



## Appendix B- Future Conditions

# I-405 Comprehensive Multimodal Corridor Plan

## *Future Baseline Conditions Assessment*

*prepared for*

**LA Metro**

*prepared by*

**Cambridge Systematics, Inc.**



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## 1.0 Introduction and Background

Los Angeles (LA) County is home to one of the most complex, interconnected, and congested highway systems in the world. There may be no LA County freeway corridor more iconic than Interstate 405 (I-405), which plays a critical role in the overall performance of this system. It serves some of the wealthiest and some of the most disadvantaged communities in the country, with cities and neighborhoods as varied as Inglewood, Carson, and San Fernando, as well as Beverly Hills, Santa Monica, and Brentwood (project orientation map is shown in Figure 1).

More than a quarter of LA County's population (nearly 2.8 million residents) live within three miles of the corridor and about 28 percent of jobs in LA County (1.4 million) are located within those boundaries.<sup>1</sup> The corridor connects critical gateways and trade hubs, including the Ports of Los Angeles and Long Beach (the San Pedro Bay Ports or SPB Ports) (via I-710), Los Angeles International Airport (LAX), California's Central Valley, the Mexican border, and the rest of the continent. The I-405 is also a critical corridor for commuters, residents, and visitors across the region, handling volumes of nearly 390,000 vehicles per day between I-710 (Long Beach) and I-605 (Santa Ana)—the fourth highest freeway segment volume in the nation.<sup>2</sup>

By 2040, population in the I-405 study area will reach nearly three million (growing by 0.4 percent per year), jobs will grow by 0.7 percent per year to a total of 1.6 million, and freight movements are expected to grow at a rate of about five percent per year.<sup>3</sup> Together, this growth will result in greater demand on the already congested infrastructure within the I-405 Corridor, creating further challenges to safety, reliability, sustainability, and the general travel experience. Concurrently, shifting demographics, new technologies, and a changing policy landscape are anticipated to further shift people's travel needs and preferences. This Future Conditions & Trends assessment aims to describe the cumulative impact of these trends on condition and performance along the I-405 Corridor, building on the work completed as part of the Baseline Conditions Assessment.

The assessment utilizes LA Metro's travel demand model to explore how anticipated future demand will affect future condition and performance of the transportation system in the corridor, as well as the impacts of major programmed improvement projects planned in the study area. A review of current research and studies on emerging trends and conditions is also incorporated to assess how topics such as the future of work, COVID-19, clean fuel technologies, and automation may impact travel patterns and needs over the long-term. The trends and conditions explored in this assessment will result in a better understanding of new (or enhanced) needs on the I-405 Corridor and inform project evaluation and improvement scenario development.

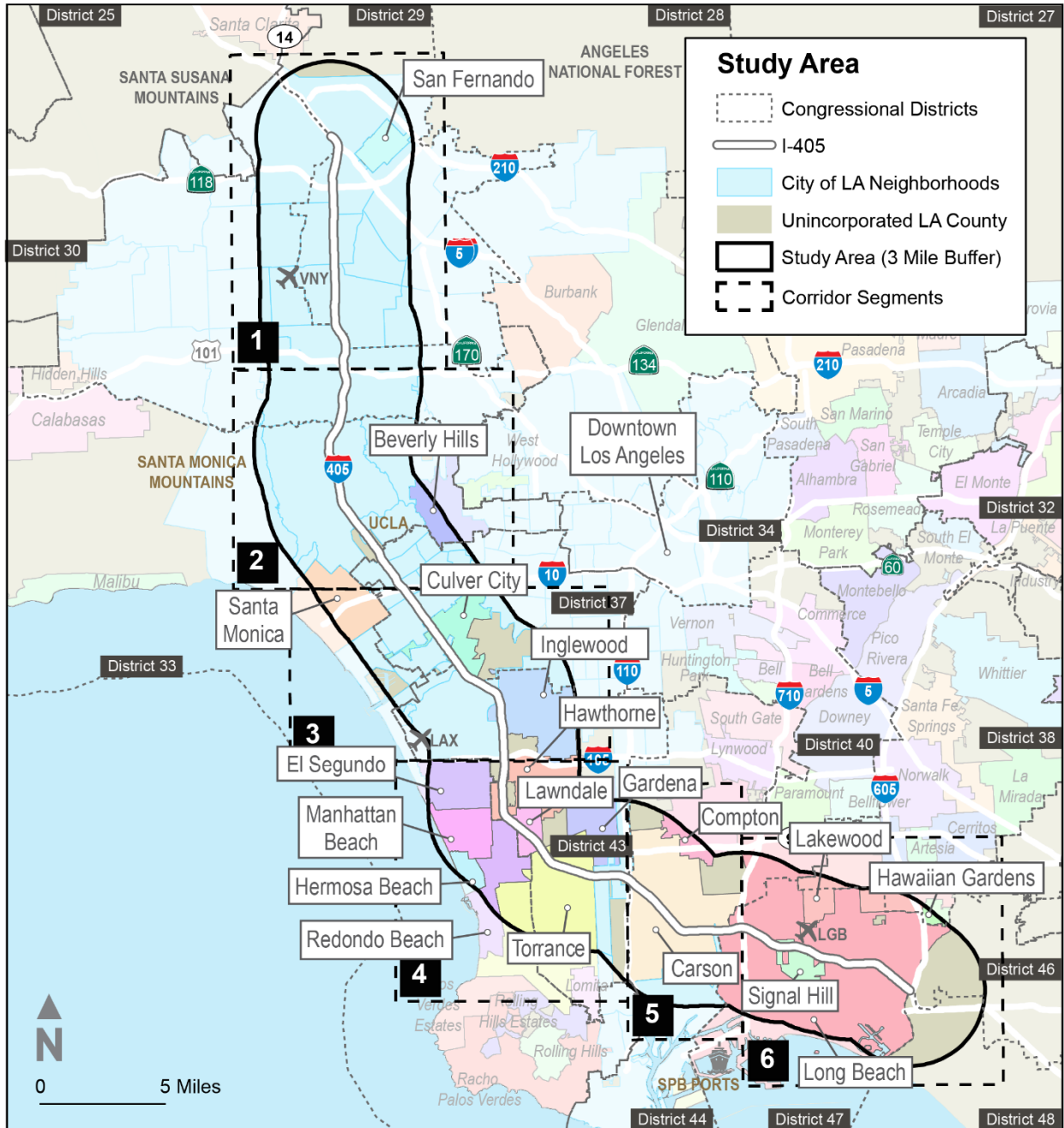
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<sup>1</sup> Population estimates are from the U.S. Census Bureau; American Community Survey; 2018. Employment estimates are from the U.S. Census Bureau; Longitudinal Employer-Household Dynamics Survey; 2018

<sup>2</sup> Federal Highway Administration, Highway Performance Monitoring System; 2019.

<sup>3</sup> Population and employment forecasts are from LA Metro's Travel Demand model, which is consistent with the SCAG Travel Demand Model. Freight market forecasts are from the Port of Los Angeles.

Figure 1 Project Orientation Map



As discussed in the Baseline Conditions Assessment, for ease of analysis, this study identifies six segments at major freeway system interchanges as shown in Figure 2.



Monica, Culver City, LAX, Torrance, and Long Beach. However, the most significant job growth is expected to occur in and around Downtown LA and Inglewood, directly east of the study area. The fastest growing sectors, consistent with recent historical trends, include health care and social assistance, leisure and hospitality, transportation, warehousing, and utilities.

- Rapidly evolving technologies, including electric vehicles, e-bikes, on-demand mobility, and connected and automated vehicles will drastically change how people travel. These changes come at a time when we are also experiencing significant changes in transportation regulation and funding environments, as well as a changing economy and workplace as recovery from the COVID-19 pandemic continues. It is impossible to predict the long-term outcomes of these shifts, but understanding and anticipating their impacts is critical to addressing the key challenges along the I-405 Corridor.
- There are many significant planned multimodal investments and programs within the study area, including the I-405 Tier 1 ExpressLanes project, the Sepulveda Transit Corridor Project, multiple LA Metro rail and BRT investments, the LA River Bike Path, the LAWA Airfield and Terminal Modernization Project, the Inglewood Transit Connector Project, and many more. These will provide more multimodal options and improve service quality for future travelers within and throughout the I-405 Corridor.
- Even with the many projects included in the Metro LRTP, travel demand forecasts from the LA Metro travel demand model suggest that the study area will see significant increases in demand through 2047, including an increase in total daily trips of about 22 percent, with less than half a percentage point shift away from drive alone travel. This suggests that autos will remain the dominant mode of transportation along the Corridor, leading to roughly 15 percent growth in VMT and nearly 50 percent growth in VHT and delay.

## KEY CHALLENGES ON THE I-405 CORRIDOR

- Rising Vehicle Miles Traveled (VMT)
- Bottlenecks and delay
- Low transit and active transportation mode shares
- Auto-oriented land use patterns
- HOV lane degradation
- Growing freeway and arterial collisions
- High levels of bicycle and pedestrian collisions
- Worsening air quality and growing impacts of climate change
- Deteriorating assets
- Racial and economic disparities in transportation benefits and burdens
- COVID-19 recovery and rebuilding

## 2.0 There are Many Challenges along the I-405 Corridor

The Baseline Conditions Assessment found that approximately 97.5 percent of all trips within the I-405 Corridor study area occur by car. The Corridor's extremely high traffic volumes, are linked to staggering levels of traffic congestion and delay, and associated negative impacts to safety, public health, and environmental sustainability. Moreover, 80 percent of trips that start in the Corridor also end in the Corridor, and most of these trips are short (under five miles) and for non-commuting purposes (83 percent). Of the trips that start or

end outside the corridor, roughly 40 percent are to or from equity-focus communities. Short trips and trips serving equity focus communities could be served well by affordable, non-auto modes. However, the Baseline Conditions Assessment found that they are not (only 2.5 percent of total trips are taken on transit, and very few are taken by biking or walking). It is clear that existing infrastructure and mobility options are not sufficiently meeting the needs of Corridor users, and investments may need to be rebalanced to better align with travel needs and preferences. A summary of the key challenges identified through the Baseline Conditions Assessment are shown in the sidebar above.

### 3.0 Growing Demand will Exacerbate these Issues

Future travel demand is driven by growth in population and jobs, as well as changes in land use and mobility options that are available to people. This section explores the first piece – how trends in population and job growth, visitation, and goods movement will impact future travel along the Corridor, and what the implications for Corridor conditions and performance over the long-term might be. Without significant interventions to accommodate growing demand, the I-405 Corridor will continue to experience high levels of delay and congestion well into the future. These trends will be discussed further in Section 3.5. Table 1 provides a summary of socioeconomic trends, which are discussed in Sections 3.1 – 3.4.

**Table 1 Summary of Socioeconomic Trends**

	Existing (2016)		Future (2040)		Growth		Growth per Year	
	Pop	Emp	Pop	Emp	Pop	Emp	Pop	Emp
<b>Study Area</b>	2,660,841	1,342,792	2,976,537	1,604,420	12%	19%	0.4%	0.7%
<b>LA County</b>	9,922,486	4,246,081	11,514,426	5,225,707	16%	23%	0.6%	0.8%
<b>SCAG</b>	18,321,856	7,428,556	22,137,997	9,848,152	21%	33%	0.7%	1.2%

Source: SCAG Travel Demand Model

## A NOTE ON MODELING

LA Metro's travel demand model was used to evaluate existing and future socioeconomic conditions, transportation networks, land uses, and pricing data to estimate future travel patterns. It relies on key inputs of socioeconomic data including population, households, income, auto ownership, and jobs, transportation network data including existing and approved roadway and transit projects, and pricing data including transit fares and fuel costs, maintenance estimates, parking, tolls, and others. LA Metro's model relies on the SCAG integrated analytical framework, and therefore socioeconomic trends and outputs are consistent across the two. The model uses these inputs to assess 1) trip generation (the number of trips made), 2) trip distribution (where trips go), 3) mode choice (how trips will be divided among available modes of travel), and 4) trip assignment (predicting the route trips will take). The result is a set of outputs that indicate future performance on the transportation system, include VMT, VHT, delay, volume-to-capacity ratios, and others that are critical to investment decision-making. While the model can test different policy and investment scenarios, the outputs included in this report reflect transportation projects included and defined in Metro's Long Range Transportation Plan and SCAG's Regional Transportation Plan (RTP).

### 3.1 Population Growth

Population within the I-405 Corridor is expected to grow by roughly 0.4 percent annually by 2040, reaching nearly three million residents. Population growth will be concentrated in the northern part of the San Fernando Valley, Culver City, and Torrance (Figure 3), with areas of high population density in the San Fernando Valley east of the I-405 Freeway, around the UCLA Campus, Culver City, Inglewood, and Long Beach (Figure 4). These areas are consistent with current pockets of population density, and have much higher rates of transit and active transportation use than other parts of the study area. Study area population is expected to grow at a slower rate than LA County and the SCAG region as a whole, with LA County growing by 0.6 percent per year and the SCAG region growing by 0.7 percent per year.

The SCAG RTP Demographics and Growth forecast notes that the majority of regional population growth will be driven by natural increase. The biggest demographic changes will be driven by an aging and racially/ethnically diversifying population.<sup>4</sup> Seniors (those aged 65 and older) will represent a larger share of the total population, and the ratio of seniors to working age population is expected to increase from 1:5 to 1:3.<sup>5</sup> The aging of the population is particularly important, because as people age, their lifestyles and mobility needs change. With retirement, they may no longer need to commute, but may take more

<sup>4</sup> SCAG *Demographics and Growth Forecast*. [https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocial\\_demographics-and-growth-forecast.pdf?1606001579](https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocial_demographics-and-growth-forecast.pdf?1606001579)

<sup>5</sup> Ibid.

frequent trips to grocery stores, parks, medical facilities, and other non-work destinations. Many older residents might also rely more heavily on public transportation and paratransit services.

With respect to race and ethnicity throughout the SCAG region, the population that identifies as Asian/Other is expected to grow the fastest of any racial/ethnic group, growing to represent more than one-fifth of the region's population by 2045. The Latino population will also continue to grow, increasing to more than half of the region's population by 2045.<sup>6</sup> With these demographic changes occurring across the Southern California region, it is anticipated that demographics in the I-405 Corridor will also shift and diversify.

While changes in income and poverty levels cannot be forecast, there is a strong linkage between race/ethnicity and income, both of which have significant transportation implications. Communities of color within the study area have some of the lowest household incomes, highest rates of poverty and lowest rates of auto ownership in the LA region. Due to these lower auto ownership rates, low-income communities of color in the corridor tend to rely more heavily on transit. Almost 70 percent of Metro riders have an annual household income of less than \$35,000, and roughly half of riders live below the federal poverty line.<sup>7</sup>

Recent trends around the growing lack of affordable housing in LA County are likely playing a role in the increase in auto ownership among lower-income households, as trade-offs are being made to seek more affordable housing away from more costly areas that are transit-rich. In 2020, the median home price in Los Angeles County was \$543,400, which is more than two and half times higher than the national average, while the median monthly cost of rent was \$1390, which is more than a third higher than the rest of the United States (\$1390 compared to \$1023).<sup>8</sup> Fifty-five percent of LA County's residents are renters, and 29.5% of that group is considered severely rent burdened, meaning households spend more than 50% of their income on rent.<sup>9</sup> As formerly high-transit usage neighborhoods gentrify and become increasingly unaffordable, high-income workers who are more likely to own vehicles move in, while low-income communities of color who rely more heavily on transit are displaced to less transit-rich areas. In fact, SCAG's 2018 study on Falling Transit Ridership cited these demographic shifts as a main cause of falling ridership across the LA region.<sup>10</sup> Should neighborhoods and communities throughout the study area continue to undergo rapid gentrification and displacement, future transportation investments should 1) align with local anti-displacement policies<sup>11</sup>, and 2) ensure that those impacted by displacement have access to safe and affordable mobility options.

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<sup>6</sup> Ibid.

<sup>7</sup> Metro Fareless System Initiative Fact Sheet; 2021; [https://media.metro.net/2020/fsi\\_fact\\_sheet\\_ENG.pdf](https://media.metro.net/2020/fsi_fact_sheet_ENG.pdf)

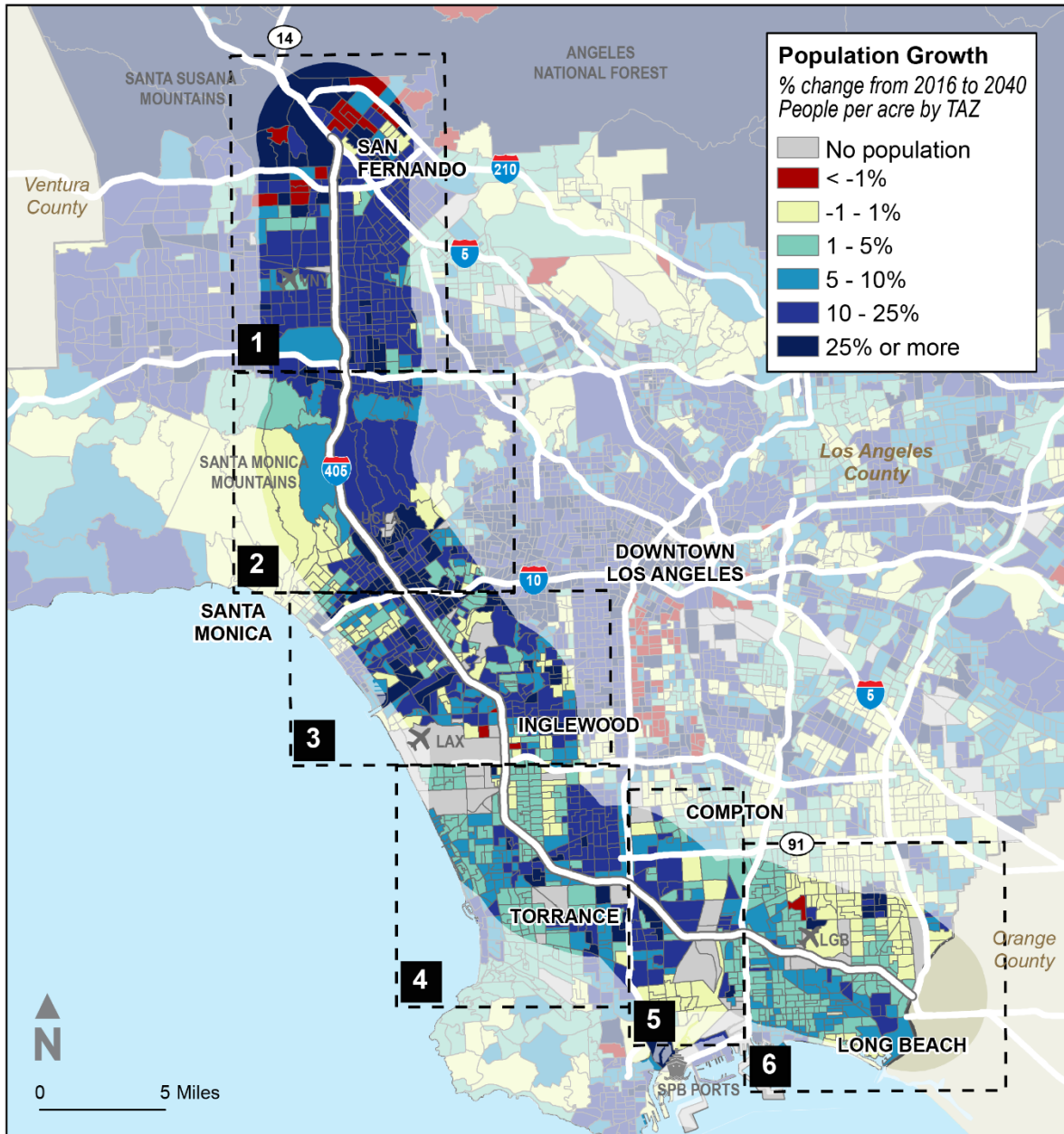
<sup>8</sup> [DATA BRIEF 3 Housing English.pdf | Powered by Box](#)

<sup>9</sup> [DATA BRIEF 3 Housing English.pdf | Powered by Box](#)

<sup>10</sup> Falling Transit Ridership: California and Southern California; SCAG, UCLA ITS 2018  
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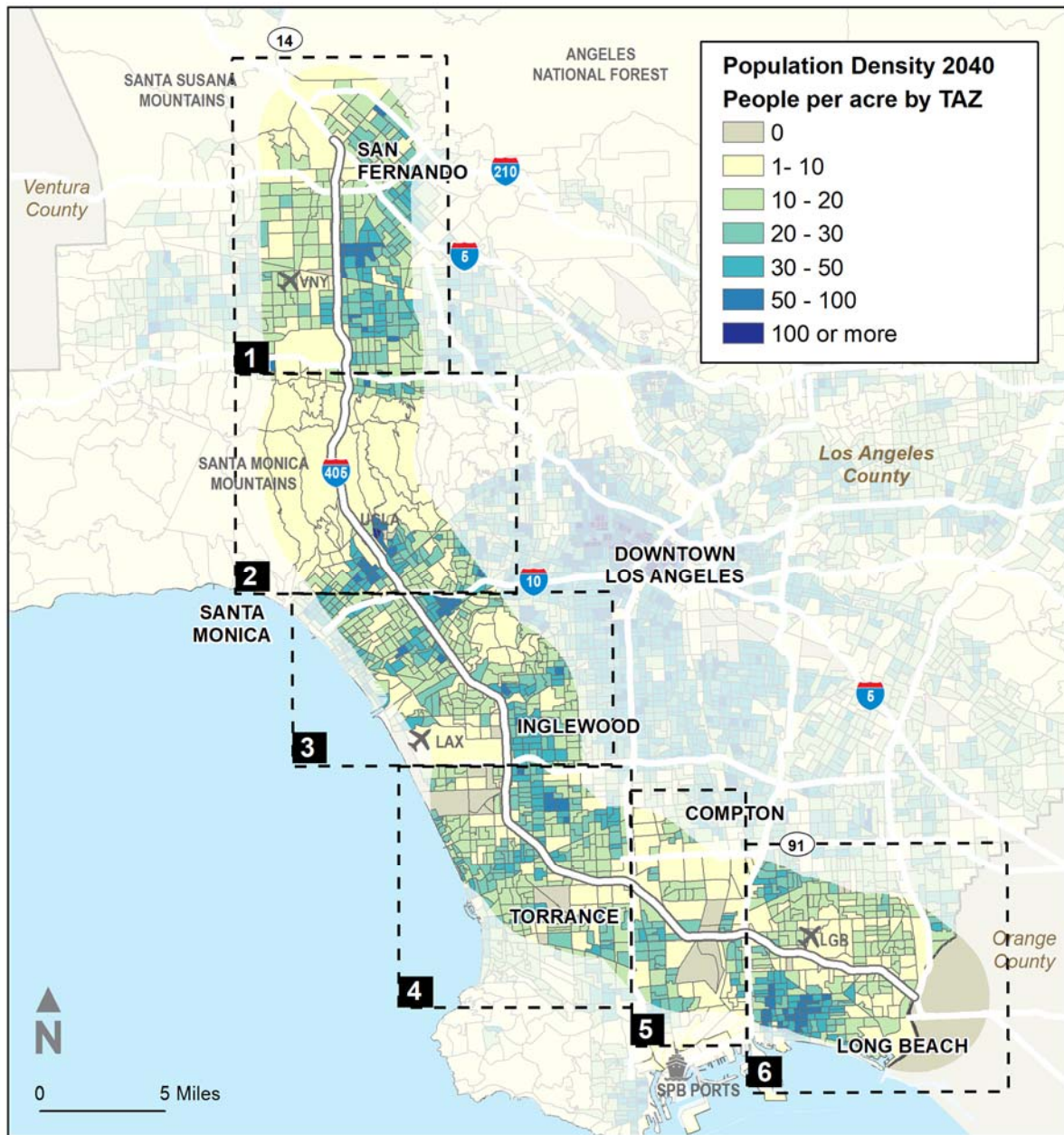
<sup>11</sup> UCLA Center for Neighborhood Knowledge; <https://knowledge.luskin.ucla.edu/2018/07/11/new-map-database-of-anti-displacement-policies/>

Figure 3 Population Growth Projections 2016 to 2040, by Segment



Source: LA Metro Travel Demand Model

Figure 4 2040 Projections: Population Density



Source: LA Metro Travel Demand Model

### 3.2 Job Growth

Job growth within the I-405 Corridor is expected to occur at a faster rate than population growth, at about 0.7 percent per year. The more than 1.6 million jobs forecast in the study area by 2040 represent a nearly 20 percent increase in jobs over the 2016 baseline. Job growth is anticipated to occur at roughly the same rate in the study area as in LA County (0.7 – 0.8 percent per year) but slower than the SCAG region as a whole (1.2 percent per year).

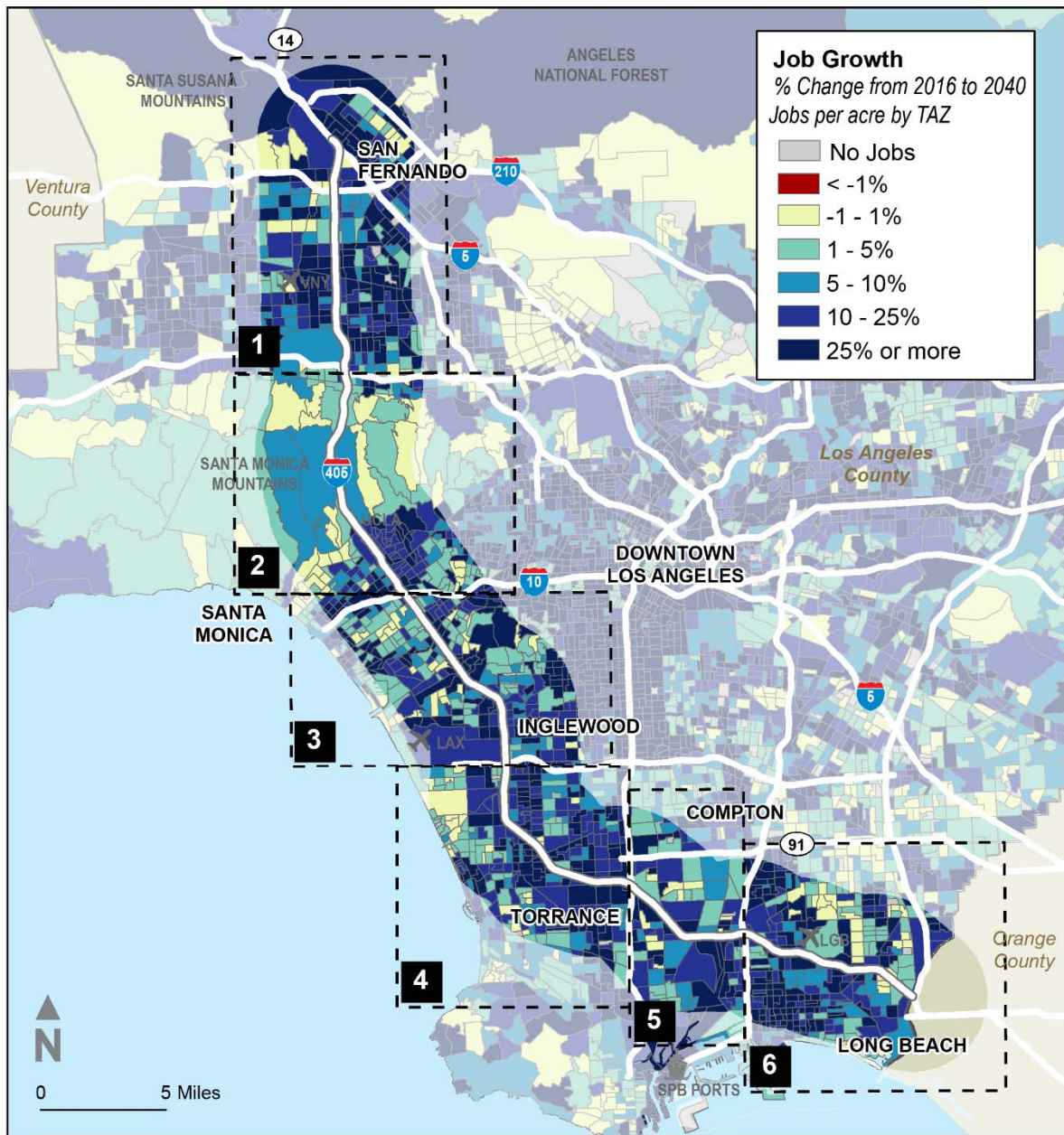
Future job growth is clustered around existing commercial corridors within the study area, including Van Nuys, Sepulveda Boulevard, Ventura Boulevard in the San Fernando Valley, the UCLA Campus and Santa Monica, Culver City, LAX, Torrance, Inglewood and Long Beach (Figure 5). These areas were identified as having some of the highest job densities in the Baseline Conditions Assessment (see Figure 18 in the Baseline Conditions Assessment). Figure 6 shows that future job density is anticipated to remain in these areas.

Historical data for the SCAG region shows that high-wage jobs and low-wage jobs have both increased rapidly over the last two decades, while middle-wage jobs have decreased.<sup>12</sup> If this trend continues, many inequities experienced today may be exacerbated. People who are unable to afford housing near their jobs, as discussed previously, may be forced to move further away, which will necessitate longer commutes and presumably more limited access to non-auto mobility options. The jobs housing balance may also be impacted by long-standing land use policies which continue to make single-family residences the predominant form of housing throughout the region. Connect SoCal describes the importance of integrating future transportation and land use investments, and prioritizing growth strategies such as infill and mixed-use development that support more dense living, working, and traveling, thereby promoting non-auto travel and minimizing congestion. Not doing so may limit future economic growth in the corridor.

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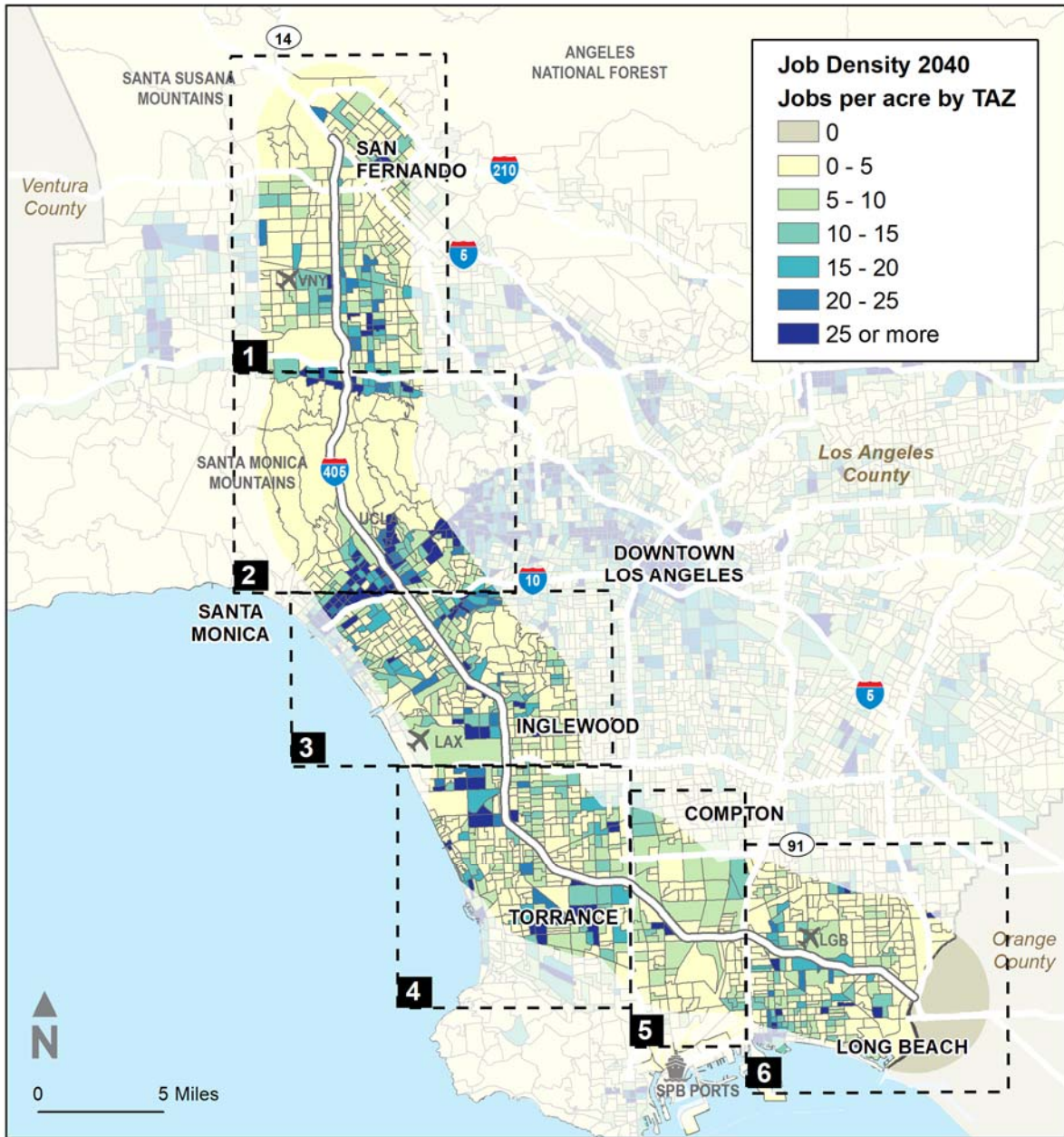
<sup>12</sup> SCAG *Demographics and Growth Forecast*. [https://scag.ca.gov/sites/main/files/file\\_attachments/0903fconnectsocial\\_demographics-and-growth-forecast.pdf?1606001579](https://scag.ca.gov/sites/main/files/file_attachments/0903fconnectsocial_demographics-and-growth-forecast.pdf?1606001579)

Figure 5 Job Growth Projections 2016 to 2040



Source: LA Metro Travel Demand Model

Figure 6 2040 Projections: Job Density



Source: LA Metro Travel Demand Model

According to long-term industry employment projections from the Employment Development Department, the fastest-growing sector in LA County is educational services, health care, and social assistance, which is expected to grow by roughly 24 percent between 2018 (when projections were estimated) and 2028,

outpacing the statewide growth rate of roughly 19 percent (Figure 7).<sup>13</sup> This sector is by far the largest employment sector in LA County, growing from 821,300 jobs in 2018 to more than 1 million in 2028.

The leisure and hospitality; transportation, warehousing, and utilities; construction; and professional services sectors are all expected to grow by more than 10 percent over the same period.<sup>14</sup> Although a small amount of overall jobs in LA County, farming, durable and nondurable goods manufacturing, and manufacturing are all anticipated to lose jobs in the range of a 9 – 17 percent decrease. Statewide, jobs in these sectors are anticipated to decline at a much slower rate of 1 – 2 percent between 2018 and 2028.

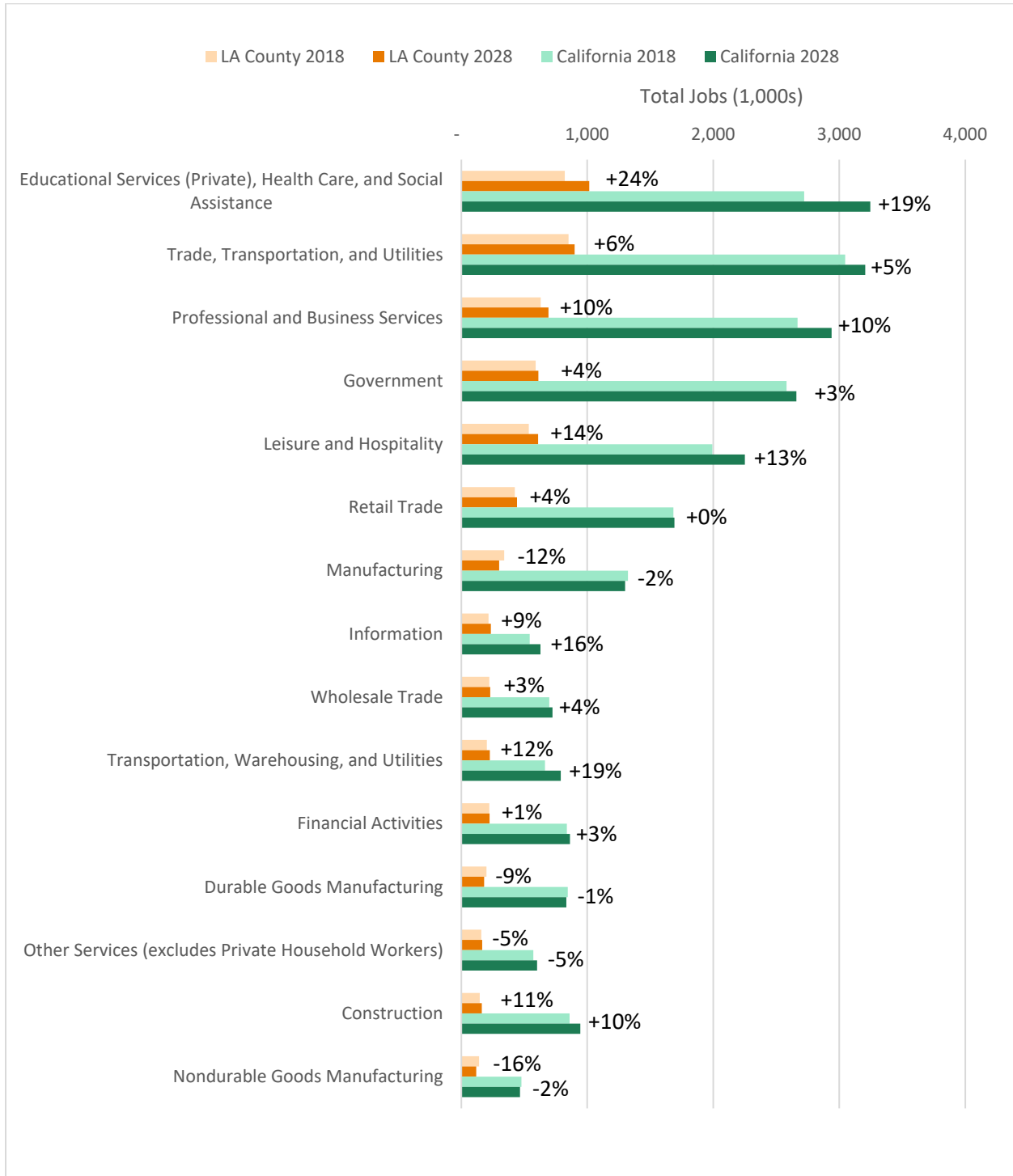
Changes in job distribution will have an impact on overall travel patterns and needs. More jobs in educational services, health care, and social assistance – which includes doctors, registered nurses, and elementary, middle, and post-secondary school teachers – could suggest more off-peak commute trips, since these jobs tend to require in-person attendance and can start and end outside the typical morning and afternoon peak periods. However, the rise in professional and business services could lead to more peak-hour commuting, depending on the extent to which remote work remains permanent in the aftermath of COVID-19. The future of the workplace, the rise of telework, and the impacts of the COVID-19 pandemic are discussed in greater detail in Section 5.4.

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<sup>13</sup> A sector-level employment summary for the I-405 corridor was not completed as part of this assessment; however, corridor-specific employment trends are likely to track with LA County as a whole

<sup>14</sup> Long-Term Industry Employment Projections; California Employment Development Department; <https://data.edd.ca.gov/Employment-Projections/Long-Term-Industry-Employment-Projections/sp6i-jezb>

**Figure 7 Employment Projections by Sector for LA County and California (2018 – 2028)**



Source: California Economic Development Department. Note: Farm and mining and logging sectors not included due to extremely limited employment

### 3.3 Tourism Growth

Many major tourist attractions are located in the study area, including the Getty Center, Manhattan Beach, Venice Beach, the RMS Queen Mary, Rodeo Drive, Beverly Hills, the LA County Museum of Art, and others. The Los Angeles International Airport (LAX), a major passenger and trade hub, is located within the I-405 study area. LAX supported nearly 43 million passenger enplanements in 2019, ranking 2<sup>nd</sup> in the U.S. As of 2020, during the height of the COVID-19 pandemic, enplanements fell to roughly 14 million, ranking 5<sup>th</sup> in the U.S.<sup>15</sup>

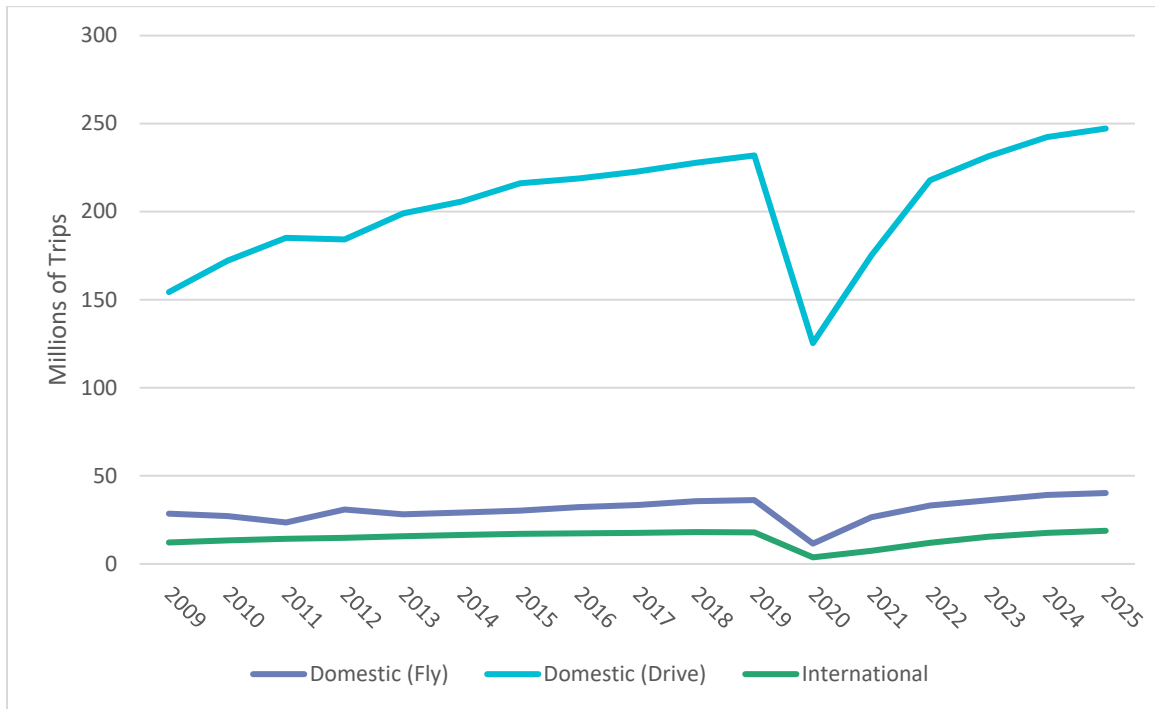
The tourism industry has experienced significant hardship during the COVID-19 pandemic. Both domestic and international travel plummeted (Figure 8). Hotel occupancy reached a nationwide low in April of 2020. However, many indicators have nearly achieved pre-pandemic levels or are rapidly improving. Travel is expected to return to 2019 levels by 2024, with domestic travel recovering slightly ahead of international.<sup>16</sup>

In addition to existing tourist destinations within the I-405 Corridor, many major upcoming events will bring millions of visitors to the LA region, placing additional demands on the I-405 “system of systems.” Many of the venues identified for the 2028 Olympics and Paralympics, including SoFi Stadium (Inglewood), Staples Center (downtown LA), Pauley Pavilion at UCLA (Westwood), and the LA Memorial Coliseum (Exposition Park) are located in close proximity to the study area. LA Metro, SCAG, and local municipalities are working to implement projects before the 2028 Olympics that can accommodate the surge in demand. As Figure 8 shows, a majority of access the corridor by car. Providing viable non-auto options to visitors will be a critical strategy in accommodating this growing demand.

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<sup>15</sup> Bureau of Transportation Statistics, 2020; <https://www.bts.gov/content/passengers-boarded-top-50-us-airports>

<sup>16</sup> California Travel-Related Sped & Visitation Forecast; Visit California; <https://industry.visitcalifornia.com/research/travel-forecast> .

**Figure 8 California Tourism Projections**

Source: California Travel-Related Spend & Visitation Forecast. 2021. Visit California.

### 3.4 Goods Movement Growth

While the I-405 Corridor does not carry the highest truck volumes within the regional freight network, it provides an important connection to regional population clusters and air cargo facilities located near LAX. Certain freeway segments carry more than 20,000 trucks per day, and a number of locations along the corridor have been identified as high priority bottlenecks.<sup>17</sup> In addition, the I-710, a primary connection to the SPB Ports intersects the I-405 in the Gateway Cities region (Segments 5 and 6 from Figure 2).

Both POLA and POLB have committed significant financial resources to upgrading landside facilities and improving intermodal facilities.<sup>18</sup> Much of that investment reflects a shift in focus toward investment on the ports' rail network. Significant upgrades are planned for the Alameda Corridor, a freight expressway that supports intermodal railroad cars that pass under I-405 at Alameda Street/SR 47. In 2020, approximately 4.8 million TEUs were either moved on the Corridor or passed through the Corridor facilities.<sup>19</sup> Nationally,

<sup>17</sup> Connect SoCal Goods Movement Technical Report; SCAG; [https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocial\\_goods-movement.pdf](https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocial_goods-movement.pdf)

<sup>18</sup> Port Infrastructure: A Look Ahead; Port of Long Beach 2020; <https://polb.com/port-info/news-and-press/port-infrastructure-a-look-ahead-11-04-2020/>

<sup>19</sup> The Alameda Corridor Monthly TEU and Revenue History; [https://1popqd1sgf8034z1s33q7dj6-wpengine.netdna-ssl.com/wp-content/uploads/2020/12/Monthly\\_TEUREV\\_History.pdf](https://1popqd1sgf8034z1s33q7dj6-wpengine.netdna-ssl.com/wp-content/uploads/2020/12/Monthly_TEUREV_History.pdf)

rail freight is expected to increase by about 5 percent per year through 2025.<sup>20</sup> And while the I-405 is not a major truck corridor, the intersection with the I-710 in the Gateway Cities area will likely see increases in truck traffic.

Air cargo demand and throughput experienced volatility in the pandemic, and it remains to be seen how those impacts along with the forecasted growth in air cargo will shape the future. Air cargo demand increased in the pandemic while also experiencing disruptions. Initially, sharp decreases in the number of passenger flights created a bottleneck for many shippers who are no longer able to use cargo space on canceled passenger flights.<sup>21</sup> Meanwhile, greater e-commerce activity has increased demand for air cargo by about nine percent, in many cases outstripping carriers' cargo capacity.<sup>22</sup> The nearly month-long blockage on the Suez Canal in March of 2021 is also contributed to increased demand. Prior to the pandemic forecasts estimated that air cargo would grow by about four percent per year between 2019 – 2027.<sup>23</sup> However, with the change in consumer behavior, it is possible that these growth projections may be underestimating the role air cargo will play in the future.

Continued growth in e-commerce will have significant implications for truck traffic in the I-405 Corridor. The COVID-19 pandemic helped fuel growth in e-commerce deliveries and many of those consumer behaviors will remain after the pandemic subsides. E-commerce sales make up roughly 15 percent of total US retail sales (up from 14 percent in 2020) and are on track to surpass 20 percent of all retail sales by 2024.<sup>24</sup> Given that these deliveries occur primarily by truck, continued growth in e-commerce will significantly impact travel demand on the I-405 Corridor and surrounding arterials.

### 3.5 Impacts on Corridor Performance

Combined, these trends will result in increased VMT, congestion, delay, and HOV lane degradation if not addressed with a with a comprehensive and multimodal oriented approach for transporting more people and goods, (Table 2). The LA Metro Travel Demand Model was used to assess these key metrics of future condition and performance along the I-405 Corridor. The 2047 LRTP Scenario shown in Table 2 includes transportation projects defined in Metro's Long Range Transportation Plan and SCAG's Regional Transportation Plan (RTP). The 2047 LRTP Scenario is the most aggressive of the four different LRTP scenarios evaluated during the LRTP development process. It includes the Measure M funded capital projects, along with several bold policy initiatives, including a VMT fee, free transit, and faster bus speeds. However, even with the number of investments planned in the Corridor study area ***the performance of the system is expected to degrade:***

- **The number of miles that travelers are traveling, both on the Corridor and in LA County, is expected to increase.** In 2017 VMT exceeded 68 million miles in the Corridor study area, and is

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<sup>20</sup> Rail Freight Revenues to Grow by 4.7% per year through 2025; Supply Chain Quarterly; <https://www.supplychainquarterly.com/articles/4746-rail-freight-revenues-to-grow-47-per-year-through-2025>

<sup>21</sup> IATA Cargo Webinars; 2021; <https://www.iata.org/link/c0ffd38a721c4055a32844dc78c865e7.aspx>

<sup>22</sup> Ibid.

<sup>23</sup> Air Cargo Gone Wild: 9% Growth in February; FreightWaves 2021; <https://www.freightwaves.com/news/air-cargo-gone-wild-9-growth-in-february>

<sup>24</sup> Insider Intelligence, 2021

expected to increase by nearly 0.5 percent per year through 2047. LA County VMT is expected to increase at a slightly faster rate of 0.61 percent per year, due to additional population and job growth occurring outside the study area, as discussed in Section 3.1 and 3.2. VMT growth is particularly pronounced in the San Fernando Valley, along the I-105, and in the area north of the I-405 near the I-110 (Figure 9). Average daily VMT per capita is roughly 25.6 miles within the Corridor, but only 23.7 miles throughout LA County. Comparatively, the growth in daily VMT per capita within the Corridor study area is expected to have a smaller increase (an additional 0.6 miles in 2047) than what is anticipated countywide (an additional 0.8 miles in 2047).

- Congestion will outpace the increase in VMT.** In the I-405 Corridor, vehicle hours traveled (VHT) under congested conditions is expected to grow from nearly 2.5 million hours in 2017 to just over 3 million hours in 2047 – an increase of 25 percent. This equates to an annual increase of 0.76 percent per year, compared to a 0.45 percent increase in VMT per year.<sup>25</sup>
- Hours of Delay are expected to increase.** Travelers on the I-405 Corridor experienced more than 730,000 vehicle hours of delay in 2017, with that number increasing to more than one million hours of delay in 2047. The projected increase in delay equates to an increase of more than one percent each year, over the next thirty years.
- HOV Lane performance will continue to degrade.** To avoid or minimize delay, some travelers turn to High Occupancy Vehicle (HOV) Lanes, but these lanes are unlikely to offer benefits to HOVs in the future unless these lanes are further managed. Roughly four percent of travelers on I-405 currently use HOV lanes, compared to 3.3 percent in LA County, which is likely due to the significant congestion within the I-405 study as compared to other parts of LA County. However, as of 2017, all segments of HOV lanes in both directions were classified as “extremely degraded,” meaning that peak commute hour speeds regularly dropped below 45 miles per hour, which lessens the incentive for users to shift to carpooling, transit, or other modes that can utilize the HOV lanes.<sup>26</sup> Preliminary traffic and revenue forecasts for the year 2035 indicate that degradation levels will worsen if the current HOV 2+ occupancy rate remains. Based on this forecast, a majority of the I-405 Corridor would experience degradation anywhere between 10 to 75 percent of PM peak periods, with areas around the Sepulveda Pass experiencing degradation more than 75 percent of the time.<sup>27</sup> Conversion to ExpressLanes would not be possible, as there would be no excess capacity available to sell to non-HOV motorists. However, adding ExpressLanes could be expected to mitigate the overutilization of existing lanes. Without management or further restrictions on usage, performance will continue to degrade.
- Mode split will shift minimally.** Roughly 95 percent of trips are expected to be made by auto in 2047, with the majority—53 percent—made by Single Occupant Vehicles (SOV). More than 15 million trips were made in 2017 by SOV; these are expected to increase to more than 17 million

<sup>25</sup> VHT is defined as total vehicle flow multiplied by travel time in hours. Daily congested VHT is calculated as total daily vehicle flow multiplied by congested time during peak and off-peak periods. Daily-free flow VHT is calculated as total daily vehicle flow multiplied by free-flow time, which is based on all traffic under free-flow speed. VHT is computed by subtracting estimated free-flow VHT from congested VHT.

<sup>26</sup> “2017 California High-Occupancy Vehicle Facilities Degradation Report and Action Plan.” Caltrans Division of Traffic Operations Office of System Operations. 2018.

<sup>27</sup> “LA Metro Countywide ExpressLanes Strategic Plan Final Report.” LA Metro. 2017.

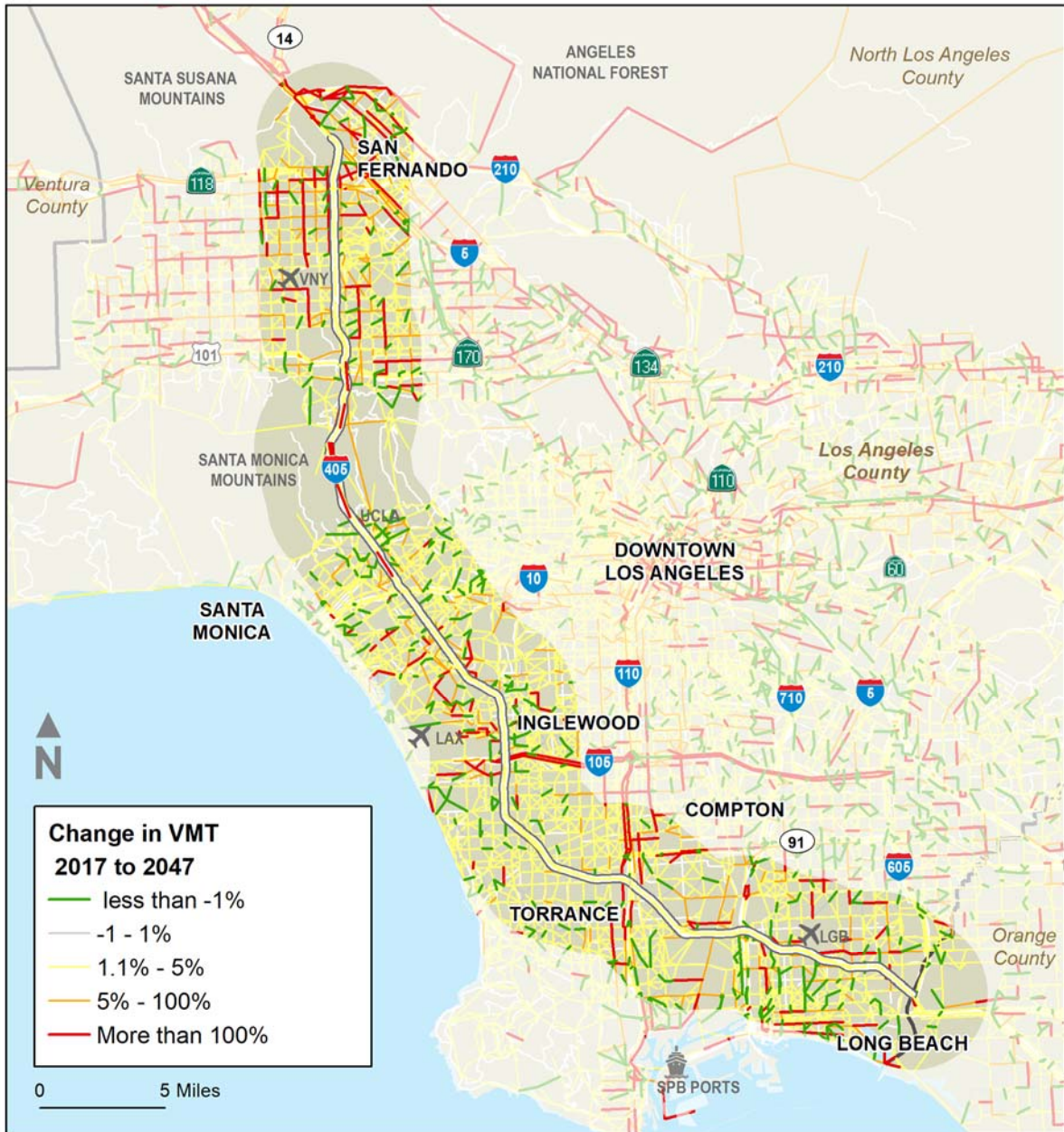
trips in 2047—an increase of 13 percent. Transit mode share is expected to increase by 1.2 percent, from one million trips in 2017 to 1.2 million trips in 2047. High Occupancy Vehicle (HOV) trips are anticipated to increase at roughly the same rate as SOV trips—13 percent—but will decrease in mode share by about 0.5 percent (Figure 10). This is attributed to the assumption that many HOV trips will shift to transit between 2017 and 2047.

**Table 2 Future Performance on the I-405 Corridor**

Measure	Location	2017	2047 LRTP	Total Added	% Change	Annualized % Change
Daily Vehicle Miles Traveled (VMT) (Total of AM, PM, Midday, and Overnight for Auto and Truck)	I-405 Study Area	68,057,840	77,938,148	9,880,308	14.5%	0.45%
	LA County	234,750,614	281,476,538	46,725,924	19.9%	0.61%
Daily VMT Per Capita (Total of AM, PM, Midday, and Overnight for Auto and Truck)	I-405 Study Area	25.58	26.18	0.61	2.4%	0.08%
	LA County	23.66	24.45	0.79	3.3%	0.11%
Daily Vehicle Hours Traveled under Congestion Conditions (VHT) (Total of AM, PM, Midday, and Overnight)	I-405 Study Area	2,467,439	3,092,271	624,832	25.3%	0.76%
	LA County	8,045,906	10,692,410	2,646,504	32.9%	0.95%
Daily Vehicle Hours of Delay (VHD) (Total of AM, PM, Midday, and Overnight)	I-405 Study Area	731,788	1,073,333	341,555	46.7%	1.28%
HOV Lane Usage (Total of VMT for AM, PM, Midday, and Overnight)	I-405 Study Area	3.9%	4.6%	0.7%	19.9%	0.55%
	LA County	3.3%	3.8%	0.5%	15.2%	0.47%

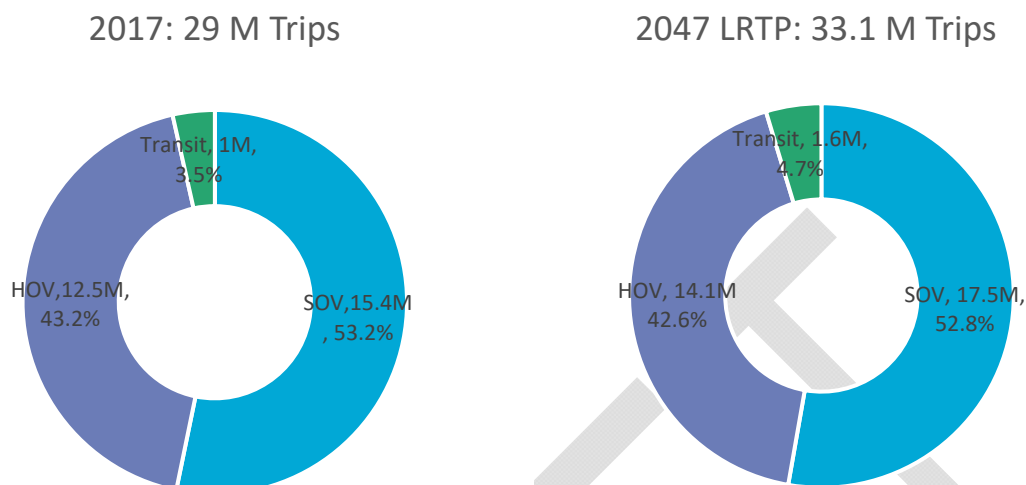
Source: LA Metro Travel Demand Model

Figure 9 Forecasted Growth in VMT (2017 – 2047)



Source: LA Metro Travel Demand Model

**Figure 10 Mode Split in LA County (2017 – 2047)**



Source: LA Metro Travel Demand Model

## 4.0 Other Trends and Uncertainties will Impact Travel

In addition to changes in population and jobs, there are numerous trends and technologies that will impact how people live, work, and travel in the future. This section explores the many trends and associated transportation impacts observed during the COVID-19 pandemic; how emerging technologies that support shared mobility platforms, vehicle electrification, and vehicle automation may change travel behavior; and how a changing workplace and shifting policy landscape may impact future travel within the I-405 Corridor.

### 4.1 Post-COVID Travel Patterns

The protracted pandemic has California and Los Angeles still transitioning to a “new-normal” and rebounding from the early stay-at-home order that drastically shifted mobility patterns in March of 2020. As discussed in the Baseline Conditions Assessment, congestion disappeared almost overnight, transit ridership fell drastically, and there was a significant increase in bicycling and walking for recreation in the early days of the pandemic. While traffic volumes have mostly reverted to pre-pandemic levels, there is still uncertainty as to whether peak-hour commuting will grow as workers return to the office, and if other

observed trends in mode shift will hold. Some of the key changes witnessed during the pandemic that may have long-term impacts on mobility include (but are not limited to) the following:

**Key Trend: Decline in peak period commuting and widespread acceptance of remote work and hybrid schedules.** In the early stages of the COVID-19 pandemic there were steep declines in vehicular traffic volumes, rush hour delay, and vehicle miles traveled (VMT) as most non-essential trips were curtailed, and many employers adapted to remote work arrangements. Many employers will continue to support remote work and hybrid schedules.

- **Implications:** The shifts in commute-related travel behavior may reduce demand on freeways

### *Metro Recovery Task Force*

Metro authored a COVID-19 recovery report which identified a variety of measures and strategies to help the agency with its adjustment to pandemic-influenced changes and post-pandemic conditions. The report outlined 20 near-term recommendations and 17 long-term recommendations to help with its recovery.

The 20 near-term recommendations focus on measures that uphold the current public health and safety needs of Metro customers and employees (e.g. more frequent vehicle cleaning, ubiquitous mask vending, etc), and “relaunch” recommendations which are oriented toward the anticipated relaxation of stay-at-home measures. The “relaunch” recommendations included strategies to bring Metro service back up to pre-pandemic levels and solidifying support for a variety of mobility alternatives which took hold during the pandemic to help manage post-pandemic transportation demand such as working from home, bicycling, emerging models for shared mobility, and other innovative mobility solutions.

The 17 long-term recommendations were grouped into measures which improve mobility, advance social equity, and measures which help Metro save costs and generate new revenues. Improved mobility strategies included support for capital projects on freeways such as express buses running on improved HOV lanes, complete streets network, improved station amenities, and strategies such as fare integration across all transit agencies to make more efficient use of the region’s transit resources. Approaches to improve social equity included better public engagement tactics and more data analysis of travel patterns. Cost savings strategies include building up internal staff expertise to keep specialized planning tasks in-house, study of industry best practices on construction cost control.

and major roads during historic ‘peak’ periods of demand, and may also reduce demand around major job centers.<sup>28</sup> However, the ability to telecommute is not available to all employees. Front-line workers, service workers, and manufacturing workers are likely to maintain pre-COVID commute patterns. In the I-405 Corridor, the largest employers (including UCLA, LAX, VA Medical

<sup>28</sup> Has COVID-19 Forever Changed Rush-Hour Traffic Patterns? GovTech;  
<https://www.govtech.com/analytics/has-covid-19-forever-changed-rush-hour-traffic-patterns.html>

Center, Ports of Los Angeles and Long Beach) are not likely to experience a significant shift in long-term work-from-home arrangements.

**Key Trend: Falling transit ridership, transit budget shortfalls, and reduced service.** In the Spring and Summer of 2020, many US transit agencies reported a sharp decline in ridership – including Metro and all municipal operators serving the Corridor - as a result of stay-at-home directives. With that decline, many agencies have experienced budget shortfalls that have caused further service reductions, reinforcing ridership declines. Moreover, those who rely on transit - most commonly students, essential workers, and those without access to a vehicle – are disproportionately impacted by these service cuts.

However, while the total number of transit trips has declined sharply, some research suggests that the number of individual users has not declined noticeably. This suggests that regular transit users are making fewer trips than before, rather than generally abandoning transit as a mode.<sup>29</sup> In fact, in the I-405 Corridor, the routes that experienced the highest percentage loss in ridership serve the areas around LAX and UCLA. Areas less affected by the decline in ridership include areas serving the ports.<sup>30</sup>

- **Implications:** While Metro bus ridership data suggests that ridership is slowly recovering, it is unclear whether past and potential future riders will remain apprehensive, or if transit will be embraced as vehicle travel and congestion return to pre-pandemic levels. In response to falling ridership and concerns around equity, Metro launched a Fareless System Initiative to assess the benefits and impacts of eliminating fares across Metro services – a strategy being explored by many transit agencies across the country. With declining fare revenue (as a result of falling ridership and potential future reductions in fares), rises in operating costs, and a need to both expand and improve service quality, ensuring access to stable transit funding sources will be critical.

**Key Trend: Growth in bicycle usage.** During the pandemic, a study by People for Bikes found that 10 percent of American adults engaged in bicycling in a new way, and the majority of these new riders plan to continue to ride.<sup>31</sup> Many cities have closed roads to cars, lowered speed limits, implemented temporary bike lanes in order to meet increased demand for active forms of transportation, expanded or subsidized bike share programs, and reallocated curb space. Research suggests that these improvements are here to stay.

- **Implications:** In a region primarily designed for cars, the swift uptick in active transportation provides momentum for continued investment in safe, connected, and enjoyable mobility options for people biking, walking, and rolling. Metro has many plans for rolling out these improvements, including the Active Transportation Strategic Plan (ATSP) and First-Last Mile Strategic Plan. Expanding access to funding, continued collaboration with communities and stakeholders, and education for all road users will be essential to supporting this growth.

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<sup>29</sup> A Transit Agenda for the COVID-19 Emergency; TransitCenter 2020 [https://transitcenter.org/wp-content/uploads/2020/10/TC\\_Covid\\_FINAL\\_Pages-1.pdf](https://transitcenter.org/wp-content/uploads/2020/10/TC_Covid_FINAL_Pages-1.pdf)

<sup>30</sup> LAMetro Recovery Task Force; <https://www.metro.net/projects/recovery-task-force/>

<sup>31</sup> How Bicycling Changed During a Pandemic; People for Bikes; <https://www.peopleforbikes.org/news/how-bicycling-changed-during-a-pandemic>

**Key Trend: Repurposing of Roadways and Proliferation of Open Streets / Slow Street Networks.**

With widespread indoor restrictions and the closure of parks and other recreational destinations, many cities, including those in the I-405 study area, have identified networks of ‘slow streets’ in residential areas as a temporary step to provide people with an outlet for outdoor recreation.<sup>32</sup> Slow streets are low-speed, typically low-traffic neighborhood streets with soft closures to vehicular traffic, allowing more space for people biking, walking, or rolling. At the same time, many restaurants and commercial business districts converted parking areas (on-street and in private lots) into outdoor dining space. LADOT has developed a permit program for on-street dining, LA Al Fresco, which permits businesses to expand dining and drinking areas into the street, sidewalk, or parking lots adjacent to their establishments.

- **Implications:** The popularity of ‘slow streets’ has led for some to call for making such programs permanent, which is being considered by the City of LA. These types of changes and legislation could lead to a drastic reorganization of how streets and public space have been used over the last century. These changes suggest more active use of street space that supports walking, biking, and transit modes. It also will require more active management of the curb, as businesses, delivery vehicles, transit, and shared mobility services all compete for increasingly limited curb space.

## 4.2 Land Use and Housing Affordability

**Key Trend: Housing supply and affordability.** While housing supply remains one of California’s most pressing challenges, recent legislation suggests that the State, including LA County, is on its way toward accommodating more housing, and within the existing footprint of development. California recently passed Senate Bills (SB) 9 and 10. SB 9 allows accessory dwelling units (ADUs) and/or duplexes on most single-family lots, and SB 10 requires local municipalities to streamline high density development near existing transit service. However, local municipalities have discretion to determine affordability requirements for new housing. If future housing is not affordable and available to low- and no-income residents, current trends in displacement and associated mobility impacts (supercommuting, limited access to jobs/goods/services) may worsen.

- **Implications:** Increasing urban housing density, and ensuring mixed land uses that reduce the need to travel long distances, hold significant promise for reducing VMT, GHG emissions, and improving mobility and accessibility. Already, roughly 80 percent of trips within the corridor are less than five miles. But most of these trips are in single-occupant vehicles. More dense development will allow people to live closer to their jobs, education, services, and other every-day needs, and expand access to (and feasibility of) high-quality transit and non-auto modes. However, if housing is not affordable to those facing the greatest cost burdens, displacement and many of the inequities faced today will be exacerbated.

<sup>32</sup> L.A. Announces COVID “Slow Streets” Pilot then Postpones it: Program Needs Focus on Health, Equity; Streetsblog 2020; <https://la.streetsblog.org/2020/05/01/l-a-announces-covid-slow-streets-pilot-then-postpones-it-program-needs-focus-on-health-equity/>

## 4.3 Vehicle Electrification

**Key Trend: Electric vehicles.** The State of California has set a goal of bringing five million zero-emission vehicles (ZEVs) on the road by 2030, compared to about 30 million vehicles currently in the state (including motorcycles, light-duty vehicles, and trucks) to curb greenhouse gas (GHG) emissions from transportation.<sup>33</sup> California has led the nation in setting specific targets to achieve GHG emission reduction goals. Most recently, in late 2020, Governor Newsom issued an Executive Order (EO-N-19-19) directing the California Air Resources Board (CARB) to develop regulations to mandate that 100 percent of in-state sales of new passenger cars be zero-emission by 2035 and all medium- and heavy-duty truck to be zero-emission by 2045.<sup>34</sup> These changes continue the state's legacy of policy support for electric vehicle adoption, which has helped to support the state's dominant role in the electric vehicle market. Electric vehicle sales in California account for between 45-50 percent of all EV sales in the country.<sup>35</sup> Growth in full Battery Electric Vehicle (BEV) sales and Plug-in Hybrid Electric Vehicles (PHEV) sales have risen by approximately 72 percent, on an annual average basis, from 2010 to 2020 (Figure 11).<sup>36</sup>

### *Case Study: Santa Monica Zero-Emission Delivery Zone*

Through this effort, one-square mile in the city's downtown, Main Street, and Ocean Park neighborhoods will grant priority curb access for zero emission delivery vehicles in up to 20 loading priority curb areas.<sup>1</sup> The concept was developed by Transportation Electrification Partnership (TEP), a coalition of local government officials, utilities, state regulators, automakers, industry leaders, labor, and startups. The TEP is working to accelerate transportation electrification and zero-emissions goods movement in advance of the 2028 Olympic and Paralympic Games.<sup>1</sup>

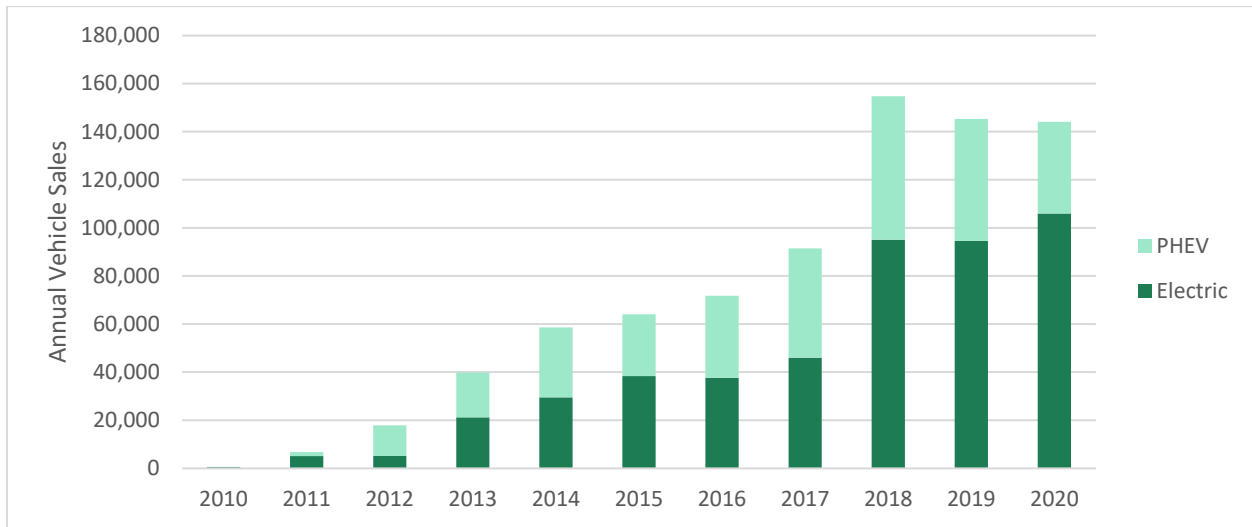
<sup>33</sup> Summary of California Vehicle and Transportation Energy; California Energy Commission; <https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/summary-california-vehicle-and-transportation>

<sup>34</sup> Governor Newsom Announces California Will Phase Out Gasoline Powered Cars & Drastically Reduce Demand for Fossil Fuel in California's Fight Against Climate Change; Office of Governor Newsom 2020; <https://www.gov.ca.gov/2020/09/23/governor-newsom-announces-california-will-phase-out-gasoline-powered-cars-drastically-reduce-demand-for-fossil-fuel-in-californias-fight-against-climate-change/>

<sup>35</sup> Electric Vehicle Market Report; Veloz 2021; <https://www.veloz.org/sales-dashboard/>

<sup>36</sup> Zero Emission Vehicle and Infrastructure Statistics; California Energy Commission; <https://www.energy.ca.gov/data-reports/energy-insights/zero-emission-vehicle-and-charger-statistics>

**Figure 11 California Electric Vehicle Sales (2010 – 2020)**



Source: California Energy Commission; Zero Emission Vehicle and Infrastructure Statistics

Electric truck and transit sales will also increase in the coming years, using both fuel cell and battery technology. In 2021, CARB formally adopted the Advanced Clean Trucks (ACT) Regulation, which will require Original Equipment Manufacturers (OEMs) to achieve a certain percentage of Medium- and Heavy-Duty Electric Vehicle (MHDEV) sales. Requirements take effect in 2024.<sup>37</sup> For transit, in 2018, CARB approved a regulation to require public agencies to gradually transition fleets to 100 percent zero emission by 2040.<sup>38</sup>

As electric vehicles become more commonplace across Los Angeles, the need for charging infrastructure will also increase. According to the Alternative Fuels Data Center (current data as of December 7, 2021), there are more public Level 2 charging stations and plugs than any other charging type in the area, with approximately 900 individual stations serving approximately 2,200 individual plugs. There are relatively few public connectors available for Level 1 charging (see Table 3 for charging level definitions), with only five stations and approximately 20 plugs. Of DC Fast Chargers, there are approximately 70 public stations serving approximately 320 plugs (Table 4). Level 2 chargers are available throughout the corridor. DC Fast Chargers and Level 2 chargers are most abundant in the sections of the corridor that pass through Torrance, Inglewood, Santa Monica, and Culver City. The highest concentration of electric vehicle service equipment (EVSE) in the corridor is located in the vicinity of the Los Angeles Airport.

**Table 3 Electric Vehicle Charger Type**

Type of charger	Power supply	Output	Typical charging time
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<sup>37</sup> Advanced Clean Trucks Regulation; CARB Final Regulation Order; <https://ww3.arb.ca.gov/regact/2019/act2019/fro2.pdf>

<sup>38</sup> California Transitioning to All-Electric Public Bus Fleet by 2040; CARB; <https://ww2.arb.ca.gov/news/california-transitioning-all-electric-public-bus-fleet-2040>

Level 1	Standard 120 volt AC	1.44 kW to 1.92 kW	8-10 hours to full charge, or 2-5 miles of range per hour of charging
Level 2	240 volt AC	3.1 kW to 19.2 kW	4-8 hours to full charge, or 10-20 miles of range per hour of charging
DC Fast Chargers	480 volt AC converted to direct current	50 kW to 350 kW	30-60 minutes, or 60-80 miles of range per hour of charging

**Table 4 Electric Vehicle Service Equipment in the I-405 Corridor**

	Level 1	Level 2	DC Fast Chargers
Stations	5	897	72
Plugs	18	2,194	318

Implementation of AB 2127 *Electric Vehicle Charging Infrastructure Assessments (2021)* suggests that current chargers are generally deployed where there are higher concentrations of people and EVs, with low-income census tract communities generally having slightly fewer public chargers per capita than middle- and high-income communities. Future charging needs vary depending on the EV forecast used. The California Air Resources Board (CARB) Draft 2020 Mobile Source Strategy projects the highest rate of EV adoption of several models used, and incorporates a policy achievement approach and projects the necessary vehicle population to meet state air quality and climate policy goals. Under that forecast, the number of plugs required in Los Angeles County would need to increase more than 40 times by 2030 (from approximately 8,300 chargers identified in the Alternative Fuels Data Center Station locator to approximately 340,000 total chargers). To help identify where those chargers will be located, the CEC has awarded grant funding for EV blueprint development to the County of Los Angeles and the Port of Long Beach, among others.<sup>39</sup>

- Implications:** Different types of chargers will be necessary to meet the variety of needs expected by electric vehicle drivers, with Level 1 charging sufficient for most overnight charging and faster DC Fast Charging necessary to support longer trips.<sup>40</sup> Residents across Los Angeles County, including along the I-405 Corridor, will soon see increased opportunities for home-based electric vehicle charging through ‘streetlight charging’, where streetlights are modified to provide at least

<sup>39</sup> Report Shows California Needs 1.2 Million Electric Vehicle Chargers by 2030; California Energy Commission; <https://www.energy.ca.gov/news/2021-06/report-shows-california-needs-12-million-electric-vehicle-chargers-2030>

<sup>40</sup> Liquid Cooling in Electric Vehicles: What to Know to Keep EVs on the Go; Electric Vehicle Magazine 2019; <https://chargedevs.com/newswire/liquid-cooling-in-electric-vehicles-what-to-know-to-keep-evs-on-the-go/>

Level 1 charging access. The Bureau of Street Lighting has installed more than 400 charging stations on streetlights throughout the City of Los Angeles.<sup>41</sup>

Vehicle electrification will profoundly influence the environmental impacts of the transportation sector and the public's mobility options. Electrification will not impact congestion, but can reduce the GHG emissions and air quality impacts generated by vehicles on congested roadways. The long-term ability to convert our fleet to electric vehicles will depend on expanding access to electric vehicles for low-income residents, adequate supportive infrastructure in addition to a sustainable and sufficient energy supply.

**Key Trend: Electric bikes and scooters.** Advancement in battery technology has supported electrification of non-auto modes—primarily e-scooters and e-bikes—for both shared and personal mobility. A recent study of micromobility (shared non-auto mobility services—most of which are electric) by INRIX placed Los Angeles ninth in a list of top US cities with micromobility potential.<sup>42</sup> Annual electric bicycle (e-bike) sales have more than doubled since the beginning of the COVID-19 pandemic, with usage skyrocketing in cities across America – including Los Angeles.<sup>43</sup>

- **Implications:** The INRIX study noted that as micromobility options become more widely used, they have high potential to replace auto-trips. Since these modes are particularly effective at serving short trips and first-last mile connectivity, they hold promise for reducing auto use for short trips, a key challenge in the I-405 Corridor. E-bikes and e-scooters enable travelers to get around using less effort compared to pedal bicycles, which is enticing for potential users looking for alternatives to driving but who may be adverse to bicycling. The lower energy expenditure required and the increased speed of these vehicles improves many users' tolerance for longer travel distances. The continued increase in e-bike usage will likely increase bicycling mode share, and this can be compounded by supportive investments in bicycle infrastructure. Financial incentives and rebates targeted at e-bikes and e-scooters will also drive adoption. In the study area, the Clean Mobility Options Voucher Pilot Program awarded two grant applications for e-bike programs in 2021.<sup>44</sup> As many travelers' trip-making behavior continues to evolve and reshape following the pandemic, travelers' use of different modes of transportation may continue to shift.

## 4.4 Automation and Technological Advancement

**Key Trend: Connected and automated vehicles.** Connected and automated vehicles (CAVs) are those in which one or more aspects of safety-critical vehicle operations are performed without direct driver input, and where vehicles communicate with each other, with users, and with infrastructure. Autonomous vehicles, or self-driving vehicles, are those that are capable of operating with little to no human input. Many cars currently on the road have driving functions that are supported by automated technology,

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<sup>41</sup> SmartCity EV Charging; City of Los Angeles; <https://bsl.lacity.org/smartcity-ev-charging.html>

<sup>42</sup> Shared Bikes and Scooters Could Replace Nearly 50 Percent of Downtown Vehicle Trips; INRIX; <https://inrix.com/press-releases/micromobility-study-us-2019/>

<sup>43</sup> Electric Bike Sales in the US Grew 145% from 2019 to 2020; Cycling Industry News 2020; <https://cyclingindustry.news/e-bike-sales-3-7m-17m-2030-industry-experts/>

<sup>44</sup> Mobility Project Awardees 2020; Clean Mobility Options; <https://www.cleanmobilityoptions.org/mp-awardees/>

including pre-emptive braking systems, parking assistance systems, adaptive cruise control, and lane centering systems (described as level 1 and 2 automation technologies by SAE International).<sup>45</sup> However, deployment of full automated driving features has proceeded more slowly than early experts predicted. In early 2021, Uber and Lyft both sold their autonomous vehicle research divisions.<sup>46</sup> Recent forecasts estimate that fully autonomous vehicles will be commercially available around 2025, half of new vehicles sold will be autonomous around 2045, and half the vehicle fleet will be autonomous around 2060.<sup>47</sup>

As of 2021, California was one of eighteen states that allow autonomous testing or deployment without a human operator in the vehicle.<sup>48</sup> However, many automakers and tech companies suspended testing during COVID-19, and tech startups focused on autonomous vehicles have seen significant decrease in their firms' valuation.<sup>49</sup>

- **Implications:** CAVs have potential to drastically transform the transportation sector. They may offer increased safety by eliminating human errors from driving, and could potentially lead to more efficient use of roadway space through platooning and other vehicle-to-vehicle, vehicle-to-infrastructure, and vehicle-to-passenger capabilities, as well as reduced emissions and congestion if they are shared and electric. Fully autonomous vehicles also offer accessibility benefits to people who are not able or willing to drive a vehicle.

However, widespread use of CAVs could lead to more cars on the road, as people can work, sleep, or engage in other activities during their trip instead of driving. This maximizes the utility of auto travel, which may not only encourage more people to travel by car, but could allow people to live further from work, school, services, and recreation, thereby leading to longer trips, more VMT, and growing congestion. The California Transportation Plan 2050 found that if unregulated, autonomous vehicles could increase statewide VMT by up to 33 percent.<sup>50</sup> This would be extremely costly for Corridors such as I-405 which already operate at or over capacity during peak and off-peak periods and which suffer from significant congestion and delay.

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<sup>45</sup> SAE International; <https://www.sae.org/news/2019/01/sae-updates-j3016-automated-driving-graphic>

<sup>46</sup> Lyft Sells Autonomous Unit to Toyota's Woven Planet; AutoWeek 2021; <https://www.autoweek.com/news/technology/a36276955/lyft-sells-autonomous-unit/>

<sup>47</sup> Autonomous Vehicle Implementation Predictions; Victoria Transport Policy Institute 2022; <https://www.vtpi.org/avip.pdf>

<sup>48</sup> Governors Highway Safety Association; <https://www.ghsa.org/state-laws/issues/autonomous%20vehicles>

<sup>49</sup> Top 30 Self Driving Technology and Car Companies; <https://www.greyb.com/autonomous-vehicle-companies/>

<sup>50</sup> California Transportation Plan 2050; Caltrans; <https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/ctp-2050-v3-a11y.pdf>

		SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
What does the human in the driver's seat have to do?		You <u>are</u> driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You <u>are not</u> driving when these automated driving features are engaged – even if you are seated in “the driver’s seat”		
		You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you must drive	These automated driving features will not require you to take over driving	
What do these features do?		These are driver support features			These are automated driving features		
		These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/acceleration support to the driver	These features provide steering AND brake/acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met	This feature can drive the vehicle under all conditions	
Example Features		<ul style="list-style-type: none"> <li>• automatic emergency braking</li> <li>• blind spot warning</li> <li>• lane departure warning</li> </ul>	<ul style="list-style-type: none"> <li>• lane centering OR</li> <li>• adaptive cruise control</li> </ul>	<ul style="list-style-type: none"> <li>• lane centering AND</li> <li>• adaptive cruise control at the same time</li> </ul>	<ul style="list-style-type: none"> <li>• traffic jam chauffeur</li> </ul>	<ul style="list-style-type: none"> <li>• local driverless taxi</li> <li>• pedals/steering wheel may or may not be installed</li> </ul>	<ul style="list-style-type: none"> <li>• same as level 4, but feature can drive everywhere in all conditions</li> </ul>
<p>For a more complete description, please download a free copy of SAE J3016: <a href="https://www.sae.org/standards/content/J3016_201806/">https://www.sae.org/standards/content/J3016_201806/</a></p>							

**Key Trend: Workforce and Supply-Chain Automation.** Automation is not only impacting personal mobility. The way goods are produced, stored, and distributed is also subject to drastic transformation as a result of emerging technologies. Widespread automation within the manufacturing sector has changed where manufacturers choose to locate facilities. Access to a large labor force is no longer a key consideration; however, access to distribution facilities and key markets up and down the supply chain remain important. These distribution mechanisms are also changing with advancements in automated trucking and truck platooning, automated warehousing, and last-mile delivery technologies. As discussed previously, a top priority in California is supporting freight electrification to reduce emissions from the goods movement sector.

- Implications:** Automated trucking and truck platooning would support more optimal use of freeway capacity by allowing trucks to operate closely together. While the I-405 Corridor is not a significant freight corridor, automated truck technology may provide operational benefits along the southern part of the Corridor where there is heightened freight activity related to the SPB ports. E-commerce and same- and next-day deliveries (discussed in Section 4.5) will also continue to change how goods are distributed and delivered.

**Key Trend: Data and information technology.** Advancements in data and information technology systems are already leading to significant improvements in user experience, and enabling access to more mobility options. LADOT supported development of the Mobility Data Specification (MDS), a program that requires mobility providers to provide real-time information on vehicle location and required shared use

mobility providers (including carshare, scooters, and bikes) to provide this information to LADOT. The data standard may provide support for connected vehicle technology as it develops.

LA Metro's Connected Vehicle building blocks include establishing Countywide Signal Priority, Signal Sync and Bus Speed Improvements, developing an ITS Field Inventory Resource Sharing Tool (ITS FIRST), CAV pilots, and Connect-IT infrastructure. The Countywide Signal Priority Program seeks to minimize delay experienced by buses and to shorten round trip running times by establishing a communication protocol between buses and traffic signal controllers. Signal Sync and Bus Speed Improvements use ITS technologies at signalized intersections to provide adaptive traffic signal control. The ITS FIRST is a platform to collect and share inventory information among transit agencies.

- **Implications:** Continued advancements in data and information technology – particularly the real time information on vehicle location and signal priority improvements discussed above – can make buses and transit easier to use by making those trips more efficient and reliable. Real-time travel data can also inform travelers choice of mode, and which routes they take, thereby alleviating congestion and optimizing travel conditions.

## 4.5 A Changing Workplace and Economy

**Key Trend: A shift to telework.** Approximately 25 percent of workers over the age of 15 reported working from home during the 2017-2018 period, according to the Bureau of Labor Statistics American Time Use Survey.<sup>51</sup> During the COVID-19 pandemic, the number of workers who telework dramatically increased, particularly for office-based workers with sufficiently fast internet connection.<sup>52</sup> At the peak of the pandemic, up to half of the workforce worked remotely.<sup>53</sup> Supplemental data measuring the effects of the pandemic on the labor market released by the Bureau of Labor Statistics suggests that approximately 23 percent of workers continued to work at home as a result of the pandemic (not related to those who teleworked for reasons unrelated to the pandemic) in February of 2021, down from 35 percent in May of 2020. Furthermore, the groups most likely to telework include women between the ages of 25 to 54. The least likely ethnic group to telework includes Latino workers, only 13 percent of whom teleworked in February of 2021. Black workers were also less likely than white workers to telework, at approximately 20 percent of workers.<sup>54</sup> Jobs held by Black and Latino workers typically provide lower-incomes than those held by white workers.

- **Implications:** It is unclear if and how these workforce trends will change as LA County continues to recover from the COVID-19 pandemic. The data suggests that teleworking in the future will continue in some form. However, there is likely to be an imbalance in certain sectors that are unlikely or unable to pivot to delivering services online such as the education, health care, and social assistance sector, which is forecasted to grow in the I-405 study area. It is possible that

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<sup>51</sup> Economic News Release 2018; Bureau of Labor Statistics; <https://www.bls.gov/news.release/flex2.t01.htm>

<sup>52</sup> Ability to Work from Home: Evidence from Two Surveys and Implications for the Labor Market in the COVID-19 Pandemic; Bureau of Labor Statistics <https://www.bls.gov/opub/mlr/2020/article/ability-to-work-from-home.htm>

<sup>53</sup> COVID-19 and Remote Work: An Update; Gallup 2020 <https://news.gallup.com/poll/321800/covid-remote-work-update.aspx>

<sup>54</sup> Workers Ages 25 to 54 More Likely to Telework Due to COVID-19 in February 2021; Bureau of Labor Statistics; <https://www.bls.gov/opub/ted/2021/workers-ages-25-to-54-more-likely-to-telework-due-to-covid-19-in-february-2021.htm>

future teleworking could see similar disparities in the racial and economic make-up of those that are likely or able to telework, and those that work in-person and therefore commute. However, commute patterns may shift as essential workers - who typically earn lower incomes - are forced to live further from urban centers where their jobs are located. This rise in supercommuting will place additional burdens on those who are already struggling.

**Key Trend: The gig economy.** Approximately 16 percent of Americans have earned money through an online gig platform, according to the Pew Research Center’s American Trends Panel (ATP), a nationally representative online survey panel of US adults and one of the leading sources of information on gig work.<sup>55</sup> A number of organizations, including MBO Partners, the Freelancers Union, and McKinsey Global Institute have found that between 25 to 35 percent of workers have engaged in non-standard or gig work on at least a supplementary basis in the preceding month.<sup>56</sup>

- **Implications:** As gig work becomes more common, typical nine-to-five commute patterns may continue to wane. Workers who previously commuted during peak hours to a stable destination over a period of months may instead do more work-related driving during off-peak hours to a wider variety of gig-determined destinations. Within the I-405 corridor, this means more dispersed travel patterns, and likely more demand for curb space as rideshare and delivery services grow.

**Key Trend: E-commerce and deliveries.** As discussed above in Section 3.4, e-commerce grew substantially during the COVID-19 pandemic. As of 2021, e-commerce sales made up 15.3 percent of total US retail sales and were forecast to surpass 20 percent of all retail sales by 2024.<sup>57</sup>

- **Implications:** Given that these deliveries occur primarily by truck, continued growth in e-commerce will significantly impact travel demand on the I-405 Corridor and surrounding arterials. Freight is likely to continue shift more toward last-mile fulfillment and away from interstate and long haul trucking.<sup>58</sup> The type of vehicles on the I-405 Corridor may change slightly in the future as well, as the growth in e-commerce has generally seen a decrease in demand for the heaviest freight vehicles (i.e., Class 8 vehicles) and more demand for medium-duty vehicles (i.e., Class 5 vehicles).<sup>59</sup> Some industry observers expect mixed fleets (i.e., a combination of light-duty, medium-duty, and heavy-duty vehicles) to become more common in the future.<sup>60</sup>

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<sup>55</sup> The State of Gig Work in 2021; Pew Research Center <https://www.pewresearch.org/internet/2021/12/08/the-state-of-gig-work-in-2021/>

<sup>56</sup> Ibid.

<sup>57</sup> Insider Intelligence, 2021

<sup>58</sup> How is the Growth of E-Commerce Affecting Trucking? Trucking Info 2019; <https://www.truckinginfo.com/324451/how-is-the-growth-of-e-commerce-affecting-trucking>

<sup>59</sup> E-Commerce Faces Sharp Slowdown in 2021; FleetOwner; <https://www.fleetowner.com/news/economics/article/21157761/e-commerce-faces-sharp-slowdown-in-2021-as-us-economy-rebounds>

<sup>60</sup> Mixed-Vehicle Fleets are Uncommon in TL. E-Commerce Could Change That; Transport Dive 2021; <https://www.transportdive.com/news/trucking-fleet-diversity-labor-e-commerce/607275/>

## 4.6 Worsening Impacts of Climate Change

**Key Trend: Worsening Climate Change & GHG Emissions.** According to the California Air Resource Board's (CARB) *California Greenhouse Gas Emissions for 2000 to 2019*, the transportation sector is responsible for approximately 40 percent of all emissions in the state. Of that, passenger vehicles represent approximately 29 percent of all statewide emissions and heavy-duty vehicles account for approximately eight percent of all statewide emissions.<sup>61</sup> As the largest source of GHG emissions in California, transportation was responsible for generating more than 160 metric tons of CO<sub>2</sub>e (where CO<sub>2</sub>e is a measure of CO<sub>2</sub> equivalent, or the global warming potential of all greenhouse gases equal to the global warming potential of one metric ton of CO<sub>2</sub>) in 2019.

Just as vehicular traffic negatively contributes to climate change, so does climate change negatively impact vehicular movement, and other forms of transportation. Higher temperatures associated with climate change are expected to cause pavement to soften and expand, resulting in rutting and potholes especially in areas of higher traffic. Higher temperatures also cause vehicles to overheat and tires to deteriorate more quickly. Conversely, a higher number of warm days in the winter may reduce cold-weather related damage to vehicles. Extreme weather events such as flooding and extreme snow events can also shorten the life expectancy of roadways and disrupt normal operations. Impacted roadways may also be unavailable to travelers seeking to evacuate the area as a result of an extreme weather event. Wildfires and dust storms may also negatively impact vehicular movement. As extreme weather events become more common, their associated transportation delays are likely to become routine. For people biking, walking, and rolling, extreme heat and weather events pose serious health and safety impacts, and also act as a deterrent from using these modes that are so critical to combatting climate change.

- **Implications:** As climate change worsens, it becomes increasingly important for the transportation sector to minimize its footprint and reduce tailpipe emissions associated with vehicular travel. In California, the Climate Action Plan for Transportation Infrastructure (CAPTI), adopted in 2021, directs discretionary transportation dollars to less GHG-intensive forms of transportation, including rail, transit, bicycle, pedestrian, and other modes. Included in the CAPTI are strategies around for improving and accelerating the adoption of alternative fuel vehicles (i.e., battery electric vehicles and hydrogen fuel cell vehicles) and emphasis around solutions that promote reduced automobile travel in the future.
- Simultaneously, climate related impacts will continue to deteriorate the condition and effect the operations of the transportation system, and corridors like the I-405. Increased temperature and changes in precipitation will result in higher maintenance costs and more travel delay.<sup>62</sup>

## 4.7 A Changing Funding Environment

Transportation planning in the Los Angeles area, as for every other transportation agency in the Country, continues to lack a stable source of transportation funding to resolve transportation needs in the future. The traditional source of revenue for transportation funding, the gas tax, continues to erode as it does not

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<sup>61</sup> California GHG Emission Inventory Data; CARB; <https://ww2.arb.ca.gov/ghg-inventory-data>

<sup>62</sup> Climate Effects on US Infrastructure: The Economics of Adaptation for Rail, Roads, and Coastal Development; NCBI 2021; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8459675/>

effectively adjust for inflation and improved fuel efficiency and the growing number of non-gas powered vehicles means there is less revenue per vehicle collected. The 2050 California Transportation Plan (CTP), released in 2021, highlights the critical importance of identifying a sustainable, long-term funding source to achieve plan goals. The State found some relief in 2017 with the successful passage of SB1, which increased the gas tax for the first time since the 1990s, and provides approximately \$5.4 billion per year in increased transportation revenue.

However, more funding is needed. State, local, and special-purpose governmental entities have increasingly turned to credit markets and private investment to finance infrastructure projects. California was the top issuer of municipal bonds in 2020, with \$71.6 billion issued in municipal securities.<sup>63</sup> Other innovative financing mechanisms increasingly used in transportation financing include the use of public-private partnerships, loans (such as State Highway Account Loan Program or the Infrastructure State Revolving Fund Loan Program), several forms of credit assistance through the Transportation Infrastructure Finance and Innovation Act (TIFIA), and toll road programs supported in California through Partnership Ventures (PV). Due to their size and complexity, these financing mechanisms are generally used for larger projects or programs. In addition, LA Metro is one of 24 self-help counties, which deliver voter-approved transportation sales taxes to fund transit, highway, freight, active transportation, and other mobility improvements.

At the Federal level, the \$1 trillion Infrastructure and Jobs Act, passed on November 5, 2021 is anticipated to increase funding for many of the transportation solutions being considered in the I-405 Corridor, including roadway, transit, safety, and electrification projects. Current Federal grant programs, including the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant program, provide funding to invest in road, rail, transit and port projects that help achieve national objectives. However, reliance on discretionary grant programs presents challenges as these are highly competitive programs, creating a level of risk and uncertainty for projects depending on these funding opportunities for their implementation.

At the State level, the funding programs authorized by SB1, namely the Solutions for Congested Corridors and Trade Corridor Enhancement programs (SCCP and TCEP) provide funding to address severely congested and/or critical trade corridors across the state, but the funding is extremely limited. The SCCP is capped at \$250M annually, and TCEP is funded at approximately \$300M through the state, with some federal funding infusion made through the transportation authorization bill. These funding levels, while helpful, are not sufficient to address statewide transportation needs.

Other financing mechanisms are currently being considered to help close the funding gap, including efforts to study moving away from a gas tax to a mileage-based user fee. California completed its first Road Charge Pilot in 2017 that tested implementation approaches and gauged general acceptance of a mileage-based road charge. In 2021, Caltrans initiated the Caltrans Road Charge Phased Demonstration to test user payment, focusing on usage-based insurance, ridesharing, EV charging stations/pay-at-the-pump systems, and autonomous vehicles. A report with recommendations is expected in 2022. In Los Angeles County, congestion pricing is one tool being explored to resolve the question of funding. Metro's Traffic Reduction Study was launched in February of 2021, and the I-405 Corridor is included in several of

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<sup>63</sup> US Municipal Bond Statistics; SIFMA; <https://www.sifma.org/resources/research/us-municipal-securities-holders/>

the tolling concepts being studied. If enacted, the congestion toll would support funding for \$25 billion in transportation projects planned in the region in advance of the 2028 Olympic Games.<sup>64</sup>

## 5.0 These Trends will present Continuing Challenges and Opportunities

Metro and its partners are leveraging the region's unique resources, and addressing these emerging trends in a variety of ways. In the coming decade, the I-405 Corridor and the surrounding communities will see a transformed transportation landscape as major capital projects and large-scale policy initiatives take form. While building and improving the transportation system through major projects, the region will also host several high-profile events, such as the 2028 Olympics, that demand a responsive and efficient transportation system. The planned events to be aware of include the NCAA Basketball (2024), World Cup (2026), the Olympics and Paralympics (2028). These events can be the impetus for partnerships and funding that advance policy and project priorities.

The combination of population and job growth will inevitably increase travel demand in the study area. While Metro and its partners have many planned investments on the horizon, (as described in the Baseline Conditions Report), the emergence of new technologies, and the potential for more telework may help to mitigate the impacts of this increased demand. However, without significant intervention, the condition and performance of the Corridor is expected to continue to deteriorate. Given the importance of the I-405 Corridor to the performance of the entire Countywide transportation system, this continued performance degradation could have significant impacts on the economic vitality of the County and the safety, mobility, and health of residents, workers, and visitors.

This CMCP provides an opportunity to help Metro and its partners make progress on collective mobility, air quality, and equity goals. The trends discussed here will be critical to consider when developing and evaluating projects, programs, strategies, and initiatives to help improve the performance of the I-405 and, by extension, improve accessibility, mobility, economic vitality, and equity Countywide.

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<sup>64</sup> Los Angeles Launches Congestion Pricing Study; Eno Center for Transportation 2021; <https://www.enotrans.org/article/los-angeles-launches-congestion-pricing-study/>