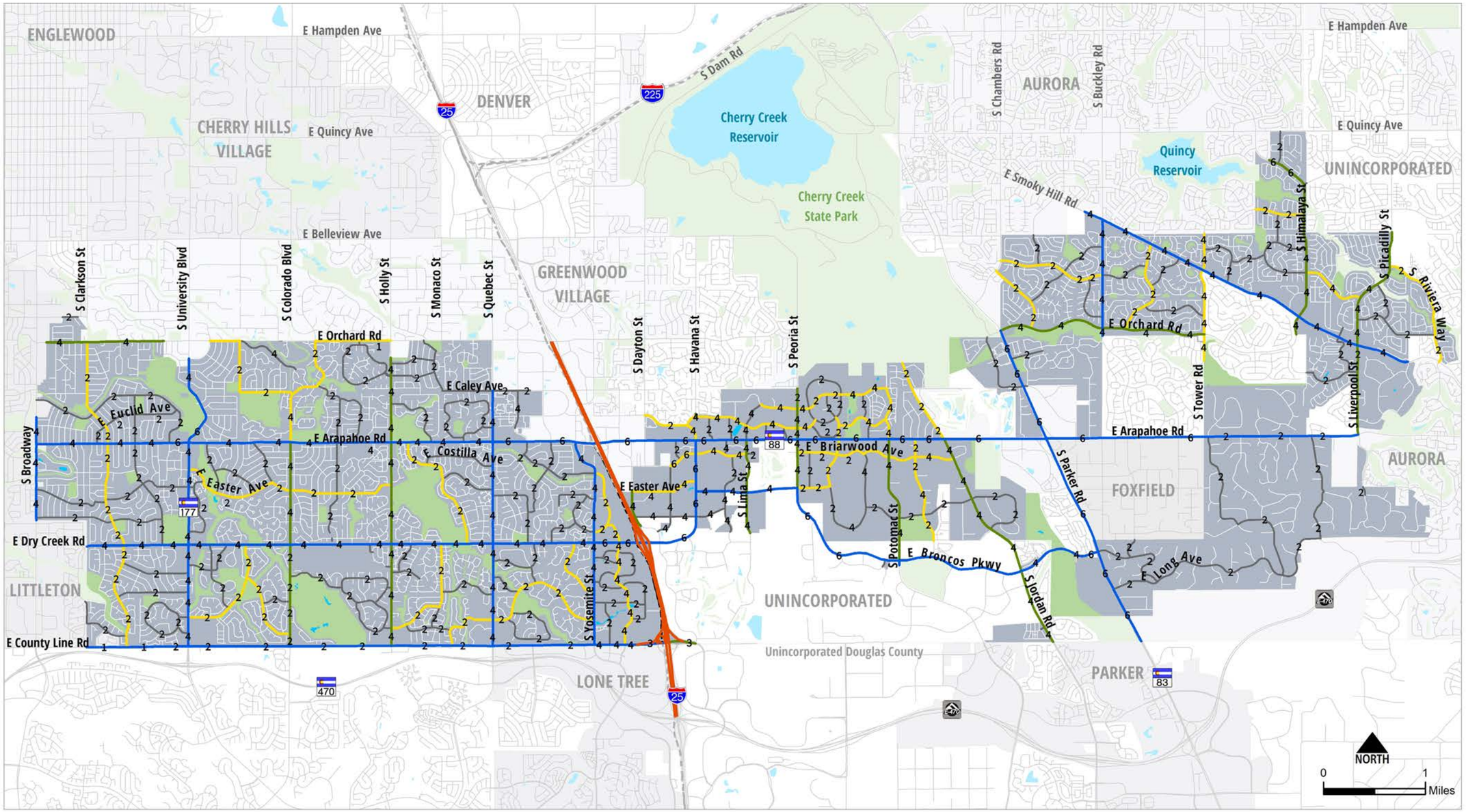
- County Line Rd: Quebec St to I-25
- I-25: County Line Rd to Dry Creek Rd

HIGH INJURY NETWORK

- Broadway
- University Blvd
- Quebec St: County Line Rd to Dry Creek Rd
- I-25
- Peoria: North of Arapahoe Rd
- Parker Rd
- Chambers Rd: North of Parker Rd
- Buckley Rd: North of Arapahoe Rd
- Smoky Hill Rd
- Himalaya St: North of Smoky Hill Rd
- Picadilly Rd: North of Smoky Hill Rd
- County Line Rd: University Blvd To Colorado Blvd
- Dry Creek Rd: University Blvd To Quebec St
- Arapahoe Rd: Broadway to Buckley Rd

Source: City of Centennial

FIGURE 15: STREET FUNCTIONAL CLASSIFICATION



Legend

City Of Centennial, 2021

- # Number Of Lanes
- Functional Road Classification
  - Interstate
  - Major Arterial
  - Minor Arterial
  - Major Collector
  - Minor Collector
  - Local
- Light Rail
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

Posted Speed Limits

Posted speed limits in Centennial generally range from 20 miles per hour (MPH) on some local streets to 55 MPH on state highway corridors like Arapahoe Road (east of I-25) and Parker Road, and 65 MPH along I-25, as shown on **Figure 16**. While some local and collector streets in Centennial are signed for 25 MPH, the default speed for local and collector streets is 30 PMH. Arterial streets are typically signed at 40 or 45 MPH. Access, adjacent land use, placement of crosswalks and other elements of street design can all impact speed limits along the street. It is important to design streets to balance the safety and mobility needs of all users. Higher speeds are associated with severe injury and fatal crashes, as described in the previous section.

Traffic Signals & ITS Infrastructure

Intelligent Transportation Systems (ITS) include a wide range of technology and applications that process and share information to improve travel safety, traffic management, ease congestion, minimize environmental impact, and increase mobility. ITS improves transportation systems operations and maintenance by helping to provide timely and accurate information to operators and allow remote and automated control. Robust and reliable traffic infrastructure (e.g., traffic signal controllers, detection, communications devices) equates to safer and more efficient field operations and better overall operations. ITS tools can also be used to provide more timely information to transportation users. **Figure 17** shows the locations of the 150 traffic signals in the City of Centennial, along with the City's ITS infrastructure. Of the 150 total traffic signals, 87 of them are owned and operated by the City of Centennial. Close to half of these are BlueTOAD ™ & CCTV signals. The remaining signals (26) are CCTV only or do not use BlueTOAD ™ or CCTV (20).

CLOSED-CIRCUIT TELEVISION (CCTV)

These devices monitor traffic flow through video surveillance, and can be used to obtain peak traffic level information.

BLUETOAD ™

These bluetooth devices provide real-time traffic data for travel-time forecasting, signal coordination, origin destination, and many other transportation data uses. BlueTOAD ™ readers are installed on traffic signals along arterial corridors.

SCHOOL ZONE BEACON

These devices are amber flashing lights active during school dropoff and pickup times and controlled in real time. These lights notify motorists of a school zone speed limit and that increased pedestrian activity can be expected. There are 32 school zone beacons in Centennial.

Daily Traffic Counts

The amount of traffic volume that can be moved along a street depends on several considerations, such as the number of lanes, the number of driveways, presence of left turns lanes, and when and how often traffic will be required to stop at stop signs or traffic signals. Current and future forecasted traffic volumes are important data used in the evaluation of current conditions as well as future corridor-wide and intersection improvements to ensure all modes of transportation can travel safely and efficiently to their destinations. The average daily traffic counts (typically in 2019) on major arterials, minor arterials, and select collector streets in Centennial are shown on **Figure 18**.

Existing Volume to Capacity Ratios

Volume to capacity ratio (V/C ratio) is a metric used to identify deficiencies in the existing street network by describing congestion on street segments. V/C ratios are calculated based on daily traffic volumes and street capacities and do not account for peak hour conditions or individual intersections. As the V/C ratio approaches 1.0, drivers experience congestion including queuing at intersections and longer delays. Streets with lower functional classifications and fewer lanes would be expected to carry fewer vehicles per day, whereas streets with higher functional classifications and a higher number of lanes would be expected to accommodate more vehicles. However, as the number of vehicles increases due to population and employment growth, many streets are starting to experience traffic congestion throughout the day because the number of vehicles is approaching the street's capacity. **Table 3** shows the per-lane capacities for different functional classifications. V/C ratios are important in evaluating current and future conditions along a street as well as implementation of improvements. The existing V/C ratios are shown on **Figure 19.**

TABLE 3: Typical Daily Street Capacities

Functional Classification	Vehicles (per through Lane)
Interstate	20,000
Expressway*	12,000
Major Arterial	7,500
Minor Arterial	6,500
Collector	5,000

*Expressway capacity used for Parker Road and Arapahoe Road between I-25 and Parker Road

Peak Period Mobility

With the advent of mobile technologies, Big Data aggregation by companies such as INRIX has emerged as one of the primary means of gaining an understanding of existing traffic conditions. INRIX data, which provides spatial and temporal traffic data services, was used to develop an understanding of traffic conditions through peak hour average travel speeds between major intersections. Data were compiled for all weekdays in 2019, as a typical commuting travel period before the effects of COVID-19. This year-long weekday average was compared to a typical summer weekday average in May 2019 as well, and no appreciable differences were noted. The morning (AM) peak period is defined as 7:00 AM to 9:00 AM and the PM peak period is 4:00 PM to 6:00 PM. The average travel speeds for these peak periods are shown as a percentage of the Free Flow Speed (FFS) in **Figure 20 and 21**. FFS was determined using INRIX data and in the context of INRIX data, is defined as the 85th percentile speed along a segment.

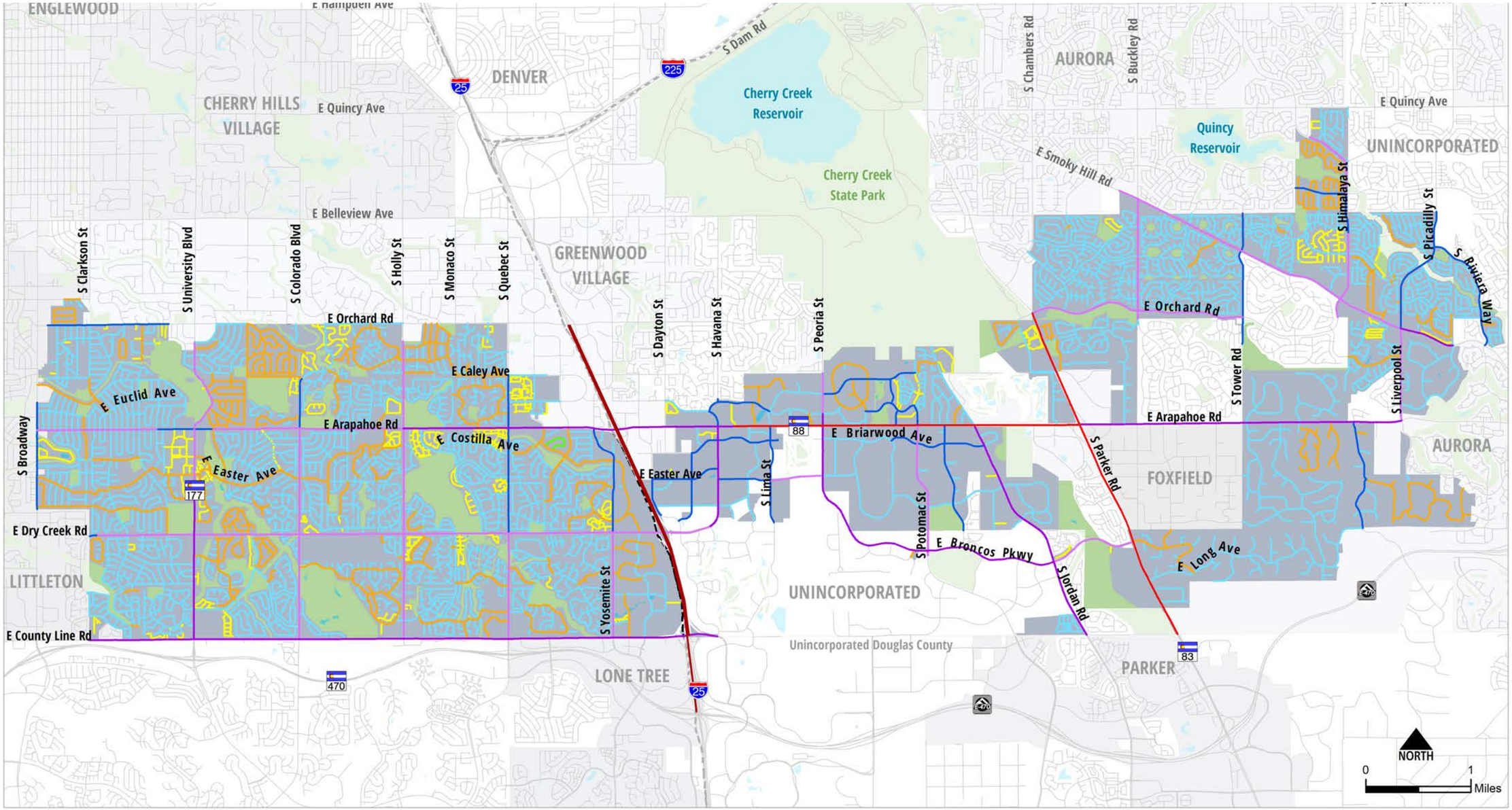
The PM peak period experiences higher levels of congestion than the AM peak. Additionally, the congestion is directional in nature and is dependent on the time of day. This is especially the case for major arterial corridors such as Parker Road, Arapahoe Road and County Line Road.

Bottlenecks are locations of significant breakdown of traffic flow as a result of a physical and/or operational conditions. INRIX data were used to assess bottleneck locations, which occur at multiple locations in the City notably along Arapahoe Road, County Line Road, Dry Creek Road, Broadway, Holly Street, Smoky Hill Road, Orchard Road and Quebec Street. The top five bottleneck locations in Centennial are listed in **Table 4**.

TABLE 4: Top 5 Bottleneck Locations

S. No	Bottleneck Head Location	Direction	Average Daily Duration
1	Arapahoe Road @ Jordan Road	Westbound	1 h 2 m
2	Smoky Hill Rd @ Buckley Rd	Southbound	56 m
3	Quebec St @ Dry Creek Rd	Southbound	37 m
4	Smoky Hill Rd @ Liverpool St/ Picadilly St	Southbound	35 m
5	Parker Rd @ Lewiston Way/E Fair Pl	Southbound	25 m

FIGURE 16: POSTED SPEED LIMITS



City Of Centennial, TomTom, Google, 2021

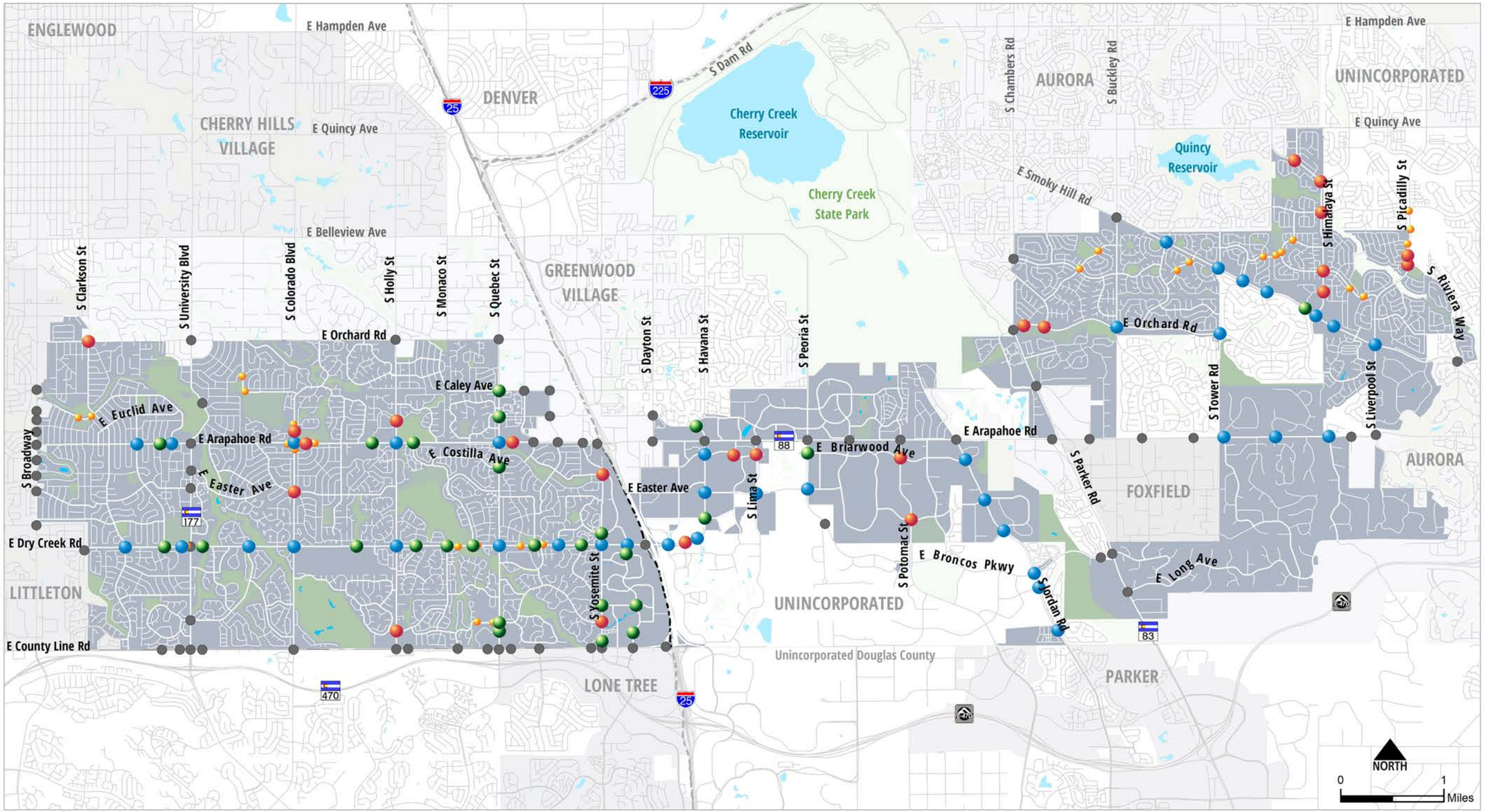
Legend

Posted Speed Limit

- 15 MPH
- 20 MPH
- 25 MPH
- 30 MPH
- 35 MPH
- 40 MPH
- 45 MPH
- 55 MPH
- 65 MPH
- Light Rail
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

FIGURE 17: TRAFFIC SIGNALS & ITS INFRASTRUCTURE



City Of Centennial, 2021

Legend

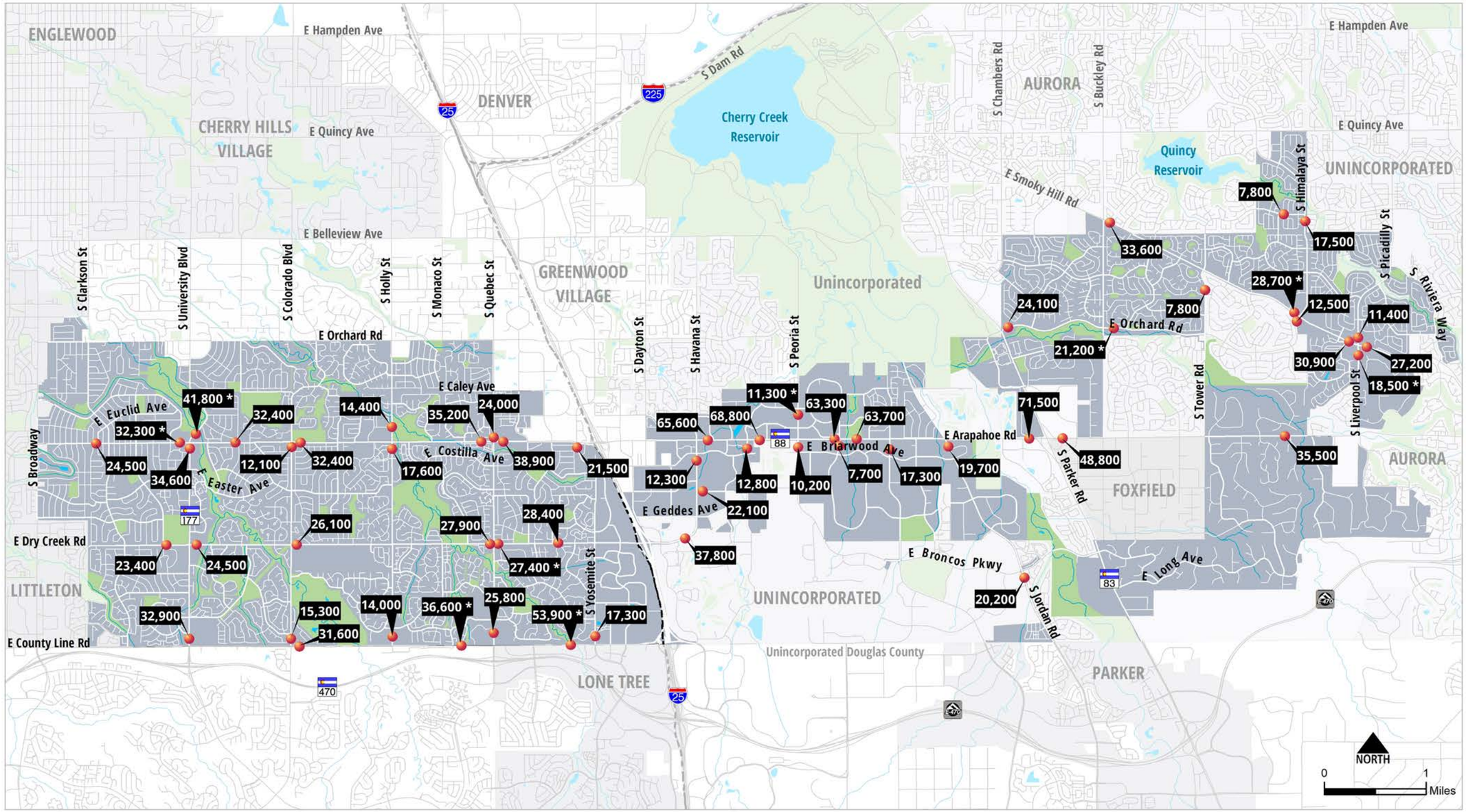
Centennial Traffic Signals
- BlueTOAD™/CCTV
- CCTV Only
- No BlueTOAD™/No CCTV
- School Beacons

- Non-Centennial Signals
- Roads
- Light Rail

- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

FIGURE 18: EXISTING DAILY TRAFFIC COUNTS



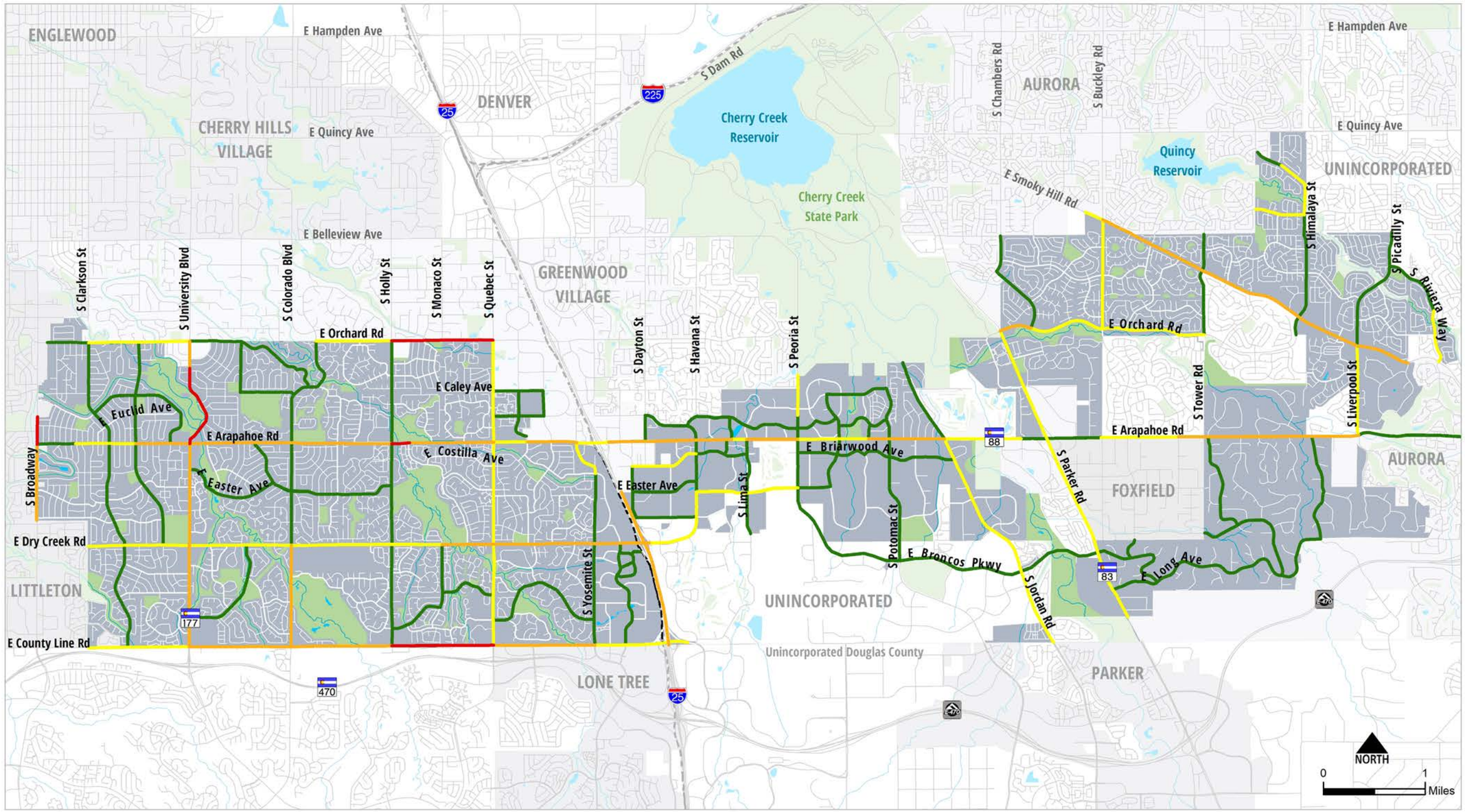
DRCOG, 2019 (Unless otherwise indicated (*) reflects a count from 2017/2018)

Legend

- XXXX Daily Traffic Volume
- Traffic Count Location
- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

FIGURE 19: EXISTING VOLUME/CAPACITY RATIOS



DRCOG, 2021

Legend

Existing Volume to Capacity Ratio

- Uncongested (V/C less than 0.7)
- Approaching Congested (V/C between 0.7 - 0.9)
- Near Capacity/Congested (V/C between 0.9 - 1.2)
- Over Capacity/Highly Congested (V/C greater than 1.2)
- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

FIGURE 20: AM PEAK PERIOD MOBILITY

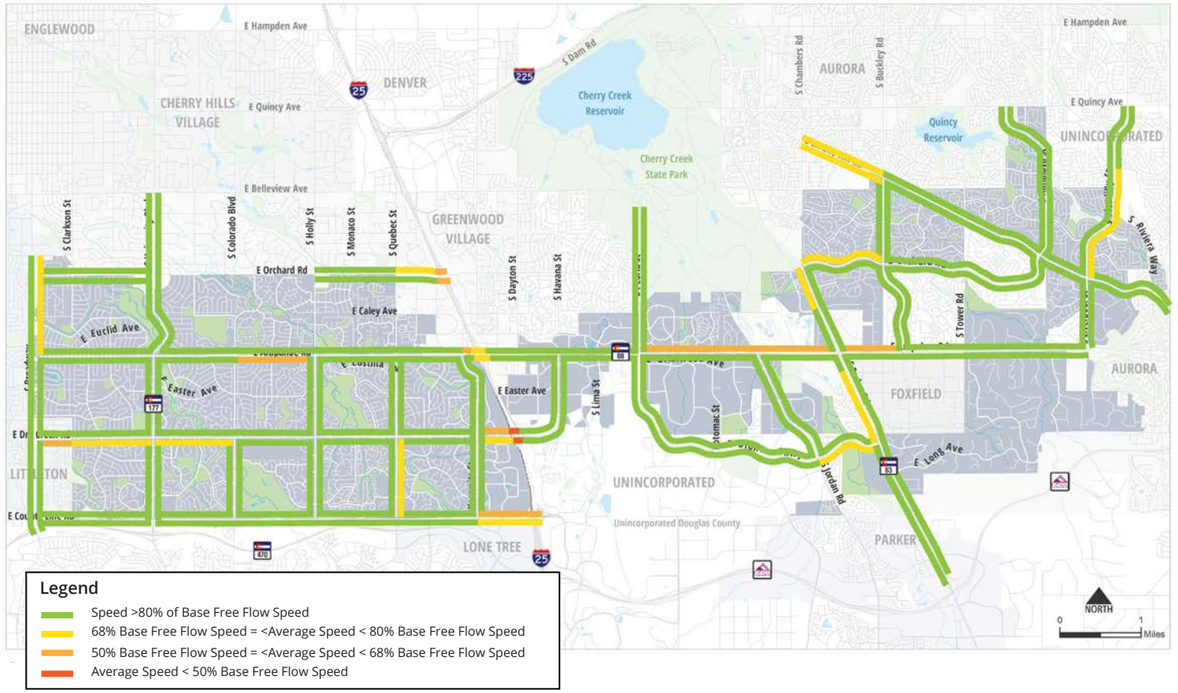


FIGURE 21: PM PEAK PERIOD MOBILITY

Source: FHU

FUTURE CONDITIONS

As Centennial and the region experience residential and employment growth over the next 20 years, traffic volumes are expected to increase. The analysis of future travel in Centennial is based on the DRCOG 2040 regional travel demand model. This computerized regional model accounts for anticipated growth of the seven-county Denver Metro Region and associated cities. Demographic data, including household and employment estimates and forecasts, form the basis for travel demand forecasting. The future travel demand patterns in Centennial and the metro region are based on the population and employment growth (as described on page 2) and multimodal transportation infrastructure available for travel in the region. The DRCOG model includes those transportation projects that are expected to be funded and built by 2040. Centennial and other communities within the DRCOG region provide project updates to DRCOG to ensure the model reflects changes such as land use, funded projects, and street reconfigurations within the community.

The DRCOG model was used to develop a 2020 and 2040 refined street network within the City of Centennial to help inform the development of TMP recommendations and projects in the upcoming tasks. These refinements create baseline existing and future street networks that are used in conjunction with the employment and population growth described previously. Within the City of Centennial, only those roadway projects with committed funding are included in the 2040 model:

- Arapahoe Road bridge replacement over Big Dry Creek
- County Line Road widening to 4 lanes from Broadway to University
- Orchard Road widening to 3 lanes (and new sidewalk) from Franklin Street to the High Line Canal

2040 Traffic Forecasts

The 2040 traffic forecasts that result from the future baseline street network and the household and employment growth previously described are shown on **Figure 22**. The model volumes have been post-processed using the methodology described in the National Cooperative Highway Research Program Report 765 (NCHRP Report 765). This methodology compares current year model (2020) to the actual traffic counts and applies the relative difference to the forecasted 2040 traffic volume.

2040 Volume to Capacity Ratios

As traffic volumes increase over time, the street network in Centennial will experience more congestion. The 2040 V/C ratios are shown on **Figure 23**. The future street network experiences much higher demand and the volume to capacity ratios will reflect the congestion and impacts to traffic operations. Over half of arterial streets are expected to be congested (V/C of 0.9 or greater) in 2040 if no additional improvements were made, and approximately 15 percent of arterial streets are expected to be highly congested (V/C of 1.2 or greater).

OVER 50%

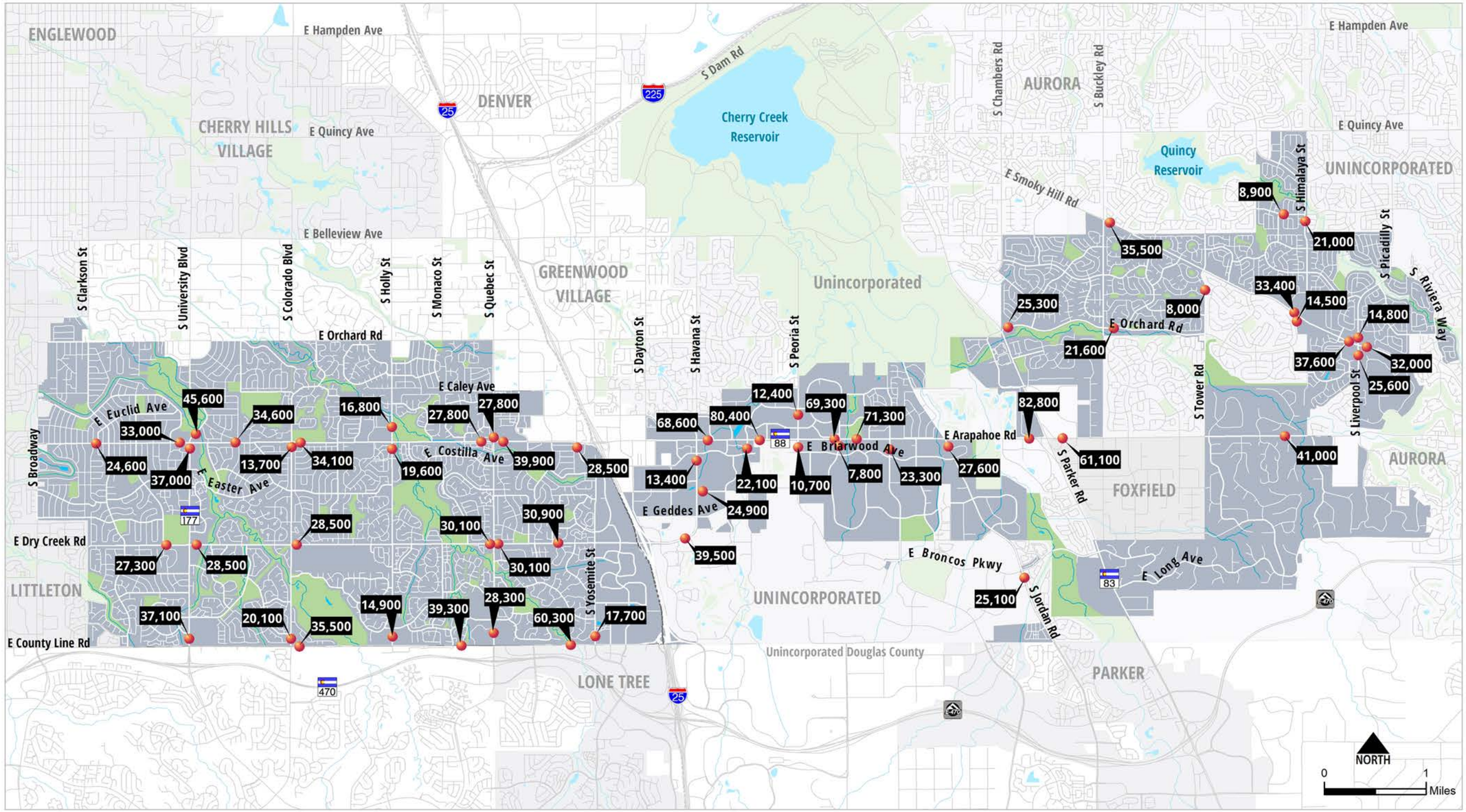
of arterial streets are expected to be congested (V/C of 0.9 or greater) in 2040 if no additional improvements were made.

APPROXIMATELY 15%

of arterial streets are expected to be highly congested (V/C of 1.2 or greater).

Source: City of Centennial

FIGURE 22: 2040 DAILY TRAFFIC FORECASTS



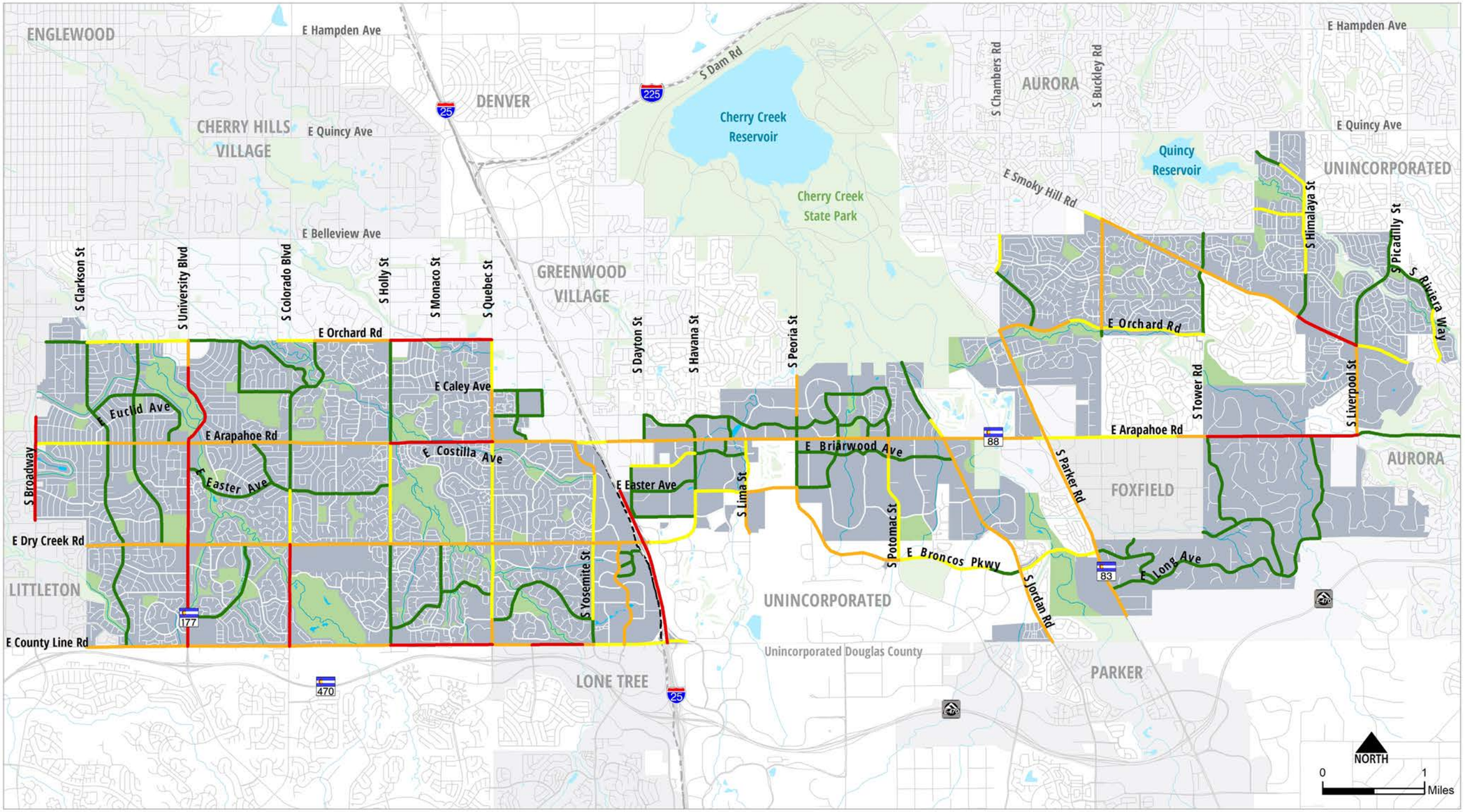
DRCOG Focus Model 2.2, 2021

Legend

- XXXX 2040 Traffic Forecast
- Traffic Count Location
- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks

Centennial TRANSPORTATION MASTER PLAN

FIGURE 23: 2040 VOLUME TO CAPACITY RATIOS



DRCOG Focus Model 2.2, 2021

Legend

2040 Volume to Capacity Ratio

- Uncongested (V/C less than 0.7)
- Approaching Congested (V/C between 0.7 - 0.9)
- Near Capacity/Congested (V/C between 0.9 - 1.2)
- Over Capacity/Highly Congested (V/C greater than 1.2)
- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

BICYCLE NETWORK

TYPES OF BICYCLISTS

Research has shown that people can generally be classified into one of four types of bicyclists based on their attitudes toward biking: "Strong & Fearless," "Enthused & Confident," "Interested but Concerned," and "No Way, No How." The primary factors that decide into which of the four categories an individual falls include comfort level with various bicycle facility types, comfort level with biking close to motor vehicles, and degree of experience with cycling.

Everyday bicycle commuters and most elite athletes fall into either the "Strong & Fearless" or "Enthused & Confident" categories. "Strong & Fearless" riders are those who will ride regardless of the surrounding conditions and feel comfortable sharing the road with motor vehicles; they only make up between 4 and 7 percent of the general population. "Enthused & Confident" riders are comfortable in most conditions but prefer to use designated bicycle facilities rather than mixing with vehicle traffic; about 5 to 9 percent of the population falls into this category.

Over half of the general population, including most recreational bicyclists, can be classified as "Interested but Concerned". These are people who would like to bicycle more but have significant safety concerns and are hesitant to share the road with vehicles; they are not comfortable around high-volume and high-speed traffic unless some form of separation is provided. Due to their reservations about how safe bicycling is, and despite their interest in doing so, many of the people in this category do not bike regularly. The remainder of the population (31 to 37 percent) is classified as "No Way, No How" because they are either unable or uninterested in bicycling. A bicycle network designed with "Interested but Concerned" users in mind will be most successful in encouraging more people to travel by bike.

ON-STREET BIKE FACILITIES & TRAILS

The City of Centennial has been gradually building a network of on-street bike facilities that is integrated with its robust network of local and regional trails. Currently, there are 11 miles of shared lanes, 15 miles of bike lanes, and 64 miles of trails. Most of the City's existing on-street bike facilities are west of I-25 – Easter Avenue and Clarkson Street are the two longest continuous stretches of striped bike lanes and/or signed bike routes in the City. East of I-25, there are only a handful of street segments with either striped bike lanes or signed bike routes; the irregular City boundaries in eastern Centennial are a significant challenge to establishing a continuous bicycle network, making it particularly important to integrate with bike facilities in Aurora, Greenwood Village, and unincorporated Arapahoe County. The City's street network west of I-25 also more closely represents a typical grid system, providing more alternative routes to arterials and major collectors for bicyclists looking to ride outside of a single neighborhood area.

Centennial has a well-established network of off-street trails. Numerous major regional trails – the High Line Canal, Big Dry Creek, Willow Creek, Cherry Creek, and Piney Creek Trails – pass through the City. The High Line Canal Trail is primarily soft-surface, while the others are concrete and/or asphalt trails; all are generally wide enough to comfortably accommodate both bicyclists and pedestrians. In addition to these, the City has many local trails that provide local recreation opportunities and connectivity to the regional network. Many of Centennial's on-street bike facilities, particularly those west of I-25, provide direct connections to and between the regional trails.

TYPES OF BICYCLISTS

INTERESTED BUT CONCERNED

51 - 56%
of the population

ENTHUSED AND CONFIDENT

5 - 9%
of the population

STRONG AND FEARLESS

4 - 7%
of the population

NO WAY NO HOW

31 - 37%
of the population

CENTENNIAL BIKE FACILITIES & TRAILS

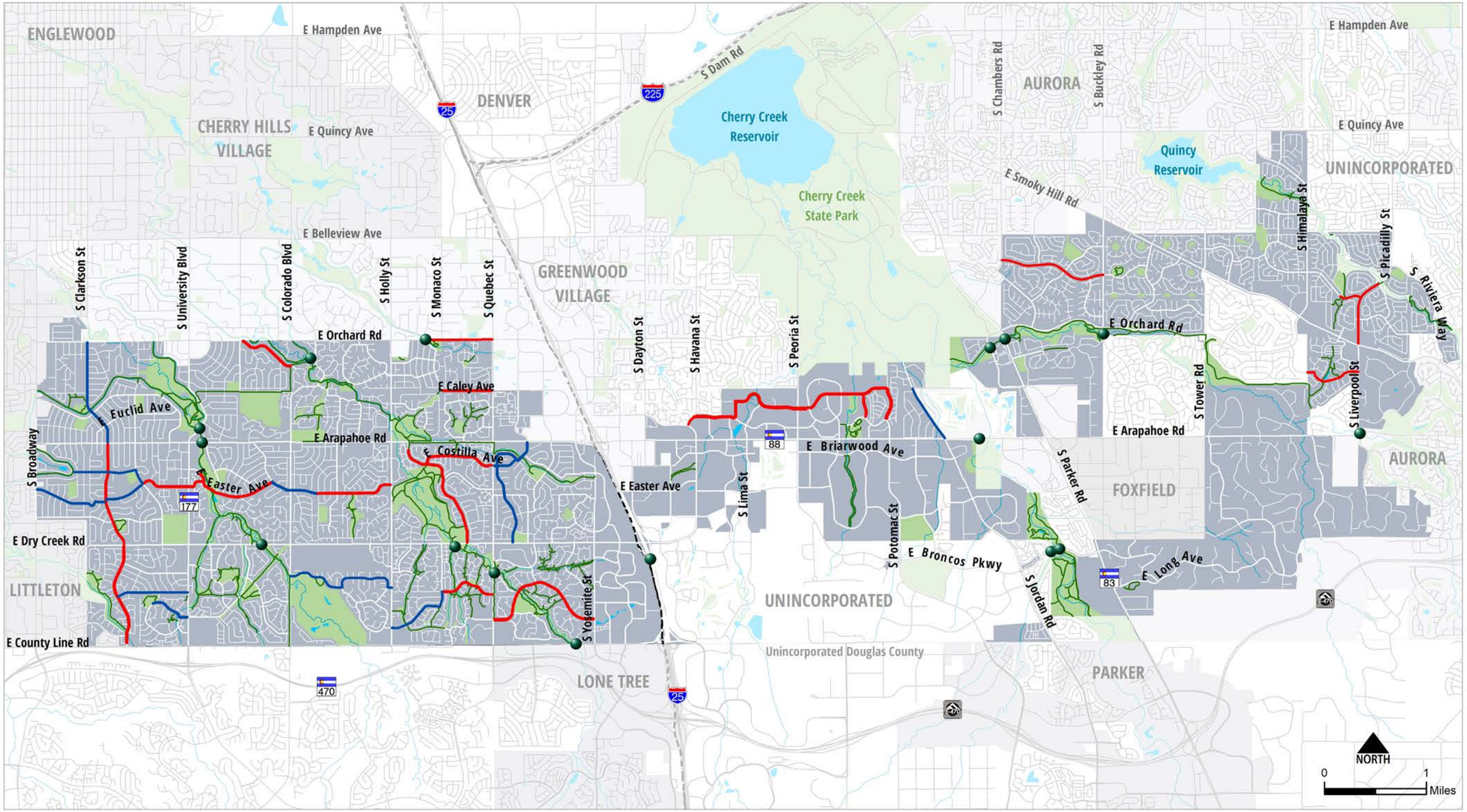
11 Miles
SHARED LANES

15 Miles
BIKE LANES

64 Miles
TRAILS

Source: City of Centennial

FIGURE 24: ON-STREET BIKE ROUTES & TRAILS



City Of Centennial, 2021

Legend

- Existing Bike Lane
- Existing Shared Lane
- Existing Bicycle/Pedestrian Underpass/Overpass
- Existing Trails
- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

LEVEL OF TRAFFIC STRESS

To attract bicyclists of a wide range of ages and abilities, a bicycle network needs to include safe, low-stress, and high-comfort facilities that limit the interaction with motor vehicles on streets. The bicycle Level of Traffic Stress (LTS) assesses the comfort level associated with bicycling on different types of on-street bicycle facilities and is useful in identifying where gaps in a community's low-stress network exist. The results of this analysis help to identify potential areas of concern in a transportation network. Using street characteristics, including traffic speeds and volumes, number of lanes, and bike lane width (if applicable), the analysis calculates a grade on a scale of 1 to 4, with each grade corresponding to the levels of comfort shown on the right.

LTS scores of 1 and 2 are considered low-stress and generally acceptable to people within the 'Interested but Concerned' category. To identify the extents and gaps of Centennial's existing low-stress bike network, the LTS on all City streets classified as a collector, arterial, or highway was analyzed. As shown in **Figure 24**, more than half of the City's collectors and arterials are currently LTS 3 or 4 streets. **Figure 25** maps the results of this analysis. While not analyzed specifically, the City's local and private roads can generally be considered part of the low-stress network.

Many of the City's collectors are comfortable for bicycling today, but they are segmented by a grid of high-speed, high-volume arterials like Arapahoe Road and University Boulevard which would require physical separation to provide a comfortable bicycling environment – a focus on intersection improvements at these arterial crossings would enhance connectivity.

Similar to the existing on-street bike network displayed in **Figure 24,** the low-stress network is much more comprehensive west of I-25 where most existing bike lanes are and where more alternative routes to arterials are available. Between I-25 and Parker Road, the low-stress network is very limited – the development pattern, with predominantly commercial and industrial land uses and few through streets with speed limits below 35 miles per hour, makes this a challenging area for bicyclists. East of Parker Road, low-stress streets are spread sporadically through different neighborhoods but are not well-connected to each other. There are numerous LTS 3 streets throughout the eastern part of the City that present opportunities for expanding the low-stress network with less extensive modifications than would be necessary along the arterials.

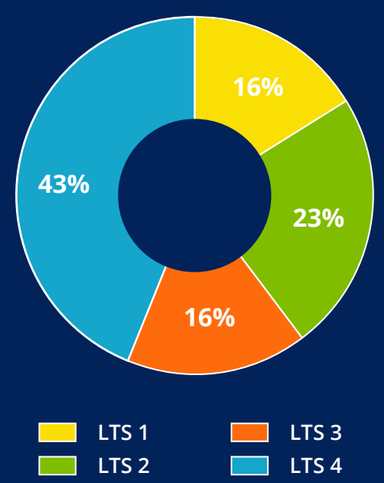
LTS 1:
Little traffic stress; suitable for most all bicyclists, including children

LTS 2:
Minimal interaction with traffic; suitable for most adult bicyclists

LTS 3:
Exclusive riding zone or shared lane with low speeds; comfortable to many current bicyclists

LTS 4:
High traffic stress; only suitable for "strong and fearless" bicyclists

CENTENNIAL LTS

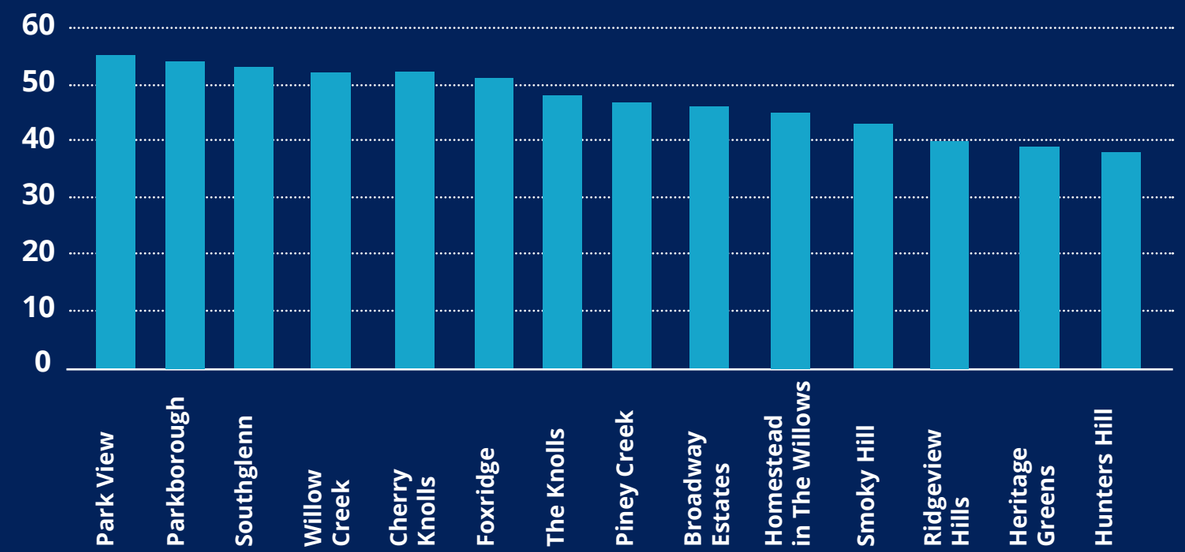


BIKE SCORE

47
BIKE SCORE

Bike Score is a measure initially developed for the real estate industry that assess the bikeability of a community based on four components: presence of bike lanes, topography, connectivity to major destinations, and bicycle mode share for commuting. Centennial has a Bike Score of 47 out of 100, indicative of a somewhat bikeable community with minimal bike infrastructure. This score is consistent with the disjointed nature of the City's existing bike network.

BIKE SCORES IN CENTENNIAL NEIGHBORHOODS



BIKE SCORES IN NEARBY MUNICIPALITIES

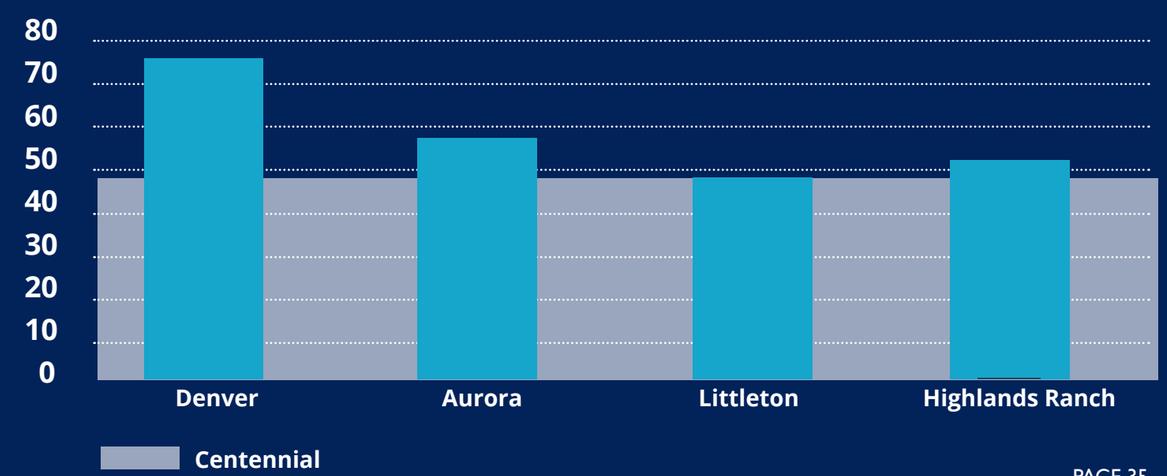
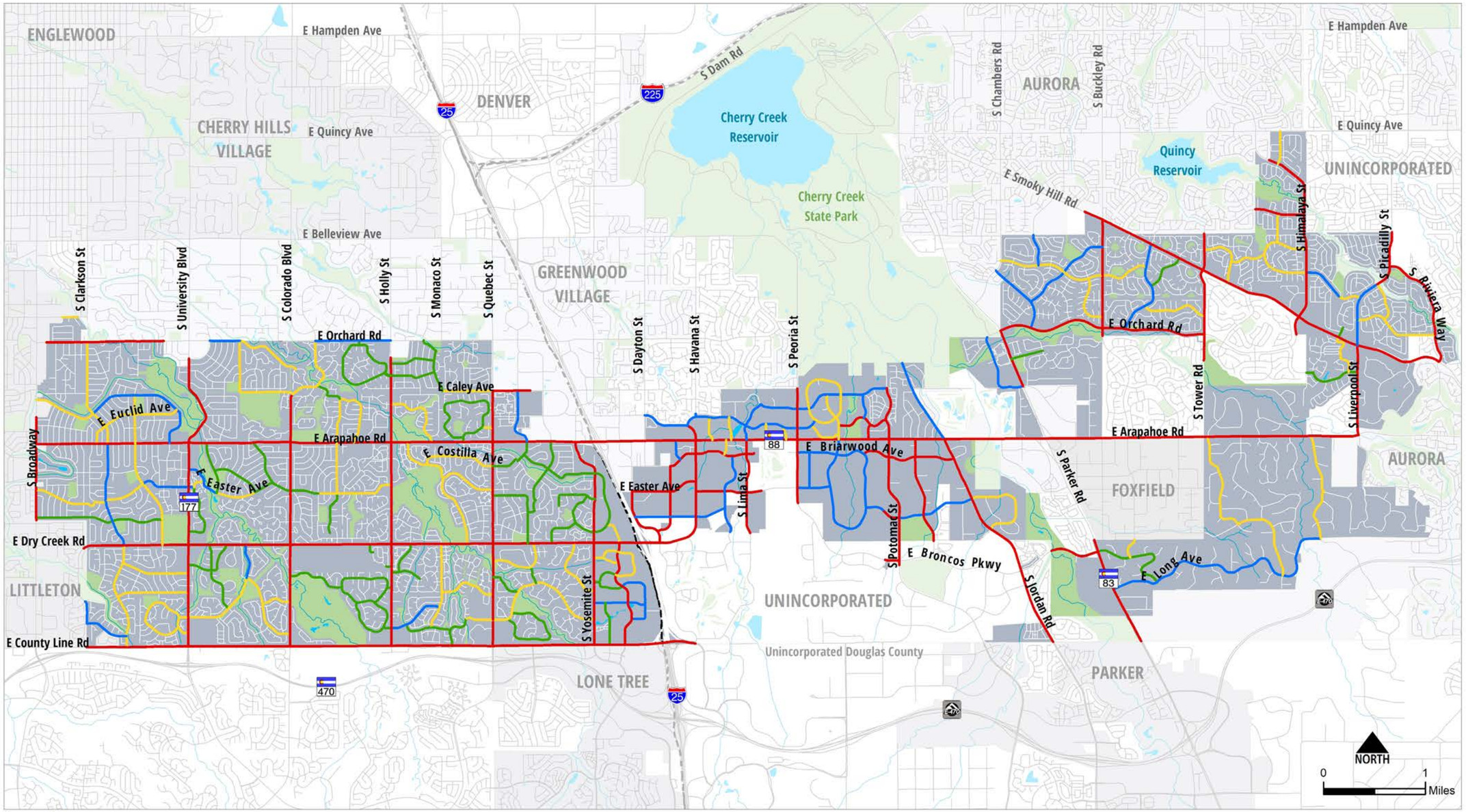


FIGURE 25: LEVEL OF TRAFFIC STRESS



Legend

Level of Traffic Stress (LTS)

- LTS 1 – Little traffic stress (suitable for most all bicyclists)
- LTS 2 – Minimal interaction with traffic (suitable for most adult bicyclists)
- LTS 3 – Close interaction with moderate speed/multilane traffic (suitable for most 'enthused and confident' bicyclists)
- LTS 4 – High traffic stress (suitable only for 'strong and fearless' bicyclists)
- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks
- Centennial City Boundary

Note:
The LTS analysis framework assesses, on a scale from 1 to 4, the stress level of cycling on road segments based on factors including road width, traffic speed, and the degree of separation between cyclists and automobiles. LTS 1 indicates a segment with minimal traffic stress that is suitable for almost all cyclists, including children, while LTS 4 indicates a segment with significant traffic stress that is only suitable for experienced and dedicated cyclists.

Centennial TRANSPORTATION MASTER PLAN

PEDESTRIAN NETWORK

SIDEWALK STANDARDS

Centennial's Roadway Design and Construction Standards (updated 2018) specify the sidewalk requirements for different street types in the City. All public streets require sidewalks, with collector and arterial streets requiring a landscape area between the sidewalk and curb to allow for separation between pedestrians and traffic traveling a higher speeds. The landscape area also provides an opportunity for street beautification. While a landscape area is preferred on local streets, it is not required.

SIDEWALK GAPS

Approximately 67 percent of collector and arterial streets in Centennial have sidewalks on both sides of the street. While sidewalks exist on the majority of streets, some do not meet current standards. Sidewalks in poor conditions or that do not meet standards can limit the ease of mobility of pedestrians, including persons with disabilities. **Figure 26** highlights those streets with missing sidewalks. Examples of sidewalk deficiencies include:

- Gaps in the sidewalk
- Missing accessible curb ramps at street crossings
- Poor sidewalk condition
- Missing or inadequate crossings
- Narrow widths and/or lack of buffer between sidewalk and street

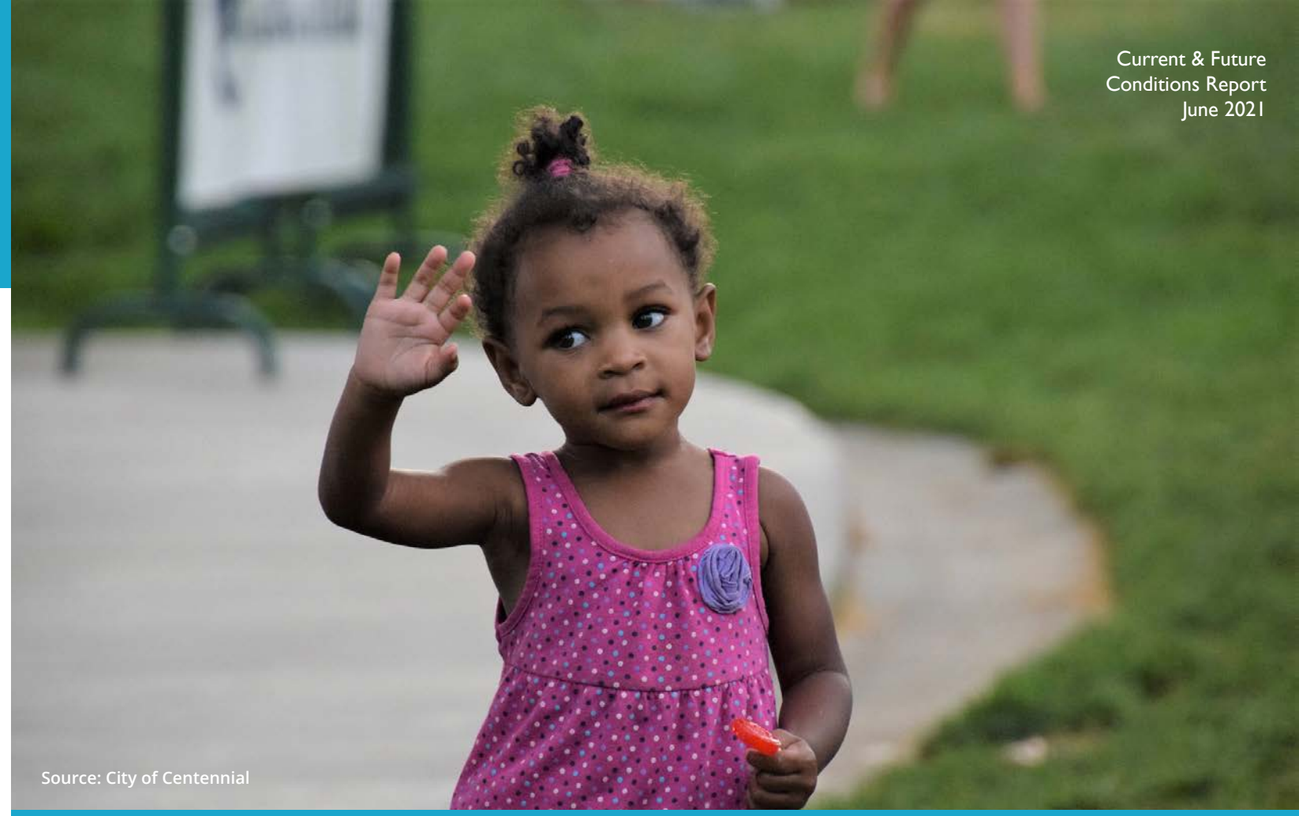
WALK ACCESS TO RECREATION

The Trust for Public Land, National Recreation and Park Association and the Urban Land Institute are leading a nationwide movement to ensure that there is a great park within a 10-minute walk of every person, in every neighborhood, in every city across America. Many communities in Colorado have pledged a commitment to the 10-Minute Walk mission.

A 10-minute walkshed analysis was conducted to identify the percentage of residences within City of Centennial that are within a 10-minute walk (approximately a half mile, using the existing sidewalk and trail network) of a park or open space that offers an outdoor recreational experience within the City of Centennial. The results of the analysis are shown spatially on **Figure 27**. The areas within a 10-minute walk of a park or open space include 50 percent of households in Centennial. That is, 19,697 households that have access to a park or open space within a 10-minute walk. Neighborhoods where residents cannot walk to a park within 10 minutes may be investigated for improvements to enable walking access, such as street crossing improvements, completion of missing sidewalks, or trail connections.

WALK ACCESS TO SCHOOLS

A similar analysis was conducted to identify walksheds associated with each school in Centennial. **Figure 28** shows the areas that are accessible within a 10-minute walk (approximately a half mile) of each school using the existing sidewalk and trail network. Neighborhoods that are proximate to a school, but residents cannot walk to the school within 10 minutes may be investigated for improvements to enable walking access, such as street crossing improvements, completion of missing sidewalks, or trail connections.



Source: City of Centennial

CENTENNIAL SIDEWALK REQUIREMENTS

6 LANE ARTERIAL:

10' detached sidewalk with **9'** landscape area

4 LANE ARTERIAL:

6' detached sidewalk with 10' landscape area

MAJOR COLLECTOR:

6' detached sidewalk with 8' landscape area

MINOR COLLECTOR:

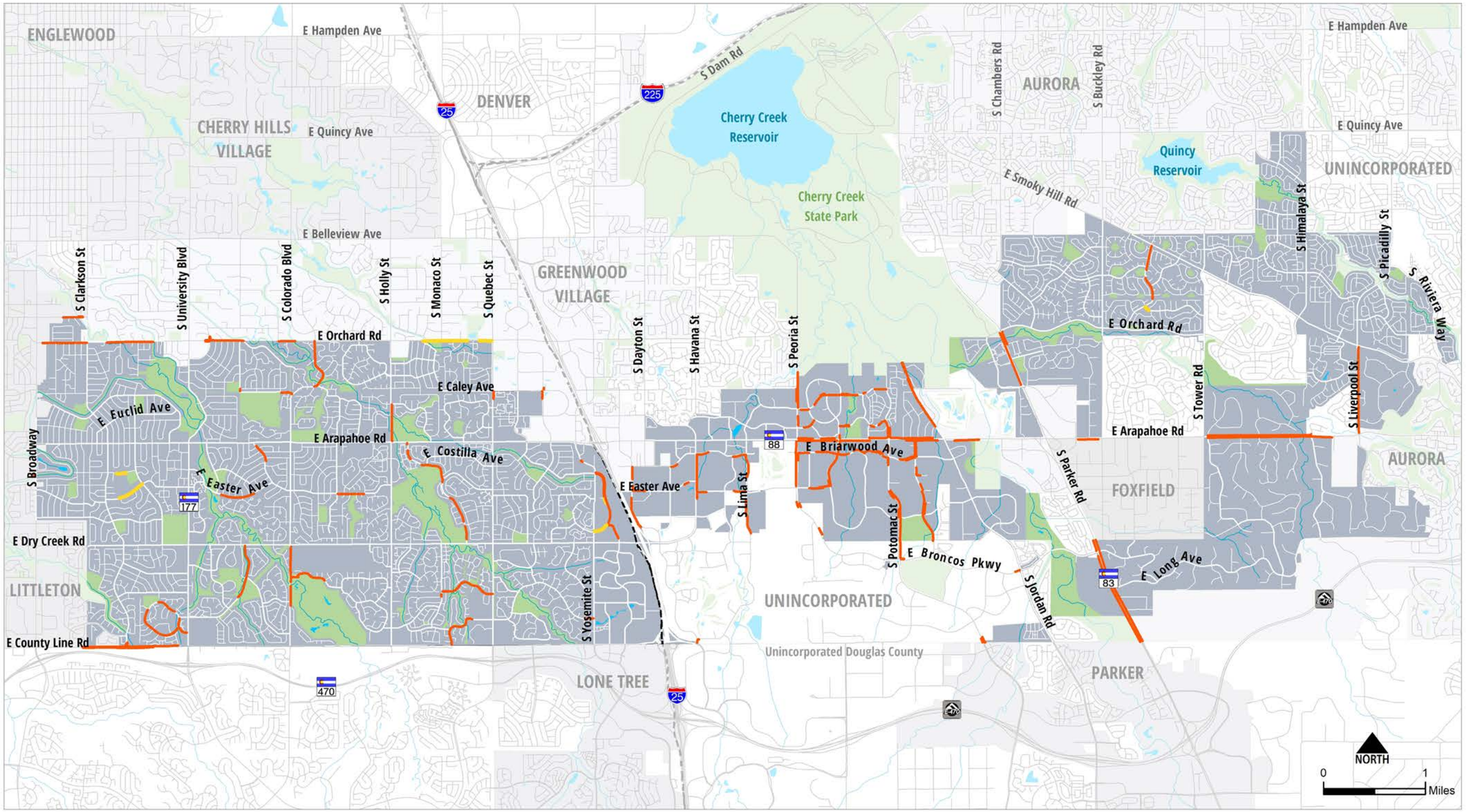
5' detached sidewalk with 8' landscape area

LOCAL STREETS:

5' sidewalk with 8' landscape area preferred

Source: City of Centennial

FIGURE 26: SIDEWALK GAPS



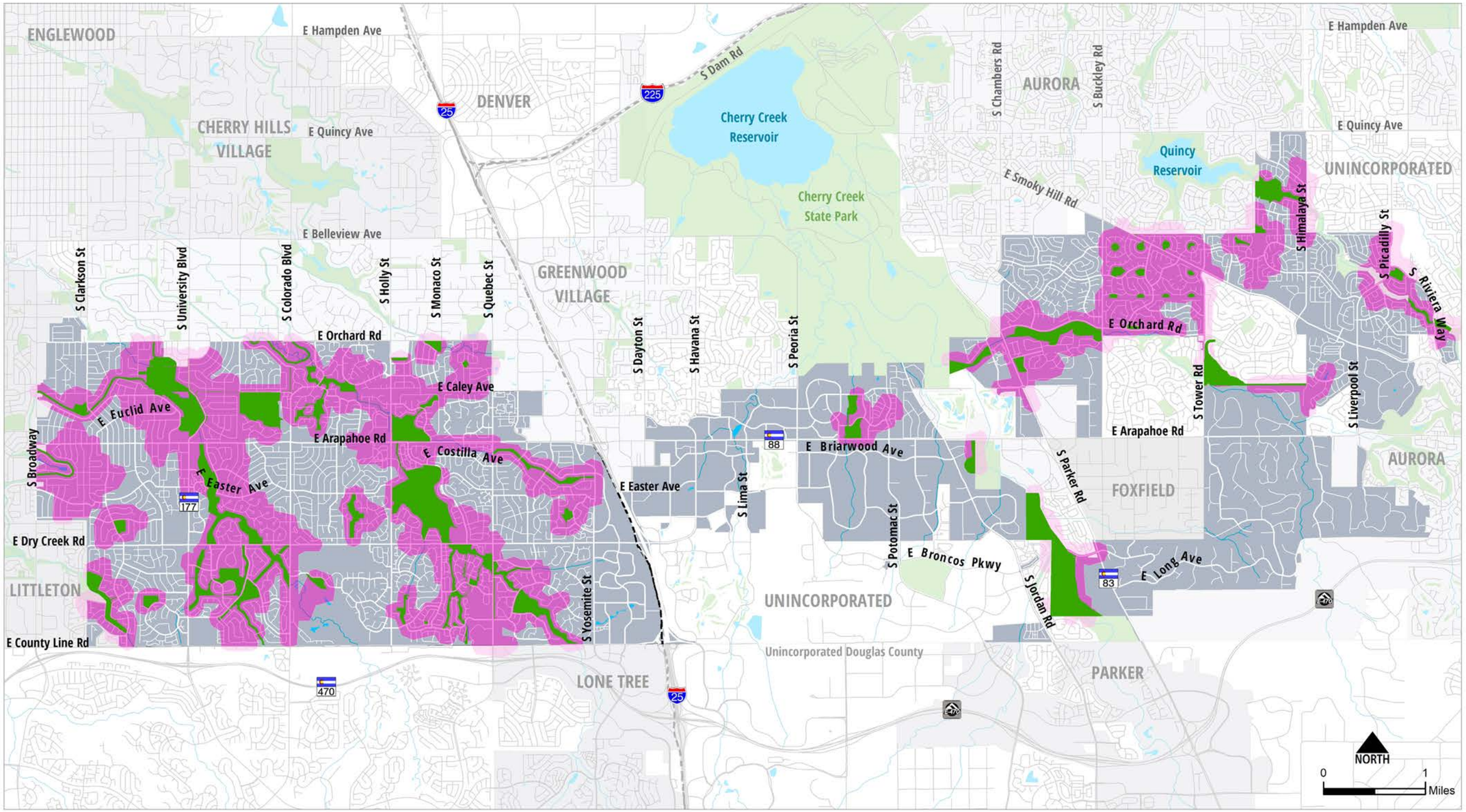
DRCOG, FHU, 2021

Legend

- Sidewalk Gap
- Planned Sidewalk Construction (2021)
- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

FIGURE 27: 10-MINUTE WALK ACCESS TO RECREATION



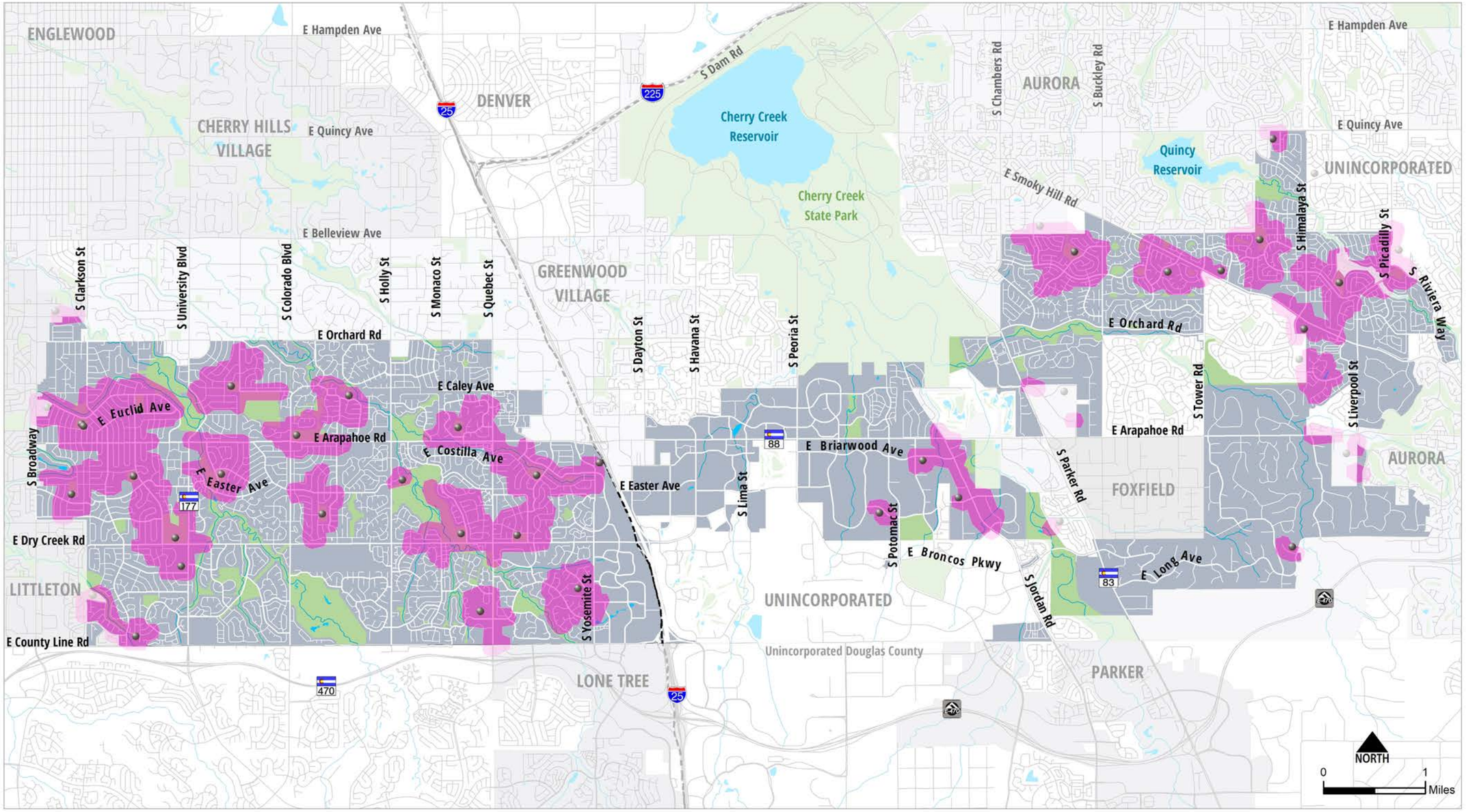
Legend

City Of Centennial, 2021

- Parks/Open Space
- 10 Minute Walkshed
- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

FIGURE 28: 10-MINUTE WALK ACCESS TO SCHOOLS



City Of Centennial, 2021

Legend

- School Locations
- 10 Minute Walkshed
- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks
- Centennial City Boundary

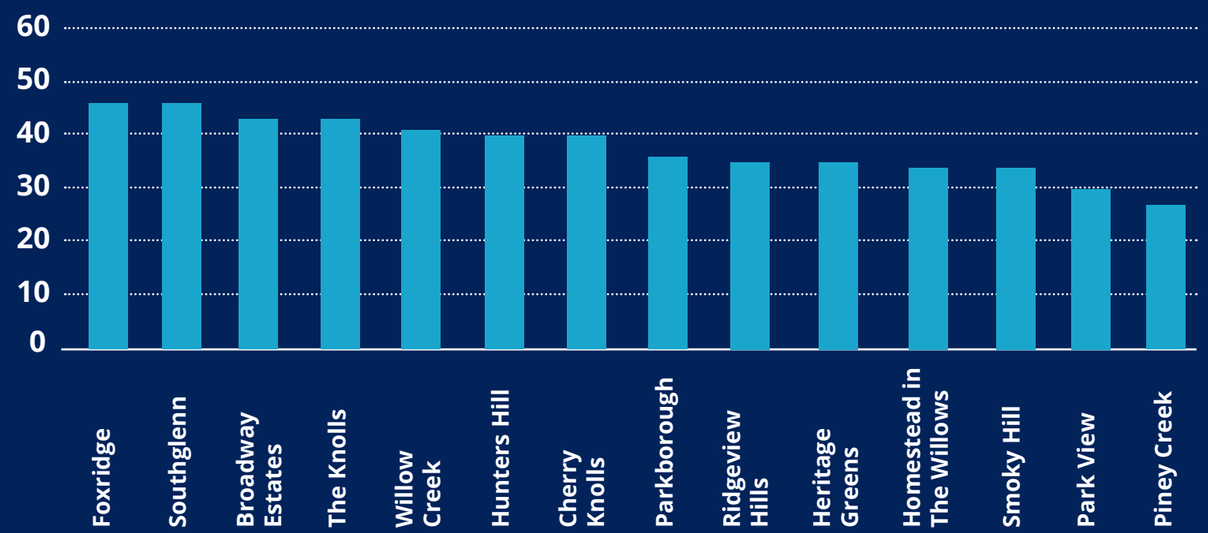
Centennial TRANSPORTATION MASTER PLAN

WALK SCORE

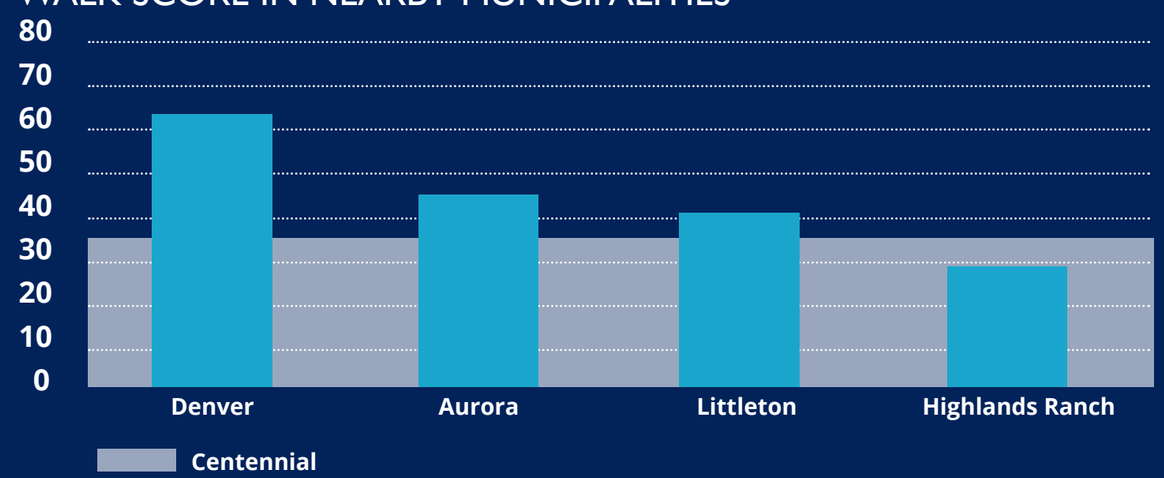
36
WALK SCORE

Walk scores for different cities, along with comparative data on neighborhoods and adjacent municipalities can be attained through different measures such as, proximity, comfort, and ease of travel to nearby destinations. Walk Score, a nationally recognized metric for multimodal accessibility, shows Centennial with a walk score of 36. This score is defined as car-dependent, where most errands require a vehicle. Neighborhood data shows, mostly similar walk scores, while nearby municipalities with the exception of Highlands Ranch have higher walk scores than Centennial.

WALK SCORES IN CENTENNIAL NEIGHBORHOODS



WALK SCORE IN NEARBY MUNICIPALITIES



Source: City of Centennial

TRANSIT
BUS AND RAIL SERVICE

Regional Transportation District

The Regional Transportation District (RTD) serves eight counties in the Denver Metro region. Specific RTD service within the City of Centennial includes fixed route bus and complementary paratrasit service, FlexRide, and light rail transit (LRT) service.

Bus Service

RTD operates 14 bus routes in Centennial on major arterials including Broadway, Arapahoe Road, University Boulevard, Parker Road, and Smoky Hill Road **(Figure 29)**. Service frequencies for the majority of the routes in Centennial are either 30- or 60-minutes. Service changes put in place as a response to the COVID-19 pandemic have affected service hours for Routes 0, 0L, 66, 67, 139, 153, 169, and 483.

FlexRide Service

FlexRide service offers on-demand bus service in specific areas of the Denver Metro Region, and provides first- and last-mile connections to RTD Park-n-Rides, transit stations, and medical centers. This service is offered to the general public on a first-come, first-served basis. The Orchard, Dry Creek and Arapahoe service areas, presented in **Figure 29** make up the three FlexRide options available in Centennial; they are all centrally located within the City. Due to COVID-19 service changes, all subscription-reserved trips have been suspended; however, on-demand service for the three FlexRide service areas are continuing without the need for reservations.

Light Rail Transit Service

RTD also operates several LRT lines that connect residents to regional destinations in the Denver Metro region. The E, F, and R Line serve the City of Centennial.

E Line
The E Line provides service from Union Station to RidgeGate Parkway Station. Residents can utilize this service to connect south into Lone Tree or head north to South Denver and Union Station. The Union Station stop provides connections to other regional rail lines (e.g., A Line to DEN) and the Flatiron Flyer bus rapid transit service to Boulder. The E Line averages about 18,400 daily weekday riders.

F Line
The F Line connects riders from 18th and California to RidgeGate Parkway Station. Residents can use this service to reach Lone Tree or head north to connect into central Denver. The F Line averages approximately 13,420 daily weekday riders.

R Line
The R Line provides service from the Peoria Station to RidgeGate Parkway Station. This line passes through South Denver and Aurora and provides connections to Denver International Airport and the Anschutz Medical Campus. The R Line averages nearly 6,600 daily weekday riders.

Bustang

The Colorado Department of Transportation's (CDOT) interregional bus service, Bustang, previously offered service connecting into the Denver Tech Center from Colorado Springs. However, this service has been discontinued and will not resume.

TRANSIT FACILITIES

Bus Stops

Pre-COVID-19 numbers show bus stops with the highest number of boardings and alightings were located along the 0L, 66, and 67 routes near the intersection of Easter Ave and University Boulevard and Race Street and Easter Avenue **(Figure 30)**. COVID-19 service changes have affected service availability and service hours.

The 0L Route (Broadway) and Route 67 (Ridge Road) are not operating at this time. Route 66 (Arapahoe Road west of Arapahoe at Village Center Station) operates every weekday on a Saturday schedule and the area east of Arapahoe at Village Center Station is now served by Route 153.

Route 153 (Arapahoe Road east of Arapahoe at Village Center Station) also had a high number of boardings and alightings (Pre-COVID-19) particularly the area between Potomac Street and Blackhawk Street. As mentioned the route has been extended and continues to operate on a weekday schedule with some changes to early morning service (12:30 AM - 4:30 AM) on weekdays. Route 135, which serves Smoky Hill Road, was bookended by high numbers of boardings and alightings at the intersections of Buckley Road and Picadilly Street.

Transit Stations

The Dry Creek Station is the only LRT station located within the City limits **(Figure 29)**. The station provides 235 parking spaces and on average, in 2019, had 12 percent availability. Before COVID-19 service changes, Dry Creek Station provided connections to Route 0 and continues to provide connecting service to Route 1, the E line, R line, and Dry Creek FlexRide service.

Park-n-Rides

Although there are many nearby Park-n-Rides located throughout central Arapahoe County, there is just one Park-n-Ride within the City of Centennial, as shown in **Figure 29**. The Smoky Hill and Picadilly Park-n-Ride is located on the northeast side of the City and provides connections to Routes 135 (Smoky Hill Road) and 139 (Quincy Avenue). RTD data show that there are almost 60 parking spaces available at this Park-n-Ride and (pre-COVID-19) there was on average 71 percent space availability.

TRANSIT STATION UTILIZATION

12% SPACE AVAILABILITY

235 AVERAGE # OF SPACES AVAILABLE

PARK-N-RIDE UTILIZATION

71% SPACE AVAILABILITY

58 AVERAGE # OF SPACES AVAILABLE

Source: RTD, 2019

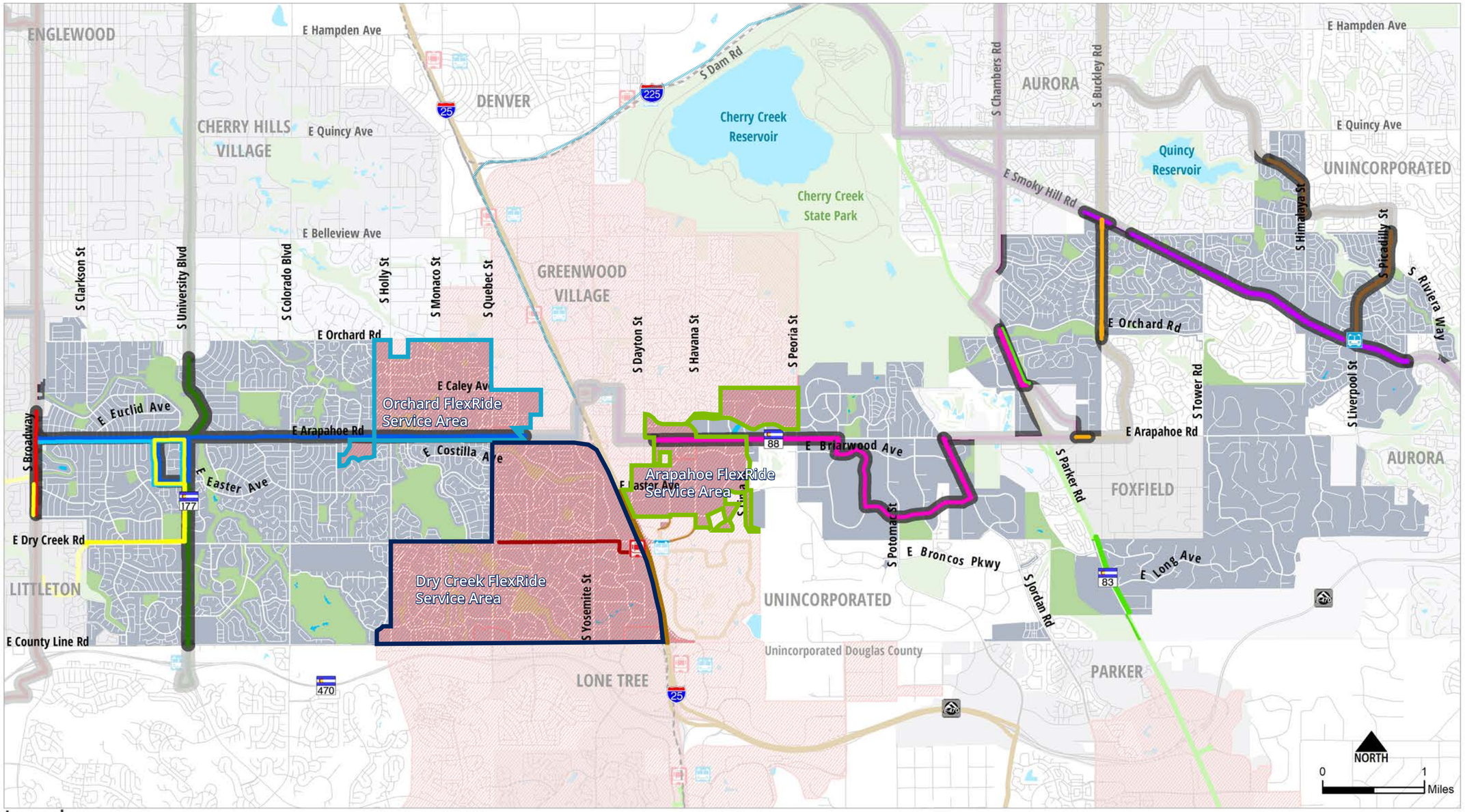
IDENTIFIED BRT NETWORK ROUTES

1. BROADWAY
2. UNIVERSITY BOULEVARD
3. ARAPAHOE ROAD

Source: RTD BRT Feasibility Study, 2019

Source: RTD

FIGURE 29: RTD BUS & RAIL SERVICE



RTD, 2021

Legend

- Light Rail Station
- Park-n-Ride
- Light Rail
- SkyRide (AT/ATA)

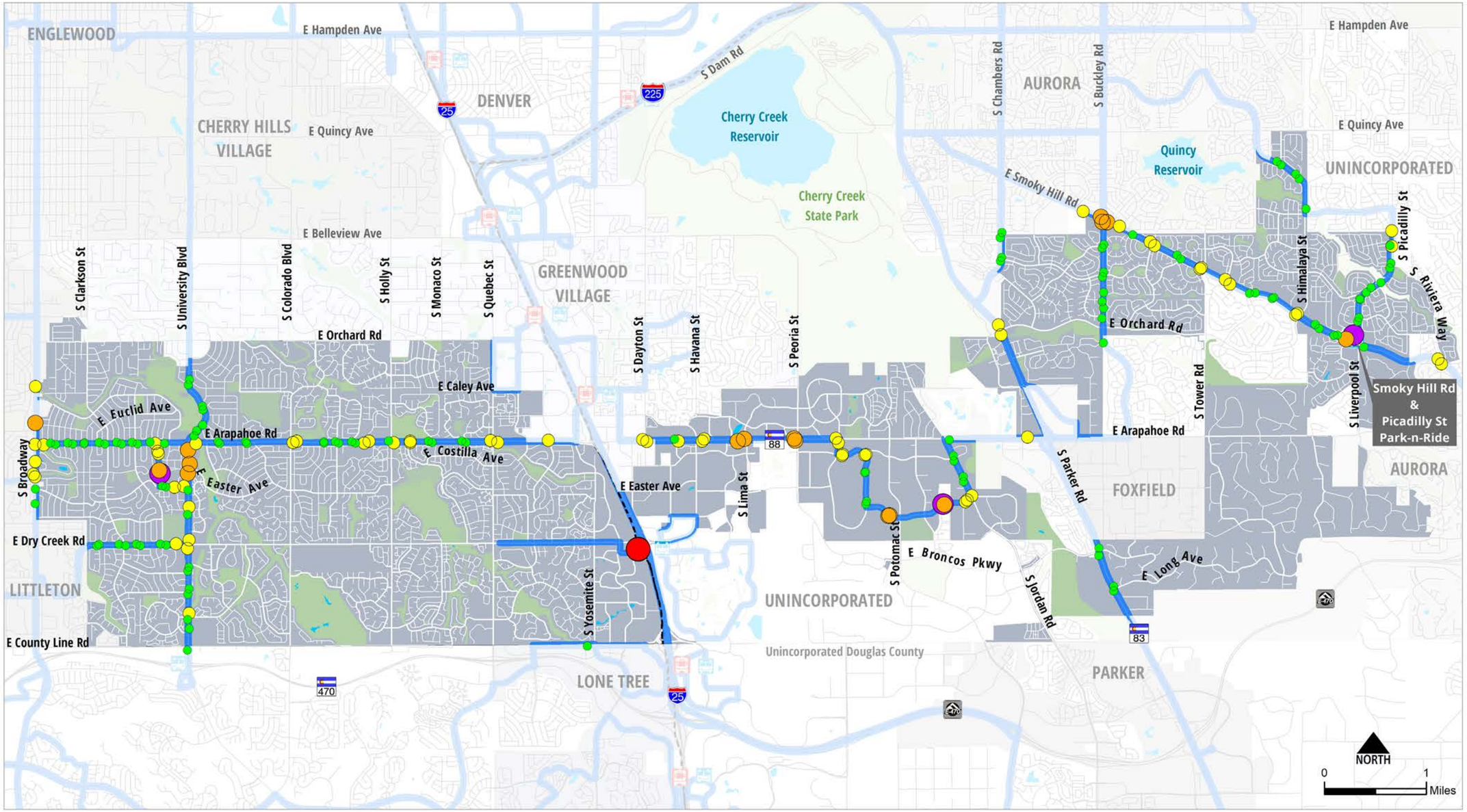
RTD Bus Routes

- 0
- 0L
- 135
- 139
- 153
- 169
- 24
- 483
- 66
- 67
- DRFX (Peak Period Fixed Route)
- P

- Routes Operating During COVID-19 Pandemic
- FlexRide Service Area
- Roads
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

FIGURE 30: RTD BOARDINGS & ALIGHTINGS



RTD, 2019

Legend

Total Weekday Boardings/Alightings by Bus Stop

- 0 - 10 Boardings/Alightings
- 10 - 40 Boardings/Alightings
- 40 - 75 Boardings/Alightings
- 75 - 150 Boardings/Alightings
- Greater Than 150 Boardings/Alightings
- Light Rail Station
- Park-n-Ride
- Existing Bus Routes
- Light Rail
- Roads
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

HUMAN SERVICES TRANSPORTATION

Different organizations such as RTD, Via Mobility Services, and Midtown Express offer specialized transportation services to aid community members in getting to and from essential services and other important destinations. These services provide vital support for freedom of choice and mobility for different communities.

American Cancer Society, Road to Recovery

The American Cancer Society, Road to Recovery. transit program provides transportation for cancer related medical appointments at no cost to riders. The service area spans seven counties including Arapahoe County. Rides must be scheduled four days in advance.

DRMAC Rides

DRMAC Rides is a transportation provider that offers service for adults with Intellectual and Developmental Disabilities. Rides are contingent on driver availability and need to be scheduled two to three days in advance.

Midtown Express

Midtown Express is a non-emergency medical transportation provider and offers a range of transportation options. Transportation can be accessed through their call center or through an online request. Midtown Express service areas spans five counties in the metro area including Arapahoe County. Medicaid, private insurance, and private payment options are accepted. Additionally, bilingual options can be provided and accommodations can be made for special needs.

RTD Access-a-Ride

RTD's Access-a-Ride offers local bus transportation services across the Denver Metro Area. It provides ADA complementary paratransit service within 3/4 mile of fixed-route bus/light rail service and serves people with disabilities and others who may not be able to safely and easily access RTD's other services. Passengers must be pre-certified to use Access-a-Ride. Local one-way trips are $5.00 and regional one-way trips are $9.00.

Via Mobility Services

Via Mobility Services provides paratransit service that can be accessed by phone through their call center or online through an online ride request (requires phone intake/registration interview). Although service availability depends on specific locations, Arapahoe County is within the service area. Via's services are provided at no cost to riders and can be used for a variety of purposes including medical, therapy, personal, shopping, social and employment/educational trips.

RIDE HAILING SERVICES

Ride hailing services, such as Uber and Lyft are available for use by the general public. Rides can be accessed through the Uber and Lyft apps. High activity centers, like The Streets at Southglenn Mall, and others in Centennial may benefit from designated pick-up and drop-off zones for ride hailing services to ensure greater accessibility to these transportation options.

PILOT PROGRAMS

Several transportation focused pilot programs have been developed in the past couple of years in the City of Centennial. Although some of these efforts have been discontinued, the City remains committed to exploring innovative solutions to ensure community members have a wide range of accessible transportation options.

Go Centennial

Go Centennial was launched in August 2016 as a collaborative pilot program between the City of Centennial, the Denver South Transportation Management Association, and ride-hailing provider, Lyft, as a way to explore solutions for first- and last-mile travel to transit. The six-month program provided free weekday service connecting to the Dry Creek Station for people who lived RTD's Dry Creek FlexRide service area. The service was accessible through three different options including the Go Denver and Lyft mobile apps, and the Citizen Response Center.

Analysis of ridership data revealed that more people used the Lyft app than other options to access a ride and FlexRide ridership was not affected by this new service. Understanding what has worked well and what could be improved for future pilot programs and leveraging interest in these types of service from people who do not currently utilize other RTD transportation options in the City will be vital in creating sustainable transportation solutions (Source: Centennial Citizen).

Metro Taxi & RTD Pilot

In early 2021, RTD initiated a pilot program in partnership with Metro Taxi to supplement the Tech Center FlexRide services and improve quality and cost-effectiveness of midday service. Seven of the 22 FlexRide service areas are participating in this progam including the Orchard, Dry Creek, and Arapahoe FlexRide service areas. The intent is to create a small-scale circulator route that provides transportation for DTC employees and residents. This service can be accessed through the FlexRide app and FlexRide MobilityDR and is provided on a first-come, first-served basis. Service will be continuously reevaluated as RTD begins to reintroduce more service and frequency (Source: Denver Gazette).

LOCAL COORDINATING COUNCIL

Transportation Solutions Arapahoe County

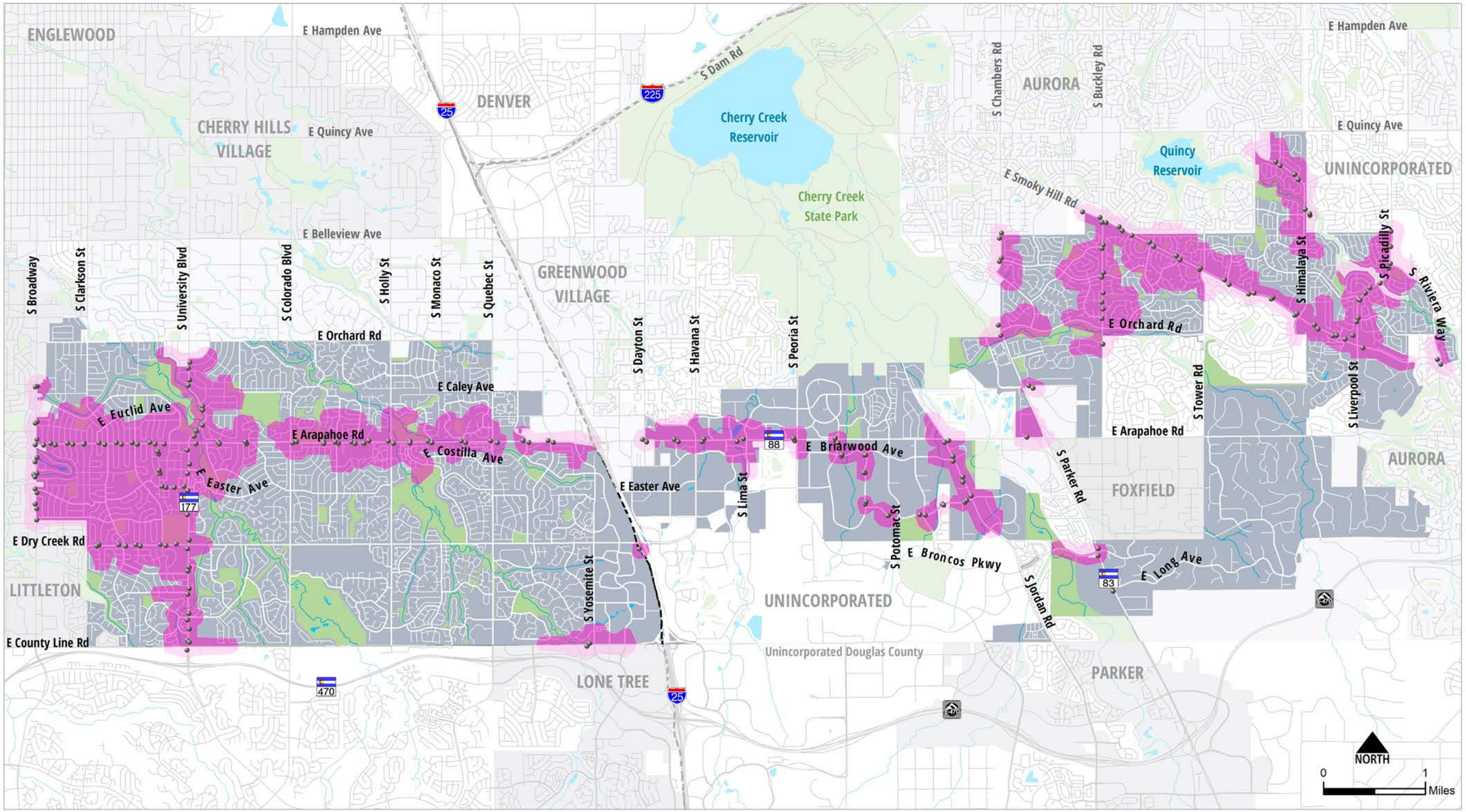
Transportation Solutions Arapahoe County was provides resources and support for older adults, people with disabilities, and people with low-incomes. The organization serves as a local coordinating council under the Denver Regional Mobility and Access Council. In 2021 the organization obtained it's non-profit 501(c)3 status.

WALK ACCESS TO TRANSIT

Similar to the walk access to parks and school analysis described in the Pedestrian section, an analysis was completed to evaluate Centennial's walk access to transit. **Figure 31** shows the areas that can access a bus stop within a 10-minute walk (approximately a half mile) using the existing sidewalk and trail network. The areas within a 10-minute walk a bus stop include 34 percent of households Centennial. Neighborhoods where residents cannot walk to a bus stop within 10 minutes may be investigated for improvements to enable walking access, such as street crossing improvements, completion of missing sidewalks, or trail connections.

Source: Colorado Public Radio

FIGURE 31: 10-MINUTE WALK ACCESS TO TRANSIT



Legend

City Of Centennial & RTD, 2021

- Bus Stop Location
- 10 Minute Walkshed
- Roads
- Light Rail
- Rivers/Streams
- Lakes
- Parks
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

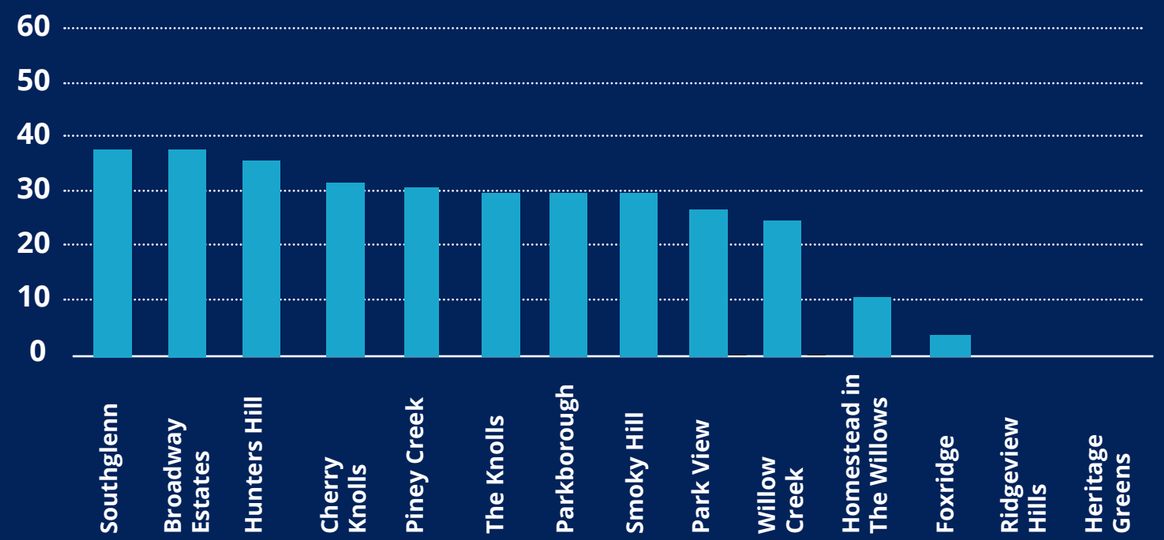
ADVANCED MOBILITY & MOBILITY HUBS

TRANSIT SCORE

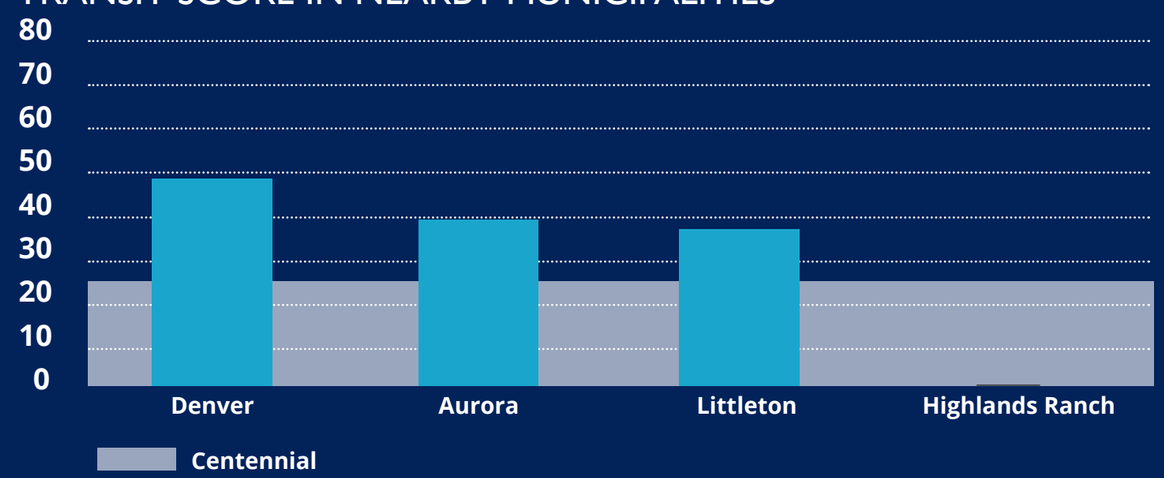
25
TRANSIT SCORE

Transit Scores are developed by assessing how well a location is served by public transit based on two measures, 1) distance and 2) the type of nearby transit service. Overall, Centennial has a transit score of 25, characterized as having minimal transit and/or access. The City's score is significantly lower than neighboring communities and also shows that the neighborhoods of Ridgeview Hills and Heritage Greens are not currently served by accessible transit.

TRANSIT SCORES IN CENTENNIAL NEIGHBORHOODS



TRANSIT SCORE IN NEARBY MUNICIPALITIES



Mobility hubs, emerging transportation technology, and connected and thoughtfully planned infrastructure that supports healthy, accessible, and inclusive mobility options will all play a significant role in shaping transportation in the coming years.

Additionally, a growing population and expanding employment sector, alongside increasing levels of emissions and pollution demonstrate the urgent need for innovative and effective transportation solutions.

The City of Centennial is poised to be at the forefront of these statewide and local efforts, given the number of important connective corridors like I-25, Arapahoe Road, and University Boulevard that link the Denver Metro region and also displayed in the City's willingness to pursue new solutions for transportation needs.

ELECTRIC VEHICLE CHARGING STATIONS

Electric Vehicle charging stations, as shown in **Figure 32,** are mostly located in central Centennial and tend to be located near major north-south corridors, including I-25, Parker Road, and Smoky Hill Road. The distribution of charging stations show that 85 percent are public stations, while 15 percent are for private use. Most charging stations have 1 or 2 ports. The highest concentration of ports within one station is located at the IKEA Store and near the Dry Creek Station.

MICROMOBILITY

Different transportation solutions will be required to address growing need to connect to educational, employment, medical, and social/recreational destinations. Micromobility, which encompasses a variety of mobility options such as small shuttles/ vehicles, station-based bikes, dockless bikes and e-bikes, and electric scooters can provide ways to address first- and last-mile connections, short trip travel, and other transportation needs. Currently, there are no micromobility options available in the City of Centennial.

MICROMOBILITY OPTIONS

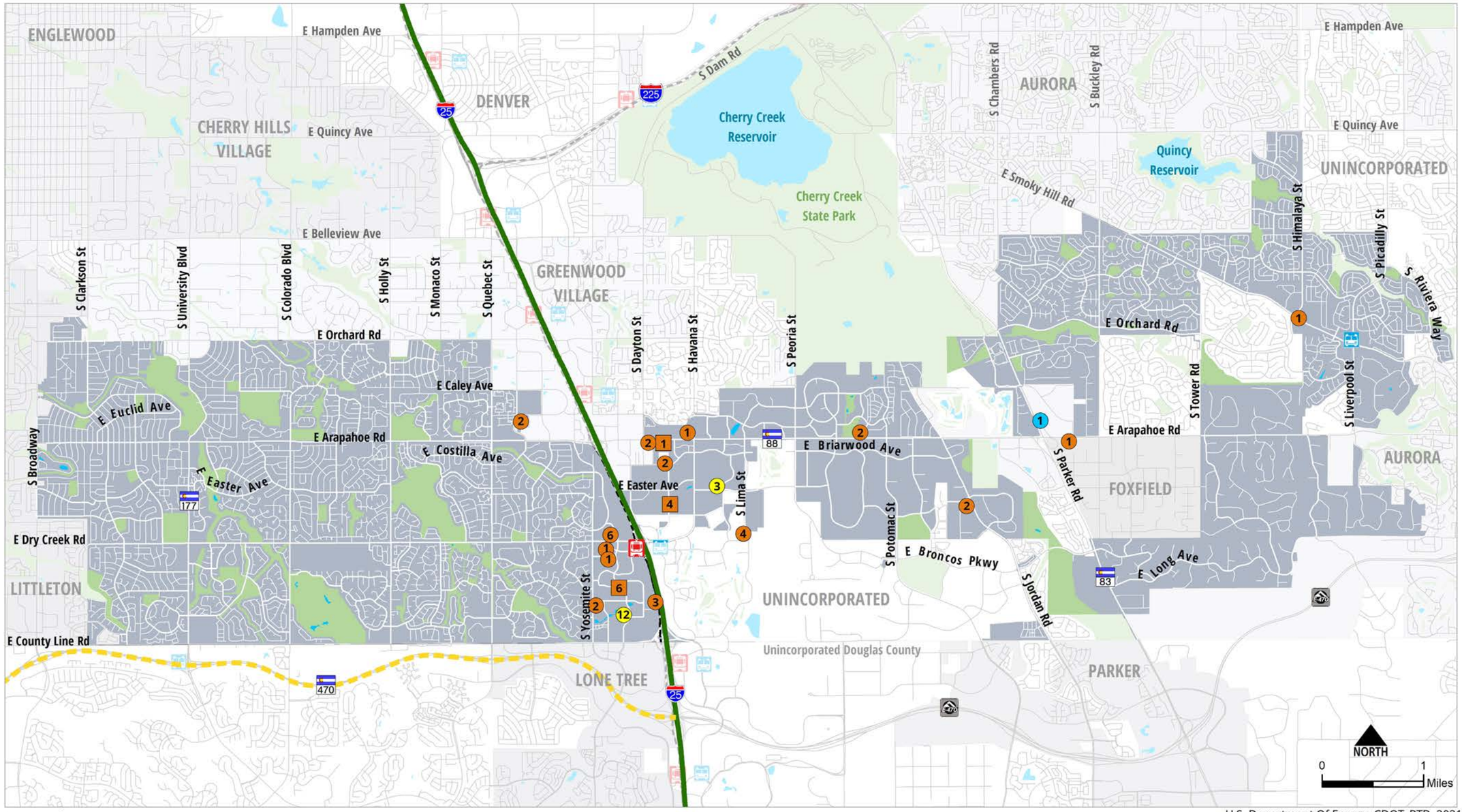
SMALL SHUTTLES/ VEHICLES

STATION-BASED BIKES

DOCKLESS BIKES/E-BIKES

ELECTRIC SCOOTERS

FIGURE 32: ELECTRIC VEHICLE CHARGING STATIONS



U.S. Department Of Energy, CDOT, RTD, 2021

Legend

- # Number of Charging Ports

Electric Vehicle Charging Station Type
- Private
- Public

Electric Vehicle Connect Type
- CHADEMO J1772COMBO
- TELSA
- J1772

High Priority Zero Emission Vehicle Corridors
- Tier One
- Tier 2

- Light Rail Station
- Park-n-Ride
- Light Rail
- Centennial City Boundary

Centennial TRANSPORTATION MASTER PLAN

TO LEARN MORE:

centennialco.gov/tmp