Appendix C

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I-105 Corridor Sustainability Study: Current Conditions Assessment

Task 4

prepared for

Southern California Association of Governments

prepared by

Cambridge Systematics, Inc.

report

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date

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Executive Summary

Task 4 of the I-105 Corridor Sustainability Study (CSS) provides a baseline assessment of existing transportation system conditions in the study area. The Current Conditions Assessment presents a detailed assessment of land use, demographics and multi-modal transportation conditions in the I-105 Study Area and provides a baseline assessment upon which future projected conditions will be compared. The report is organized as follows:

- Roadway assessment including the I-105 freeway, arterials, and truck movements;
- Transit system assessment;
- Land use and demographics assessment;
- System safety assessment;
- Corridor user assessment;
- Complete Streets assessment including active transportation modes;
- System preservation assessment; and
- Systemwide performance

The existing conditions analysis presents a detailed assessment of land use, demographics and multi-modal transportation conditions in the I-105 Study Area. This systemwide performance memorandum summarizes the results of previous work and provides a baseline assessment upon which future projected conditions will be compared. This section presents a summary of the existing conditions, followed by more detailed findings in the remainder of Section 2.0. Section 9.2 details how the transportation system performs relative to the established performance measures.

On the I-105 Freeway, roughly one-half of the trip origins and destinations occur within the Study Area, an area within three miles on each side of the freeway. The other half of the trip origins and destinations come to/from locations outside of the study area. On the west side of the Study Area, trips are highly concentrated at LAX and the El Segundo employment area, whereas corridor-related trips to the east are far more dispersed. Average trip length on the freeway is roughly double the average trip length on the local arterials; 20 miles on the freeway and 9 to 11 miles on most arterials.

The I-105 Study Area generally mirrors Los Angeles County in terms of key transportation statistics such as commute mode share; in the I-105 Study Area, nearly 75% of commute trips are made by people driving alone, 12% by carpool, and 7% by transit. However, the demographic characteristics of the I-105 Study Area are unique in that the population is predominantly non-white (90%) and lower-income, with only 28% of the households having income higher than $75,000 and 21% are below the federal poverty level. As defined by CalEnviroscreen, 76% of the census tracts are considered as “disadvantaged communities.” Despite this, transit ridership has declined and is similar to the rest of the County. There is a diversity of land uses throughout the I-105 Study Area, however, there is generally higher population density in the center of the corridor, while the employment is higher in the eastern and western portions of the I-105 Study Area.

As noted, transit usage has declined in the I-105 Study Area, matching trends in Los Angeles County. Over the past 5 years, the Blue Line and Green Lines have lost 18% and 28%, respectively, of their daily boardings. Overall, the I-105 Study Area represents 12% of LA Metro's overall bus ridership and 14% of the county's population. Rapid Bus and express bus routes experience higher ridership per stop, but the frequent local services parallel to I-105 carry the highest total number of riders overall. Several municipal transit operators offer bus transit service in the I-105 Study Area, including LADOT, Long Beach Transit, Gardena Transit, Torrance Transit, Norwalk Transit, among others.

The I-105 Freeway has a clear pattern of directionality with higher volumes, congestion, bottlenecks and collisions occurring westbound in the AM peak hours and eastbound in the PM peak hours. Key arterials that experience the higher volumes, delay and congestion include Firestone Boulevard, Vermont Avenue, Van Ness Avenue, Rosecrans Boulevard, Lakewood Boulevard, Manchester Avenue, Imperial Highway, Long Beach Boulevard, Florence Avenue, Century Boulevard, El Segundo Boulevard, Artesia Boulevard, Sepulveda Boulevard, Garfield Boulevard and Bellflower Boulevard. Overall, travel times and congestion are highest on the arterial system in the eastbound directions during the PM peak hour. For northbound and southbound arterials, during the PM period, the directionality of congestion varies depending on the location within the I-105 Study Area.

I-105 experiences higher collision rates in the eastbound direction, which are slightly higher than statewide average for similar facilities. Collision concentrations are seen at various points along the freeway, concentrated at points of congestion where traffic merges, diverges, or has a high amount of weaving. Fatal crashes on the freeway have remained relatively constant over the years, with a one year spike in 2014. However, there is a clear upward trend in overall collisions involving injuries. Truck collisions on I-105 are more concentrated east of I-710, correlating with the higher number of Port-related trucks in this portion of the freeway corridor. Total injury collisions on the arterial system have increased steadily between 2012 and 2016. Injury collisions involving bicycles have decreased, though it is not clear if bicycle ridership has changed. Fatal collisions involving bicycles, however, were notably higher in 2015 and 2016 than in prior years. Collisions involving pedestrians remained fairly constant between 2012 and 2016, however, the pedestrian fatality rate in the I-105 Study Area is relatively high compared to Los Angeles County as a whole. Furthermore, arterial collisions involving pedestrians in the I-105 Study Area make up just 12% of all injury collisions, but make up 40% of fatalities.

Constructed in 1993, the I-105 is relatively new compared to other freeways in LA County. Therefore, the freeway has relatively good overall pavement quality with approximately 75% of the pavement in good condition, 25% in fair condition, and none in poor condition. The arterial system in the surrounding I-105 Study Area, conversely, has a significant proportion of pavement in poor condition, with only 14% of the pavement in the I-105 Study Area overall considered to be in good condition. Of the almost 1,500 bridges in the Study Area, 1.3% are reported to be in condition warranting replacement and eligible for federal replacement funding. Another 23% are eligible for federal rehabilitation funding.

All of these key trends, deficiencies and gaps in the transportation system will be considered in Tasks 5 and 6 of the I-105 Corridor Sustainability Study. Task 5 examines future transportation system conditions and Task 6 develops and evaluates improvement scenarios. Some of the key trends, deficiencies and gaps to explored, along with other issues, include:

- The population has a high proportion of low-income and minority residents

- High levels of employment density and population density are located in different parts of the I-105 Study Area
- Similar to the rest of the county, there has been declining transit ridership
- There is low overall commute mode share on modes besides single passenger auto
- Injury collisions have increased, and of the fatal collisions, those involving pedestrians comprised a disproportionately large share
- Congestion on I-105 throughout the day and concentrated in the AM peak westbound and the PM peak eastbound
- There are high levels of congestion on many arterial facilities, both east/west and north/south
- The arterial system faces significant pavement quality issues
- There are higher concentration of trucks and truck collisions east of I-710 on I-105

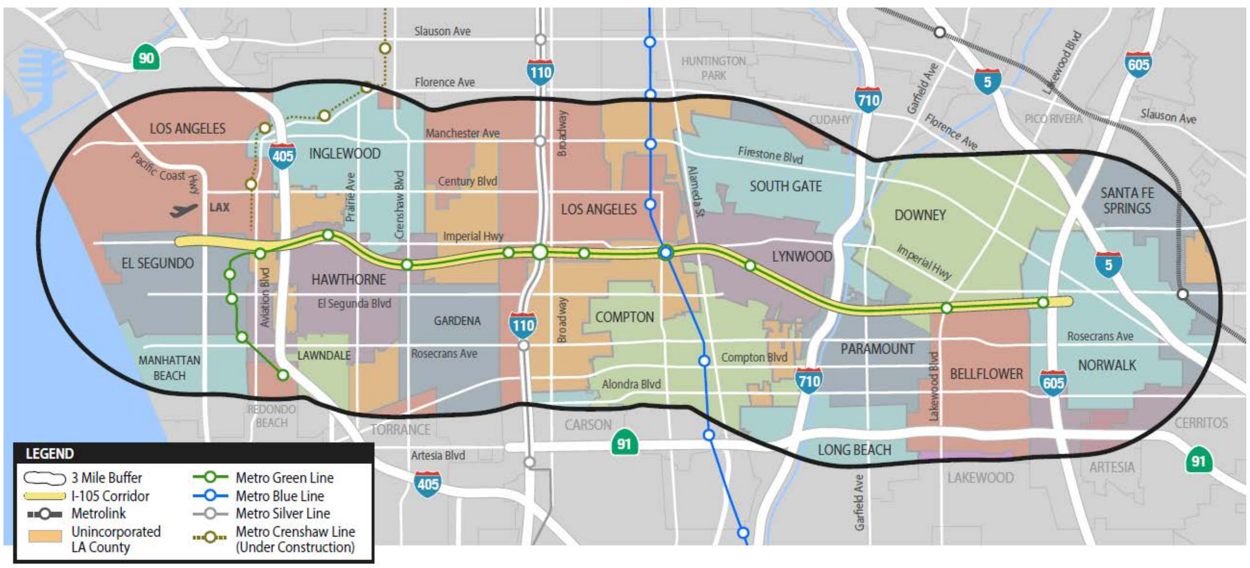
Task 4 analysis is based on a series of available data sets and information from Caltrans, Metro, SCAG, transit providers, local cities and many other sources. In addition, some original research has also been conducted for purposes of filling in the Task 4 transportation system studies. This report details the data and related analysis for each topical area covered by Task 4 and also presented to the Technical Advisory Committee (TAC) and Project Development Team (PDT) in a series of memos.

1.0 Introduction

Task 4 of the I-105 Corridor Sustainability Study (CSS) includes a current conditions assessment of the study area covering roadway (arterial and freeway), transit, safety, goods movement, active transportation, land use/demographics, corridor users, complete streets, system preservation and overall system performance. The intent of Task 4 is to provide a comprehensive assessment of current conditions and multimodal system travel conditions within the I-105 Corridor Sustainability Study Area (I-105 Study Area), leading to the identification of needs and deficiencies. This overall Task 4 report combines the results published in individual technical memorandums on various system performance topics, as described in the Executive Summary. Chapters of this report correlate to the topical areas identified in the Executive Summary and each of those areas has a separate detailed technical memorandum.

As shown in **Figure 1.1**, the I-105 Study Area includes three miles on either side of the I-105 freeway, from its western terminus two miles west of I-405 in El Segundo, to its eastern terminus 0.3 miles east of I-605 in Norwalk.

Figure 1.1 I-105 Study Area



The remainder of this report is structured as follows:

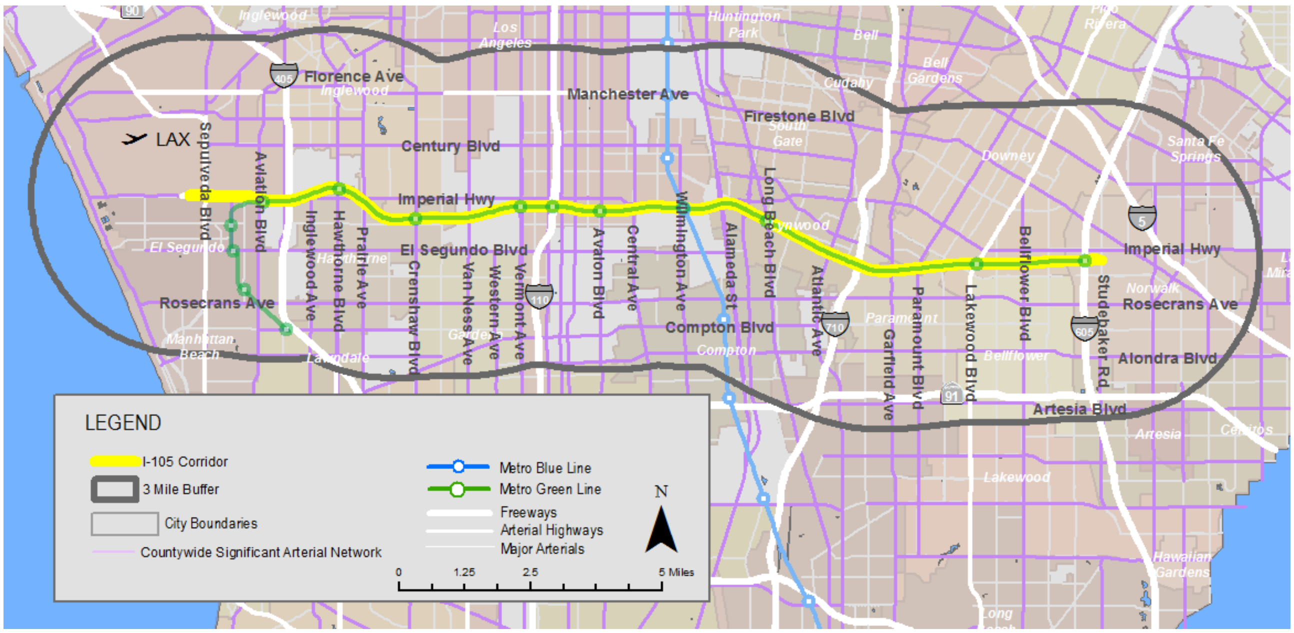
- **Section 2.0 Roadway Assessment** identifies existing I-105 freeway and arterial conditions including bottlenecks and other roadway-related performance-related issues within the I-105 Study Area.
- **Section 3.0 Transit Assessment** examines the public transportation network in the I-105 Study Area, including Metro Rail, Metrolink commuter trains, and Metro and Municipal bus systems.
- **Section 4.0 Demographic and Land Use Assessment** examines characteristics about the population living and working in the corridor, including population density, age, income, and other characteristics that influence travel behavior.

- **Section 5.0 Safety Assessment** examines recent trends in collisions involving vehicles, bicycles, pedestrians, and trucks; highlights key statistics; identifies areas of high collision frequency; and highlights areas for improvement throughout the corridor.
- **Section 6.0 Corridor User Assessment** identifies trip origins and destinations in the I-105 Study Area to convey an understanding of the potential locations for short and intermediate trips in the corridor and to understand the surrounding character and activities that can be directly addressed by complementarily transportation improvements.
- **Section 7.0 Complete Streets Assessment** contains an assessment of the active transportation infrastructure and usage, an overview of transit ridership, a discussion of the factors that influence mode choice, and the multi-modal accessibility within the I-105 Study Area.
- **Section 8.0 Preservation Assessment** inventories existing asset conditions for the State Highway System (along I-105), local arterials, and bridges within the I-105 Study Area.
- **Section 9.0 Systemwide Performance** describes the I-105 CSS performance evaluation framework and quantifies the baseline for how the transportation network is performing relative to the established performance measures.
- **Section 10.0 Summary of Findings** summarizes key findings and existing deficiencies from each aspect of the current conditions assessment

2.0 Roadway Assessment

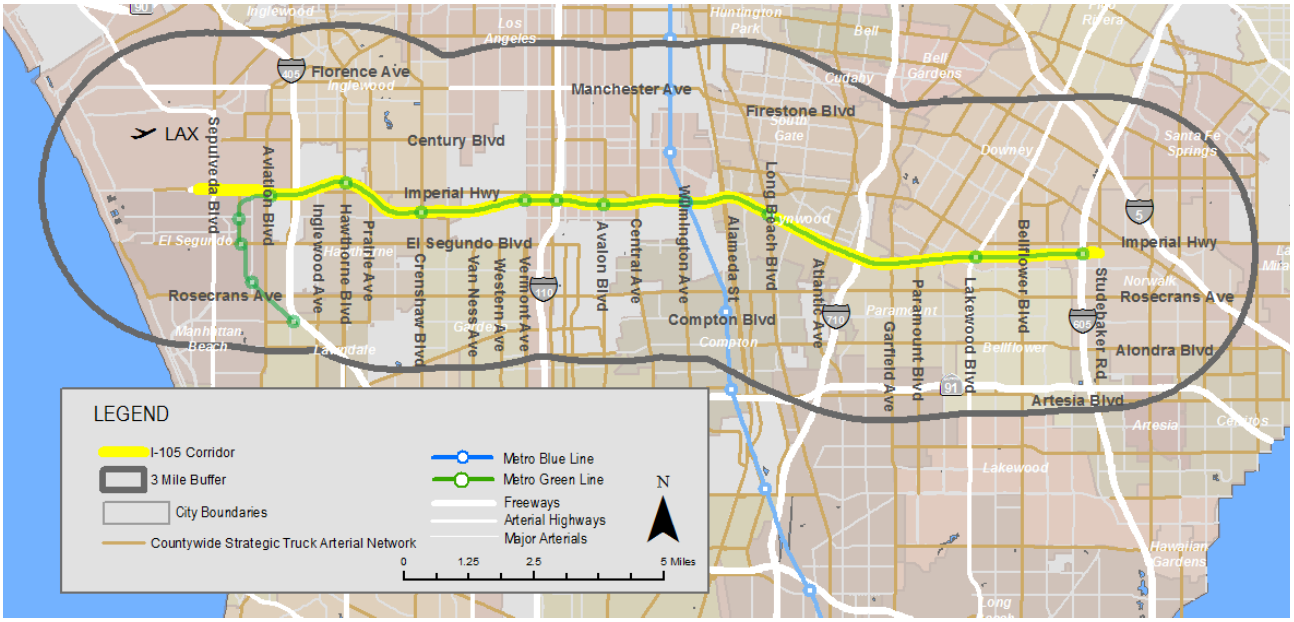
The purpose of this section is to identify existing I-105 freeway and arterial conditions including bottlenecks and other roadway-related performance-related issues within the I-105 Study Area. The roadway assessment examines trends on the entire I-105 freeway plus major arterials (see **Figure 2.1**), as well as the truck arterial network (see **Figure 2.2**). The Task 4 roadway system performance measurement is focused on the I-105 freeway plus major arterial facilities included in the Countywide Significant Arterial Network (CSAN) and Countywide Strategic Truck Arterial Network (CSTAN), which are defined by Los Angeles County Metropolitan Transportation Authority (Metro).

Figure 2.1 I-105 Study Area – Countywide Significant Arterial Network



Source: Metro

Figure 2.2 I-105 Study Area – Countywide Strategic Truck Arterial Network



Source: Metro

The roadway assessment contains the following sections:

- I-105 Freeway Assessment
  - I-105 Freeway Trip Characteristics
  - I-105 Freeway Bottlenecks
  - I-105 Freeway HOV Lane Statistics
- Arterial Assessment - Arterial Performance Measures
- Truck Assessment – Regional and Port-Related Heavy Duty Trucks on I-105

2.1 I-105 Freeway Assessment

Interstate 105 traverses portions of the cities of Los Angeles, El Segundo, Inglewood, Hawthorne, Lynwood, South Gate, Paramount, Downey, Bellflower, Norwalk, and portions of unincorporated Los Angeles County, all within Los Angeles County, California.

I-105 (known as Glenn Anderson Freeway) is an Interstate Highway in southern Los Angeles County, California that runs east–west from near the Los Angeles International Airport (LAX) to Norwalk. It is officially known as the Glenn Anderson Freeway and has also been referred to as the Century Freeway. The I-105 begins at Sepulveda Boulevard (State Route 1) on the southern edge of Los Angeles International Airport (LAX), adjacent to the city of El Segundo. It proceeds generally eastward from there on, crossing the Los Angeles and San Gabriel Rivers before terminating just east of the San Gabriel River Freeway (Interstate 605) in western Norwalk. The freeway stops short of intersecting with the Santa Ana Freeway (Interstate 5). Instead, the primary lanes of I-105 terminate at an at-grade intersection with Studebaker Road. Much of the length of the I-105 runs parallel to Imperial Highway.

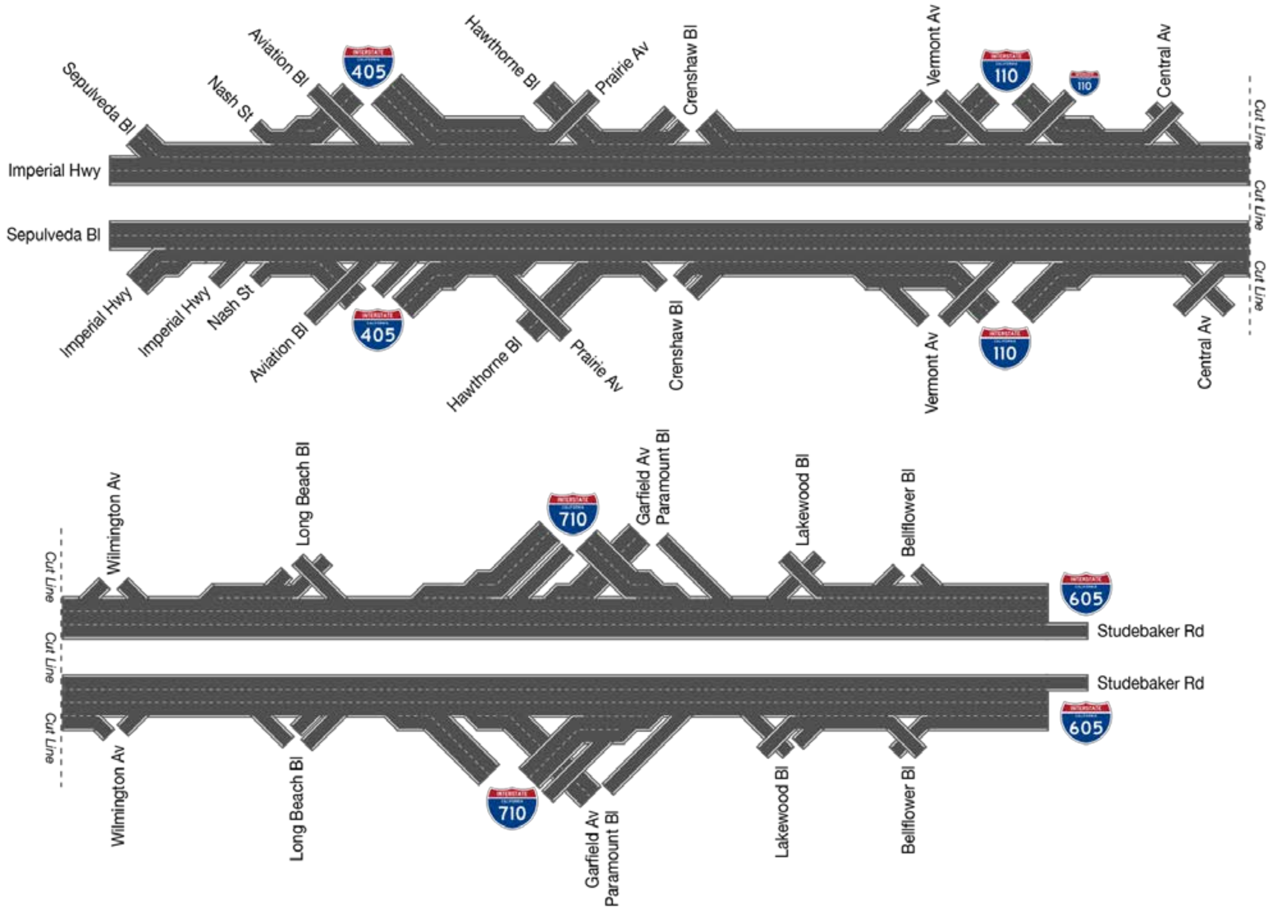
I-105 includes a High Occupancy Vehicle (HOV) facility incorporated into the original design of the freeway as a mitigation measure required by the 1979 Federal Consent Decree. Each direction of the I-105 includes one HOV lane. In both the eastbound and westbound directions, a left shoulder exists along the entire stretch of the study area. An HOV buffer exists along the entire stretch of the corridor except for the segment between Bellflower Boulevard and the I-605 interchange ramps in the eastbound direction.

At the interchange with the I-110, there are direct HOV-to-HOT (High Occupancy Tolled lanes or also called Express Lanes) ramps connecting the eastbound and westbound HOV lanes on the I-105 with the northbound I-110 Express Lanes. At the locations where the HOV connectors from the I-110 Express Lanes connect to the I-105 HOV lane, the facility is widened to two lanes. In addition, the I-105 HOV lane is widened to two lanes further away from the I-105/I-110 interchange to provide a bypass so that single occupant vehicles with FasTrak® transponders headed to and from the I-110 Express Lanes can merge into and out of the I-105 HOV lanes from the general purpose lanes. Away from this specific transition area on either side of the I-110 interchange, the HOV reverts back to one lane in each direction with conventional ingress and egress locations.[1]

Because of the complexities associated with the exit and entrance ramp arrangements, particularly around major freeway junctions, **Figure 2.3** is provided to show the lane configurations at each merge and diverge, as well as on the mainline links connecting each junction. This figure provides additional detail that could not be captured in the simplified freeway diagrams included with speed contour diagrams included in this section, and is therefore an essential tool in evaluating the causes for some observed freeway bottlenecks. For example, this figure reveals that the lane drop associated with the westbound exit at Vermont Avenue occurs before traffic from I-110 South merges onto the freeway.

[1] California Department of Transportation. I-105 General Purpose – Managed Lanes Traffic Analysis: Traffic Operations Analysis Report, 2014.

Figure 2.3 I-105 Freeway Configuration



Source: Cambridge Systematics. Active Traffic Management Congestion Relief Analysis Study, May 2014.

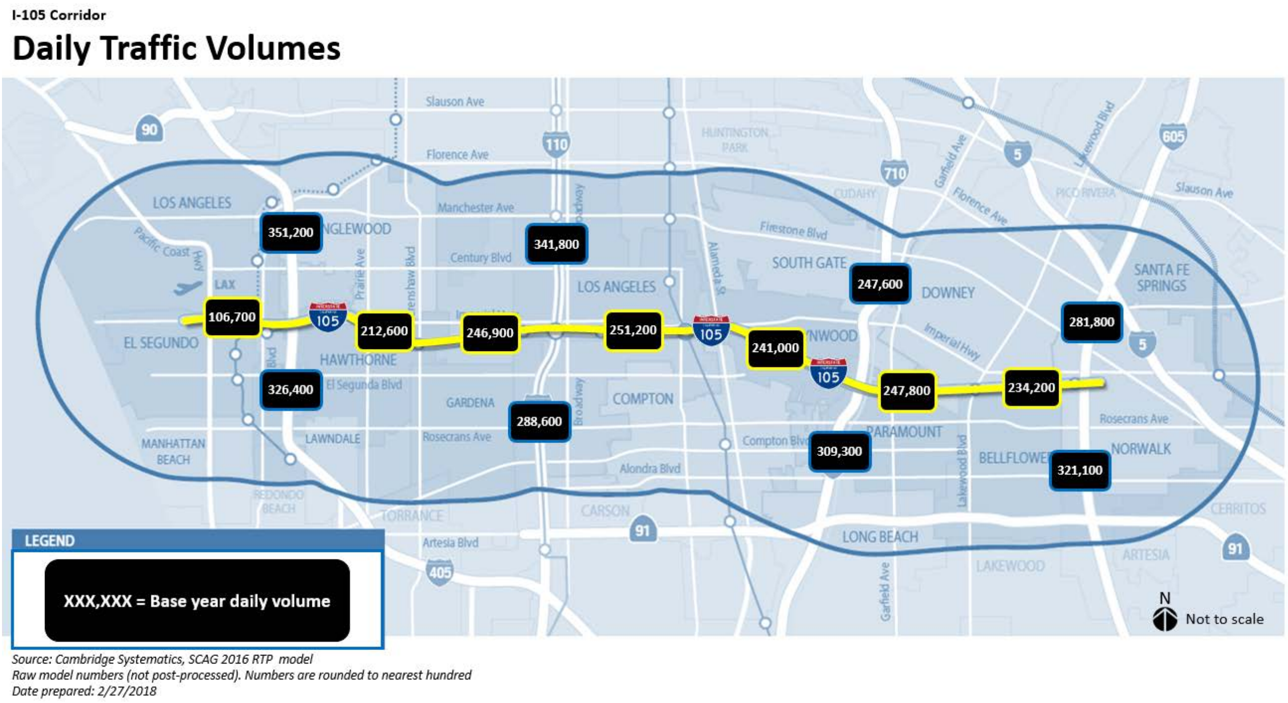
Figure 2.4 displays the SCAG travel demand model base year (2016) daily traffic volumes along I-105 and the four freeways that intersection the freeway corridor. These are model generated representations of 2016 volumes from the regional travel model, and as such are not based on field counts. However, the model is calibrated against existing counts for accuracy and the values in **Figure 2.4** represent a reasonable portrayal of existing daily flows on the freeway. The model 2016 volumes are presented so that in Task 5 (Future baseline conditions) it will be possible to compare projected growth in volumes also using the SCAG model 2040 forecasts along the corridor.

As shown in the figure, the I-105 freeway traffic flows are lowest, as expected, on the west end of the Study Area where the freeway begins, with approximately 106,000 daily vehicles west of I-405. East of the interchange with I-405 the volumes more than double, to over 210,000 daily vehicles, and volumes further increase to the east where the volumes are in the 240,000 to 250,000 range through the rest of the Study Area. Thus, through the majority of the Study Area, I-105 carries about 250,000 daily vehicles, or about 31,000 vehicles per lane on average (I-105 carries three general purpose lanes plus and one HOV lane over most of its length).

The four freeways that intersect I-105 generally carry higher volumes than I-105 as they are all longer distance facilities that carry a greater proportion of longer regionally-oriented trips. For example, the 2016 volumes on I-405 at the western end of the Study Area are over 350,000 vehicles per day, while I-110 carries 290,000 vehicles south of I-105 and over 340,000 vehicles north of I-105, indicating a large trip interaction between I-

105 and I-110. Conversely, I-710 carries over 300,000 vehicles south of I-105 and almost 250,000 north of I-105, partially due to the large number of port-related trips that use I-710 to I-105 to reach northbound I-605. Finally, I-605 carries under 200,000 vehicles south of I-105, its volume increases significantly north of I-105 to over 280,000.

Figure 2.4 I-105 Corridor Daily Traffic Volumes



Source: SCAG 2016 RTP model.

2.1.1 I-105 Freeway Trip Characteristics

Information on the use of the I-105 Freeway by single occupant vehicles and high occupancy vehicles is provided by Caltrans in the “Managed Lane Annual Report.” Information from 2016 is available from the latest publication. Caltrans monitors freeway usage and measures information such as the number of vehicles using general purpose and High Occupancy Vehicle (HOV) lanes, average vehicle occupancy and violation rates in the HOV lanes. For the I-105 Freeway, two locations are measured by Caltrans; at Long Beach Boulevard and at Lakewood Boulevard. The following information regarding the use of the I-105 Freeway at these two locations is based on the Caltrans report.

<u>At Lakewood Boulevard</u>

- AM peak period average vehicle occupancy in HOV lanes – 2.11 persons per vehicle
- AM peak period average vehicle occupancy in General Purpose lanes – 1.02 persons per vehicle
- 2 plus person carpools using General Purpose lanes in AM peak hour – 2.5 percent
- Vehicles using HOV lane AM peak hour – 1,310
- PM peak period average vehicle occupancy in HOV lanes – 2.05 persons per vehicle
- PM peak period average vehicle occupancy in General Purpose lanes – 1.08 persons per vehicle
- 2 plus person carpools using General Purpose lanes in PM peak hour – 8.2 percent
- Vehicles using HOV lane PM peak hour – 1,323

At this location, the HOV lanes carry around 1,300 vehicles and approximately 2,800 people in the peak hour. The average vehicle occupancy in the HOV lanes is approximately double that of the general purpose lanes, thus the person throughput of the HOV lanes is much higher. The number of carpools in the general purpose lanes is very low. Stated violation rates are approximately 11 percent.

<u>At Long Beach Boulevard</u>

- AM peak period average vehicle occupancy in HOV lanes – 2.05 persons per vehicle
- AM peak period average vehicle occupancy in General Purpose lanes – 1.06 persons per vehicle
- 2 plus person carpools using General Purpose lanes in AM peak hour – 5.2 percent
- Vehicles using HOV lane AM peak hour – 1,218
- PM Peak period average vehicle occupancy in HOV lanes – 2.08 persons per vehicle
- PM Peak period average vehicle occupancy in General Purpose lanes – 1.08 persons per vehicle
- 2 plus person carpools using General Purpose lanes in PM peak hour – 8 percent
- Vehicles using HOV lane PM peak hour – 1,292

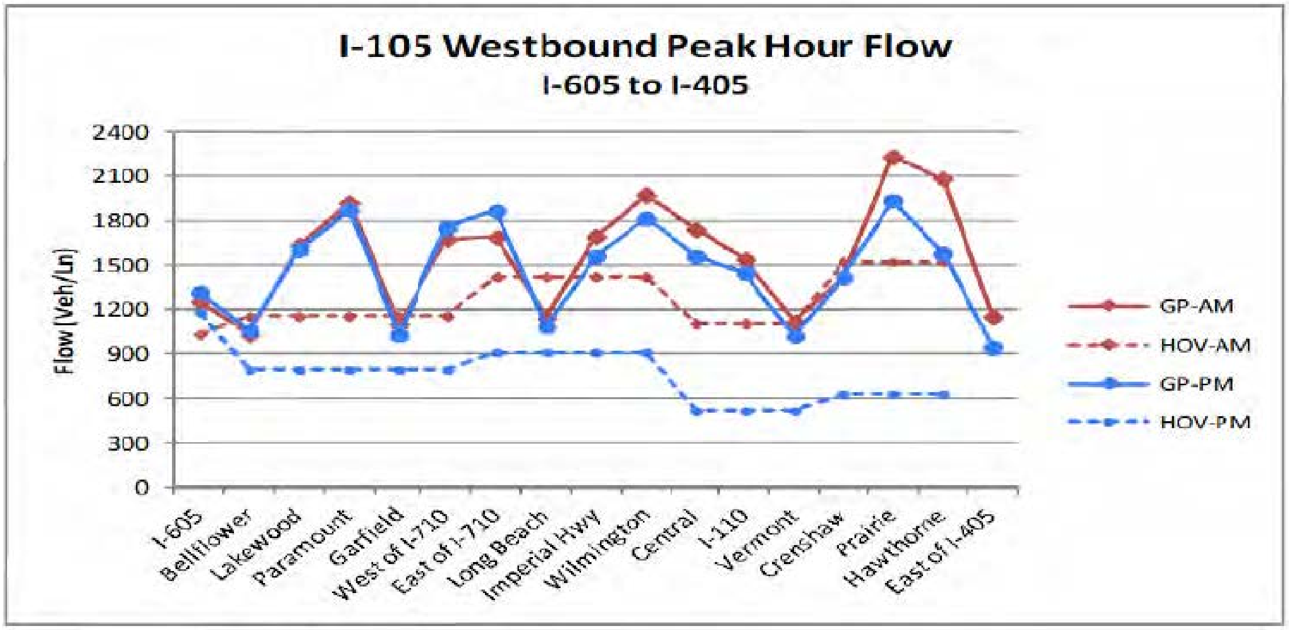
At this location, the HOV lanes carry around 1,250 vehicles and approximately 2,600 people in the peak hour. The average vehicle occupancy in the HOV lanes is approximately double that of the general purpose lanes, thus the person throughput of the HOV lanes is much higher. The number of carpools in the general purpose lanes approximately double the percentage at Lakewood Boulevard. Stated violation rates are approximately 1%, much lower compared to Lakewood Boulevard.

The overall travel pattern for the I-105 Freeway shows the peak direction of travel to be westbound in the AM peak period (see **Figure 2.5**), and eastbound in the PM peak period (see **Figure 2.6**). However, traffic volume patterns on the mixed-flow lanes do not follow a distinct reverse commute trend. In many instances, the AM and PM peak hour volumes are very similar, although congestion is very directionally oriented. This would imply that there is consistent demand for the freeway in the peak hours, but that other factors also contribute to the location of congestion and bottlenecks. The HOV volumes on the I-105 Freeway have a noticeable reverse commute. The peak direction in the AM peak hour is westbound, while the peak direction in the PM peak hour is eastbound.

The spikes in westbound AM peak hour flows are likely attributed to several trip generators. Between the I-710 and I-110 freeways, there is a concentration of commercial and industrial uses that are attracting vehicle trips from the I-105. The area near Alameda Street contains a high concentration of residential buildings which generates traffic to and from the freeways. The increase in traffic near the I-405 interchange is from vehicles with their destination along the I-405 or headed to LAX. In the PM peak hour, the westbound I-105 traffic has a similar pattern to the AM peak hour in both volume and fluctuations. There are fewer vehicles traveling westbound from near Crenshaw Boulevard. This could be due to fewer work based trips in the PM peak hour within that area.

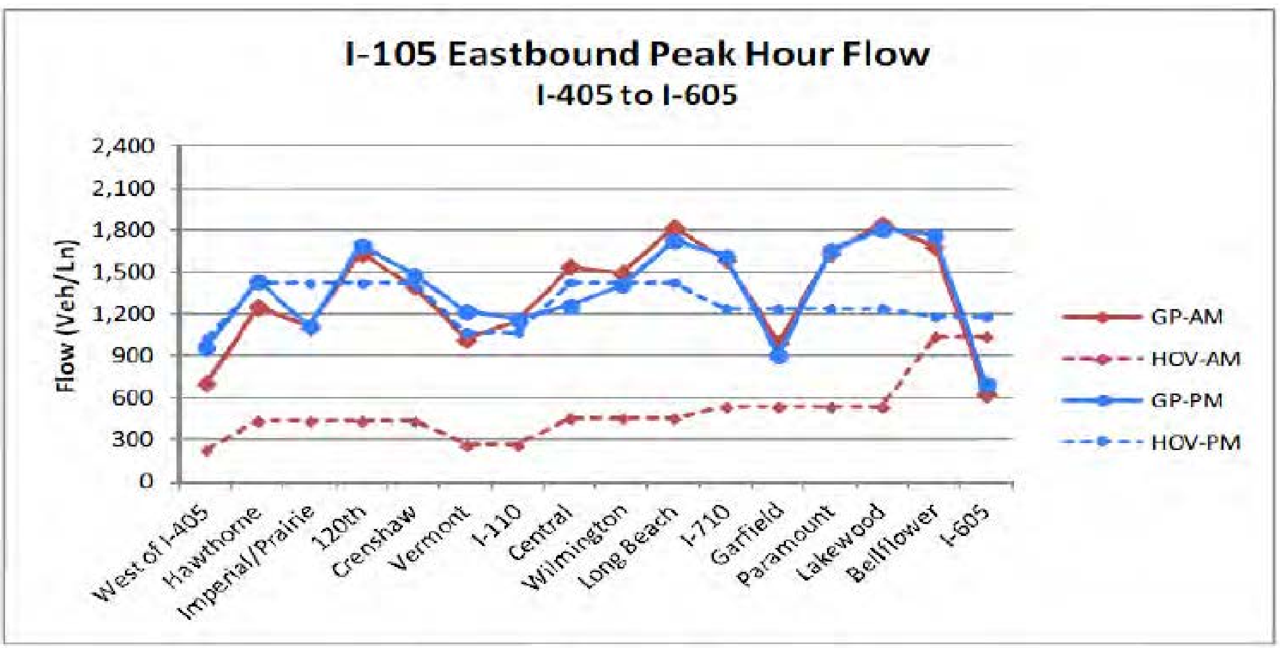
For the AM peak hour eastbound direction, the volume increases from the I-405 Freeway to the I-110 Freeway where the vehicles can merge onto the I-110 Freeway. There is an increase of approximately 300 vehicles per lane on the I-105 near the Alameda Street area likely due to the commercial and industrial uses in the area. There is an increase of approximately 600 vehicles per lane on the I-105 near the Paramount Boulevard area. The PM peak hour eastbound volumes follow a similar pattern to the AM peak hour volumes. The area east of the I-110 Freeway along the I-105 Freeway has a relatively high concentration of residential units, resulting in an increase of approximately 100 vehicles per lane in the PM peak hour near the Avalon Boulevard area.

Figure 2.5 I-105 Westbound Peak Hour Flow, 2013



Source: California Department of Transportation. I-105 General Purpose – Managed Lanes Traffic Analysis: Traffic Operations Analysis Report, 2014.

Figure 2.6 I-105 Eastbound Peak Hour Flow, 2013



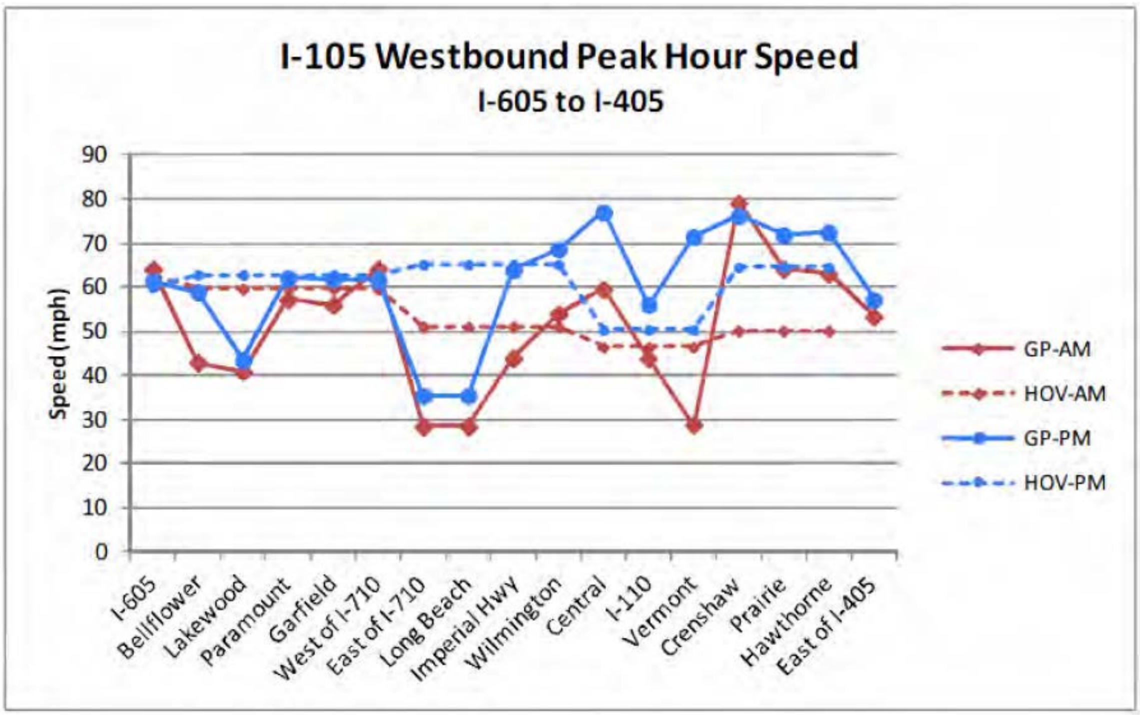
Source: California Department of Transportation. I-105 General Purpose – Managed Lanes Traffic Analysis: Traffic Operations Analysis Report, 2014.

2.1.2 I-105 Freeway Bottlenecks

Figure 2.7 shows the westbound peak hour speeds to range from lows of 28 miles per hour (mph) to highs of almost 80 mph (at Crenshaw Boulevard) in the mixed-use lanes during the AM peak hour. Vehicles in the high-occupancy vehicle (HOV) lanes travel between 45-60 mph during the AM peak hour, even when the mixed-use lanes are the most congested (at Lakewood, I-710 interchange, and I-110 interchange). During the PM peak hour, the mixed-use lanes perform slightly better compared to the AM peak hour. Speeds range from 35-78 mph in the mixed-use lanes, and 50-65 mph in the HOV lanes. The most congested mixed-use lane segment is near the I-710 interchange, while the HOV lanes are most congested between Wilmington Avenue and Vermont Avenue.

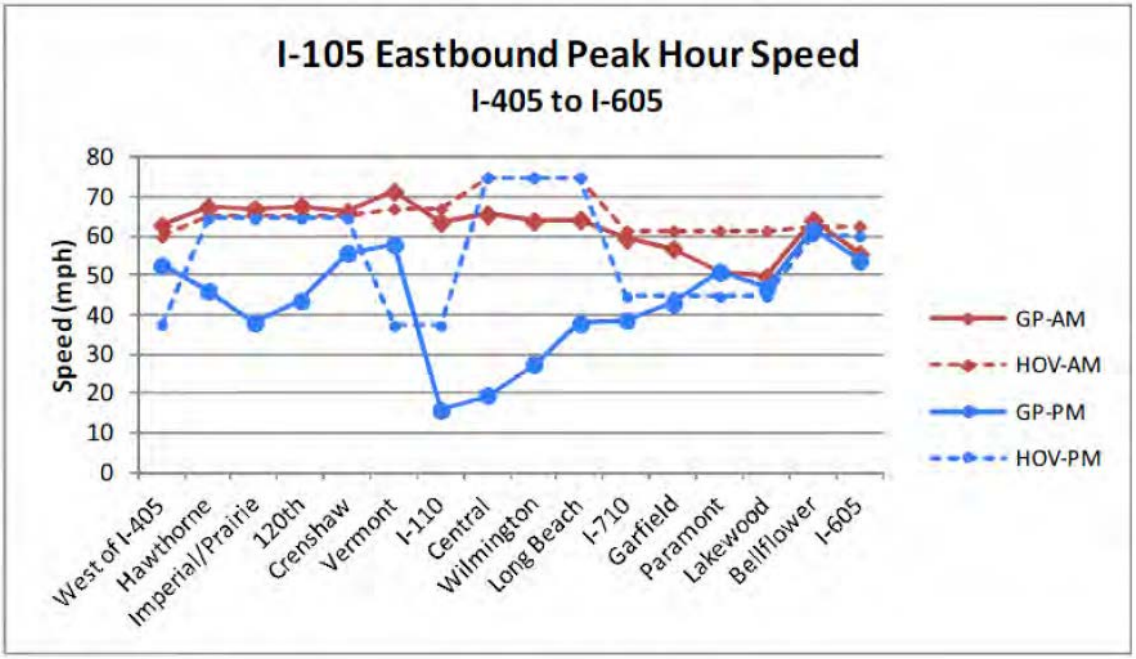
Figure 2.8 shows consistent speeds during the AM peak hour in the eastbound direction for both mixed-use (50-70 mph) and HOV lanes (60-75 mph), with larger fluctuations in speeds during the PM peak hour. In the PM peak hour, the mixed-flow lanes experience a significant drop in speed after Crenshaw Boulevard (60 mph drops to 15 mph) and doesn't recover until Long Beach Boulevard. In that same stretch, speeds in the HOV lanes jump to 75 mph.

Figure 2.7 I-105 Westbound Peak Hour Speed, 2013



Source: California Department of Transportation. I-105 General Purpose – Managed Lanes Traffic Analysis: Traffic Operations Analysis Report, 2014.

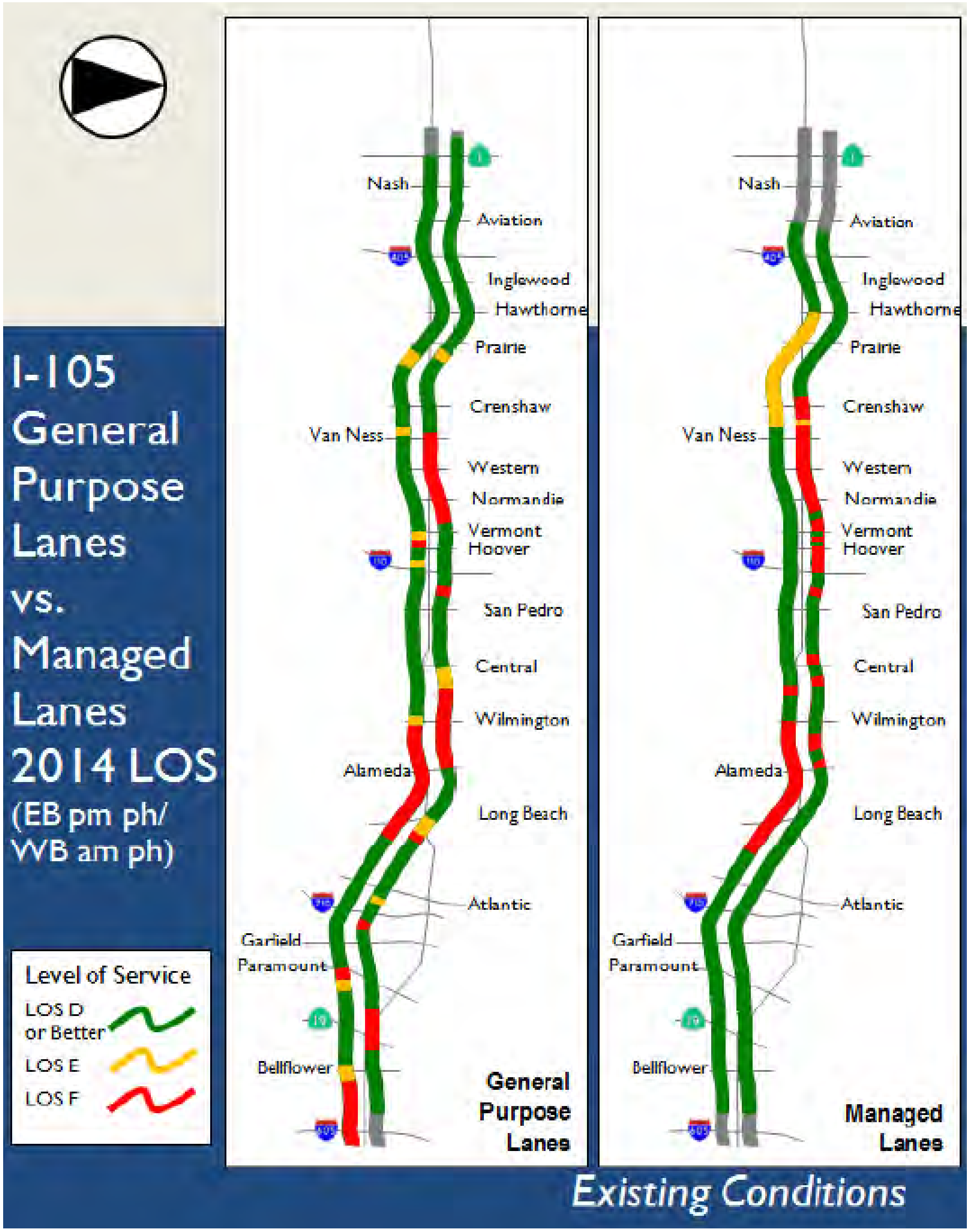
Figure 2.8 I-105 Eastbound Peak Hour Speed, 2013



Source: California Department of Transportation. I-105 General Purpose – Managed Lanes Traffic Analysis: Traffic Operations Analysis Report, 2014.

Figure 2.9 shows the summary of the existing 2014 Level of Service (LOS) for the various segments of I-105 for both General Purpose (GP) and Managed Lanes (ML). The LOS are calculated for critical peak hours: westbound AM and eastbound PM.

Figure 2.9 I-105 General Purpose Lane vs. Managed Lanes Level of Service, 2014



Source: California Department of Transportation. I-105 General Purpose – Managed Lanes Traffic Analysis: Traffic Operations Analysis Report, 2014.

The LOS values shown in **Figure 2.9** indicate peak hour patterns of congestion (LOS E and F conditions) on the general purpose lanes as follows:

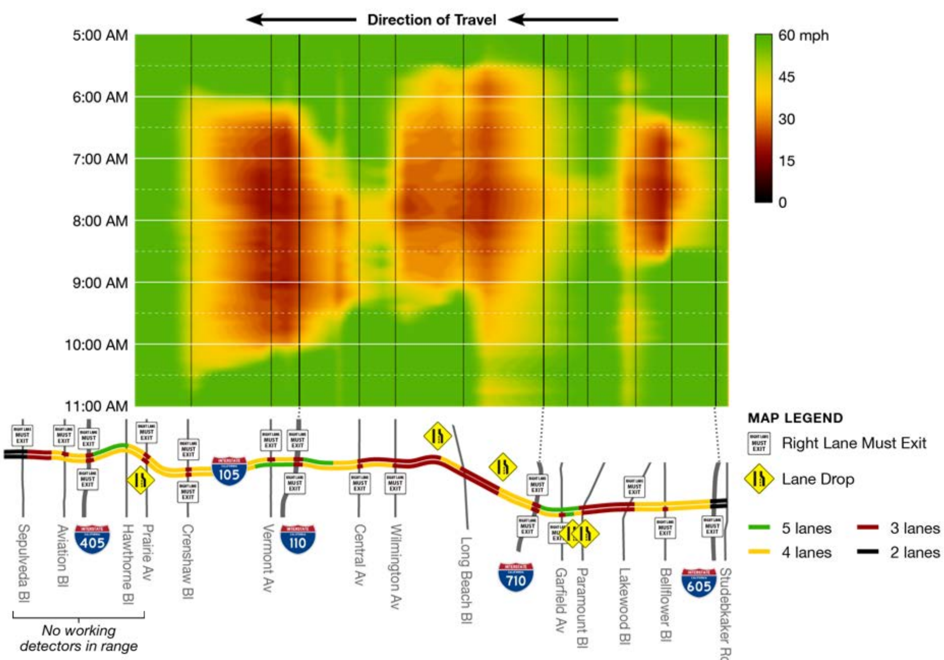
- AM Peak hour westbound – congestion and bottlenecks at Lakewood Boulevard, at I-710, at Long Beach Boulevard, between Alameda Street and Central Avenue, and between Vermont Avenue and Van Ness Avenue

- PM Peak hour eastbound – congestion and bottlenecks near Prairie Avenue, at Van Ness Avenue, at Vermont Avenue, between Wilmington Avenue and Atlantic Avenue, at Paramount Boulevard and between Bellflower Boulevard and the freeway terminus.

The speed contour charts in **Figure 2.10 through Figure 2.13** provide graphical representations of speed data for the I-105 freeway by postmile and time of day. To assist with interpreting the data, major crossings are drawn on the figures as black vertical lines, with a freeway diagram below each figure to indicate what each line represents. These freeway diagrams have also been annotated to include all mainline capacity reductions associated with either a lane drop or an "Exit Only" lane, and are color-coded to reveal the number of mainline lanes at any given location. This is meant to provide additional context for the data, and to facilitate the identification of causes for the observed freeway congestion patterns.

In the westbound direction, the AM peak period generally lasts from 6-10 AM across the much of the I-105 freeway, except west of I-710 , where it is much more limited in terms of lower speeds. The cause of these freeway bottlenecks appear to be linked to the additional volume of traffic coming from the I-605, I-710, and I-110 interchanges and some arterial interchange ramp junctions.

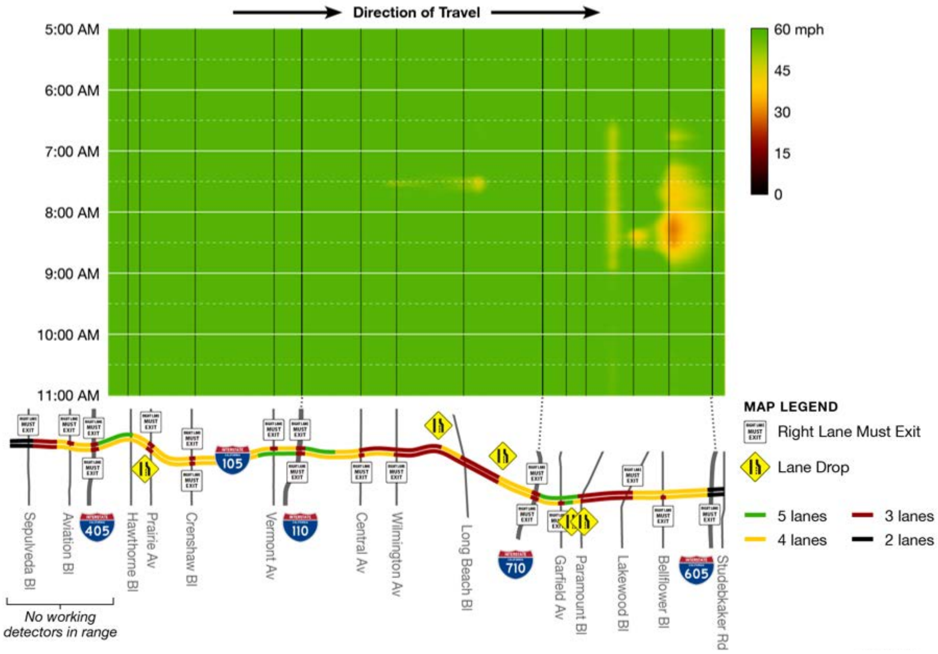
Figure 2.10 I-105 Westbound AM, Speed Contour, 2013



Source: Cambridge Systematics. Active Traffic Management Congestion Relief Analysis Study, May 2014.

In the eastbound direction, the AM period has much less demand and higher speeds, with only a very minor bottleneck around Bellflower Boulevard.

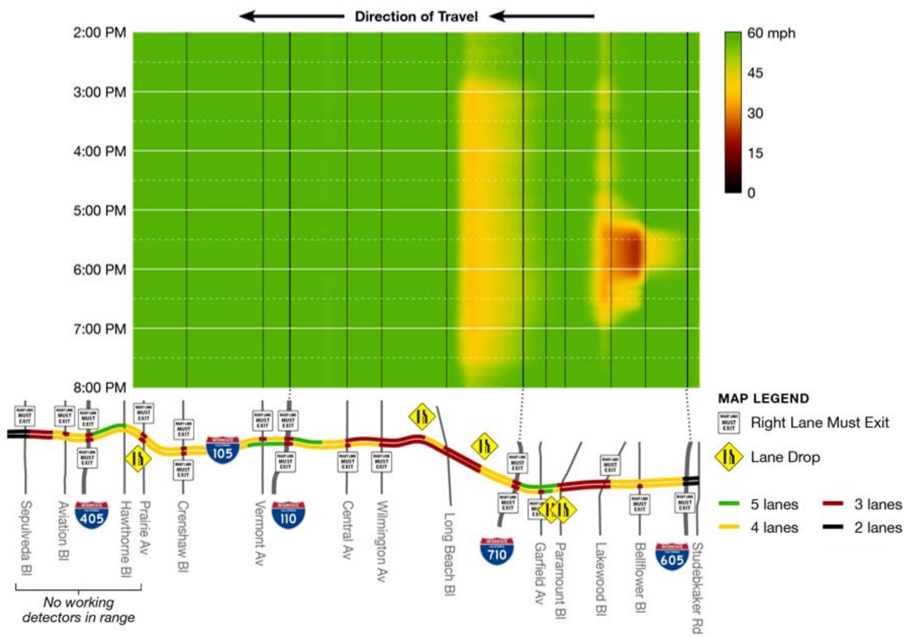
Figure 2.11 I-105 Eastbound AM, Speed Contour, 2013



Source: Cambridge Systematics. Active Traffic Management Congestion Relief Analysis Study, May 2014.

In the westbound direction, the PM period has much less demand and higher speeds, with only two minor bottlenecks between Long Beach Boulevard and I-710, and Lakewood Boulevard and Bellflower Boulevard.

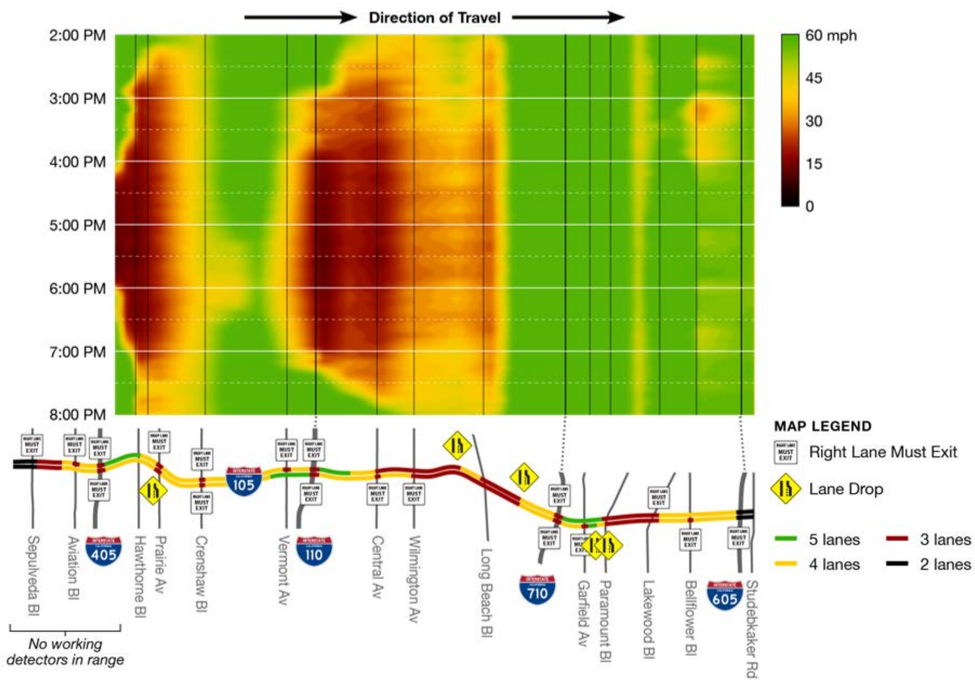
Figure 2.12 I-105 Westbound PM, Speed Contour, 2013



Source: Cambridge Systematics. Active Traffic Management Congestion Relief Analysis Study, May 2014.

In the eastbound direction, the PM peak period lasts much longer, from 2-8 PM, generally between I-405 and Long Beach Boulevard. The cause of these freeway bottlenecks appear to be linked to the additional volume of traffic coming from the I-405 and I-110 interchanges as well as some arterial interchange ramp junctions.

Figure 2.13 I-105 Eastbound PM, Speed Contour, 2013



Source: Cambridge Systematics. Active Traffic Management Congestion Relief Analysis Study, May 2014.

2.1.3 I-105 Freeway HOV Lane Statistics

Caltrans District 7 provided HOV Lane Operation reports for two locations: Long Beach Boulevard and Lakewood Boulevard. These reports show that the HOV demands remain consistent at both locations, in both the AM and PM peak hour. Note that earlier HOV volume data showed that HOV volumes vary at other locations. The HOV volumes on I-105 as shown in the Caltrans reports are generally around 1,000 vehicles per hour at both locations during both peak hours (ranging from a low of 955 vehicles eastbound at Lakewood Boulevard in the PM peak to a high of 1,070 vehicles eastbound at Long Beach Boulevard in the AM peak). Similarly, the total HOV person-throughput is very consistent at both locations and the peak hours, with a range of 2,567 to 2,832 persons per hour moved in the HOV lanes. The AM peak hour experiences slightly higher HOV lane occupancy rates, compared to the PM peak hour, with approximately 2.1 person per vehicle (compared to the general purpose lane occupancy rate of under 1.1 persons per vehicle). This is consistent with the reverse trend seen in the General Purpose lane occupancy rates. The HOV lane violation rates are approximately 10% higher at Lakewood Boulevard compared to Long Beach Boulevard in both the AM and PM peak hour.

Table 2.1 I-105 Freeway HOV Lane Statistics, 2016

	I-105 WB @ Long Beach Boulevard Postmile 11.51 Date 09/29/2016 2+	**I-105 EB @ Long Beach Boulevard** Postmile 11.51 Date 09/29/2016 2+	**I-105 WB @ Lakewood Boulevard** Postmile 15.76 Date 10/04/2016 2+	**I-105 EB @ Lakewood Boulevard** Postmile 15.76 Date 10/04/2016 2+
	AM HOV Peak 1-Hour 6:30-7:30	PM HOV Peak 1-Hour 15:45-16:45	AM HOV Peak 1-Hour 6:30-7:30	PM HOV Peak 1-Hour 16:00-17:00
High Occupancy Vehicle (HOV) Lane Vehicle Summary				
Carpools (Vehicles with 2-5 occupants only)	1,052	1,070	1,012	955
Vanpools/Buses	20	29	17	61
Exempt Vehicles (White or Green Decal Vehicles)	82	87	74	92
HOV Lane People Summary				
Total HOV Lane People	2,567	2,668	2,832	2,740
Average Occupancy				
HOV Lane Average Occupancy (people)	2.11	2.07	2.16	2.07
General Purpose Lane Average Occupancy (people)	1.06	1.08	1.02	1.09
HOV Lane Violation				
HOV Lane Violation (percentage)	0.49%	1.16%	11.60%	11.34%

Source: Caltrans District 7 HOV Lane Operation reports

2.2 Arterial Assessment – Arterial Performance Measures

Metro developed an arterial performance measurement tool (APMT) to establish baseline performance conditions for selected subregional arterial corridors in Los Angeles County. The purpose of this tool is to understand how well the transportation system performs in order to target the right projects to address local and regional mobility and reliability needs. While the APMT was developed for all nine subregions in Los Angeles County, the I-105 Study Area falls within the Gateway Cities and South Bay Cities subregions and thus data from the APMT for those two areas is documented in this section.

Figure 2.14 lists the available performance measures provided by the APMT in the categories of travel demand, productivity, mobility, and reliability. The main data sources for these performance measures are 24-hour traffic count data and INRIX speed data. Performance measures were summarized for the arterials available in the APMT that are categorized as CSAN arterials within the Study Area. There are several CSAN arterials within the Study Area that are not included in the APMT database. Those arterials remain color-coded as CSAN arterials on the maps, but do not have VMT, VHD or Travel Time Index data shown in **Figure 2.15 through Figure 2.18**.

Figure 2.14 Metro Arterials Performance Measures

Performance Outcome	Performance Measure	Definition	Data Source
Travel Demand	Vehicle Miles Traveled (VMT)	Number of vehicles multiplied by the distance traveled over a corridor.	• 24-hour traffic count data
Productivity	Flow in Vehicles per Hour (VPH)	Number of vehicles traveling along a corridor.	• 24-hour traffic count data
Mobility	Speed (MPH)	Corridor distance divided by travel time in hours.	• INRIX speed data
	Travel Time (minutes)	Time to traverse a corridor segment in minutes	• INRIX speed data
	Delay in Vehicle-Hours of Delay (VHD)	Difference in actual travel time compared to a threshold travel time (typically at the free-flow speed) along a segment. VHD is calculated as the delayed travel time multiplied by the number of vehicles experiencing that delay.	• 24-hour traffic count data • INRIX speed data
	Delay per Mile (VHD/Mile)	Ratio of VHD divided by corridor distance. A measure of congestion intensity.	• 24-hour traffic count data • INRIX speed data
	Peak Period Spreading	Average duration of peak period VHD in hours	• VHD
Reliability	Travel Time Index	Ratio of the average travel time divided by the threshold travel time (i.e., free-flow)	• INRIX speed data
	Planning Time Index	Ratio of the 95th percentile travel time divided by the average travel time. The 95th percentile travel time is the 95th slowest day out of 100 days (approx. 1 day per month).	• INRIX speed data

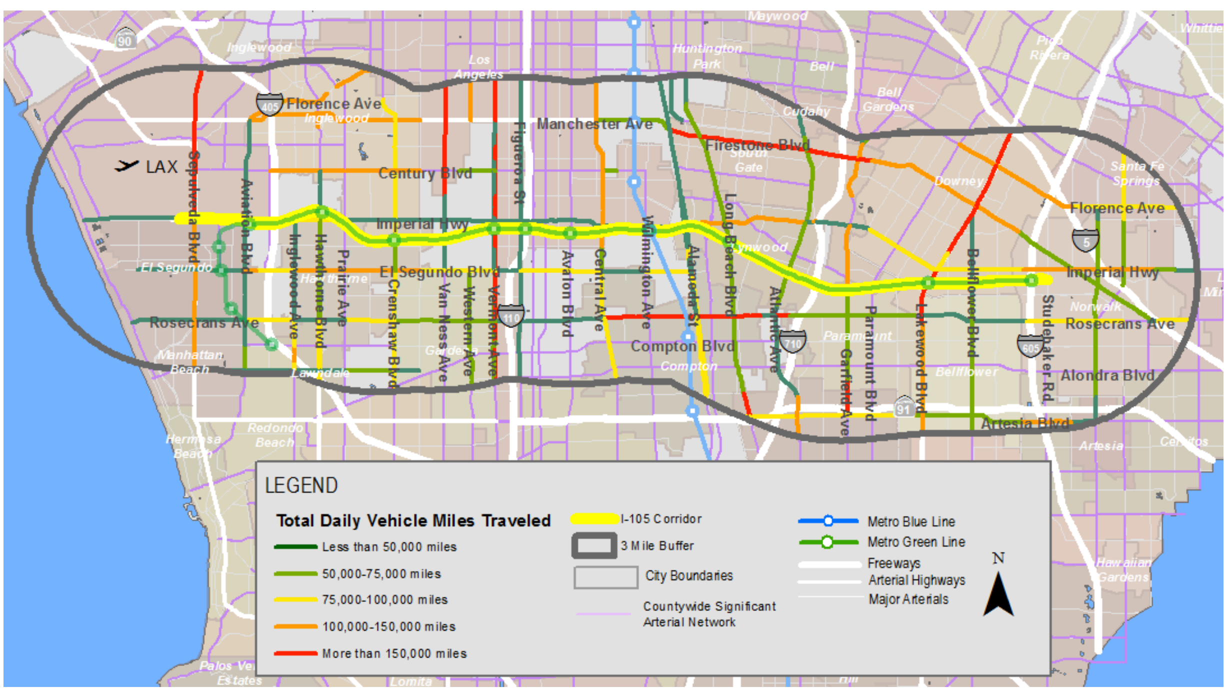
Source: Los Angeles County Metropolitan Transportation Authority. Metro Arterial Performance Measurement Tool Methodology and User's Guide, 2017.

Figure 2.15 displays the total daily vehicle miles traveled (VMT) on CSAN arterials (for those included in the Metro APMT database) as a combination of VMT in both directions. The VMT by arterial are categorized by five VMT ranges, from 50,000 vehicle miles travelled per day up to over 150,000 vehicle miles traveled per day. The maps graphically portray the arterials with the highest VMT based on color, with the yellow, orange and red segments showing the highest VMT. As shown in the figure, the most highly travelled arterial segments based on VMT include Rosecrans Avenue between Central Avenue and I-710, Firestone Boulevard between Alameda Street and Garfield Avenue, Van Ness Avenue north of Imperial Highway, Vermont Avenue throughout the study area, Lakewood Boulevard north of Rosecrans Avenue and small segments of Long Beach Boulevard and Garfield Avenue near SR-91 at the southern end of the study area. All of those segments carry more than 150,000 vehicle miles traveled on a daily basis. Other arterials with higher VMT totals (ranging up to 150,000 vehicle miles per day) include portions of Florence Avenue (two segments), Manchester Boulevard, Firestone Boulevard, Century Boulevard, Sepulveda Boulevard, Imperial Highway (two segments), El Segundo Boulevard, Artesia Boulevard, Sepulveda Boulevard, Central Boulevard. Garfield Avenue and Lakewood Boulevard.

Figure 2.16 identifies arterial segments with the highest daily vehicle-hours of delay (VHD). The patterns of arterial segments with higher delay generally follows similar patterns where the VMT totals are high. Segments of Firestone Boulevard, Imperial Highway, Manchester Avenue, Van Ness Avenue, Long Beach Boulevard, Garfield Avenue, and Lakewood Boulevard experience higher levels of VHD. Imperial Highway and Firestone Boulevard/Manchester Avenue are major arterials which run parallel to the I-105 freeway and may be used as an alternate route when the freeway is congested. Lakewood Boulevard, also known as State Route 19, may carry larger volumes of traffic to the freeway, resulting in higher levels of VHD as well as VMT.

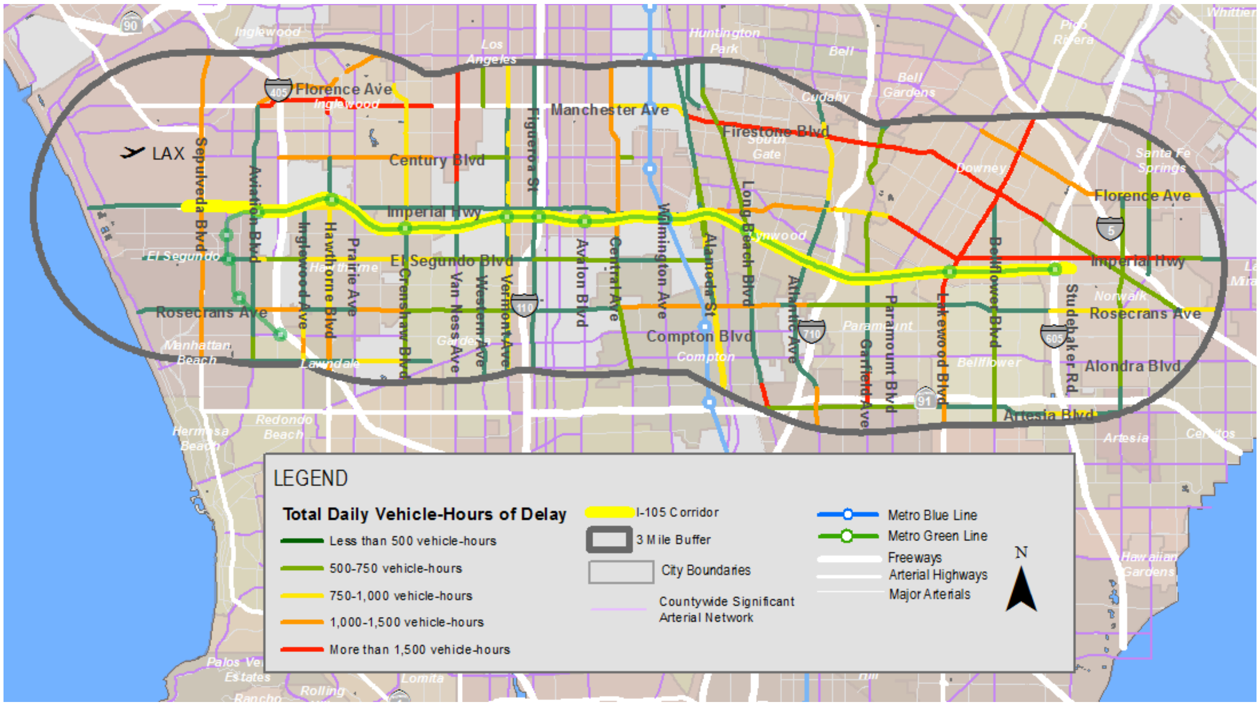
Figure 2.17 and Figure 2.18 highlight the travel time index (TTI) in the northbound/eastbound directions and southbound/westbound directions. A ratio of 2.0 means that the average travel time for that segment is twice as long as it would take during free-flow conditions. Note that none of the arterials have a TTI of 1.0, which would mean that traffic flows at free-flow speed; thus all arterials operate less than free flow speeds during peak hours. The highest concentration of arterial segments with a TTI of more than 2.0 can be seen in the southeast portion of the Study Area, regardless of direction, including Bellflower Boulevard, Lakewood Boulevard, Rosecrans Avenue and Artesia Boulevard. In addition, Sepulveda Boulevard in the western portion of the study area north of I-105 in the segment leading to LAX has a high TTI. In the northbound or eastbound directions, the majority of the arterials experience higher travel time indices (up to 2.0), including large portions of Manchester Avenue/Firestone Boulevard, Century Boulevard, Imperial Highway, Rosecrans Avenue, Artesia Boulevard, Alameda Street, Long Beach Boulevard, and Lakewood Boulevard. In the southbound or westbound directions, other arterial segments with higher travel time indices (up to 2.0) include portions of Sepulveda Boulevard, Firestone Boulevard, Imperial Highway, Aviation Boulevard, Inglewood Avenue, Hawthorne Boulevard, Crenshaw Boulevard, Long Beach Boulevard, Lakewood Boulevard and Florence Avenue.

Figure 2.15 Countywide Significant Arterial Network within I-105 Study Area, Bidirectional Daily Vehicle Miles Traveled, 2017



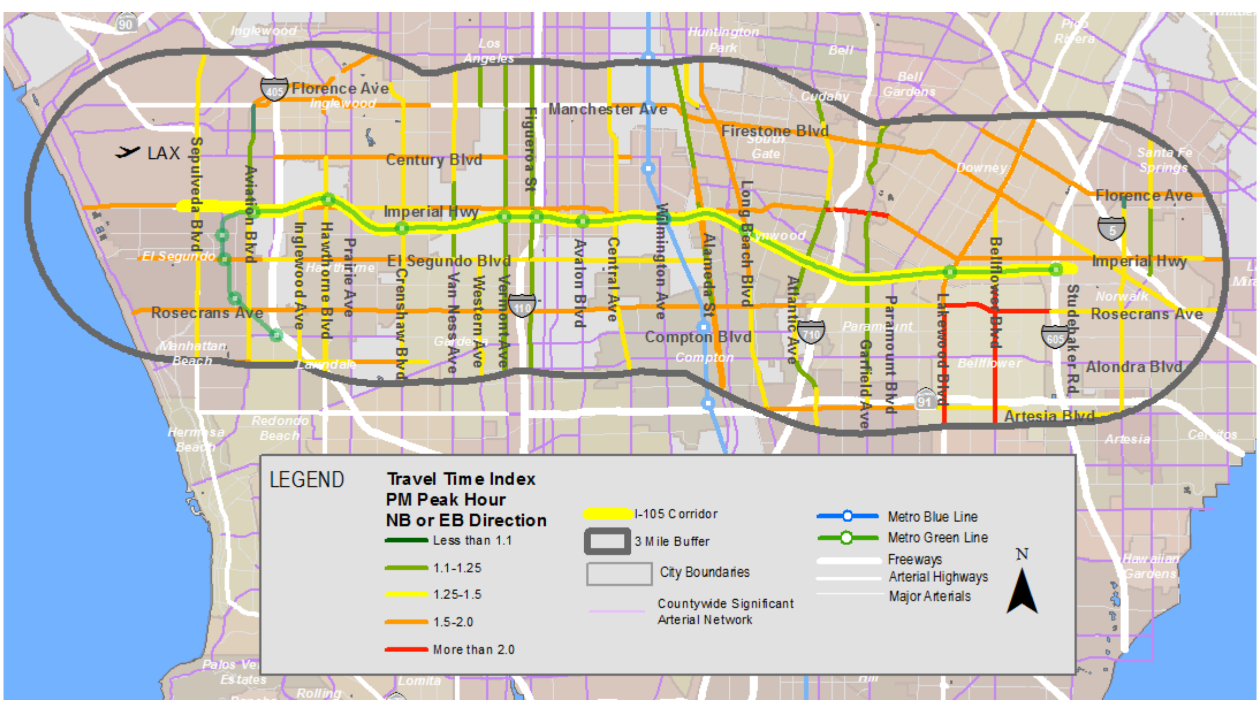
Source: Los Angeles County Metropolitan Transportation Authority. Metro Arterial Performance Measurement Tool, 2017.

Figure 2.16 Countywide Significant Arterial Network within I-105 Study Area, Bidirectional Daily Vehicle-Hours of Delay, 2017



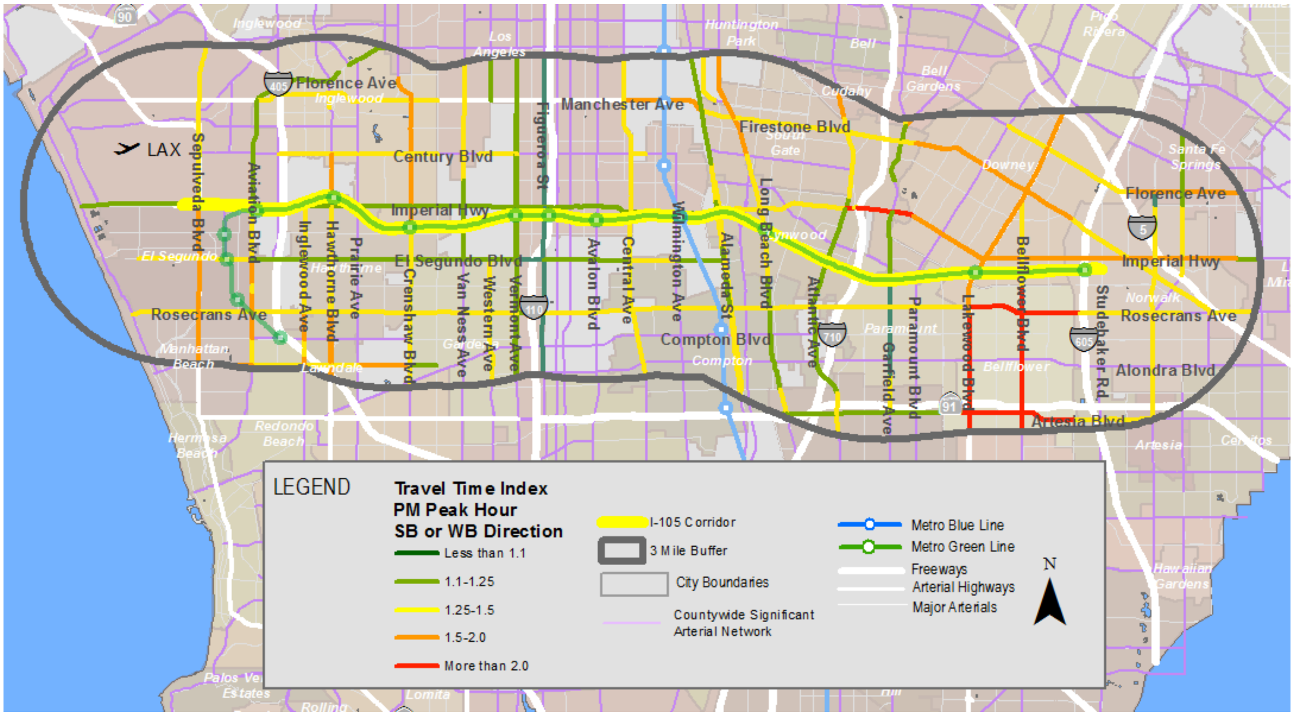
Source: Los Angeles County Metropolitan Transportation Authority. Metro Arterial Performance Measurement Tool, 2017.

Figure 2.17 Countywide Significant Arterial Network within I-105 Study Area, Travel Time Index, PM Peak Hour, Northbound or Eastbound Direction, 2017



Source: Los Angeles County Metropolitan Transportation Authority. Metro Arterial Performance Measurement Tool, 2017.

Figure 2.18 Countywide Significant Arterial Network within I-105 Study Area, Travel Time Index, PM Peak Hour, Southbound or Westbound Direction, 2017



Source: Los Angeles County Metropolitan Transportation Authority. Metro Arterial Performance Measurement Tool, 2017.

2.3 Truck Assessment – Regional and Port-Related Heavy Duty Trucks on I-105

Figure 2.19 illustrates 2016 Heavy Duty Trucks (HDT) including all regional HDT as well as Port-related HDT as a component. The sources of the data include the SCAG Heavy Duty Truck model as well as the Port's PortTAM model.

Heavy Duty Trucks are defined in the SCAG model as all trucks over 8,500 pounds gross vehicle weight (GVW), and they are further categorized into three weight classes of HDT as follows:

- Light-Heavy -- 8,500 to 14,000 GVW
- Medium-Heavy -- 14,000 to 33,000 GVW
- Heavy-Heavy -- Over 33,000 GVW

Port-related Heavy Duty Truck movements are truck trips that have one end at either the Port of Los Angeles or the Port of Long Beach. These include trucks moving full and empty ocean containers to and from the Port terminals as well as trucks without containers (called "bobtail" truck moves) and truck with chassis but no container. These are differentiated from other regional HDT trips which have both origin and destination outside of the Ports. The Port truck trips are specifically called out due to the large number of Port-related movements in the Gateway Cities subregion (which covers about half of the Study Area) including freeways such as I-710 and I-105.

Figure 2.19 2016 Daily Heavy Duty Trucks on I-105

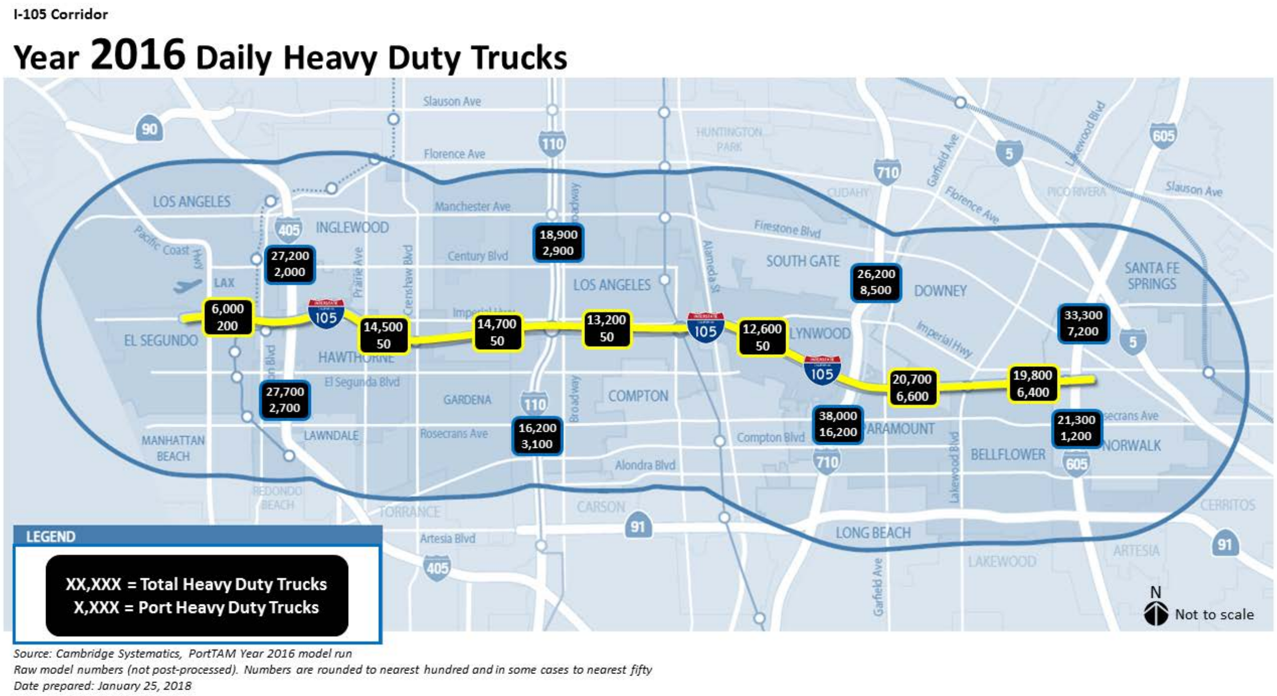


Figure 2.19 presents two statistics: total daily heavy duty trucks and total daily port heavy duty trucks, both as an aggregate of eastbound and westbound traffic. The graphic helps portray an important issue for the I-105 corridor with respect to trucks. As shown, the key finding associated with HDT movements along I-105 is the significant difference in truck volume east and west of I-710. On a daily basis, west of I-710, the freeway carries approximately 12,600 total Heavy Duty Trucks and 50 Port-related truck trips, but to the east of I-710 those numbers increase to nearly 21,000 total HDT trips per day and 6,600 Port-related HDT trips. This demonstrates that I-105 is a key truck corridor for Port truck trips that move to and from destinations to the east including industrial areas such as Santa Fe Springs as well as further east to the Inland Empire. This truck route includes the I-710 and I-605 and the I-105 between those two freeways which serves as a key route for trucks to and from the east. Outbound from the Ports, trucks go up I-710, east on I-105 and north on I-605 to their destinations, and the reverse move occurs for trucks headed inbound to the Ports.

It is also important to note that HDT trips utilize more of the freeway capacity than automobile trips. This is due to two reasons; 1) trucks have slower rates of acceleration and thus the throughput of a lane with Heavy Duty Trucks is lower in a given time period, and 2) trucks are longer and larger and take more of the physical roadway space and capacity. The concept of “Passenger Car Equivalent” or PCE is used to describe the effects of trucks on the freeway. Typically, one HDT is considered to take the equivalent capacity of two passenger cars. Thus, only half as many HDTs will generate the same level of congestion as twice the number of passenger cars. On grades, the effect is even greater due the slower acceleration of large trucks moving uphill.

West of I-710, I-105 carries approximately 205,000 to 224,000 vehicles per day and west of I-710 the freeway carries approximately 197,000 to 220,000 vehicles per day based on Caltrans report “2016 Traffic Volumes on California State Highway” (volume varies depending on specific location counted). This correlates to existing HDT percentages of 6% west of I-710 and between 9% to 11% HDT to the east. The truck percentage west of I-710 is fairly typical of urban freeways in Los Angeles County, while the portion of

I-105 east of I-710 carries a significantly higher number and percentage of Heavy Duty Trucks than most area freeways.

3.0 Transit Assessment

The purpose of this section is to evaluate the public transportation system within the I-105 Study Area. The transit assessment examines the public transportation network in the Study Area, including Metro Rail, Metrolink commuter trains, and Metro and Municipal bus systems (to the extent system information is available). This assessment includes an evaluation of the ridership, frequency, and coverage of public transportation in the I-105 Study Area.

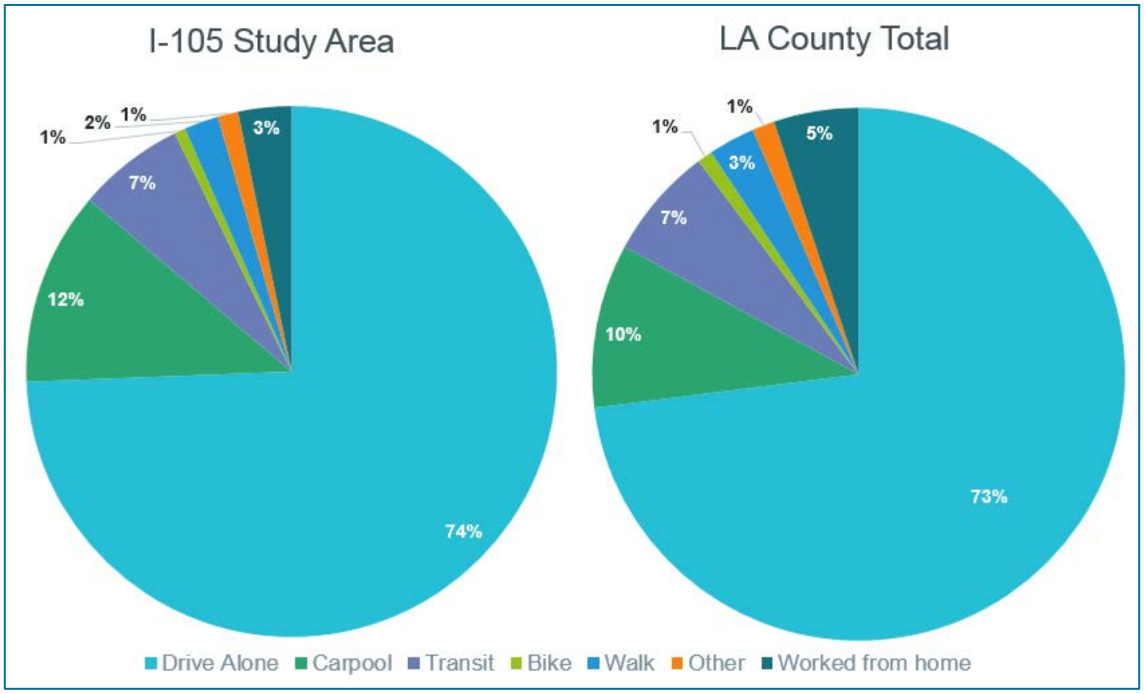
The transit assessment contains the following sections:

- Transit Commute Mode Share
- Rail
  - Metro Rail
  - Metrolink
- Bus Transit System
  - Metro Bus Service
  - Municipal Transit Operators

3.1 Transit Commute Mode Share

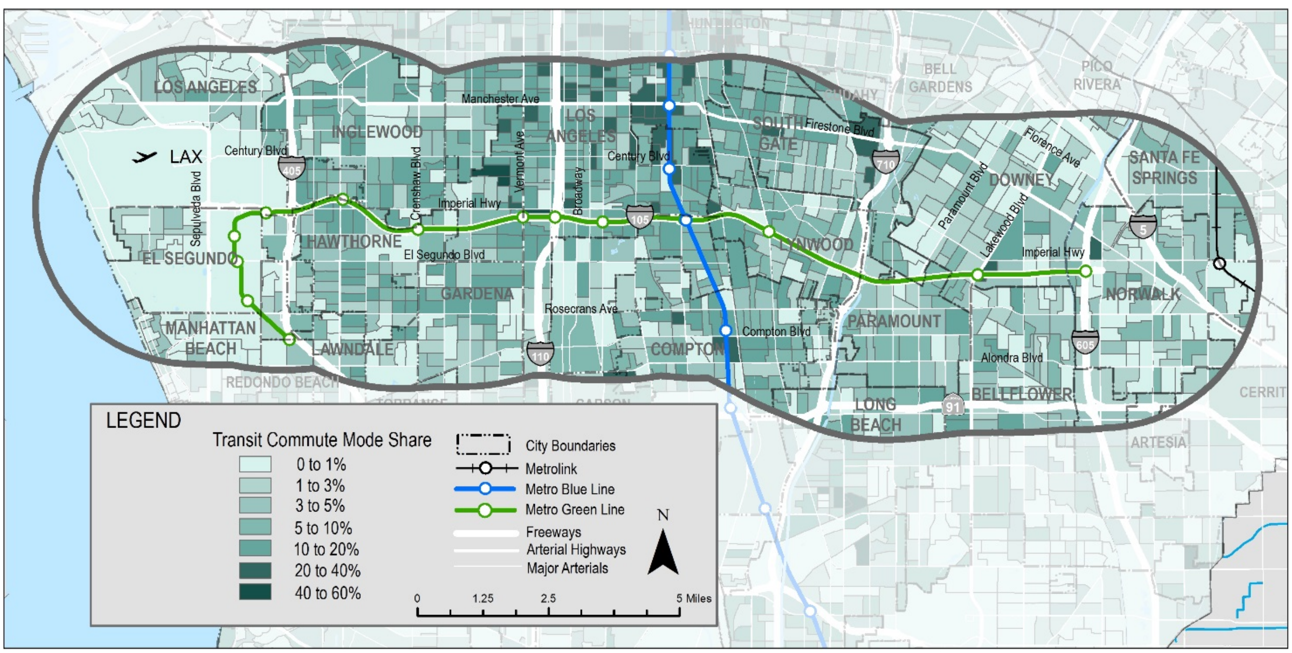
Mode choice for residents of the I-105 Study Area is similar to the Los Angeles County average. **Figure 3.1** shows that in the I-105 Study Area, in 2015, 74% of all employees drive alone to work, with 7% of residents using transit as their primary mode to access work. In some locations, concentrated in the South Los Angeles and Unincorporated neighborhoods north of the Green Line, the commute mode share for transit is much higher. In one Census Block Group adjacent to two Metro Green Line stations, transit is the most common mode for commuting to work (60% of employees). Furthermore, the transit commute mode share makes up at least 10% of commute trips in over 25% of the Census Block Groups in the Study Area (see **Figure 3.2**).

Figure 3.1 Mode share for commute trips



Source: ACS 2015, 5-year estimates.
*Other includes Taxicab, Motorcycle, and "Other means"

Figure 3.2 Transit Commute Mode Share in I-105 Study Area



Source: American Community Survey, 2015 5-year Estimates

3.2 Rail

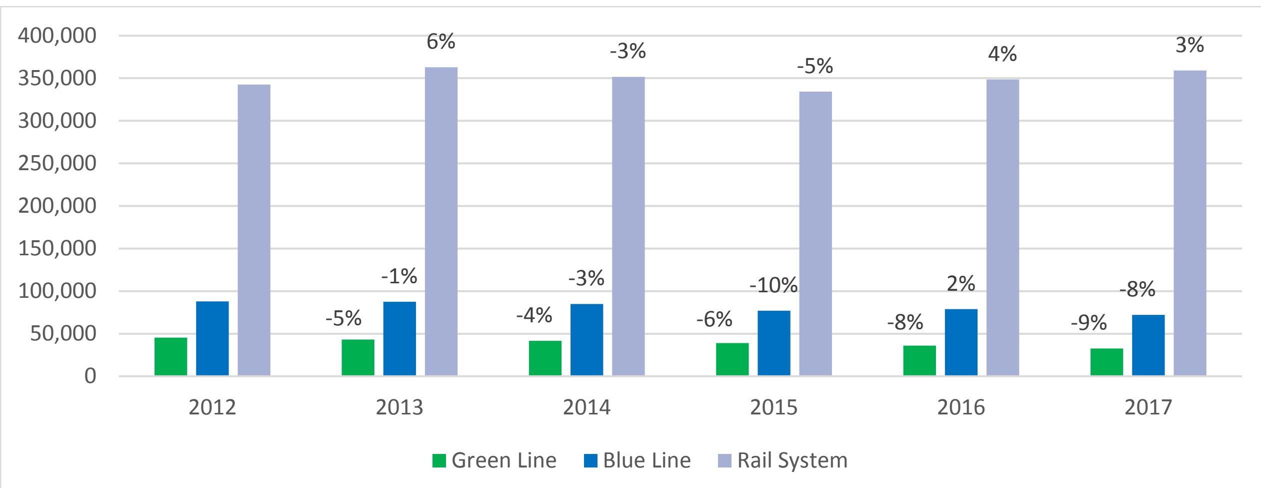
3.2.1 Metro Rail

Two of the Los Angeles Metropolitan Transportation Authority's (Metro) rail lines have stations in the I-105 Study Area. The Metro Green line, an elevated railway with 14 stations, shares the I-105 right of way for almost the entire corridor and connects the City of Redondo Beach to the City of Norwalk. The Metro Blue line, opened in 1990, was the first line in Los Angeles County's modern rail network. The Blue Line runs from Long Beach in the south to Downtown Los Angeles. Of the 22 stations on the line, there are four in the I-105 Study Area, including a transfer to the Green Line at Willowbrook/Rosa Parks station.

Metro Rail Ridership

In recent years, Metro has seen declines in ridership throughout the system. The rail system as a whole has not seen a dramatic drop in total ridership, in part due to the opening of new lines in recent years (Expo Phase 1 to Culver City, Expo Phase 2 to Santa Monica, Gold Line to Azusa). **Figure 3.3** below shows the average weekday boardings from 2012 through 2017 for the entire rail system, the Green Line, and the Blue Line. While the system as a whole has not seen significant decreases in ridership, the Green Line and Blue Lines have experienced steady declines.

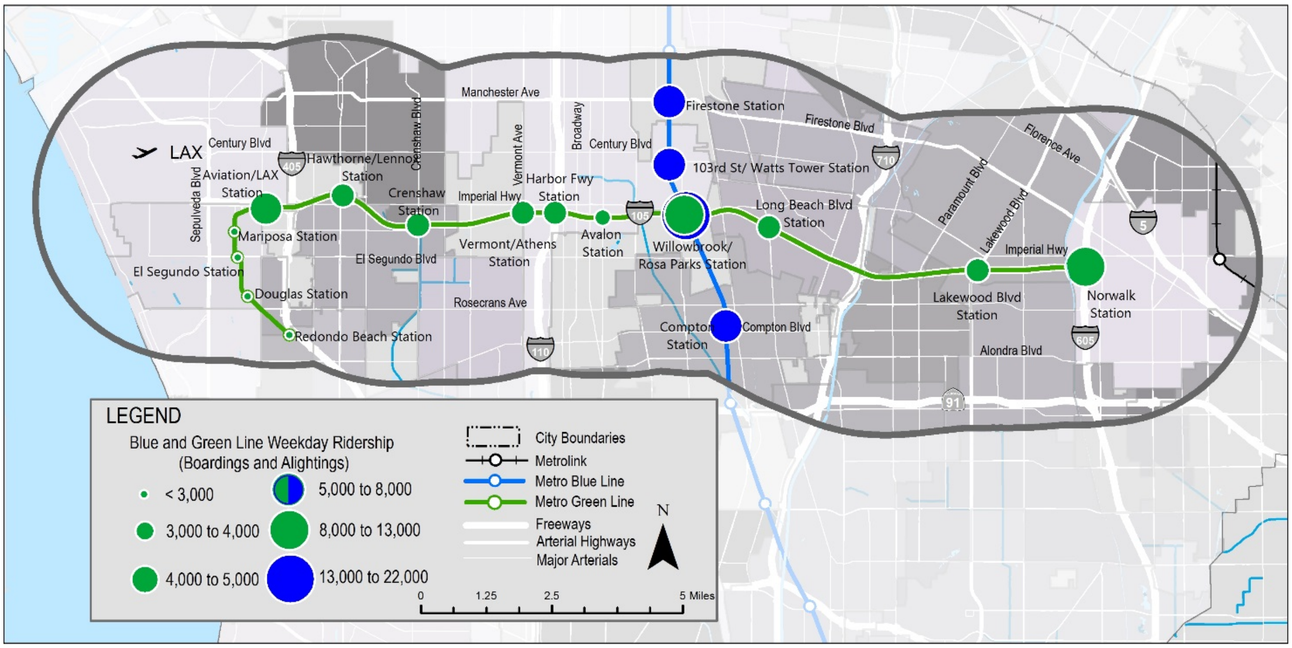
Figure 3.3 Metro Rail Average Weekday Boardings, 2012 - 2017



Source: LA Metro
Note: Percentages show change from previous year.

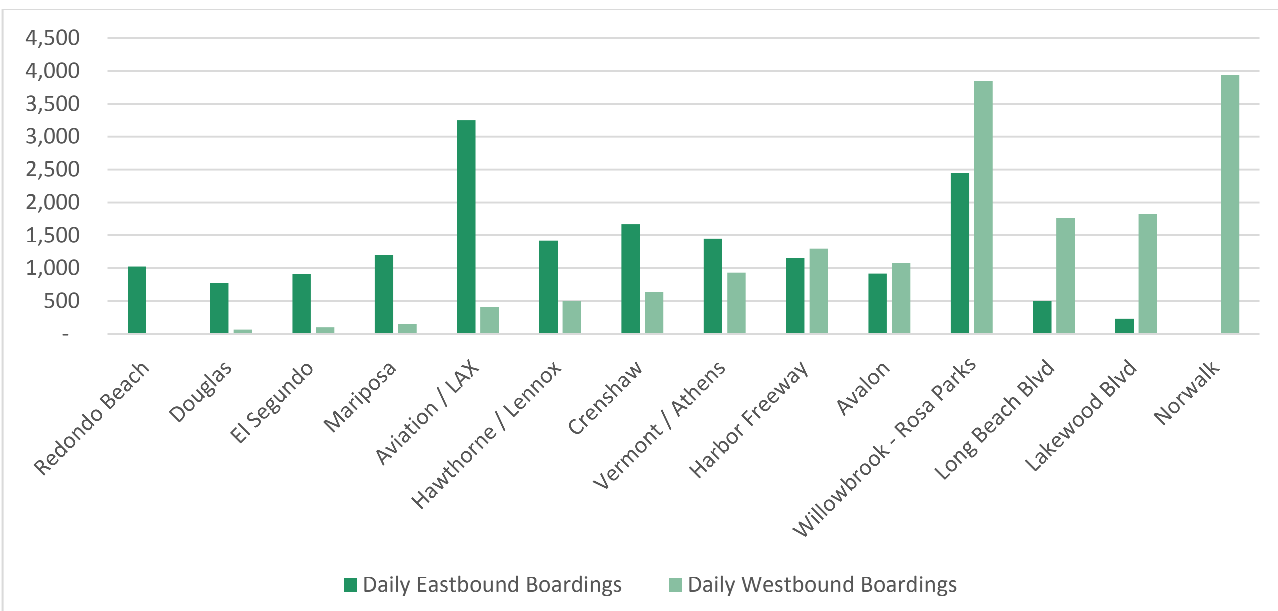
The Blue Line has higher per station ridership than the Green Line within the Study Area. Some Green Line stations, such as WIllowbrook/Rosa Parks, Aviation/LAX, and Norwalk have significant daily ridership. **Figure 3.4** shows the station locations for the Blue and Green Lines and highlights the total weekday boardings and alightings. **Figure 3.5** highlights the boardings by station and by direction. Unsurprisingly, westbound boardings are high at Norwalk, the end of the line, and Willowbrook, a transfer station. Norwalk has the largest parking facility of any station in the I-105 Study Area (see **Table 3.1**), and high rates of parking utilization. The eastbound boardings are highest at Aviation and Willowbrook. These boardings are likely return trips from the job-rich Aviation/LAX station area and return trip transfers from the Blue Line.

Figure 3.4 Metro Rail Ridership by Station, Average Weekday Boardings and Alightings



Source: LA Metro, October 2017

Figure 3.5 Metro Green Line Daily Boardings by Stop and Direction, 2017



Source: LA Metro, October 2017

Table 3.1 Parking Availability at Metro Rail Stations

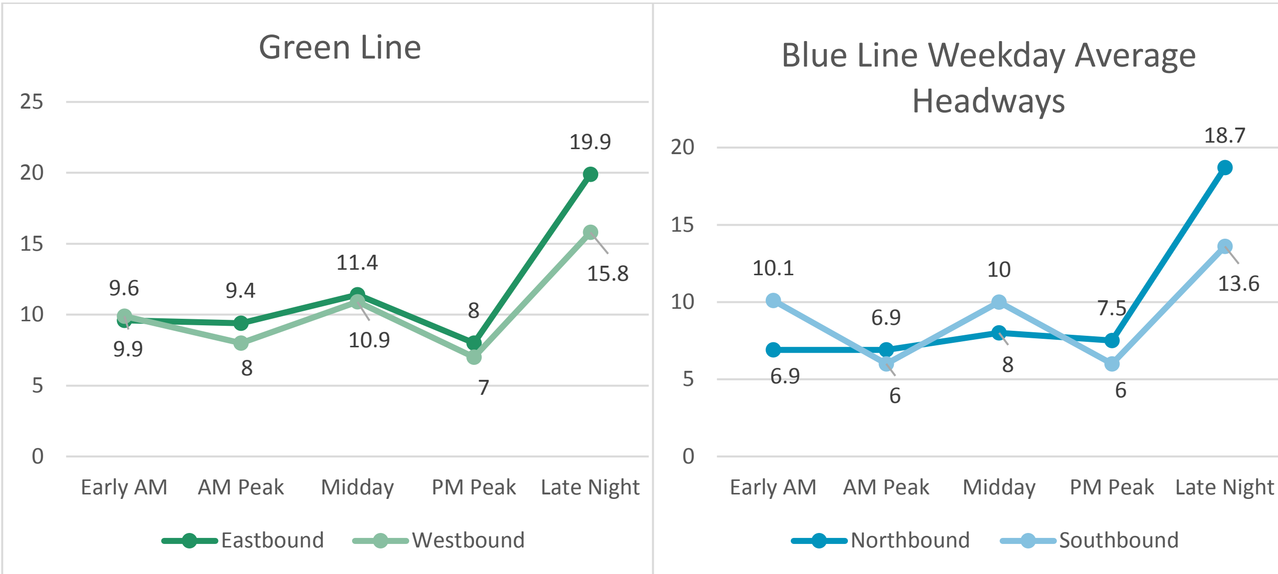
Station	Free Parking Spaces*	Line	Utilization (2012)
Norwalk	1,792	Green	High
Lakewood Bl	414	Green	High
Long Beach Bl	646	Green	Low
Willowbrook/Rosa Parks	231	Green/Blue	High
Avalon	158	Green	Low
Harbor Freeway	253	Green	High
Vermont/Athens	155	Green	Low
Crenshaw	513	Green	Medium
Hawthorne/Lennox	362	Green	Low
Aviation/LAX	390	Green	High
Mariposa	0	Green	N/A
El Segundo	91	Green	Low
Douglas	30	Green	Medium
Redondo Beach	403	Green	Low
Compton	0	Blue	N/A
103rd St /Watts Towers	63	Blue	Low
Firestone	0	Blue	N/A

Source: Metro, 2018. Metro Office of Inspector General, Review of Transit Station and Park & Ride Maintenance and Parking Utilization, 2012
*Some Metro rail stations have paid or reserved parking; however, all parking in the I-105 Study Area is currently free

LA Metro Rail Frequency

Metro Rail runs frequent service on most routes throughout the system. Rail service is not 24 hours per day; depending on the line, the first train of the day originates between 4:00 and 5:00am. The last train of the day on each line terminates by 3:00am. **Figure 3.6** highlights the average headways (time between trains) in minutes, by direction, for the Green and Blue lines during weekdays. Service is frequent (less than 12 min headways) for most of the day on both lines, with the exception of late night service. Similarly, northbound service on the Blue Line is consistently very frequent for the majority of the day, but falls off sharply in the late evening. Southbound Blue Line and each direction of the Green Line have more frequent service during peak periods and reduced service during the midday period.

Figure 3.6 Green Line and Blue Line Average Weekday Headways (minutes)



Source: LA Metro Rail Timetables

3.2.2 Metrolink

The Southern California Regional Rail Authority operates the region's commuter rail service, Metrolink, which serves the counties of Los Angeles, Orange, San Bernardino, Riverside, and Ventura. There is one Metrolink station in the I-105 Study Area, located in the city of Norwalk. The Norwalk-Santa Fe Springs station serves two Metrolink lines: the Orange County and 91/Perris Valley lines. The Orange County line, serving Oceanside to LA Union Station, has the second highest daily riders of any line in the Metrolink system as shown in **Table 3.2**. The 91/Perris Valley line opened in June of 2016, connecting Perris and Moreno Valley to the Inland Empire-Orange County line, the Riverside Line, and the Orange County Line. According to Metrolink, there were 831 daily boardings, on average, at Norwalk-Santa Fe Springs in 2017.

Table 3.2 Metrolink Average Daily Riders by Line

Line	Weekday	Saturday	Sunday	Stations
Antelope Valley Line	5,793	2,604	2,246	11
Inland Empire – Orange County Line	5,544	1,571	1,182	15
Orange County Line	8,657	2,401	2,139	15
Riverside Line	4,274	n/a	n/a	13
San Bernardino Line	9,218	3,761	2,711	13
Ventura County Line	3,854	n/a	n/a	12
91/Perris Valley Line	2,810	670	534	12

Source: Metrolink Q1 '17-18 Fact Sheet

Table 3.3 shows the weekday Metrolink service between Norwalk and Union Station in Downtown Los Angeles. The majority of the trains are inbound/northbound in the morning to accommodate commuters traveling to downtown Los Angeles; however, there are a few evening trains that operate northbound in the evening hours. There are eight trains between Norwalk and Union Station during the morning peak period (arriving at Union Station between 6am and 9am), with an average headway of 16 minutes. The average travel time is 30 minutes and ranges from 24 to 39 minutes.

Table 3.3 Weekday Metrolink Schedule, Norwalk to LA Union Station

Depart Norwalk	Arrive Union Station	Line	Travel Time	Headway
4:57	5:25	Orange County	0:28	NA
6:13	6:40	Orange County	0:27	1:16
6:33	7:05	91/Perris Valley	0:32	0:20
6:49	7:20	Orange County	0:31	0:16
6:58	7:32	91/Perris Valley	0:34	0:09
7:16	7:45	Orange County	0:29	0:18
7:36	8:10	91/Perris Valley	0:34	0:20
7:55	8:19	Orange County	0:24	0:19
8:05	8:40	Orange County	0:35	0:10
8:56	9:26	Orange County	0:30	0:51
9:37	10:04	Orange County	0:27	0:41
17:05	17:31	Orange County	0:26	7:28
18:00	18:27	Orange County	0:27	0:55
19:06	19:45	91/Perris Valley	0:39	1:06

Source: Metrolink Schedule

3.3 Bus Transit System

3.3.1 Metro Bus Service

LA Metro operates bus service throughout Los Angeles County, including 53 routes that have at least one stop in the I-105 Study Area. The Metro bus service in the I-105 Study Area includes a range of service offerings, including local and circulator buses, eight Metro Rapid Lines (700 series), two freeway express bus lines (500 series), and the Silver Line (Route 910) bus rapid transit with fixed guideway stations along I-110.

Metro Bus Ridership

The I-105 Study Area represents a significant proportion of Metro's countywide bus ridership. **Table 3.4** highlights the weekday, Saturday, and Sunday average daily boardings for LA County and the I-105 Study Area. The I-105 Study Area bus stops contribute to over 12% of all weekday boardings in Metro's bus system, but contains 16% of Metro's bus stops and 14% of the population of LA County. Metro bus system has seen a decline in ridership over the past few years; however, ridership in the I-105 Study Area was slightly higher between March 2016 and October 2017 as shown in **Table 3.5**. There is variability between the lines in the I-105 Study Area, as shown below **Table 3.6**, with some lines showing an increase in ridership and some decreasing. Note that while March and October may have some seasonal variations that could contribute to any changes seen in the data, the two months have are in the regular school year, have comparably mild temperatures, and have no federal holidays.

A recent study published by UCLA's Institute for Transportation Studies[2] examined the change in ridership for each Metro route over a 4 year period (2013 – 2016). One of the top five routes that lost the most ridership over that period was route 40, a route that runs north-south through the I-105 Study Area on Hawthorne Blvd, Florence Ave., and Crenshaw Blvd. On the other hand, the Silver Line (Route 910) was one of the top five routes that gained the most ridership during that same period.

Table 3.4 LA Metro Average Daily Boardings, 2017

Day Type	LA County	I-105 Study Area	% of LA County
Sunday	452,665	52,048	11.5%
Saturday	591,178	67,245	11.4%
Weekday	941,099	114,095	12.1%

Source: LA Metro, October 2017 Ridership Data

Table 3.5 Average Weekday Boardings, 2016 and 2017

	Mar 2016	Oct 2017	% Change
Study Area	113,195	114,095	1%
LA County	992,428	941,099	-5%

Source: LA Metro, March 2016 and October 2017 Ridership Data.

[2] 2018. UCLA Institute for Transportation Studies. Falling Transit Ridership: California and Southern California

Table 3.6 Average Weekday Ridership by Line in Study Area, Nov 2017 and March 2016

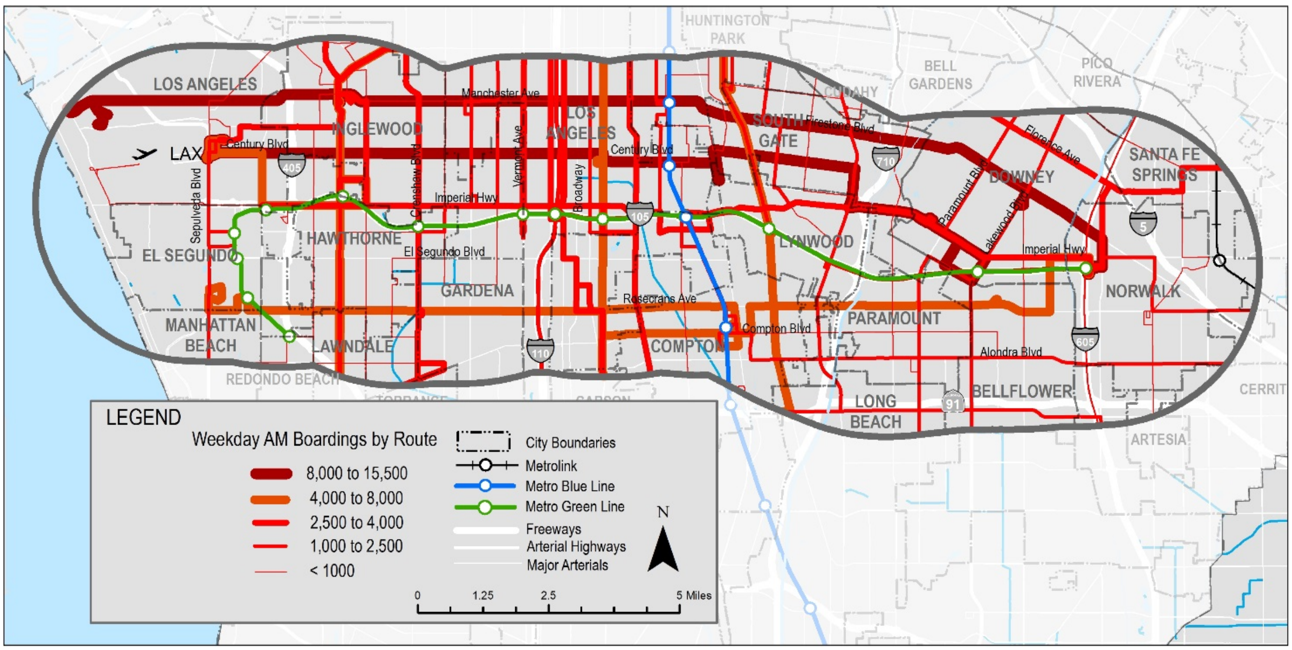
Line	# Stops in Area	Board-ings	Alight-ings	On/Offs per stop	% Change from 2016 boardings	AM Peak Headway (min)	Line	# Stops in Area	Board-ings	Alight-ings	On/Offs per stop	% Change from 2016 boardings	AM Peak Headway (min)
10	41	1334	1318	64.7	17%	10.0	210	54	3546	3517	130.8	-8%	17.5
40	87	5016	5124	116.6	-7%	12.1	211	110	658	663	12.0	9%	30.9
45	77	3813	3728	97.9	3%	8.8	212	43	3125	3140	145.7	-1%	9.9
51	103	5563	5528	107.7	-1%	5.1	232	37	1034	965	54.0	-11%	16.9
53	75	3545	3548	94.6	3%	11.1	251	48	1592	1683	68.2	0%	17.2
55	75	2098	2035	55.1	0%	13.3	254	39	247	232	12.3	-10%	52.5
60	107	5399	5613	102.9	-2%	8.1	258	29	394	402	27.4	14%	40.5
62	54	981	977	36.3	-4%	20.0	260	61	2105	2079	68.6	7%	15.0
81	32	2740	2733	171.0	7%	8.6	265	72	1023	1011	28.3	-3%	36.0
102	36	416	396	22.6	-4%	36.0	266	52	2048	2026	78.3	9%	25.0
110	14	525	473	71.3	-8%	15.1	442	37	124	122	6.6	-3%	45.0
111	78	2829	2892	73.3	2%	10.6	460	42	1918	1761	87.6	-2%	19.0
115	205	15382	15379	150.1	4%	10.5	550	6	125	136	43.5	-18%	33.0
117	167	9084	9081	108.8	7%	15.7	577	2	256	274	265.0	13%	45.0
120	180	3735	3724	41.4	1%	40.5	607	17	40	37	4.5	-22%	45.0
125	165	5271	5273	63.9	0%	15.7	611	37	321	346	18.0	0%	45.0
126	81	148	131	3.4	-12%	90.0	612	116	929	956	16.3	-8%	60.0
127	89	874	876	19.7	2%	52.5	625	29	343	344	23.7	5%	24.1
128	83	1208	1180	28.8	5%	40.5	710	16	2987	2824	363.2	8%	12.9
130	42	1141	1127	54.0	8%	26.3	740	16	1596	1531	195.4	3%	16.5
202	36	109	94	5.6	1%	60.0	745	8	1153	1098	281.4	2%	8.9
204	42	3632	3649	173.4	5%	11.7	751	6	224	162	64.3	-6%	14.4
205	33	721	666	42.0	-16%	27.9	754	11	2406	2278	425.8	1%	7.2
206	45	2056	2089	92.1	-2%	11.3	757	8	1620	1625	405.6	-1%	11.2
207	29	1806	1842	125.8	-11%	11.7	760	12	1330	1232	213.5	-15%	13.5
209	65	276	272	8.4	-17%	52.5	762	23	974	974	84.7	-11%	24.1
							910	6	2275	2215	748.3	2%	4.8

Source: LA Metro, March 2016 and October 2017 Ridership Data.

Average weekday bus ridership by line in the Study Area is detailed above in **Table 3.6** and displayed in **Figure 3.7**; the average boardings by bus stop is displayed in **Figure 3.8**. Unsurprisingly, some of the more productive lines, in terms of ridership per stop[3], are the Metro Rapid lines (routes that start with 7) and the Metro Silver Line. The Metro Rapid 754 on Vermont Avenue and 757 on Western Avenue have high ridership per stops in the Study Area. Route 115, an east/west route which traverses the entire corridor on Manchester/Firestone, features the highest total daily ridership in the Study Area as well as the greatest total number of bus stops.

North/South Metro bus lines show greater ridership on average in the Study Area. There are multiple potential reasons for this. All Metro Rapid routes run north/south and four directly feed Metrorail stops on the Green Line. Fewer Metro routes run parallel to I-105 in the Study Area; the Metro Green Line and municipal/local operators offer service for east and westbound transit trips. However, as noted above, east/west route 115 has the highest total ridership in the Study Area, followed by route 117 on Century Blvd.

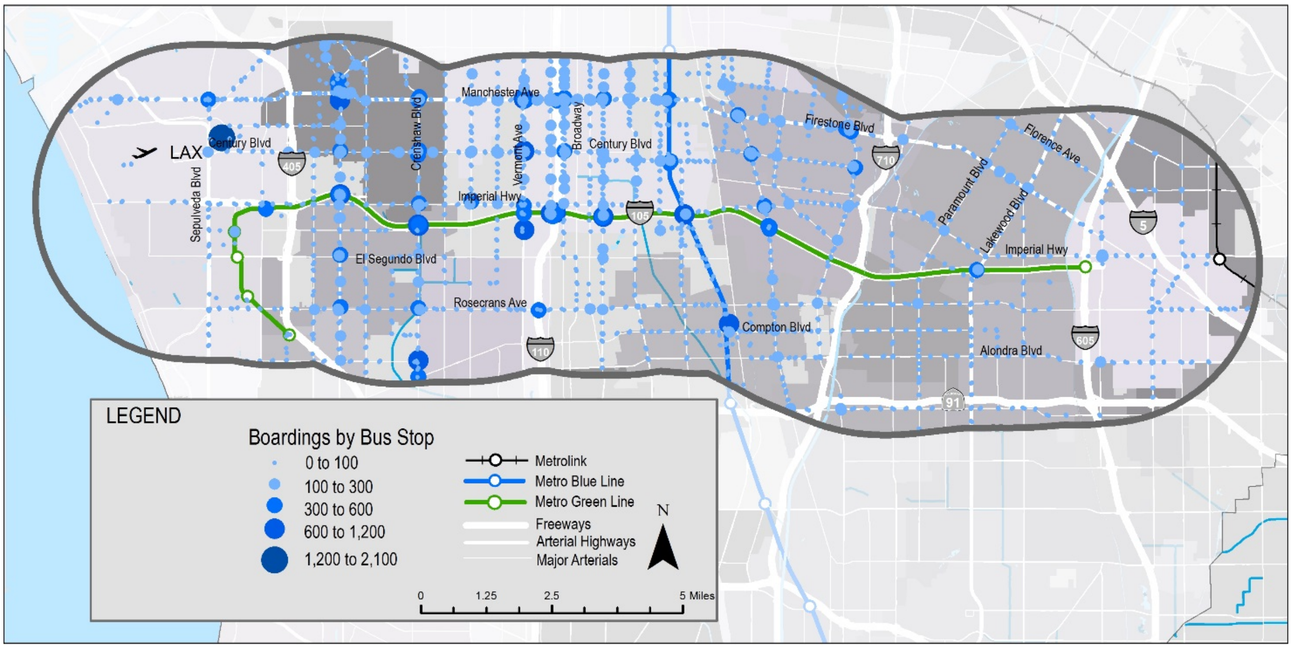
Figure 3.7 Metro Bus Ridership in Study Area by Line, Average Weekday Boardings



Source: LA Metro, October 2017 Ridership Data

3 This analysis does not include vehicle revenue hours or revenue miles in the analysis of productivity.

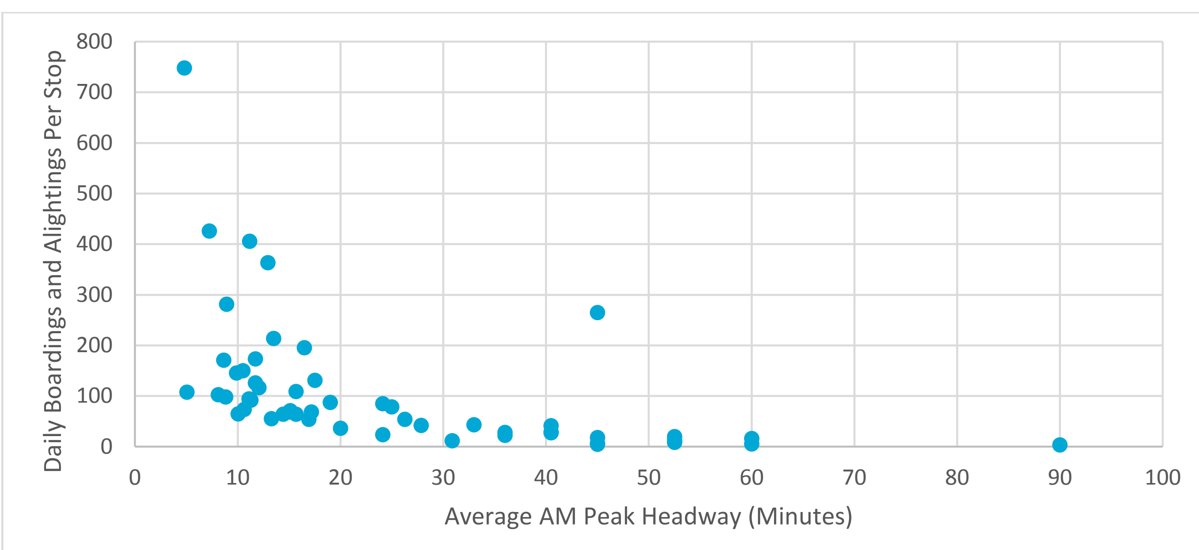
Figure 3.8 Metro Bus Ridership in Study Area by Stop, Average Weekday Boardings



Source: LA Metro, October 2017 Ridership Data

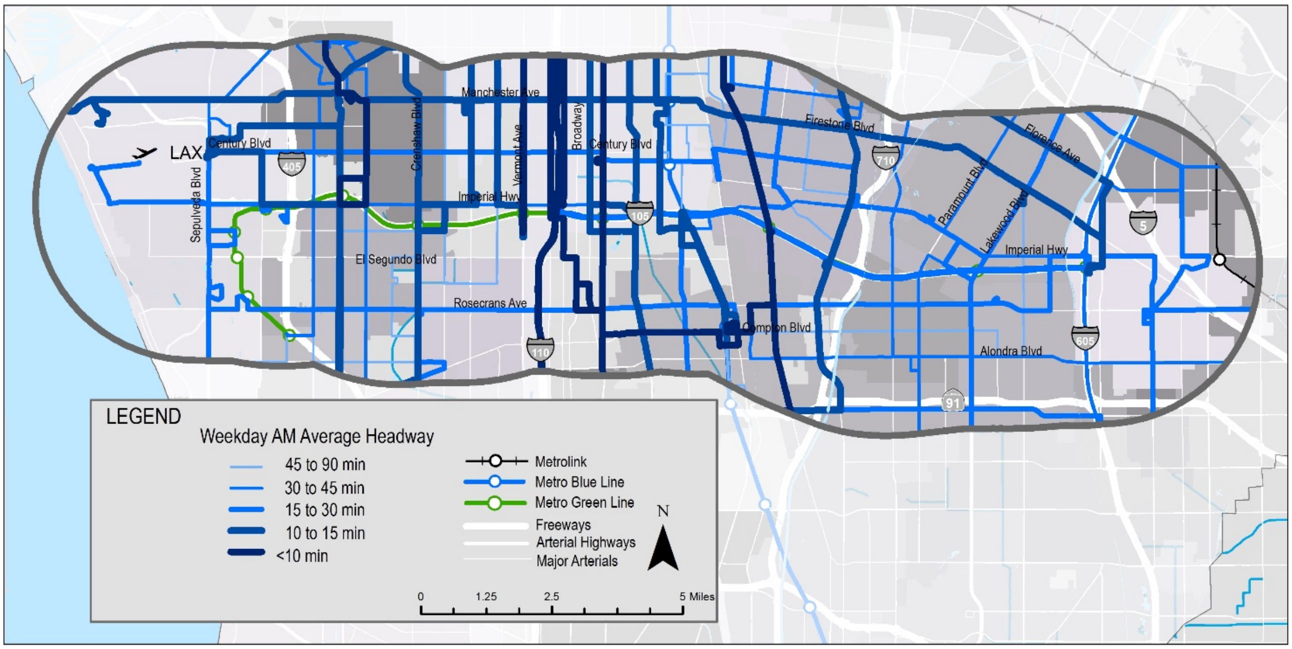
Frequent service is one of many factors that influence transit ridership. **Figure 3.9** highlights the ridership per stop of each Metro route based on AM peak headway. For the most part, higher frequency lines tend to feature higher ridership per stop. However, there are some outliers, (e.g., Metro 577, which has infrequent service and only two stops in the Study Area, but high ridership since it is an express route that utilizes I-605 for longer trips), and a few high frequency lines with low ridership, suggesting that other factors are crucial to understanding corridor transit ridership, such as the density of housing and destinations, travel time, service quality, and other elements.

Figure 3.9 Ridership per stop and AM peak headways



Source: LA Metro October 2017 Ridership and Frequency

Figure 3.10 Metro Bus Frequency by Line, Average AM Headways



Source: LA Metro, October 2017 Frequency Data

3.3.2 Municipal Transit Operators

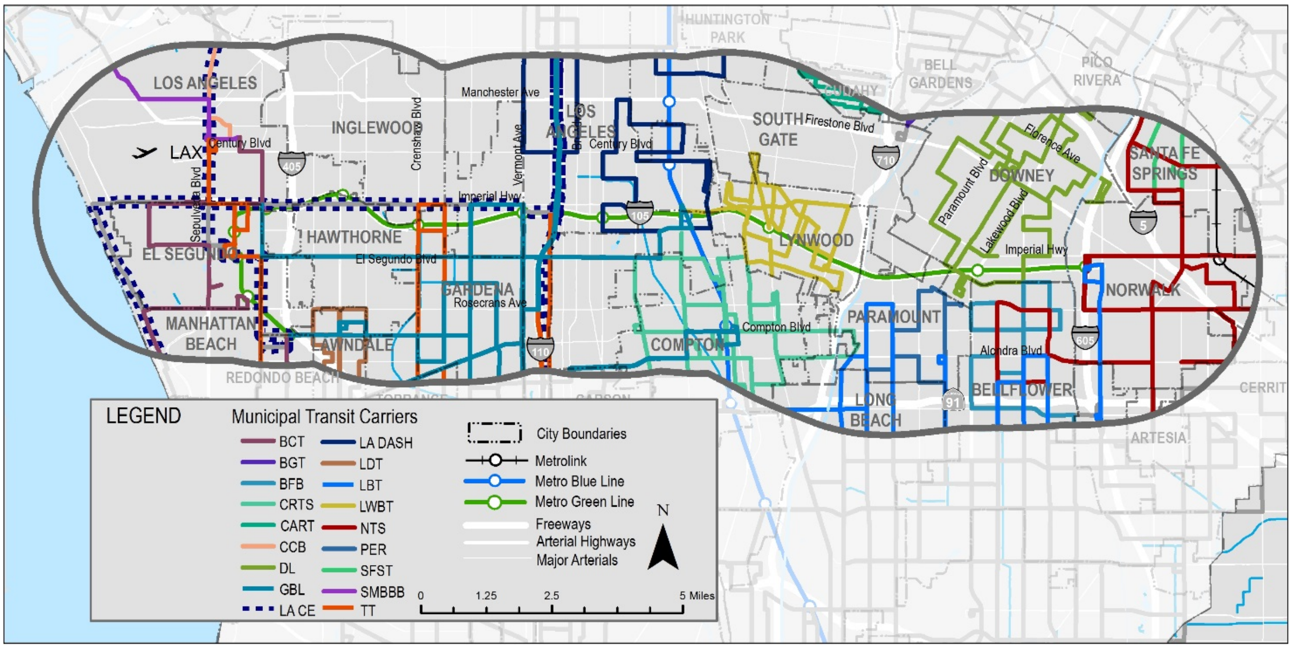
In addition to Metro bus services, several bus routes in the I-105 Study Area are operated by local and municipal transit operators. A full list of the providers offering service in the Study Area is found in **Table 3.7** and displayed in **Figure 3.11** below. Stop level ridership was not available for this study for all municipal and local transit operators. System-wide annual boardings are available from some of the municipal operators from the National Transit Database (NTD). The NTD has data on the following providers, listed by total annual unlinked passenger trips in 2017: Long Beach Transit (26.3 million), LADOT (21.5 million), Santa Monica Big Blue Bus (16.6 million), Culver City Bus (5.6 million), Torrance Transit (3.8 million), Gardena Bus (3.6 million), and Norwalk Transit (1.4 million), and Beach Cities Transit (407 thousand).[4]

Table 3.7 Municipal and Local Transit Systems in Study Area

Carrier	Code	Carrier	Code
Beach Cities Transit	BCT	LA DOT DASH	LADASH
Bell Gardens Transit	BGT	Lawndale Trolley	LDT
Bellflower Bus	BFB	Long Beach Transit	LBT
Compton Renaissance Transit	CRTS	Lynwood Trolley (Lynwood Breeze)	LWBT
Cudahy Area Rapid Transit	CART	Norwalk Transit System	NTS
Culver City Bus	CCB	Paramount Easy Rider	PER
DowneyLink	DL	Santa Fe Springs Transit	SFS
Gardena Bus Lines	GBL	Santa Monica's Big Blue Bus	SMBBB
LA DOT Commuter Express	LACE	Torrance Transit	TT

[4] National Transit Database. 2017.

Figure 3.11 Municipal and Local Transit Routes in Study Area



Note: Refer to **Table 3.7** for the name of the carrier based on code shown in legend

4.0 Demographic and Land Use Assessment

The purpose of this section is to assess the demographic and land use characteristics of the I-105 Study Area. This assessment examines characteristics about the population living and working in the corridor, including population density, age, income, and other characteristics that influence travel behavior. The assessment is based on SCAG's 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) data, and data from the U.S. Census Bureau's American Community Survey (ACS) 2015 5-year estimates.

The demographic and land use assessment contains the following sections:

- Population Characteristics
  - Population and Households
  - Race and Ethnicity
  - Income and Poverty
  - Other Environmental Justice Indices
- Land Use in Study Area
  - Employment
  - Population Density and Housing
- Key Destinations
- Travel Behavior
  - Commute Patterns
  - Vehicle Ownership

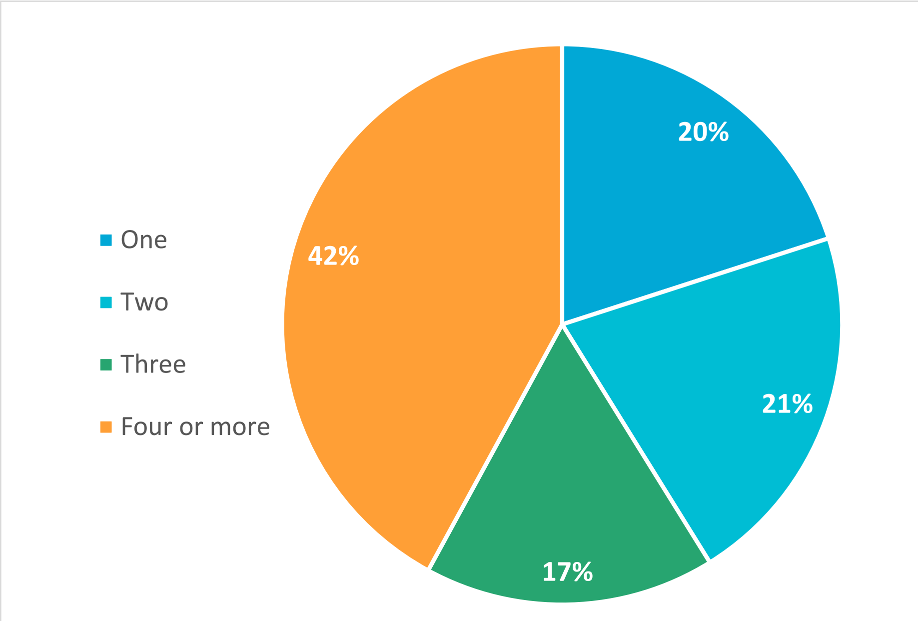
4.1 Population Characteristics

4.1.1 Population and Households

According to the U.S. Census Bureau, in 2016, roughly 1.43 million people live within three miles of the I-105 freeway, comprising 14% of the Los Angeles County's (LA County) total population.[5] There are 401,000 households in the I-105 Study Area. The majority of households contain more than two residents, with 17% having three, and 42% with four or more individuals (see **Figure 4.1**). Nearly 28% of the residents in the Study Area are under the age of 17, compared to 23% countywide (See **Figure 4.2**). For the remaining age cohorts, the population of the I-105 Study Area is younger on average than the rest of LA County.

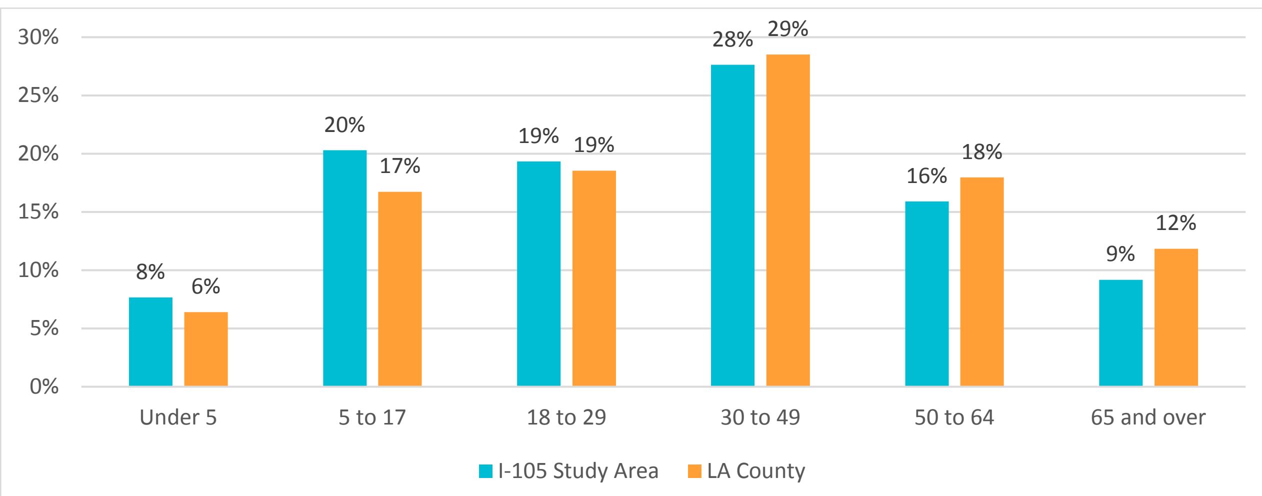
[5] American Community Survey, 2016. 5-year Estimates. U.S. Census Bureau.

Figure 4.1 Number of Individuals per Household in I-105 Study Area



Source: SCAG 2016 RTP/SCS.

Figure 4.2 Age Profile of population

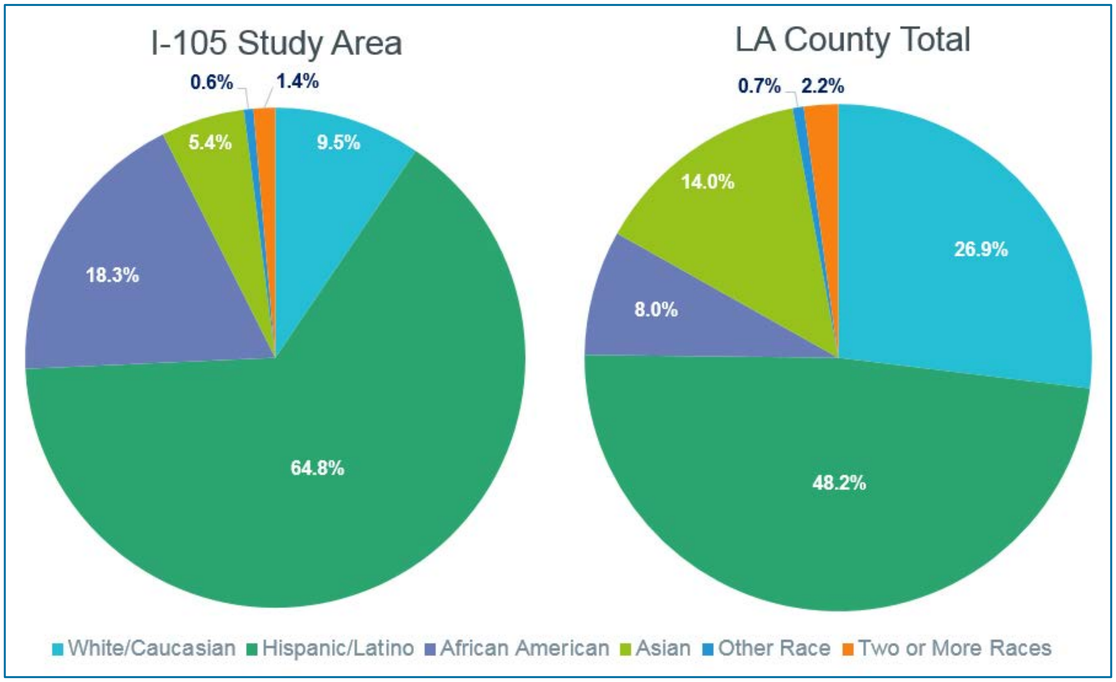


Source: SCAG 2016 RTP/SCS

4.1.2 Race and Ethnicity

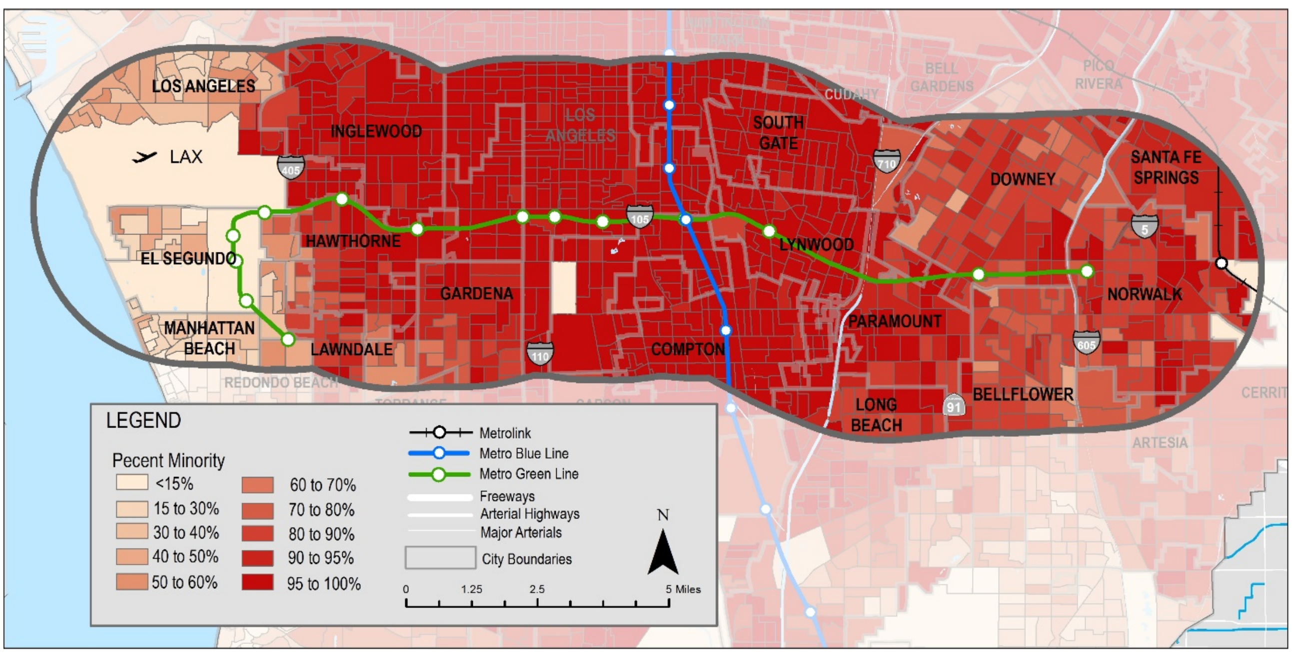
The I-105 Study Area contains a diverse population with a large proportion of minorities. **Figure 4.3** indicates the racial composition of the Study Area population compared to the LA County average. Over 90% of I-105 Study Area residents are Non-White, compared to 73.1% in LA County as a whole. Hispanic/Latino residents constitute the majority of I-105 Study Area residents (64.8%), followed by African Americans (18.3%), and White/Caucasians (9.5%). Roughly one-third of LA County's African American population lives in the I-105 Study Area. **Figure 4.4 through Figure 4.6** provide an overview of the spatial distribution of non-White, Hispanic/Latino, and African American residents in the corridor, respectively.

Figure 4.3 Racial Composition of Population in Study Area and LA County



Source: ACS 2015, 5-year estimates.

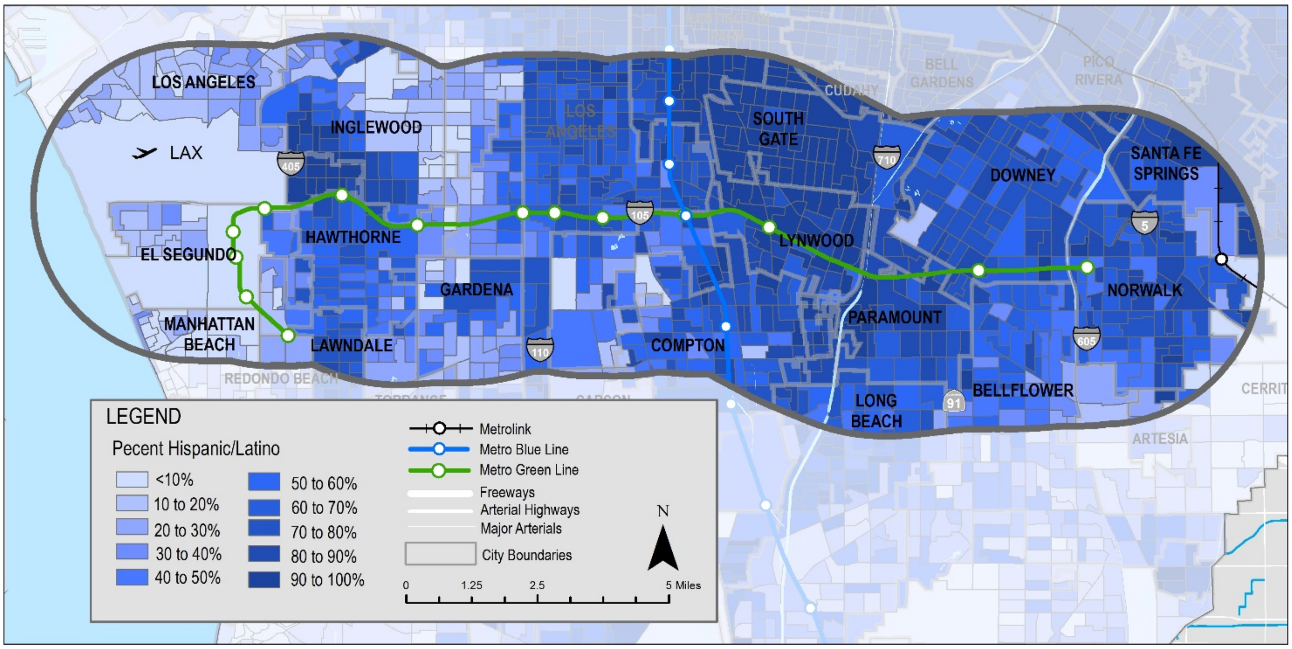
Figure 4.4 Population by percent Non-White*



Source: ACS 2015, 5 year estimates.

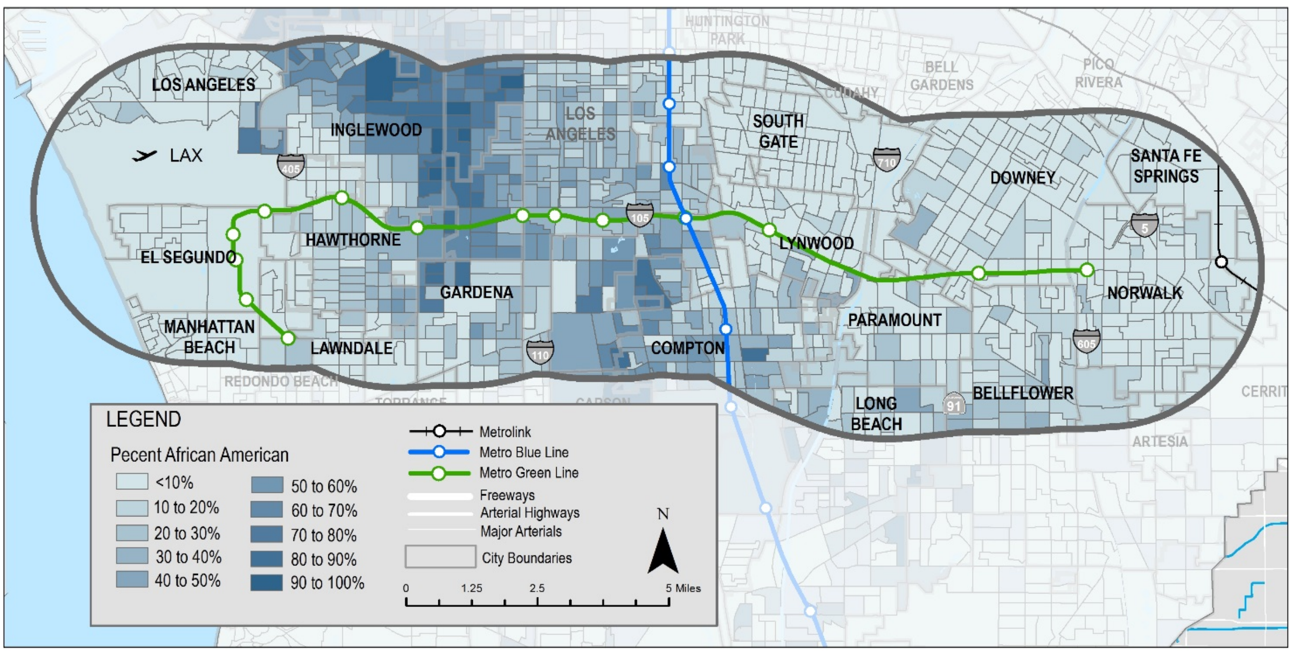
*Non-white is defined by the Census designation of “White-alone.”

Figure 4.5 Percent Hispanic/Latino



Source: ACS 2015, 5 year estimates

Figure 4.6 Percent African American

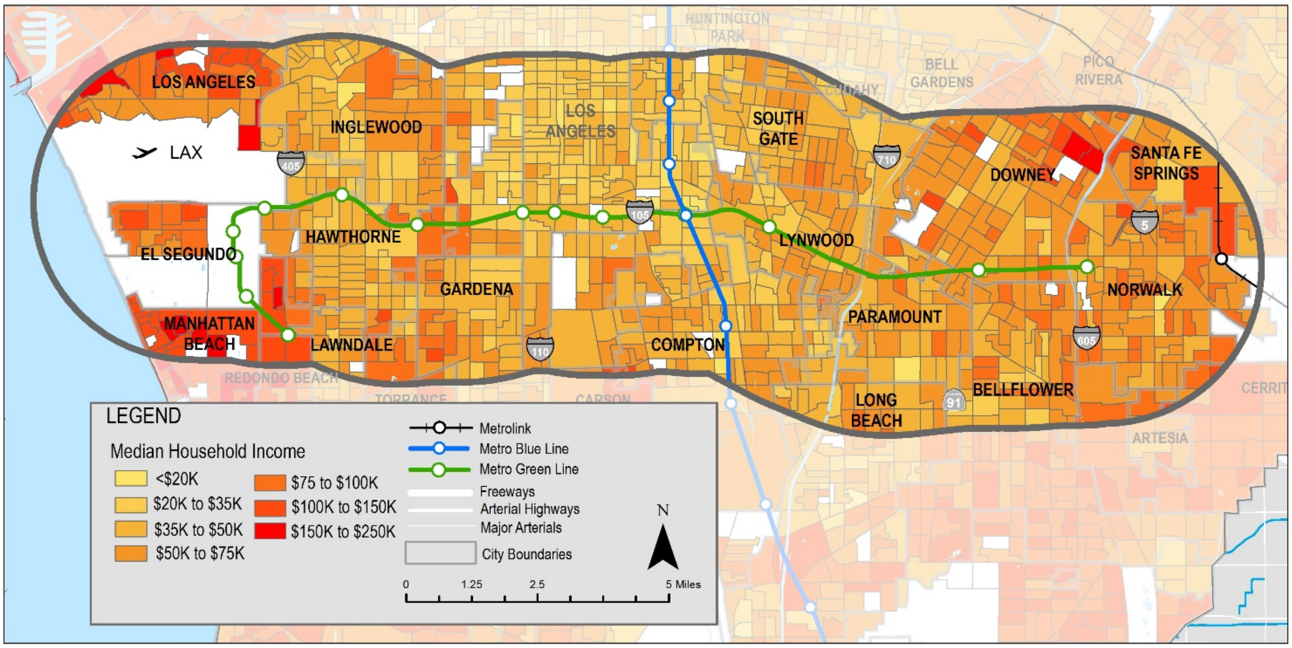


Source: ACS 2015, 5 year estimates.

4.1.3 Income and Poverty

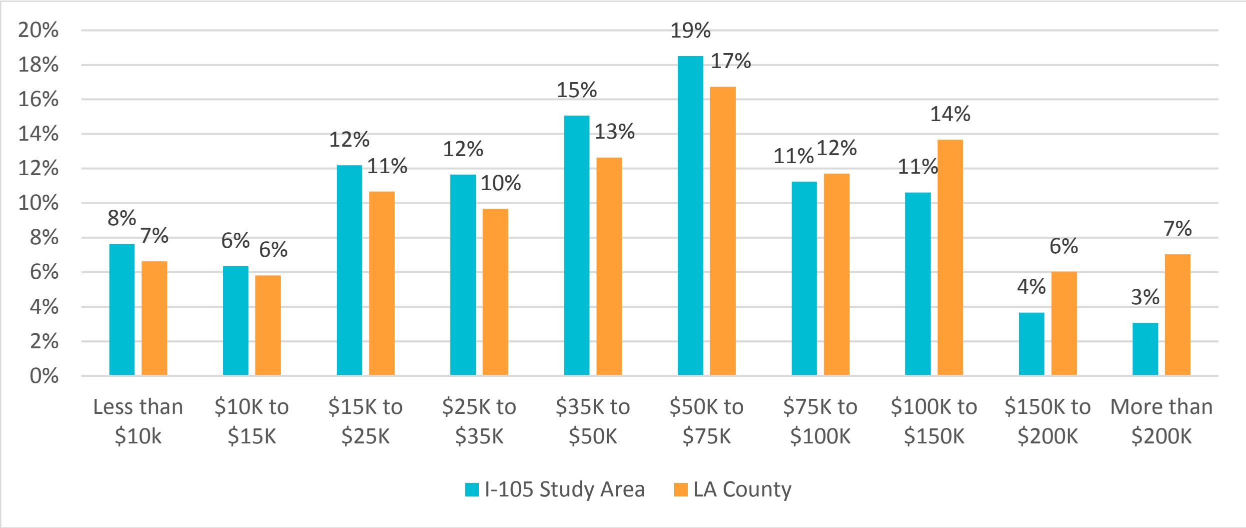
The median household income in LA County was $56,196 in 2015. However, the median income by Census Block Group varies considerably throughout the County, from a high of over $250,000 to a low of roughly $8,000 in the poorest areas. **Figure 4.7** indicates the spatial distribution of incomes throughout the I-105 Study Area. While there are Census Block Groups with median incomes over $250,000 primarily located on the west side of the Study Area, incomes within the corridor generally lag behind the countywide average. **Figure 4.8** compares median household incomes in the corridor to the LA County average. Only 18% of I-105 Study Area households have a household income over $100,000.

Figure 4.7 Median Household Income in Study Area



Source: ACS 2015, 5 year estimates

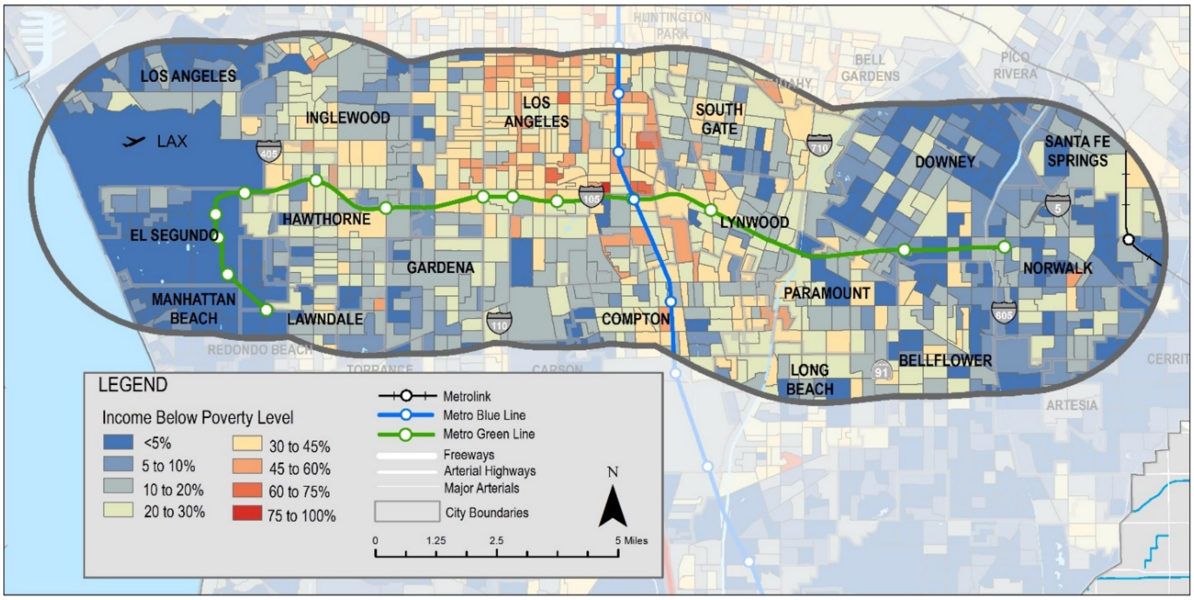
Figure 4.8 Household Income, Percent of Households



Source: ACS 2015, 5 year estimates.

The level of poverty in the I-105 Study Area is significant; 21% of households have incomes below the Federal poverty level, compared to 17% in LA County as a whole.[6] However, the poverty is concentrated in certain areas. **Figure 4.9** shows areas with the highest concentration of poverty; these areas are primarily located in neighborhoods of South Los Angeles, Unincorporated Willowbrook, and Florence-Firestone; and the Cities of Compton, Inglewood, and Lynwood.

Figure 4.9 Percent of Households with Income Below Federal Poverty Level



Source: ACS 2015, 5 year estimates.

[6] Federal poverty income thresholds are based on number of individuals per household. In 2015, the income threshold for a family of four people was $24,257

4.1.4 Other Environmental Justice Indices

Communities of Concern

SCAG maintains a list of "Communities of Concern" (COC), which are Census Designated Places (CDPs) that represent the top 1/3 in percent minority and low income residents. SCAG tracks changes to the composition of these areas as part of their Regional Transportation Plan/Sustainable Communities Strategies (RTP/SCS) updates. Out of the 80 COCs in the entire six county SCAG region, portions of 20 COCs are within the I-105 Study Area (see **Table 4.1**).

Table 4.1 SCAG Designated Communities of Concern in Study Area

Community of Concern	
Alondra Park	Lynwood
Bell Gardens	Paramount
Compton	South Gate
Cudahy	South Los Angeles
Florence-Graham	Southeast Los Angeles
Harbor Gateway	Walnut Park
Hawthorne	West Athens
Huntington Park	West Rancho Dominguez
Inglewood	Westmont
Lennox	Willowbrook

Source: SCAG 2016.

CalEnviroScreen

The California Environmental Protection Agency (CalEPA) and the Office of Environmental Health Hazard Assessment (OEHHA) developed CalEvironScreen to compare the relative pollution burden for communities across the state. Based on 20 pollution and socioeconomic indicators, the tool ranks each census tract based on the population's vulnerability to environmental pollution. Various statewide funding programs, including the Cap and Trade and Active Transportation Programs, use the CalEnviroScreen definition "disadvantaged community." This definition includes the Census Tracts with the 25% most disadvantaged scores in the state.

Table 4.2 indicates CalEnviroScreen scores in LA County and the I-105 Study Area. LA County has 29% of all Census Tracts in the State but 51% of these are disadvantaged communities. Furthermore, over 76% of the Census Tracts in the I-105 Study Area are considered disadvantaged. This is nearly one quarter of all disadvantaged communities in the County, comprising 12% of all disadvantaged communities in the State. **Figure 4.10** indicates the location of disadvantaged communities throughout the I-105 Study Area.

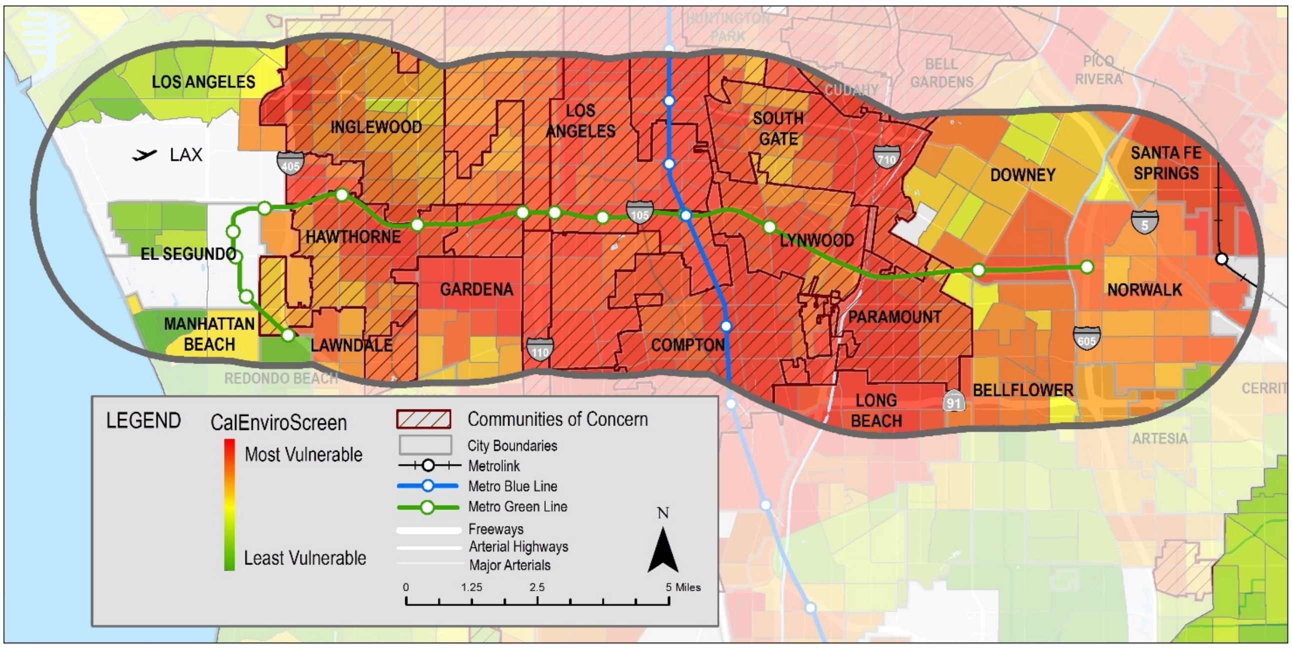
Table 4.2 Disadvantaged Communities Based on CalEnviroScreen

CalEnviroScreen Percentile	LA County (% of Statewide Tracts)	Study Area (% of Statewide Tracts)
76-80%	38%	8%

81-85%	44%	9%
86-90%	50%	9%
91-95%	64%	14%
96-100%	61%	18%
All Top 25%	51%	12%

Source: CalEPA CalEnviroScreen 3.0.

Figure 4.10 CalEnviroScreen and SCAG Communities of Concern



Source: CalEPA CalEnviroScreen 3.0; SCAG 2016 RTP.

4.2 Land Use in Study Area

Figure 4.11 indicates land use within the Study Area, per the SCAG 2016 RTP/SCS. **Table 4.3** indicates the share of study area by land use type. The majority of the I-105 Study Area consists of single- and multi-family residential housing (52%); followed by industrial (13%); transportation, communication, and utilities (8%), commercial (7%); education (5%); and open space and recreation (4%).

Table 4.3 Land Use Type by Share of Study Area

Land Use Type	% of Study Area
Single-Family Residential	40.7%
Industrial	13.2%
Multi-Family Residential	11.3%
Transportation, Communications, Utilities	8.0%
Commercial	7.2%
Education	5.1%

Open Space & Recreation	4.2%
Vacant	3.3%
Facilities	3.1%
Office	2.3%
Other	1.6%

Source: SCAG 2012 Land Use

The land dedicated to transportation (and employment, as discussed in **Section** 4.2.1 below) is abnormally high because of the Los Angeles International Airport (LAX), which dominates the western portion of the corridor. Significant industrial development exists in the corridor as well, clustered in the following areas:

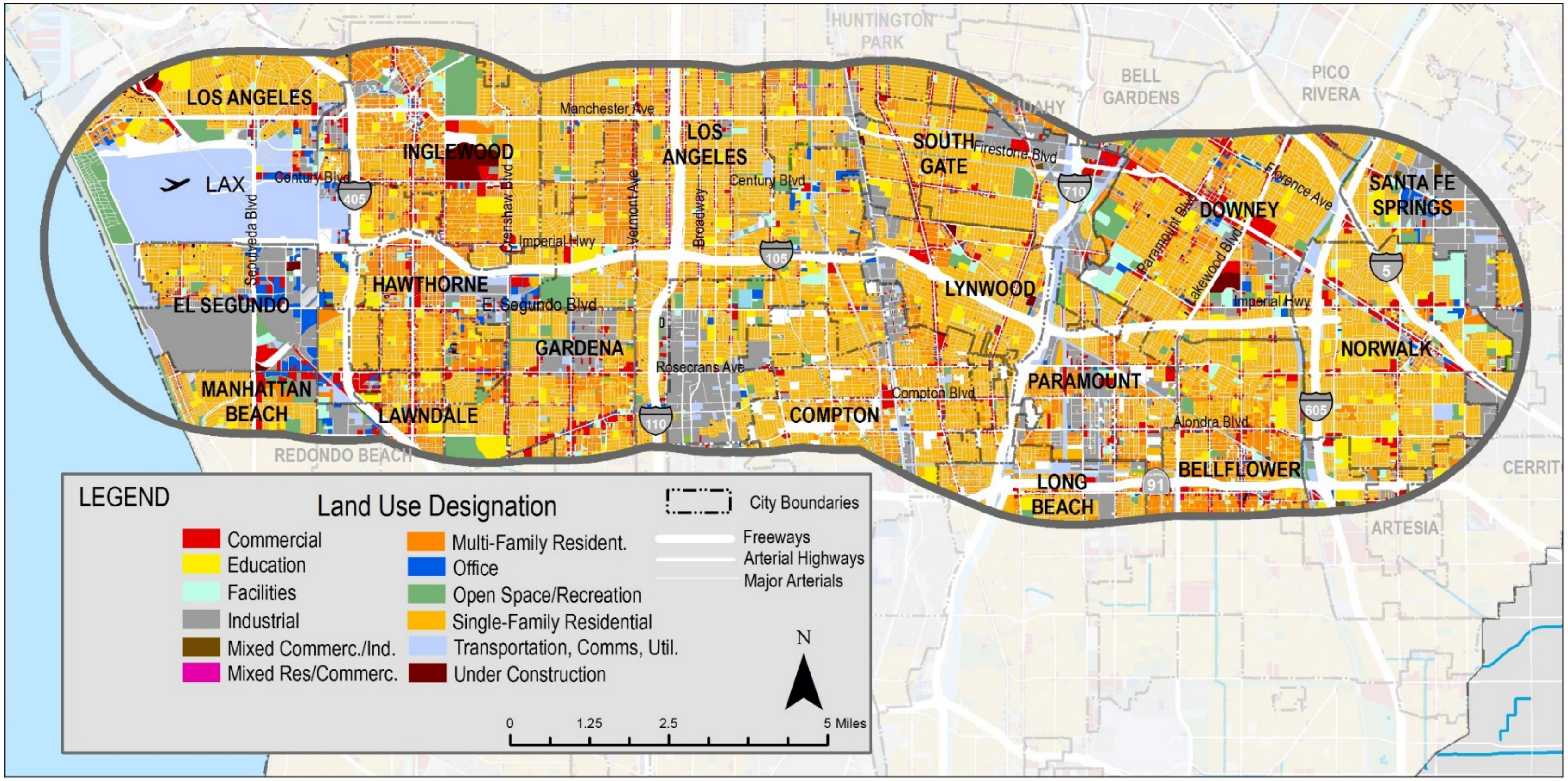
- El Segundo south of LAX,
- Hawthorne, Gardena, and West Rancho Dominguez,
- Alameda St from Huntington Park through Compton,
- South Gate near I-710 and Firestone Boulevard,
- Garfield Avenue in Paramount, and
- Santa Fe Springs east of I-5.

Significant commercial corridors in the study area include:

- Sepulveda Blvd and Rosecrans Ave near LAX,
- La Brea Ave/Hawthorne Blvd from Inglewood south through Hawthorne,
- Century Blvd between LAX and Hollywood Park in Inglewood.
- Redondo Beach Blvd in Gardena,
- Long Beach Blvd from South Gate through Lynwood to Compton, and
- Firestone Blvd from South Gate through Downey to Norwalk.

Most of the office space in the study area is near LAX and the area just to the south, bounded by Sepulveda Blvd, Aviation Blvd, Rosecrans Ave and I-105. Other office space is clustered near Crenshaw Blvd and El Segundo Blvd just south of I-105, as well as east of I-605 near Telegraph Rd and Pioneer Blvd.

Figure 4.11 I-105 Study Area Land Use

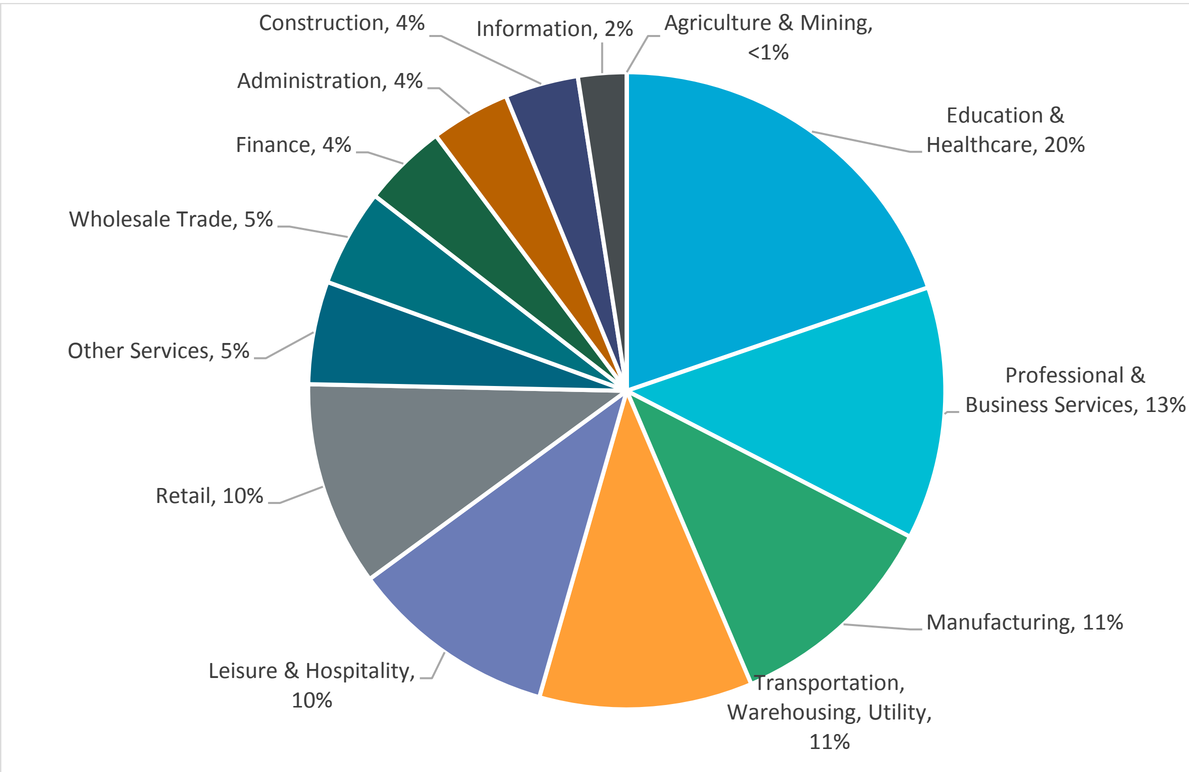


Source: SCAG 2012 Land Use.

4.2.1 Employment

The I-105 Study Area contained roughly 465,600 jobs in 2016, which is slightly more than 10% of all the jobs in LA County[7]. **Figure 4.12** highlights the employment by industry in the corridor. Education & healthcare represented the largest share of corridor jobs (20%), followed by professional and business services (13%); manufacturing (11%); and transportation, warehousing and utilities (11%). For most industries, these percentages are similar to the job profile across the entire County, with a few notable exceptions. Due to the proximity to the Port complex and LAX, the share of transportation, warehousing, and utilities (11%) is significantly higher than the countywide average (5%). Additionally, the share of professional/business services in the Study Area (13%) is lower than average (16%).

Figure 4.12 Employment by Industry in I-105 Study Area



Source: SCAG 2016 RTP/SCS.

Table 4.4 displays employment by income level within the I-105 Study Area and LA County in 2016. Over 64% of total corridor jobs paid an annual income of less than $25,000. Only 16% of corridor jobs paid over $50,000 annually. The percentages in each income level closely mirror the LA County average.

7 SCAG RTP/SCS, 2016.

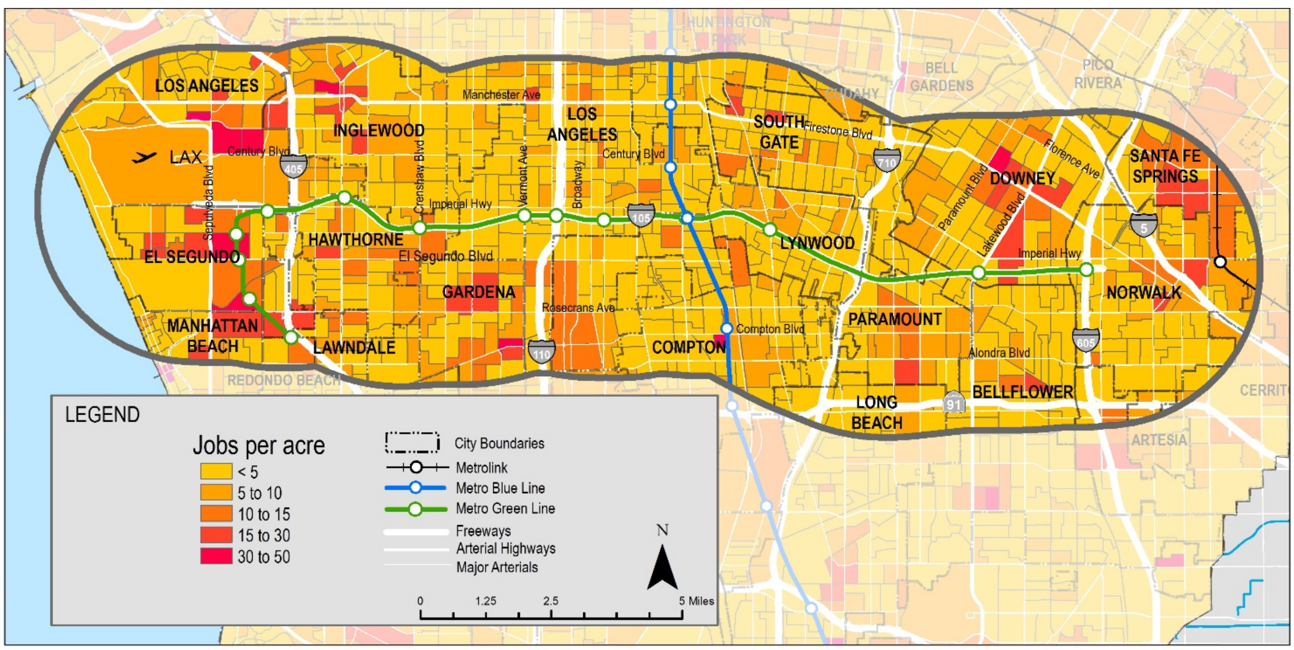
Table 4.4 Employment by Income Category

	I-105 Study Area		LA County	
Income Level	**Number of Jobs**	**%**	**Number of Jobs**	**%**
High ($50,000+)	75,043	16%	744,842	64%
Medium ($25,000 - $50,000)	90,448	19%	848,893	19%
Low-Income (<$25,000)	300,102	64%	2,856,969	17%
Total	**465,593**		**4,450,704**	

Source: SCAG 2016 RTP/SCS

Figure 4.13 indicates employment density in the I-105 Study Area. The western end of the corridor (LAX Airport, El Segundo, Manhattan Beach) features the largest concentration of jobs, with additional clusters of high employment density in the Cities of Downey, Inglewood, Gardena, and Santa Fe Springs. South Gate, Compton, and Paramount each have small pockets of high employment density. The majority of the jobs in the Study Area are lower income, as indicated in the table above.

Figure 4.13 I-105 Study Area Employment Density

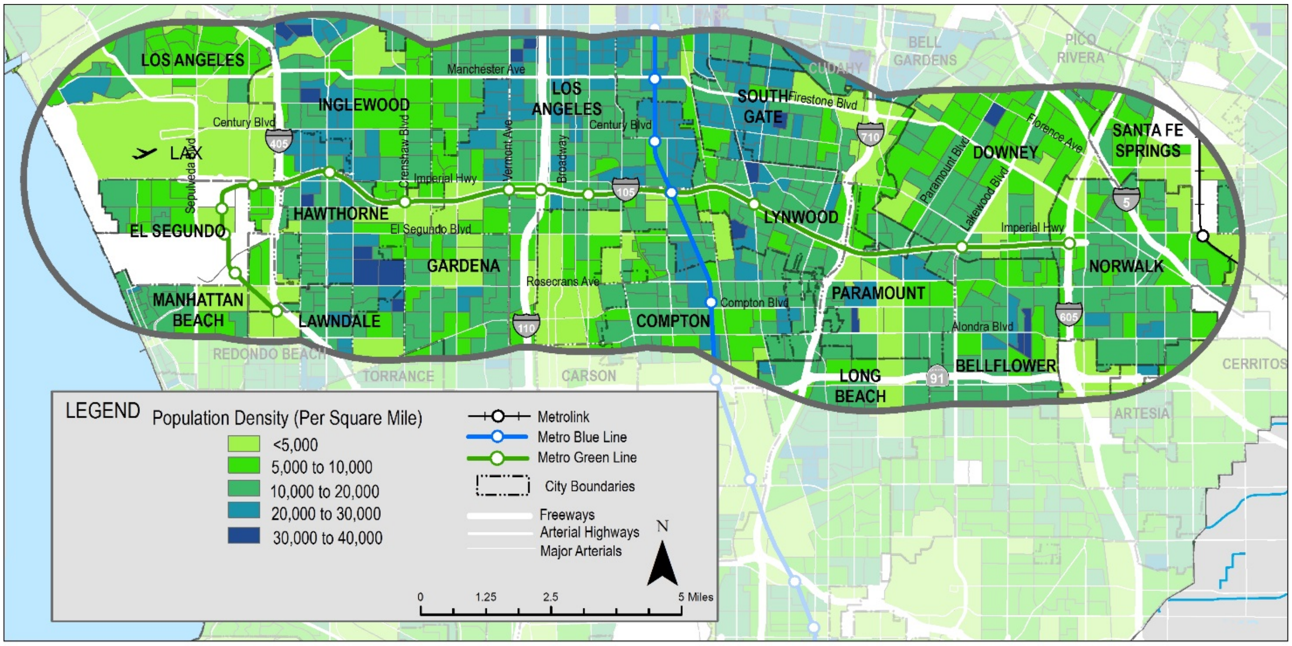


Source: SCAG 2016 RTP/SCS.

4.2.2 Population Density and Housing

The I-105 Study Area features an average population density of nearly 13,800 per square mile, exceeding the County average of 11,800. **Figure 4.14** indicates population density in the Study Area. South Los Angeles and central Paramount indicate the greatest levels of corridor population density at upwards of 38,000 per square mile, while the Cities of Bellflower, Hawthorne, Inglewood, Lynwood, and South Gate all have neighborhoods exceeding 30,000 residents per square mile. The neighborhoods in east Hawthorne, north of Rosecrans Ave between Prairie Ave and Crenshaw Blvd, comprises the largest geographic area of high density housing in the I-105 Study Area.

Figure 4.14 Population Density in I-105 Study Area



Source: SCAG 2016 RTP/SCS.

The I-105 Study Area is home to over 216,000 single family units and 192,000 multi-family units. A slight majority of I-105 Study Area households rent versus own their homes (56% vs 44%), a number that is similar but slightly higher than the County average (54% rent). Average housing costs in the I-105 Study Area and LA County are shown in **Table 4.5**. While absolute housing costs in the I-105 Study Area are 11% lower than the County average, housing costs as a percent of income are 6% higher.

Table 4.5 I-105 Study Area Housing Costs

Location	Average Monthly Housing Cost	Housing Cost as Percent of Income
Study Area	$1,371	35%
LA County	$1,544	33%

Source: ACS 2015, 5 year estimates.

4.3 Key Destinations

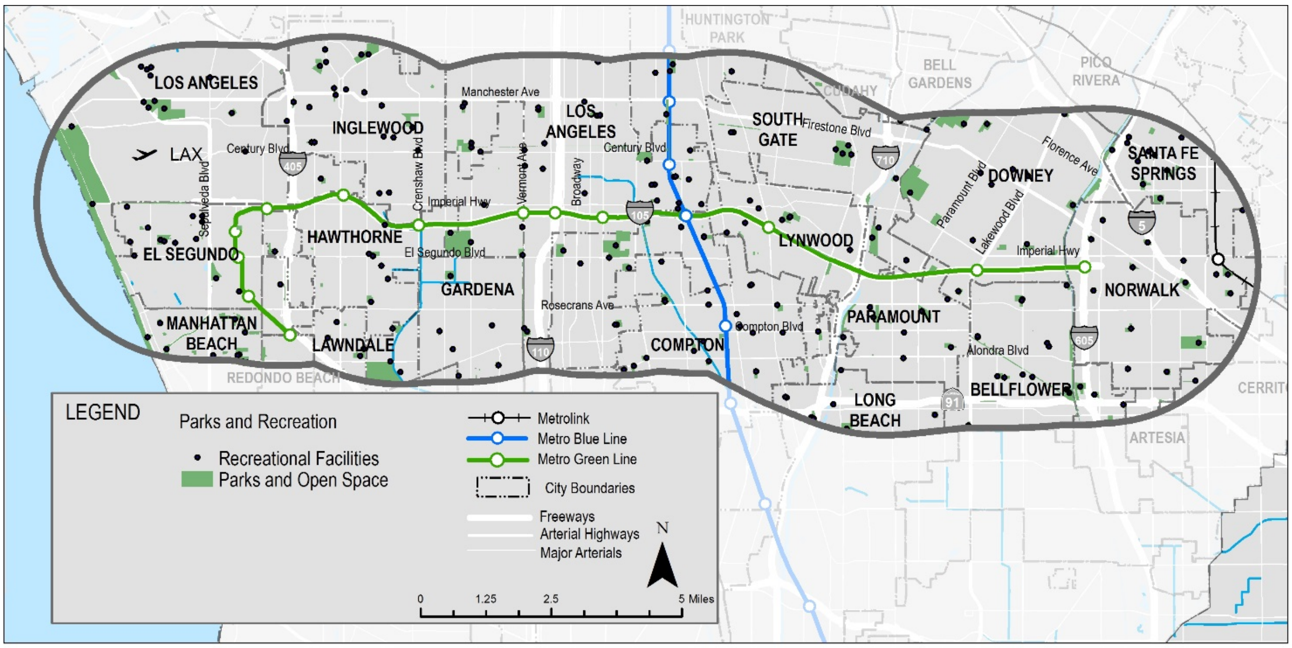
The I-105 Study Area contains a variety of destinations and activity centers. Some of the notable destinations include LAX, the beach communities, shopping centers such as the Plaza El Segundo, the Plaza Mexico, Crenshaw Imperial Plaza, and Azalea Regional Shopping Center, the Forum and soon to be completed NFL stadium in Inglewood, the Watts Towers Cultural Center, and several colleges and universities, including Southwest Los Angeles College, El Camino Community College, Loyola Marymount University, and Cerritos College This section identifies and displays important community destinations in the

Study Area, including parks and recreation; educational facilities; healthcare facilities; and other community services such as churches, libraries, and government services.

Parks and Recreation

Figure 4.15 highlights the parks and recreational facilities along the corridor. The corridor has over 250 recreational facilities and over 3,200 acres of parks and open space. The recreational facilities include pools, arts and performance centers, rec centers, golf courses, campgrounds, picnic areas, beaches and marinas, sports venues, gardens, and natural areas.

Figure 4.15 Parks and Recreational Facilities in I-105 Study Area

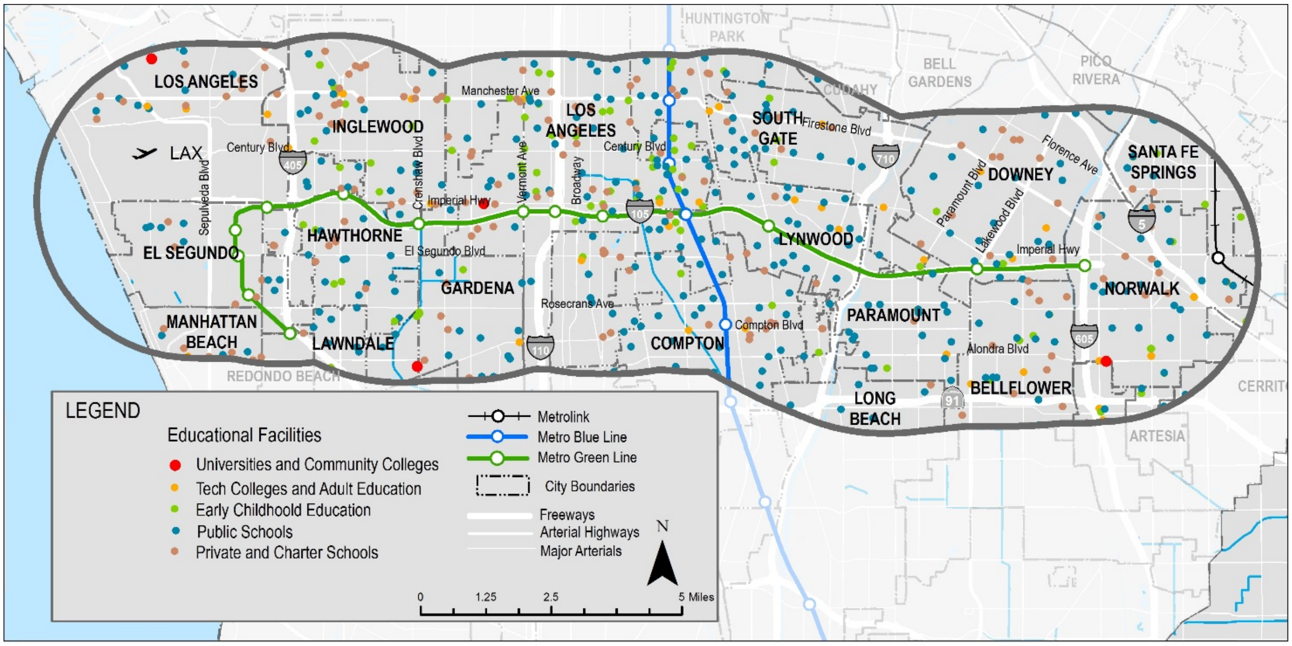


Source: LA County Location Management System, 2016

Educational Facilities

The I-105 Study Area is home to three community colleges (Cerritos College, El Camino College, and Los Angeles Southwest College) and Loyola Marymount University. There are 319 public schools, 176 private and charter schools, 99 early childhood education and head start centers, 52 adult education and technical/career colleges, 34 guidance and tutoring programs, 18 school district office locations, and 33 libraries as shown in **Figure 4.16**.

Figure 4.16 Educational Facilities in I-105 Study Area

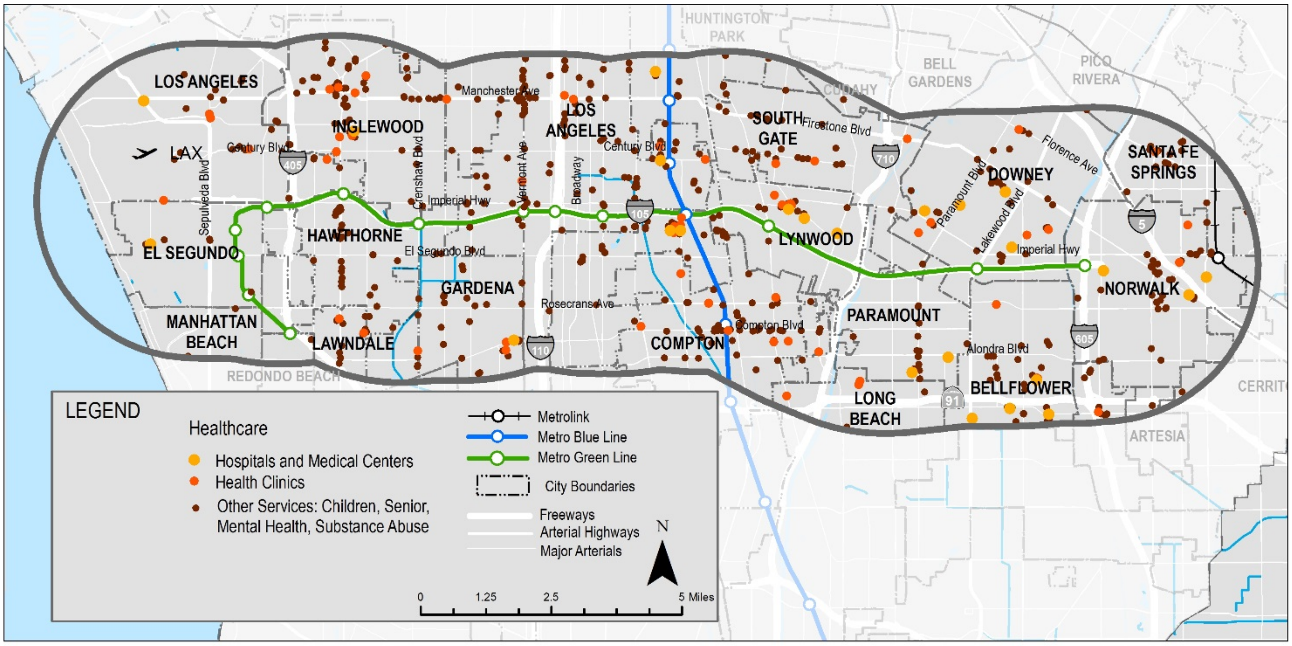


Source: LA County Location Management System, 2016.

Health and Social Services

The I-105 Study Area has over 700 health and social services locations; with many locations offering multiple services. This includes 32 hospitals and medical centers, 163 health clinics and immunization/health screening centers, 306 providers of children's services, 75 providers of domestic violence services, 60 homeless shelters and housing assistance centers, 73 job training locations, 210 mental health counseling locations, 63 senior services locations, 110 substance abuse programs and support group locations, and 411 miscellaneous service locations (dental, disability, veterans, clothing donations and thrift shops, immigration, transportation, welfare, life links, etc.) as shown in **Figure 4.17**.

Figure 4.17 Healthcare Facilities in I-105 Study Area



Source: LA County Location Management System, 2016.

Other Community Resources

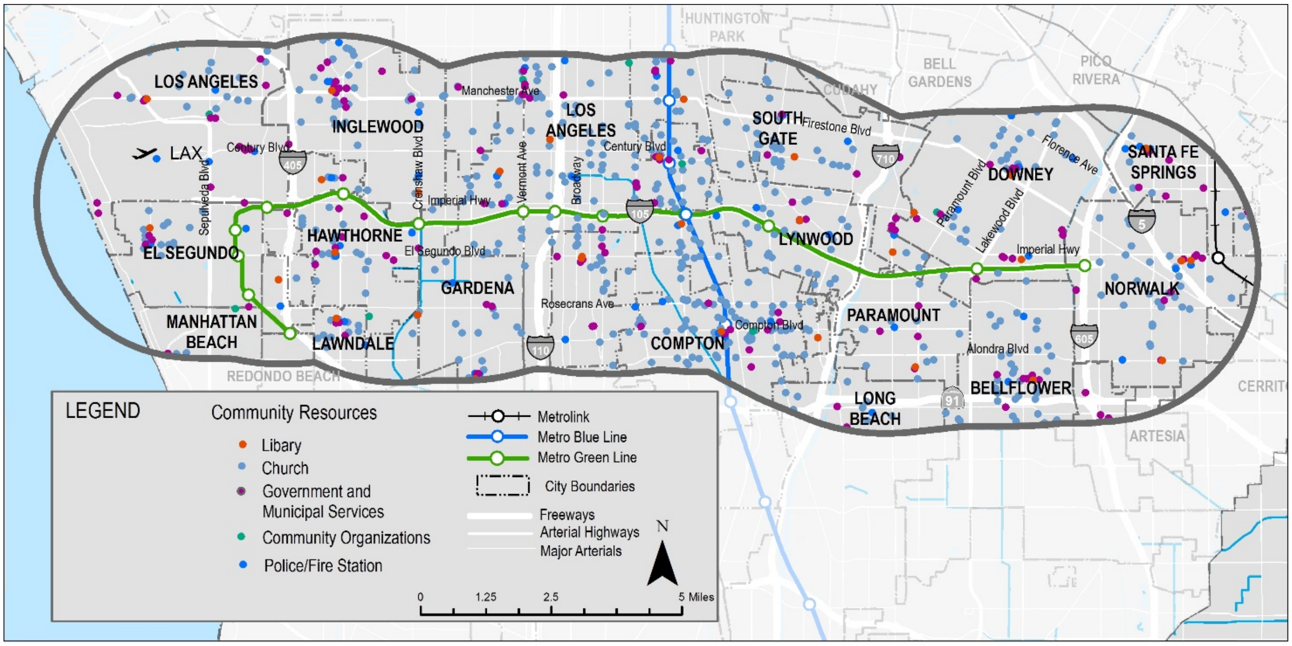
There are a number of other community resources in the I-105 Study Area, as shown in **Figure 4.18** below. These include:

Churches and Community Organizations: The corridor has 540 churches, 41 community organizations and volunteer programs, and 14 farmers markets.

Government and Municipal Services: The corridor has 181 government and municipal services locations. This includes libraries, city halls, representative's offices, permit and licensing offices, waste disposal centers, cemeteries, representative offices, county offices, social security, consulates and passport offices, community services, animal/pet centers, economic development offices, chambers of commerce, planning and zoning, and utilities.

Public Safety: The corridor has 15 courthouses, 47 fire stations, 18 police stations, 23 lifeguard towers, one jail, and 110 legal support and crime prevention offices.

Figure 4.18 Other Community Resources in I-105 Study Area



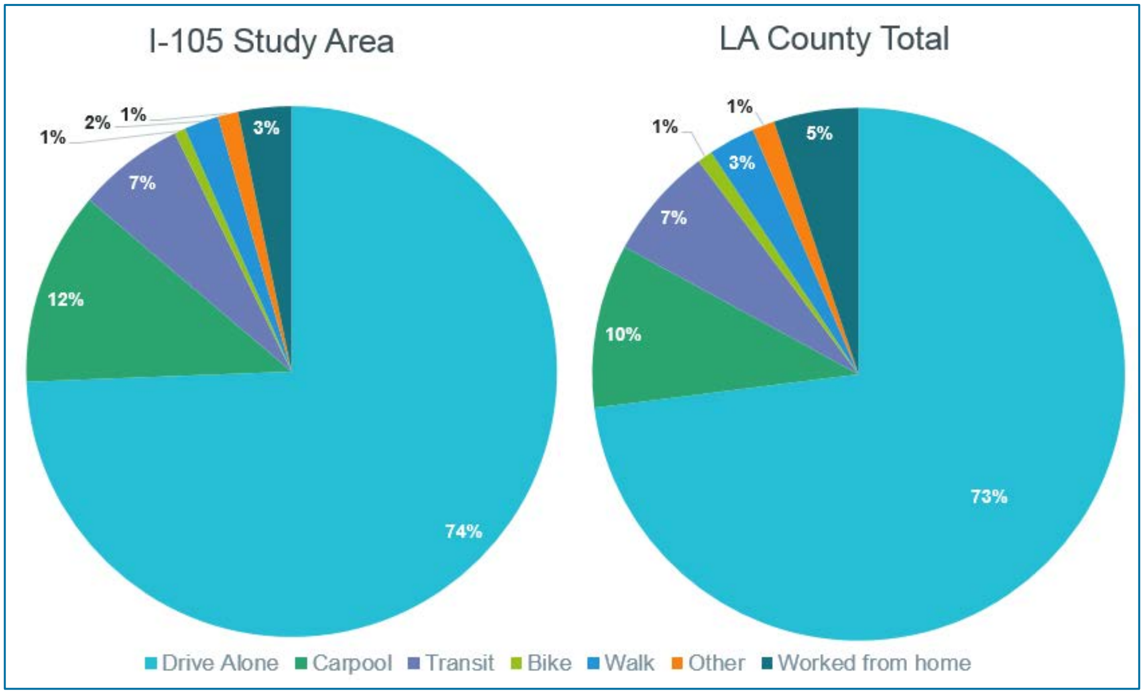
Source: LA County Location Management System, 2016.

4.4 Travel Behavior

4.4.1 Commute Patterns

Mode choice for residents who live in the I-105 Study Area is similar to the rest of LA County. In the I-105 Study Area, 74% of all employees drive alone to work. A slightly higher percent of employees carpool; 12% carpool compared to 10% in LA County as a whole. The transit commute mode share is not insignificant, with 7% of residents using transit as their primary mode to access work. Bicycling, walking, and other modes each comprise 1 to 2% of commute trips for residents in the I-105 Study Area (see **Figure 4.19**).

Figure 4.19 Mode Share for Commute Trips



4.4.2 Vehicle Ownership

Availability of a private vehicle is one of the determining factors that influence mode choice. With the absence of a private vehicle, residents must carpool, take transit, walk, bike, or use another mode of travel. Despite the I-105 Study Area having a higher concentration of low-income populations than the County as a whole, vehicle ownership rates are similar to County averages. In fact, there is a slightly lower percentage of households with no vehicles in the I-105 Study Area than the County as a whole (9.1% vs 9.7%).[8] Households with only one vehicle comprise 35% of all households in both the I-105 Study Area and Countywide.

[8] American Community Survey, 2015 5-year Estimates

5.0 Safety Assessment

The purpose of this section is to assess transportation system safety for use in the I-105 Corridor Sustainability Study (I-105 CSS). This assessment examines recent trends in collisions involving vehicles, bicycles, pedestrians, and trucks; highlights key statistics; identifies areas of high collision frequency; and highlights areas for improvement throughout the corridor.

This assessment utilizes data from the Statewide Integrated Traffic Records System (SWITRS); the Traffic Accident Surveillance and Analysis System (TASAS); and the Caltrans Performance Measurement System (PeMS).

The safety assessment contains the following sections:

- Freeway Safety Assessment
  - Collision Rates
  - Collision Hotspots
  - Collision Breakdown by Severity and Mode
  - Factors Influencing Safety on I-105 Study Area Freeway
- Arterial Safety Assessment
  - Collisions Involving All Modes
  - Collisions Involving Bicyclists
  - Collisions Involving Pedestrians
  - Collisions Involving Trucks
  - High Frequency Collision Locations
  - Factors Influencing Collisions on I-105 Study Area Arterials

5.1 Freeway Safety Assessment

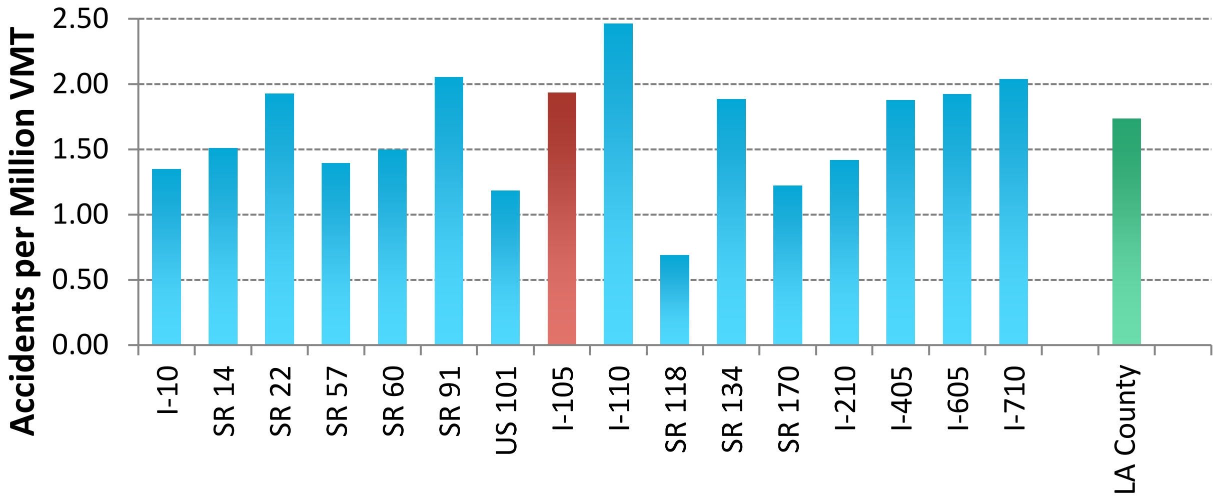
5.1.1 Collision Rates

Figure 5.1 compares I-105 collision rates[9] to those of other Los Angeles County freeways, the Los Angeles County average, and the statewide average. Data is taken from January 1, 2013 to December 31, 2013, from PeMS. The PeMS system receives incident information from TASAS (i.e., number of collisions and types of collisions) and California Highway Patrol (i.e., incident data from its computer-aided dispatch system). Only collisions are included in these rates (breakdowns, debris, weather-related incidents, and police activity are excluded, since these types of incidents cannot be addressed with project improvements). In terms of collisions per million freeway vehicle miles traveled (VMT), I-105, with 1.93, is greater than the state average (1.37) by 41% and greater than the LA County average (1.73) by 12%. While higher than the countywide

[9] Collision data accessed from PeMS, January 1, 2013 to December 31, 2013. Data excludes breakdowns, debris, weather-related incidents, and police activity.

and statewide averages, the I-105 collision rate is lower than the rates for I-110, SR-91 and I-710 and approximately the same as SR-22, SR-134 and I-605.

Figure 5.1 I-105 Freeway in Context, Collisions per Million VMT, 2013



Source: Caltrans PeMS

Table 5.1 compares collision rates on I-105 to statewide average freeway collision rates from 2010 to 2015.[10] Eastbound I-105 collision rates slightly exceed the statewide average in all three categories. The fatality rate on eastbound I-105 exceeds the statewide average by 25%, while collisions resulting in a fatality or injury (regardless of severity level) exceeds the statewide average by 7%. The total collision rate on eastbound I-105 is 3% higher compared to collision rates for similar facilities in the state. The westbound direction shows the opposite trend: the collision rates are 50%, 13%, and 11% less than statewide average collision rates for fatalities, fatalities/injuries, and total collisions, respectively.

Table 5.1 I-105 Freeway Collision Rates, 2010-2015

Direction	I-105 Actual Collision Rate *(per million vehicle miles)*			Statewide Average Collision Rate[11] *(per million vehicle miles)*		
	Fatalities	Fatalities + Injuries	Total	Fatalities	Fatalities + Injuries	Total
Eastbound	**0.005**	**0.32**	**1.00**	0.004	0.30	0.97
Westbound	0.002	0.26	0.86	0.004	0.30	0.97

Note: Numbers in bold indicate that the actual rate is higher than the average rate.
Source: California Department of Transportation. Traffic Accident Surveillance and Analysis System (TASAS) Table B – Selective Accident Rate Calculation Report.

[10] Caltrans TASAS Database, July 1, 2010 to June 30, 2015.

[11] Statewide Average Collision Rate is calculated based on collision rates for similar facilities in urban areas.

5.1.2 Collision Hotspots

Table 5.2 indicates all collisions reported on I-105 from 2010 to 2015. A total of 6,427 collisions were reported over this 5-year period, with the majority of collisions, fatalities and injury collisions occurring in the eastbound direction.

Table 5.2 I-105 Freeway Collision Counts, 2010-2015

Direction	Total # of Collisions	Fatalities	Injuries	Property Damage Only
Eastbound	3,457	18	1,075	2,364
Westbound	2,970	7	897	2,066
Total	6,427	25	1,972	4,430

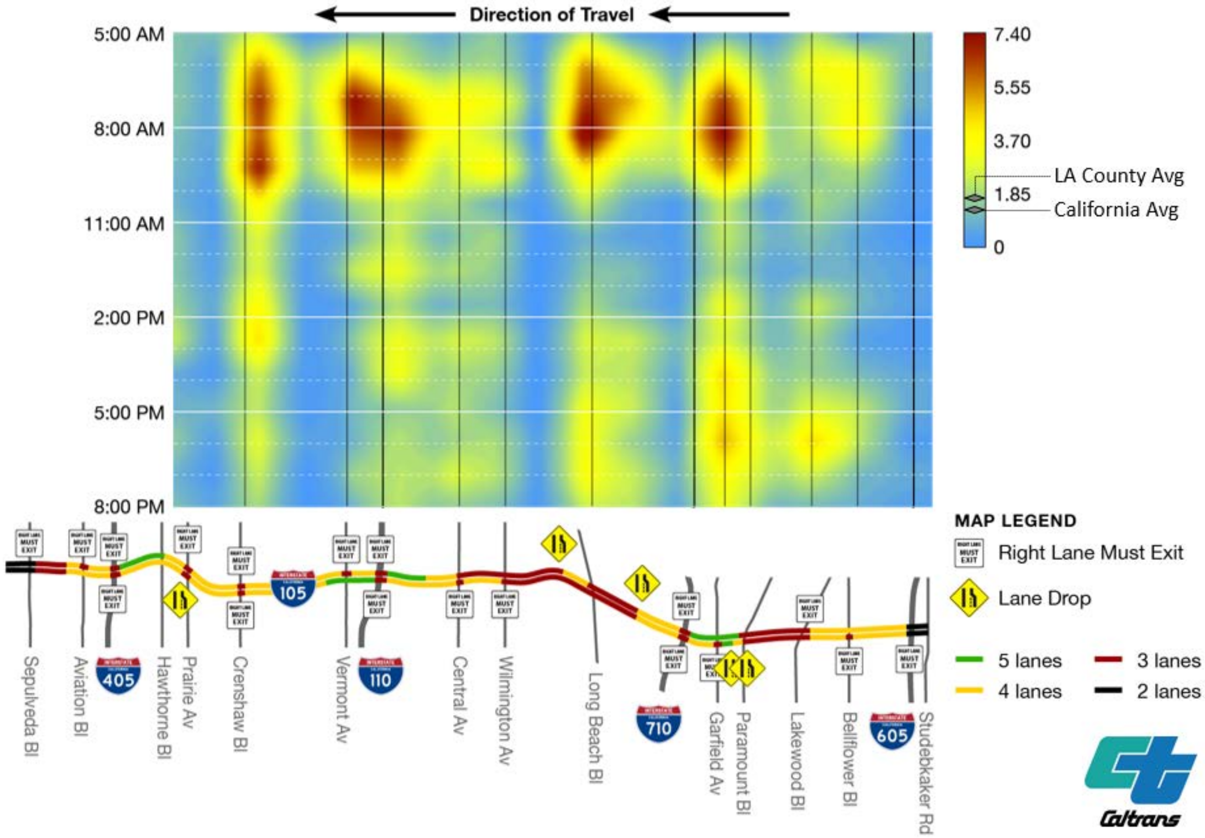
Source: California Department of Transportation. Traffic Accident Surveillance and Analysis System (TASAS) Table B – Selective Accident Rate Calculation Report.

Figure 5.2 through Figure 5.5 present visualizations of collision data as contours and spatial distributions. Major crossings are represented on these charts by solid vertical lines, with freeway diagrams placed below the charts to indicate the corresponding junction for each line. These charts are used to identify locations along the freeway with the highest concentrations of collisions.

For the contour plots and spatial distributions, incident data were collected between November 1, 2008, and October 31, 2013, for a total period of five years. For the contour plots, volume data for November 1-7, 2013 data was pulled, while for the spatial distributions, volume data were collected between October 1, 2012, and September 30, 2013, for a total period of one year. For the contour plots, milepost bins are approximately 0.5 miles in length. For the line plots, milepost bins are approximately 0.5 miles long, with extended capture zones of 1.5 miles in either direction of the bin midpoint. This is done to account for the inaccurate nature of milepost data in many incident reports, since many incidents are first reported by motorists who can be inaccurate when describing an incident's location, or emergency responders who may not precisely record the milepost information when logging an incident. The charts reflect the average number of collisions within each bin, for every one million vehicles (volume) that passed that location on the freeway.

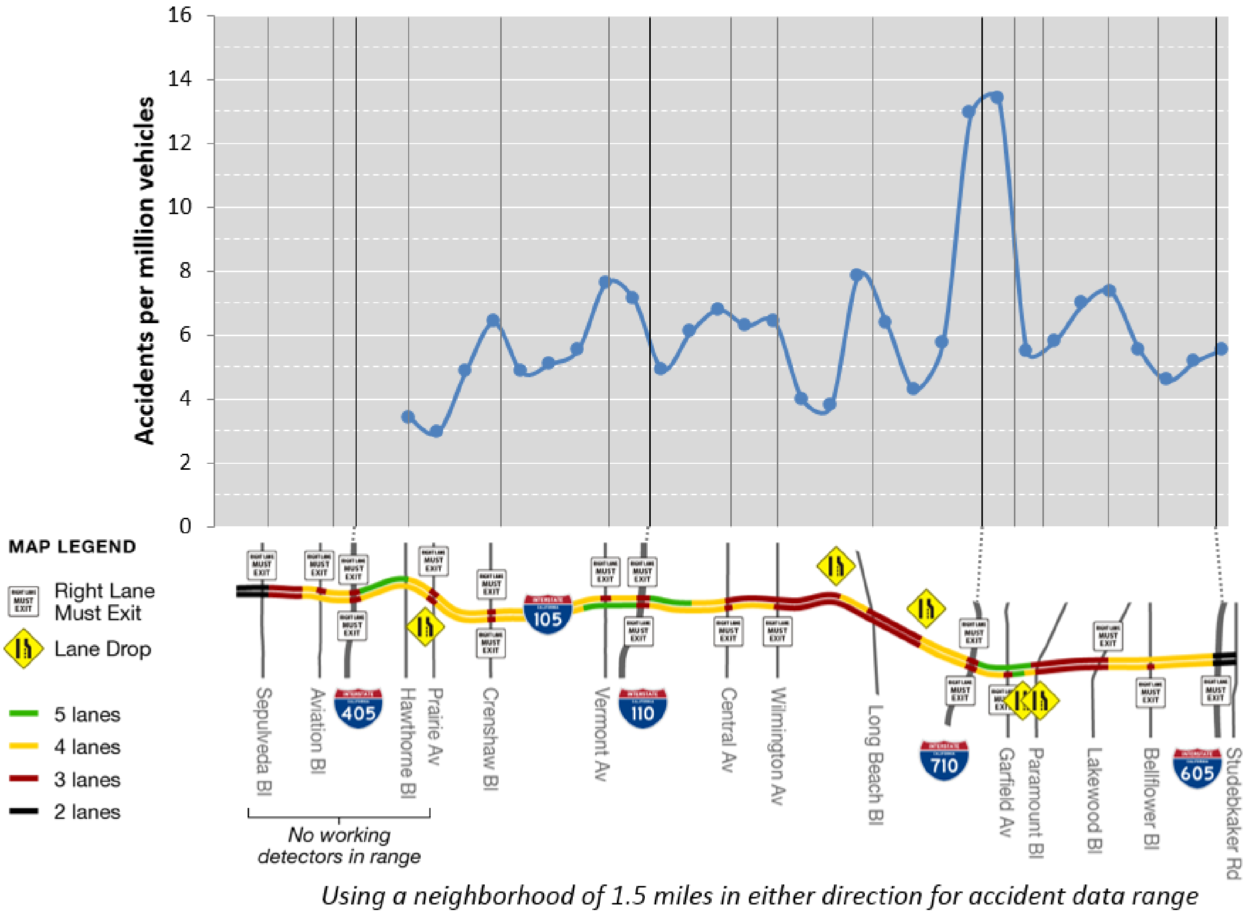
As seen in **Figure 5.2**, the highest concentrations of collisions in the westbound direction (more than five collisions per million vehicles) take place in the morning peak period (6-9 AM), near the interchanges with Garfield Avenue, Long Beach Boulevard, I-110 junction, and Crenshaw Boulevard. In terms of highest volume of collisions by location (Figure 5.3), Garfield Avenue features approximately 13.5 collisions per million vehicles, over five collisions per million vehicles more than the second highest location, Long Beach Boulevard.

Figure 5.2 I-105 Westbound, Contour Plot of Collisions per Million Vehicles



Source: Caltrans. Active Traffic Management Congestion Relief Analysis Study, May 2014.

Figure 5.3 I-105 Westbound, Spatial Distribution of Collisions per Million Vehicles

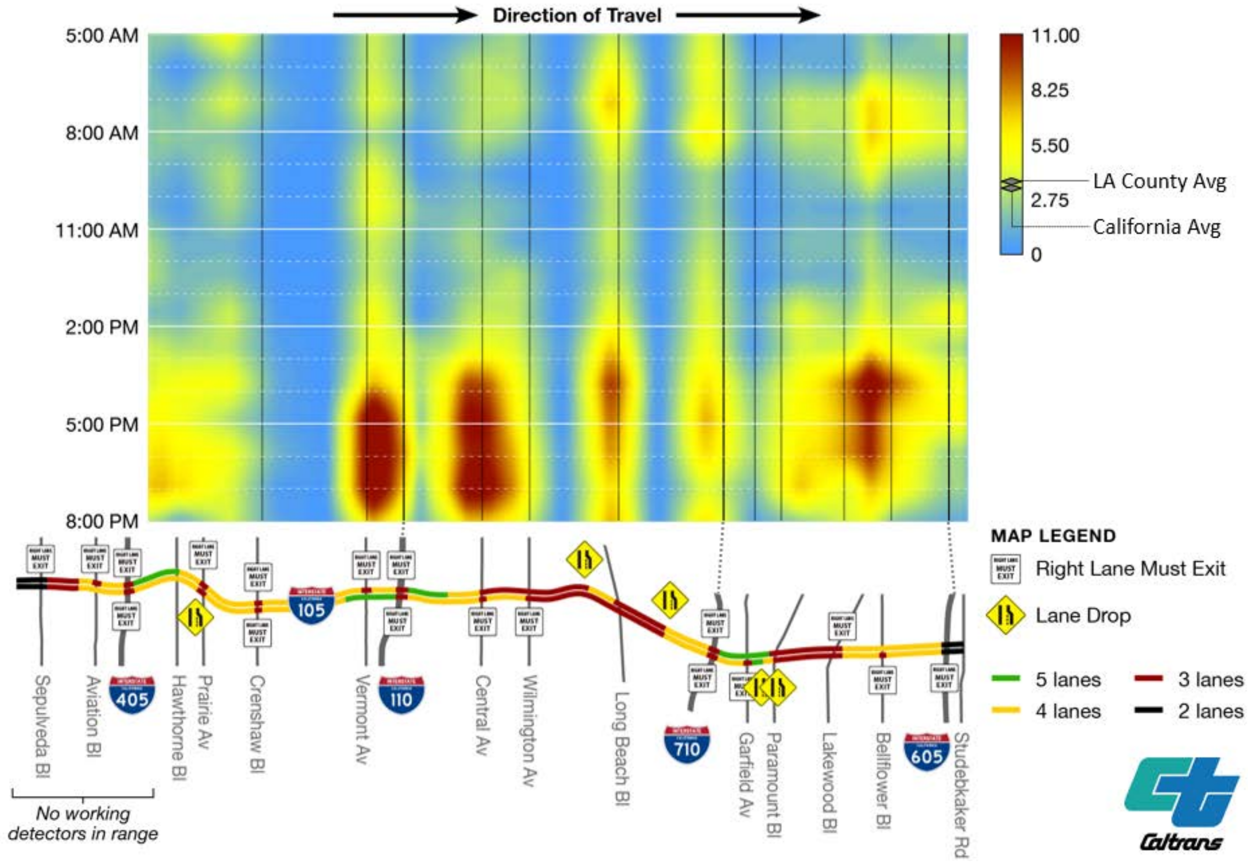


Source: Caltrans. Active Traffic Management Congestion Relief Analysis Study, May 2014.

As seen in **Figure 5.4**, the highest concentrations of collisions in the eastbound direction take place in the afternoon peak period (3-7 PM), near the interchanges with Vermont Avenue/ I-110 junction, Central Avenue, Long Beach Boulevard, and Lakewood Boulevard/Bellflower Boulevard. In terms of highest volume of collisions by location (**Figure 5.5**), the top three segments are as follows:

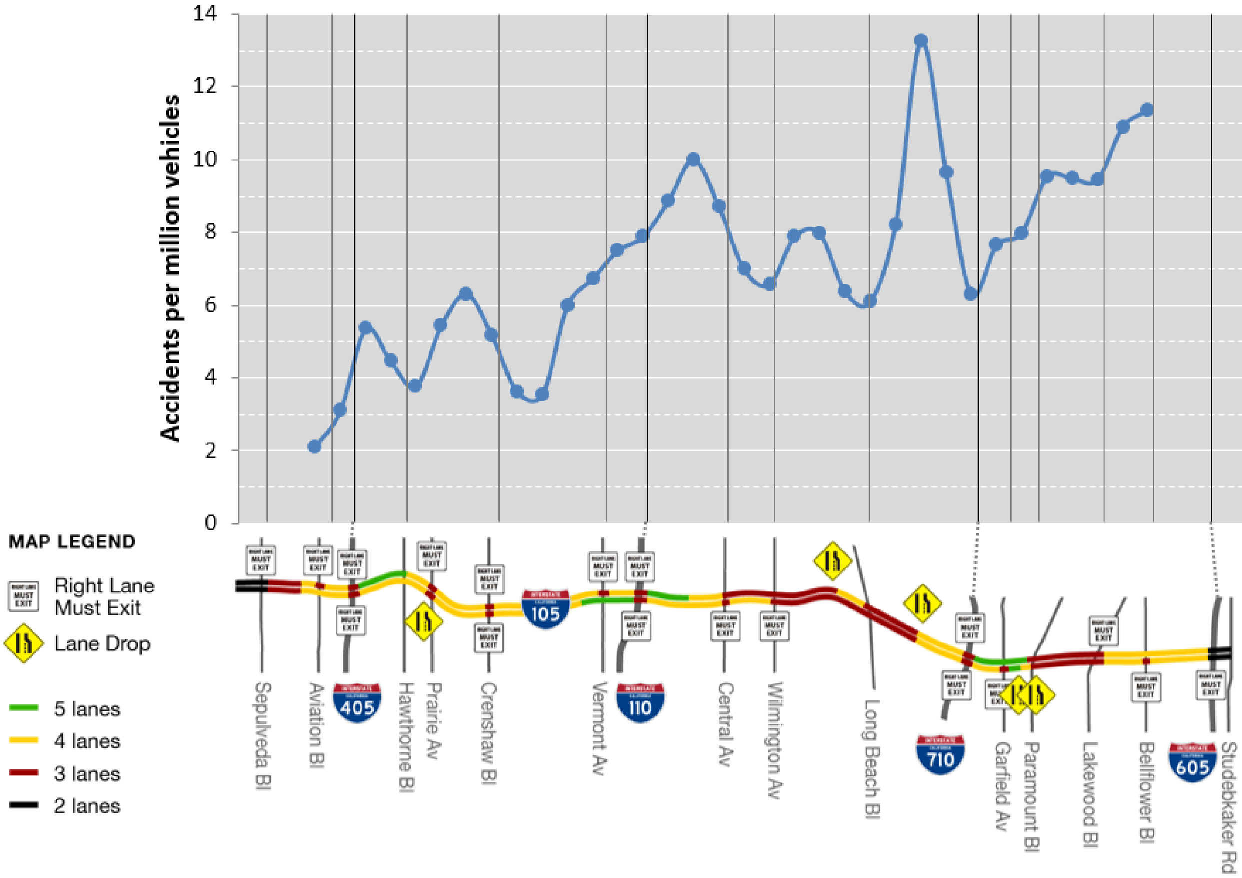
1. Between Long Beach Boulevard and I-710 junction: approximately 13.5 collisions per million vehicles;
2. Between Lakewood Boulevard and Bellflower Boulevard: approximately 11.5 collisions per million vehicles; and
3. Between I-110 junction and Central Avenue: approximately 10 collsions per million vehicles.

Figure 5.4 I-105 Eastbound, Contour Plot of Collisions per Million Vehicles



Source: Caltrans. Active Traffic Management Congestion Relief Analysis Study, May 2014.

Figure 5.5 I-105 Eastbound, Spatial Distribution of Collisions per Million Vehicles



Using a neighborhood of 1.5 miles in either direction for accident data range

Source: Caltrans. Active Traffic Management Congestion Relief Analysis Study, May 2014.

The highest concentrations can be found between Alameda Street and Atlantic Avenue, Garfield Avenue and west of I-605.

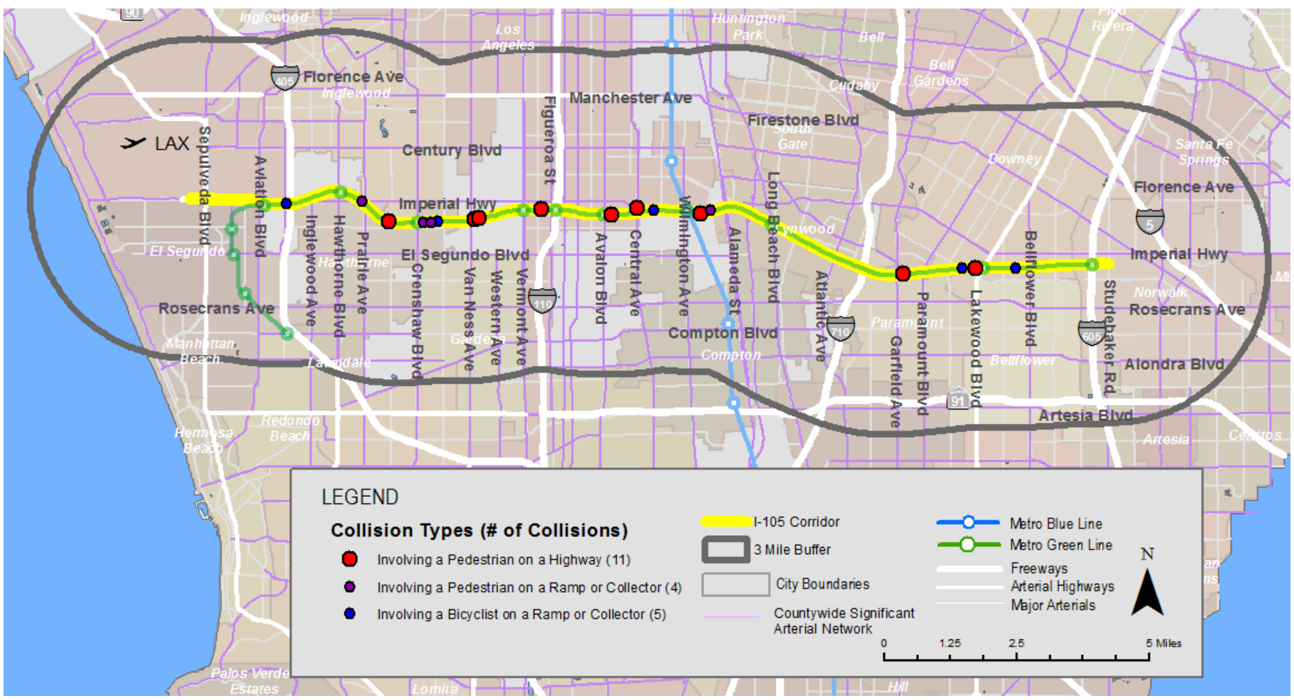
Figure 5.6 shows collisions involving trucks on the I-105 freeway. Truck collisions are more highly concentrated in the eastern portion of the study area. This is expected as the portion of I-105 east of I-710 is a key route for Port-related trucks and other trucks from the south to the north and east. Many trucks use I-710 and I-105 as access routes to and from I-605 and the Ports of Los Angeles and Long Beach. As shown, truck collision concentrations occur at the interchanges with Long Beach Boulevard, Paramount Boulevard and Bellflower Boulevard. Truck collisions are shown to become less frequent as the corridor moves to the west and are far more dispersed between Crenshaw Boulevard and the western freeway terminus.

Figure 5.7 shows the location of collisions involving bicyclists or pedestrians along the I-105 freeway and ramps. Eleven collisions involving a pedestrian on the I-105 freeway mainline occurred between 2012 and 2016. The location of these collisions are not clustered at one problem area, but rather spread across the freeway. There were a combination of nine collisions involving bicyclists and pedestrians on a ramp or collector. Overall, the majority of the collisions involving bicyclists and pedestrians are located between Prairie Avenue and Alameda Street. Presumably most of the pedestrian collisions may be motorists who have exited their vehicles, or are on ramps. Bicycle collisions are mostly on ramps and at ramp terminus intersections. Further detailed analysis would be required to pinpoint the location and causes of these collisions.

Figure 5.6 Location of I-105 Freeway Collisions involving Trucks, 2012-2016

Source: SWITRS

Figure 5.7 Location of I-105 Freeway Collisions involving Bicyclists, Pedestrians, 2012 - 2016



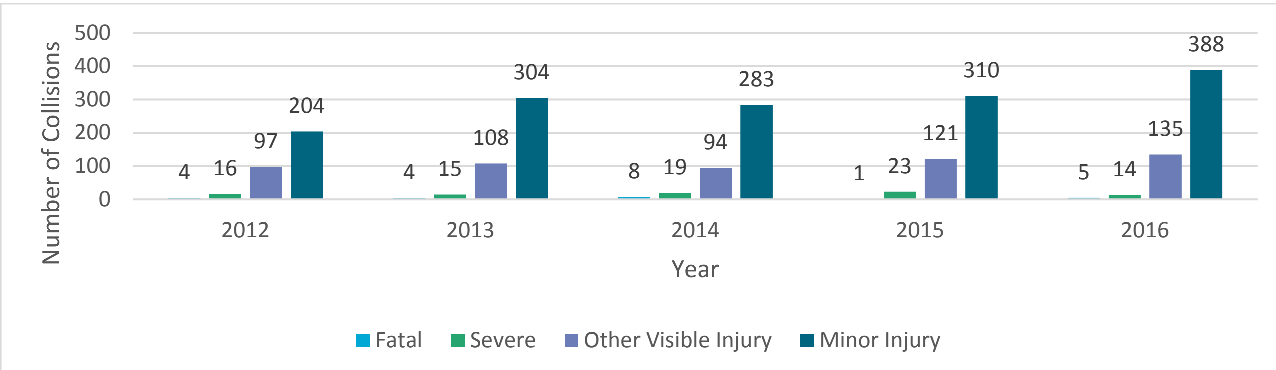
Source: SWITRS

5.1.3 Collision Breakdown by Severity and Mode

Collisions Involving All Modes

In the five year period between January 1, 2012 and December 31, 2016, there were 2,153 collisions along the I-105 mainline or ramps that resulted in injury. Of these collisions, approximately 1% resulted in fatalities, 4% in severe injury, 26% in other visible injuries, and 69% in minor injuries. Over the five year period, 22 fatal collisions resulted in 22 deaths. While fatal and severe injury collisions remained relatively consistent from year to year, the number of other visible injuries and minor injuries has steadily increased. By 2016, minor injury collisions had risen over 90 percent compared to 2012.

Figure 5.8 I-105 Freeway Collisions by Severity, 2012 - 2016



Source: SWITRS

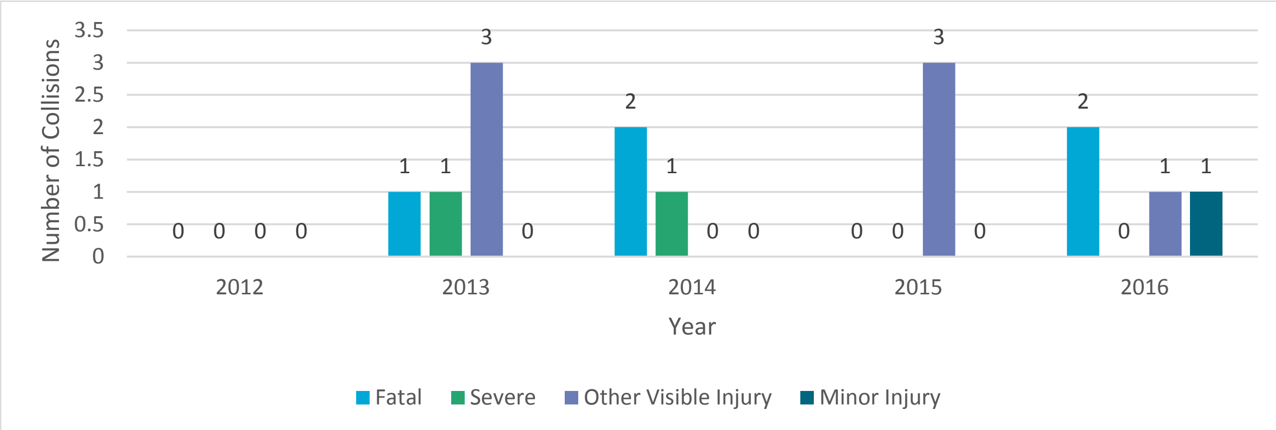
Collisions Involving Bicyclists

In the five year period between 2012 and 2016, there were five reported collisions along the I-105 ramps or collectors involving bicyclists that resulted in injury: one minor injury in 2012 and 2013, two other visible injuries in 2013 and one visible injury in 2015. Of the injury collisions, 60% resulted other visible injuries and 40% in minor injuries. Collisions involving bicyclists make up 0.2% of all collisions along I-105, and 0% of fatal collisions along I-105.

Collisions Involving Pedestrians

In the five year period between 2012 and 2016, there were 15 collisions along the I-105 mainline or ramps involving pedestrians that resulted in injury. Of the injury collisions, approximately 33% resulted in fatalities, 13% in severe injury, 47% in other visible injuries, and 7% in minor injuries. Over the five year period there were five fatal collisions that resulted in five deaths. Fatal collisions involving pedestrians have been on the rise since 2012 and not surprisingly, represent a disproportionally large percentage of injury collisions. Collisions involving bicyclists make up 0.7% of all collisions along I-105, and 0.2% of fatal collisions along I-105.

Figure 5.9 I-105 Freeway Collisions Involving Pedestrians by Severity, 2012-2016

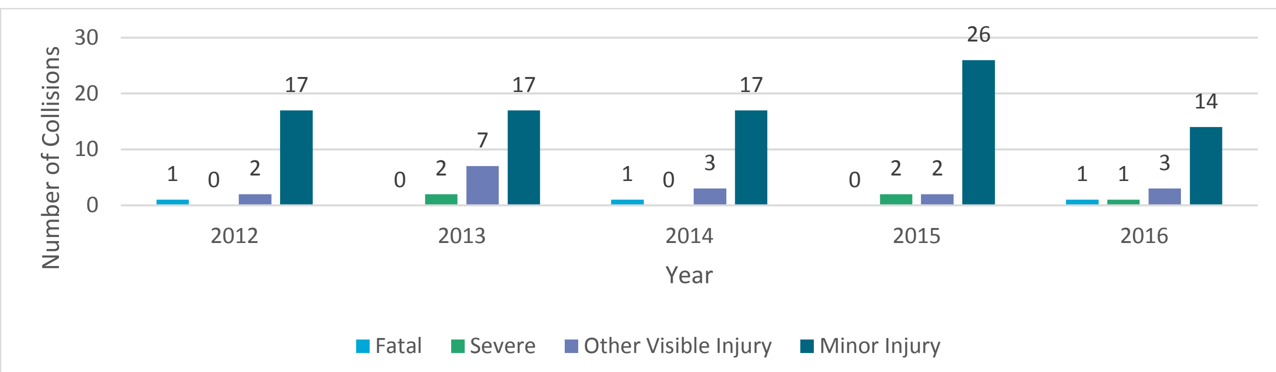


Source: SWITRS

Collisions Involving Trucks

In the five year period between 2012 and 2016, there were 116 collisions along the I-105 mainline or ramps involving trucks that resulted in injury. Of the injury collisions, approximately 3% resulted in fatalities, 4% in severe injury, 15% in other visible injuries, and 78% in minor injuries. Over the five year period there were three fatal collisions that resulted in three deaths.

Figure 5.10 I-105 Freeway Collisions Involving Trucks by Severity, 2012-2016



Source: SWITRS

5.1.4 Factors Influencing Safety on I-105 Study Area Freeway

The SWITRS database categorizes each injury collision by its Primary Collision Factor (PCF). It should be noted that the PCF is a subjective determination and there are often multiple factors that may lead to a collision. Based on these designations, the most common factors causing injury collisions along the I-105 freeway mainline or ramps are Unsafe Speed (60%), Improper Turning (15%), and Unsafe Lane Change (13%).

The majority of collisions involving pedestrians resulted from a Pedestrian Violation (40%), Unsafe Speed (20%), or a driver violation (Pedestrian Right of Way, 13%). All of the collisions involving bicyclists can be attributed to Traffic Signals and Signs (40%), Unsafe Speed (20%), Wrong Side of the Road (20%), or

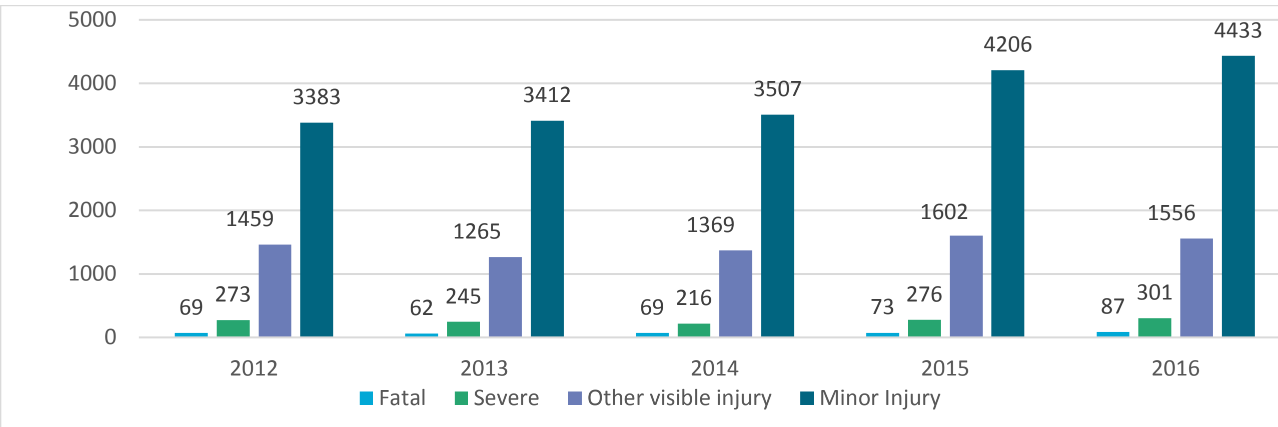
Automobile Right of Way (20%). The PCFs of collisions involving trucks follows similar trends to collisions involving other motorists: Unsafe Speed (56%), Improper Turning (13%), and Unsafe Lane Change (16%).

5.2 Arterial Safety Assessment

5.2.1 Collisions Involving All Modes

In the five year period between 2012 and 2016, there were 27,863 collisions on arterials in the I-105 Study Area which resulted in injury. Of these collisions, just over 1% resulted in fatalities, under 5% in severe injury, 26% in other visible injuries, and 68% in minor injuries. Over the five year period there were 360 fatal collisions that resulted in 379 deaths. Consistent with statewide trends, total injury collisions increased each year between 2012 and 2016, with minor injuries and fatalities showing a steady upward trend.

Figure 5.11 Arterial Collisions by Severity, 2012 - 2016

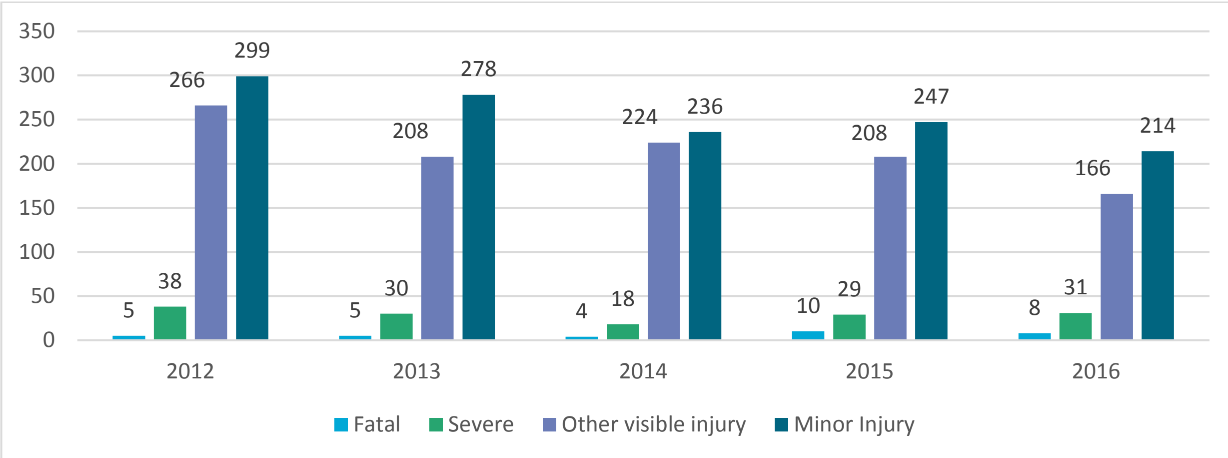


Source: SWITRS

5.2.2 Collisions Involving Bicyclists

In the five year period between 2012 and 2016, on arterials in the I-105 Study Area, there were 2,524 collisions involving bicyclists that resulted in injury. Of the injury collisions, over 1% resulted in fatalities, almost 6% in severe injury, 42% in other visible injuries, and 51% in minor injuries. Over the five year period, injury collisions involving bicyclists have decreased steadily, though it is unclear if bicycle ridership in the - 105 Study Area increased or decreased during the period. Furthermore, fatal collisions involving bicyclists, while a small number, were significantly higher in 2015 and 2016 than previous years.

Figure 5.12 Arterial Collisions Involving Bicyclists by Severity, 2012-2016

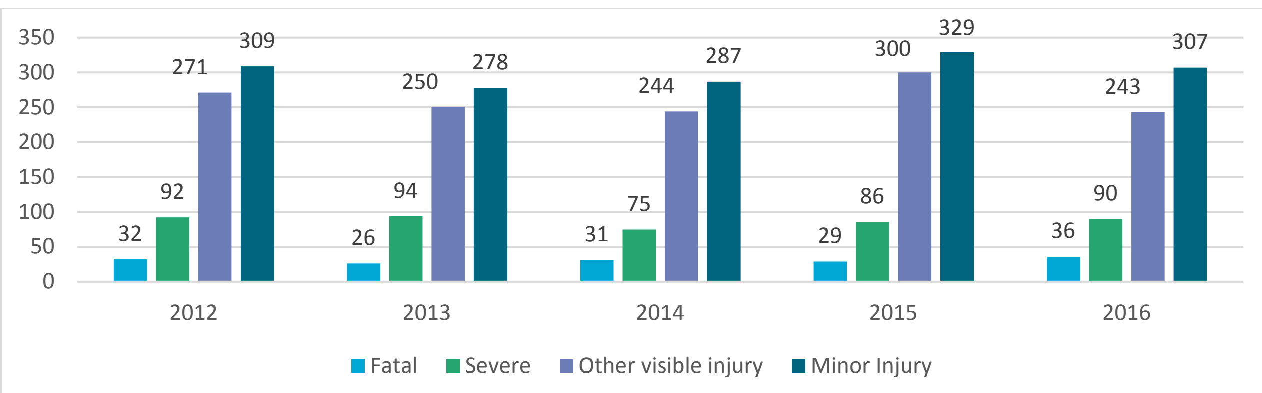


Source: SWITRS

5.2.3 Collisions Involving Pedestrians

In the five year period between 2012 and 2016, there were 3,409 collisions involving pedestrians that resulted in injury. Of the injury collisions, around 5% resulted in fatalities, 13% in severe injury, 38% in other visible injuries, and 44% in minor injuries. Injury collisions involving pedestrians have remained fairly consistent over the past five years. There has been some minor fluctuation in the severity of the collisions, but nothing that signifies a decreasing or increasing trend.

Figure 5.13 Collisions Involving Pedestrians by Severity, 2012-2016

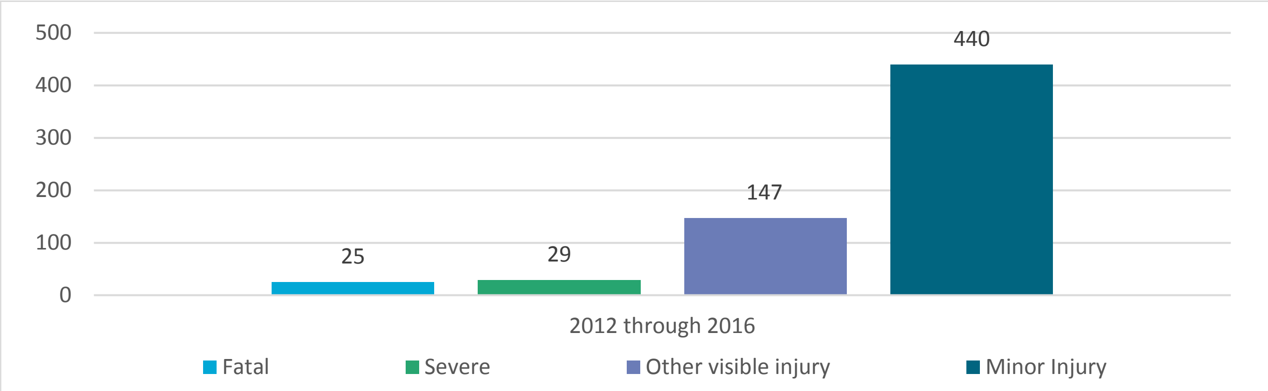


Source: SWITRS

5.2.4 Collisions Involving Trucks

In the five year period between 2012 and 2016, there were 641 collisions involving trucks that resulted in injury. Of the injury collisions, around 4% resulted in fatalities, 5% in severe injury, 23% in other visible injuries, and 69% in minor injuries.

Figure 5.14 Collisions Involving Trucks by Severity, Total 2012-2016



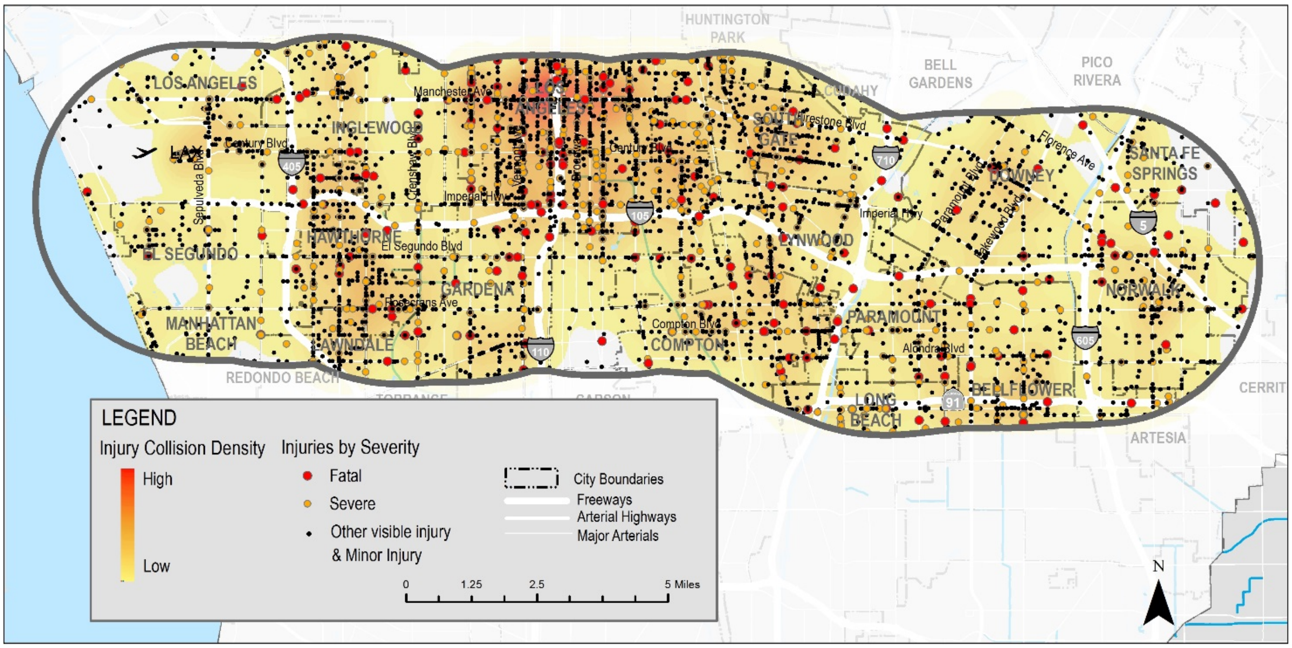
Source: SWITRS

5.2.5 High Frequency Collision Locations

Collisions involving bicyclists and pedestrians are spread throughout the Study Area, however, the highest density of collisions in the Study Area is in the neighborhoods of South Los Angeles around the interchange of I-105 and I-110 (See **Figure 5.15)**. Many of these arterials are recognized on the City of Los Angeles' Vision Zero High Injury Network (HIN). With the HIN, the City of LA created a prioritized list of corridors needing improvement based on the prevalence of severe and fatal injuries, with a special emphasis on bicycle and pedestrian injuries.[12] Of the 386 corridors identified in the HIN, 34 are located in the Study Area, with 23 in South Los Angeles, including South Figueroa St., West Manchester Blvd., West Century Blvd., Florence Ave., and South Main St, among others.

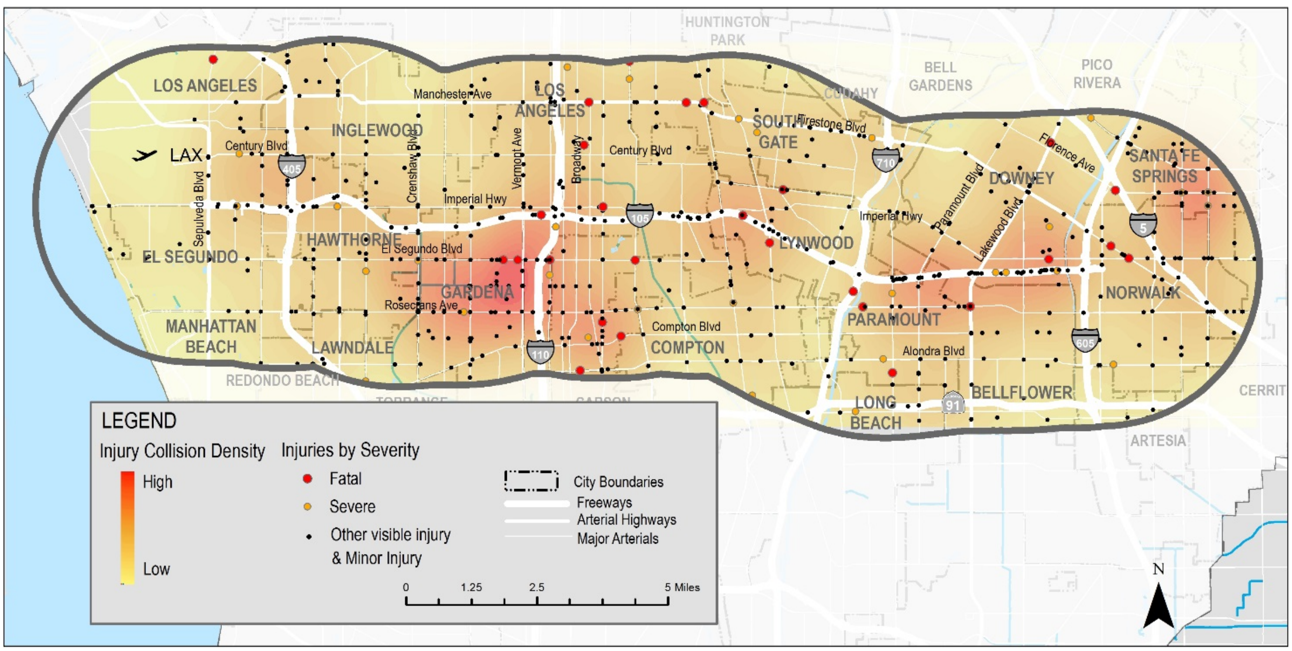
[12] City of Los Angeles, Vision Zero High Injury Network: http://visionzero.lacity.org/wp-content/uploads/2016/12/LosAngelesVisionZero_HINMethodology.pdf

Figure 5.15 Location of Bicycle and Pedestrian Collisions, 2012 - 2016



The highest concentration of truck collisions occurs in Gardena, southwest of the I-105 and I-110 interchange (See **Figure 5.16**). This area just south of West El Segundo Boulevard has a concentration of industrial facilities. Other areas of high truck collision frequency include Santa Fe Springs and along I-105 in Paramount, Bellflower, and Downey.

Figure 5.16 Location of Truck Collisions, 2012 - 2016



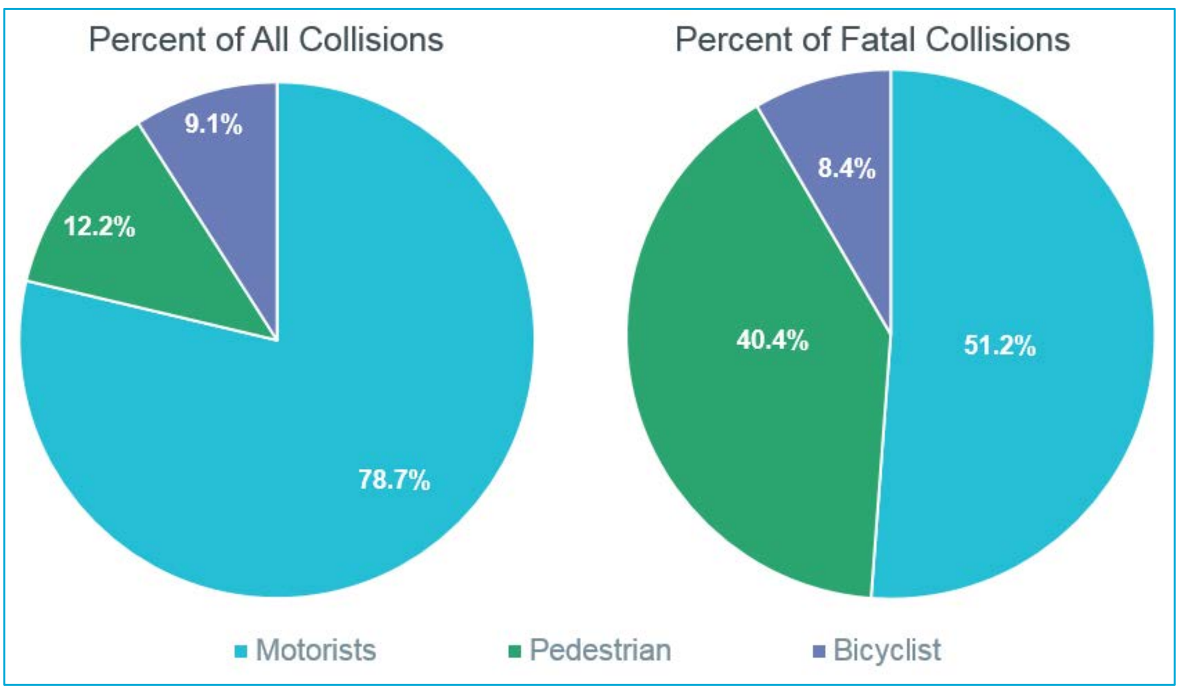
5.2.6 Factors Influencing Collisions on I-105 Study Area Arterials

As mentioned earlier, the SWITRS database categorizes each injury collision by its Primary Collision Factor (PCF). Based on these designations, on all roadways in the Study Area, the most common factors causing injury collisions are Unsafe Speed (27%), Automobile Right of Way (22%), and Improper Turning (11%). Speed is slightly less of a factor for arterial collisions, at 19%, while Automobile Right of Way (27%) and Traffic Signals and Signs (11%) are more commonly cited. It should be noted that the PCF is a subjective determination and there are often multiple factors that may lead to a collision.

On I-105 Study Area arterials, the majority of collisions involving pedestrians resulted from a driver violation (pedestrian right of way), 33%, or a pedestrian violation, 37%. However, of the pedestrian violations, 17% of collisions occurred with the pedestrian in a crosswalk. Driver speed is only the primary factor in 5% of pedestrian injury collisions, though it is the primary factor in 7% of fatal collisions. Pedestrian violation is by far the highest PCF for pedestrian fatalities, at 49%, though there are obvious issues with identifying fault in the case of a pedestrian fatality. The most common PCF for collisions involving bicyclists are bicyclists riding on the wrong side of the road (32%), Automobile Right of Way (23%), and Traffic Signals and Signs (23%). For fatal collisions involving bicyclists, the most common PCFs are Automobile Right of Way (25%), Traffic Signals and Signs (22%) and Improper Turning (16%).

It is no surprise that pedestrians are some of the most vulnerable users of the transportation system. While collisions involving pedestrians make up just 12% of all injury collisions on arterials in the I-105 Study Area, they make up 40% of all fatalities in arterial collisions. In LA County as a whole, during the same period, collisions involving pedestrians made up 9% of all collisions and 34% of fatalities.

Figure 5.17 Motorist, Bicyclist, and Pedestrian Collision Percentages on I-105 Study Area Arterials



Source: SWITRS, 2012 - 2016

6.0 Corridor User Assessment

The purpose of this section is to identify trip origins and destinations in the I-105 Study Area to convey an understanding of the potential locations for short and intermediate trips in the corridor and to understand the surrounding character and activities that can be directly addressed by complementarily transportation improvements. The discussion of land use, demographics, and key destinations presented in **Section 4.0** above provides context to the data included in this section. This section presents an analysis of the origins and destinations of I-105 travelers using SCAG's regional travel demand mode.

6.1 Trip Patterns

SCAG's regional travel demand model has been used to help identify travel patterns in and through the I-105 Study Area. The SCAG model has detailed information regarding trip patterns throughout Southern California and can be used to understand travel patterns in selected corridors. For the I-105 CSS, a series of "select link" analyses using SCAG's model were performed to understand the trip characteristics of I-105 travelers. Using this technique we can determine the origins and destinations of trips that occur in the I-105 Study Area and the length of each trip. Select link model runs were conducted at the locations listed below along I-105 and nearby arterial roadways using the 2016 SCAG Travel Demand Model. These locations were selected in order to capture distinct corridor user groups.

- **Freeway mainline –** Freeway segments at four eastbound mainline locations including near Nash Street, Crenshaw Boulevard, Central Avenue, and Lakewood Boulevard. Segments at four westbound mainline locations including near Douglas Street, South Western Avenue, Compton Avenue, and Lakewood Boulevard.

- **On-ramps –** Four eastbound on-ramps including North Nash Street, Crenshaw Boulevard, Success Avenue, and Lakewood Boulevard. Four westbound on-ramps including I-405 to I-105 westbound on-ramp, Vermont Avenue, South Croesus Avenue, and Bellflower Boulevard.

- **Off-ramps –** Eastbound off-ramp at Central Avenue and westbound off-ramp at Wilmington Avenue.

- **Arterials –** Arterial segments at the cross street of Van Ness Avenue and Century Boulevard, Imperial Highway, El Segundo Boulevard, and Rosecrans Avenue (both directions).

Based on the SCAG model select link analysis, **Table 6.1** illustrates the percentage of trips starting or ending within a three mile vicinity of the I-105.

Table 6.1 Trip Origins and Destinations within Three Mile Zone

Direction	Select Link Location	Trip Origins within 3 Miles	Trip Destinations within 3 Miles
Freeway Mainline Locations			
EB	At Nash Street	82%	34%
EB	At Crenshaw Boulevard	60%	49%
EB	At Central Avenue	53%	54%
EB	Near Lakewood Boulevard	25%	58%

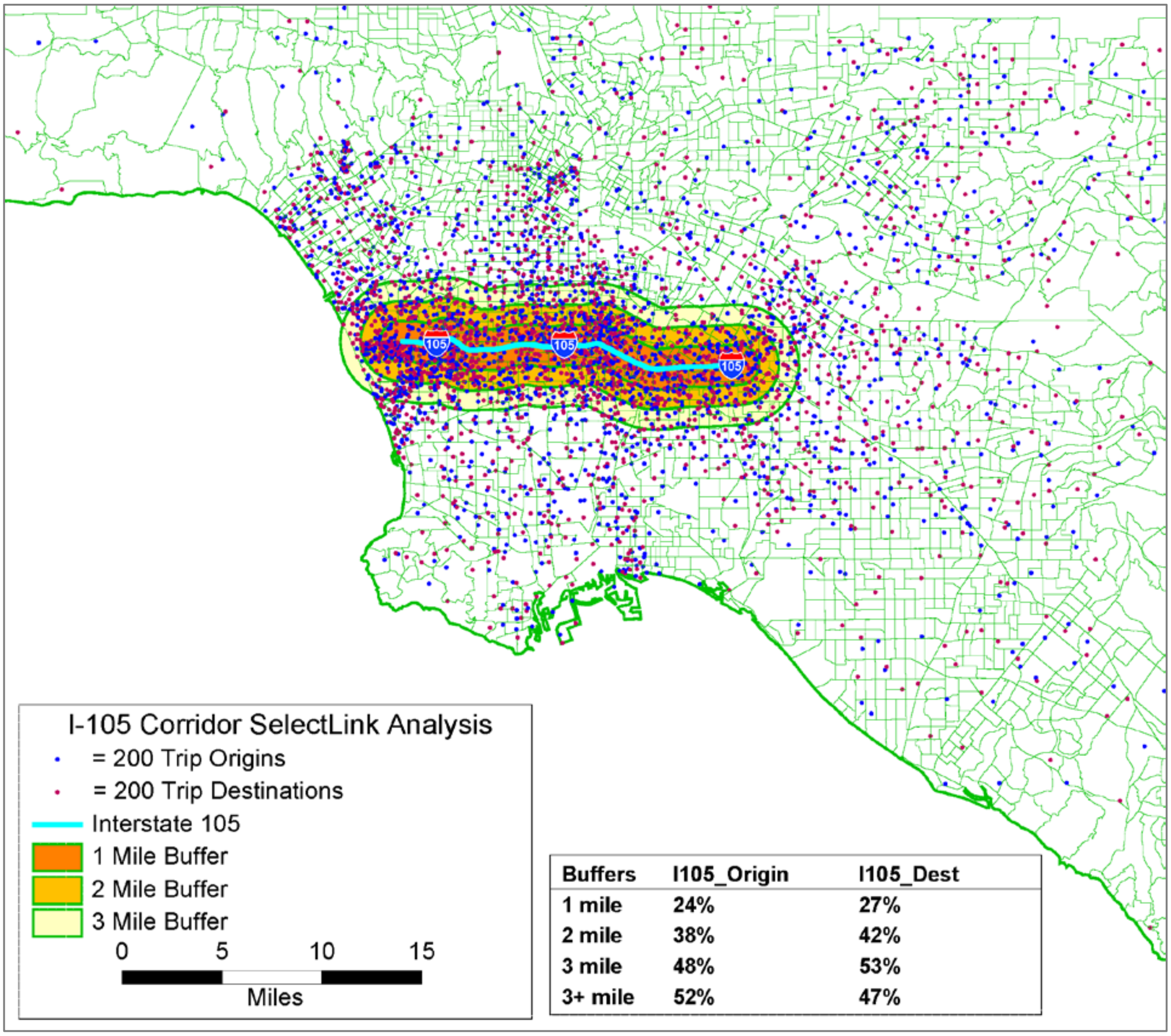
Direction	Select Link Location	Trip Origins within 3 Miles	Trip Destinations within 3 Miles
WB	At Douglas Street	31%	87%
WB	At Western Avenue	47%	65%
WB	At Compton Avenue	51%	60%
WB	Near Lakewood Boulevard	57%	27%
EB & WB	At All Freeway Mainline Locations Combined	48%	53%
On-Ramps			
EB	Nash Street	60%	49%
EB	Crenshaw Boulevard	98%	34%
EB	Success Avenue	85%	39%
EB	Lakewood Boulevard	100%	14%
WB	I-405 to I-105	7%	91%
WB	Vermont Avenue	92%	44%
WB	South Croesus Avenue	90%	43%
WB	Bellflower Boulevard	98%	39%
Off-Ramps			
EB	Wilmington Avenue	36%	92%
WB	Central Avenue	36%	92%
Arterials			
EB & WB	West Century Boulevard at South Van Ness Avenue	71%	70%
EB & WB	West Imperial Highway at South Van Ness Avenue	74%	72%
EB & WB	El Segundo Boulevard at South Van Ness Avenue	74%	73%
EB & WB	Rosecrans Avenue at South Van Ness Avenue	77%	75%

Source: SCAG Model, 2016

Approximately half of all of the trips along the freeway have trip origins and destinations within the three mile I-105 Study Area. Thus, land uses in the I-105 Study Area generate or attract about half of all trips that occur on the freeway today; the other half area generated or attracted from origins and destinations beyond the three mile buffer, mostly in Los Angeles County. Trips on the arterial network tend to be shorter and thus more of the trips on the arterial network in the I-105 Study Area begin or end in the I-105 Study Area. Based on the modeling results, about three-quarters of all arterial system trips have local trip origins or destinations within the study area, with about 25 percent coming from outside of the I-105 Study Area to use the arterial roadways in the I-105 corridor. Stated another way, the freeway trips are about 50 percent “local” from near I-105 within the three mile buffer, and 50 percent of the freeway trips start or end outside of the I-105 Study Area. The arterial system trips are about 75 percent local and 25 percent from outside the I-105 Study Area.

Figure 6.1 shows the results of the select link analysis at four freeway mainline locations, combined east and westbound flows. These locations were chosen along the corridor to capture freeway trip patterns throughout the I-105 corridor. One mile, two mile and three mile travel areas around I-105 are shown on the map to help illustrate the trip patterns. As shown, 48% of trips traversing through at least one of the eight link locations (four westbound and four eastbound) originate within the three-mile zone, while 53% of these trips end within the three-mile zone. The remaining trips are less concentrated and are shown to be dispersed generally throughout the Los Angeles County and some beyond the County line.

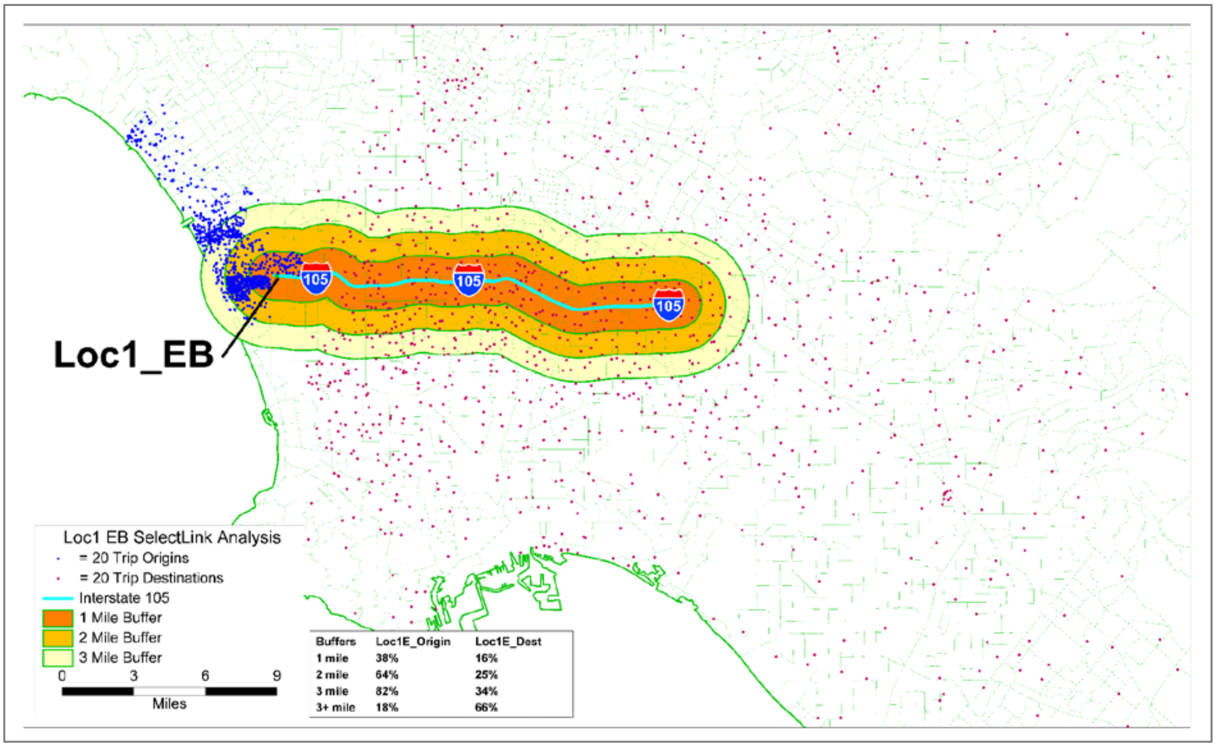
Figure 6.1 Freeway Trip Origins and Destinations



Source: SCAG Model, 2016

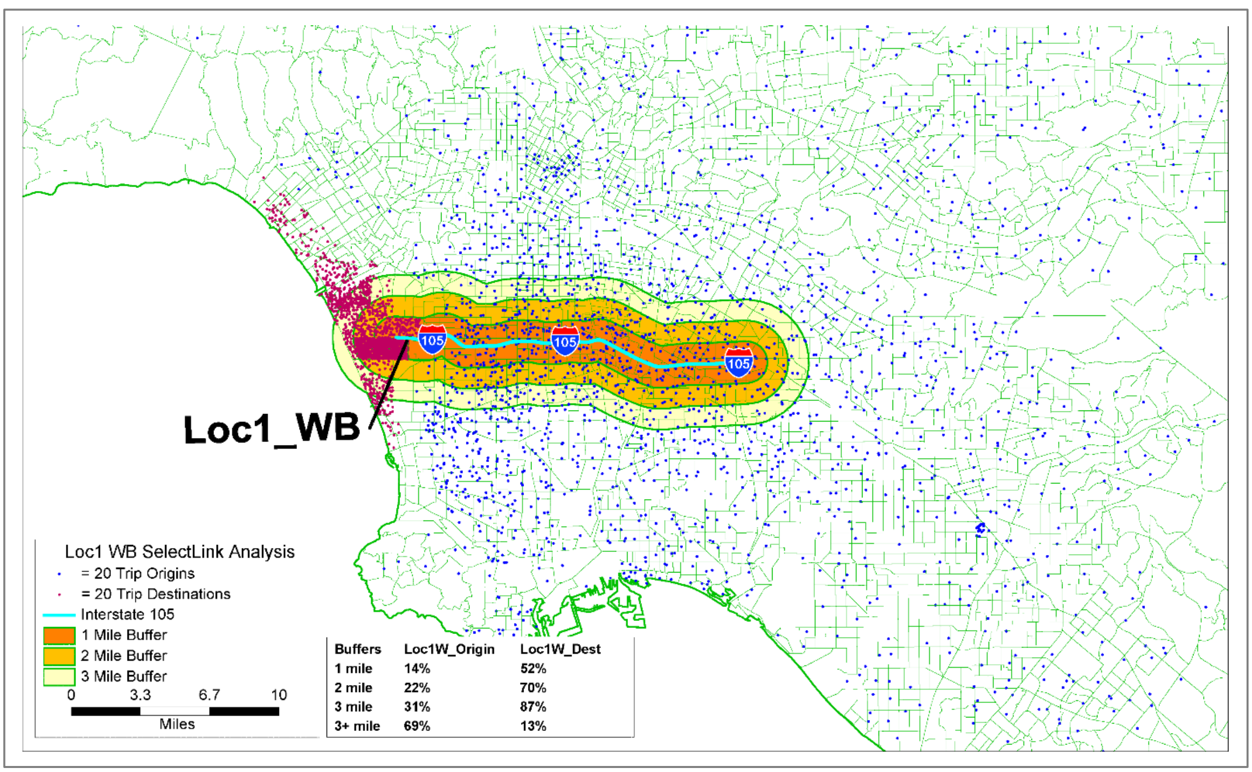
Isolating individual link analyses, the select link exercise illustrates other trip patterns in the I-105 Study Area. **Figure 6.2 and Figure 6.3** illustrate trip origins and destinations for the westernmost analysis point near Nash Street / Douglas Street in the eastbound and westbound directions, respectively. As shown, the eastbound trips have a heavy concentration of trip origins within two miles of the end of I-105 in the vicinity of LAX and also there is another concentration of trip origins to the north near the three mile boundary. Many of these are likely trips from employees at LAX and surrounding employment centers to their residence. As shown, the trip destinations are well dispersed throughout the County. At this location in the eastbound direction, 82% of the trips originate within the I-105 Study Area. Similarly, in the westbound direction, there is a very high concentration of trips in and around LAX, with 87% of the trip destinations occurring within the I-105 Study Area. Thus, at this location, over 80 percent of the freeway trips have an origin or destination within the I-105 Study Area and most of those are at or near LAX. This portion of the freeway clearly serves the airport area and El Segundo employment center, as most of the trips at this location are heavily concentrated near the end of the freeway.

Figure 6.2 Freeway Trip Origins and Destinations at Nash Street – Eastbound



Source: SCAG Model, 2016

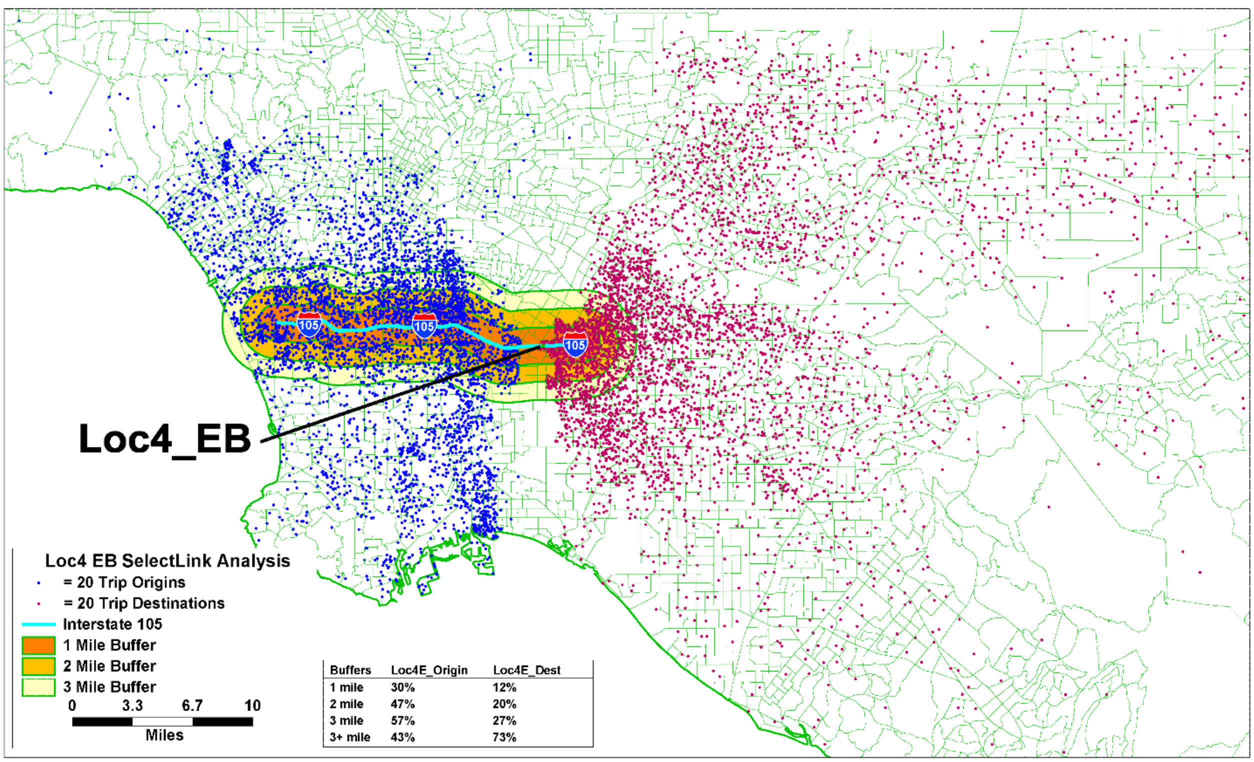
Figure 6.3 Freeway Trip Origins and Destinations at Nash Street - Westbound



Source: SCAG Model, 2016

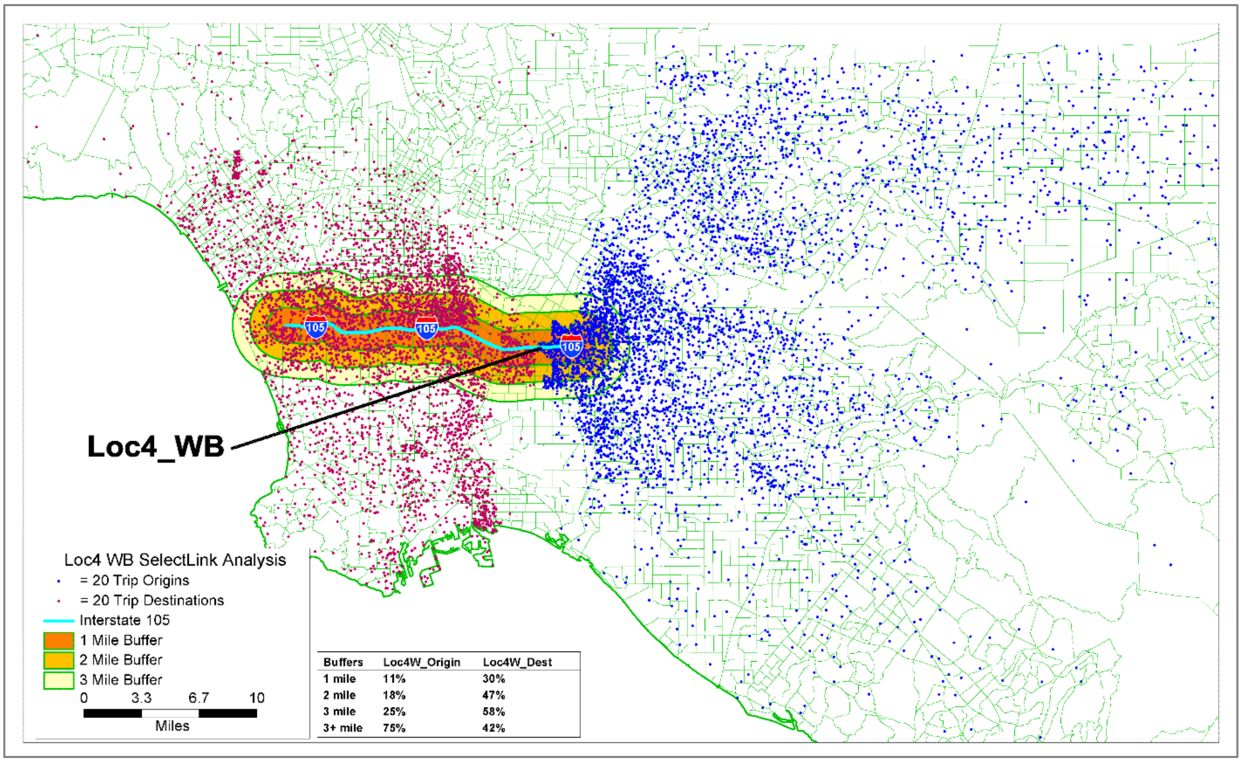
Figure 6.4 and Figure 6.5 illustrate trip origins and destinations for the easternmost analysis point near Lakewood Boulevard in the eastbound and westbound directions, respectively. As shown, in the eastbound direction near Lakewood Boulevard the trip origins are highly concentrated within three miles of the freeway and the trip destinations are more dispersed but still a large number are near the freeway within three miles. Over one half of the trip origins (57 percent) are within three miles of the freeway, while only 27 percent of the destinations are within three miles of the freeway. In the westbound direction near Lakewood Boulevard there is a concentration of trip destinations within in the I-105 Study Area (58 percent) but only 25 percent of trip origins. The origins of trips at this location are more highly dispersed throughout the County, possibly trips from the residential end to the airport and employment opportunities surrounding the I-105 Study Area.

Figure 6.4 Freeway Trip Origins and Destinations Near Lakewood Blvd - Eastbound



Source: SCAG Model, 2016

Figure 6.5 Freeway Trip Origins and Destinations Near Lakewood Blvd - Westbound

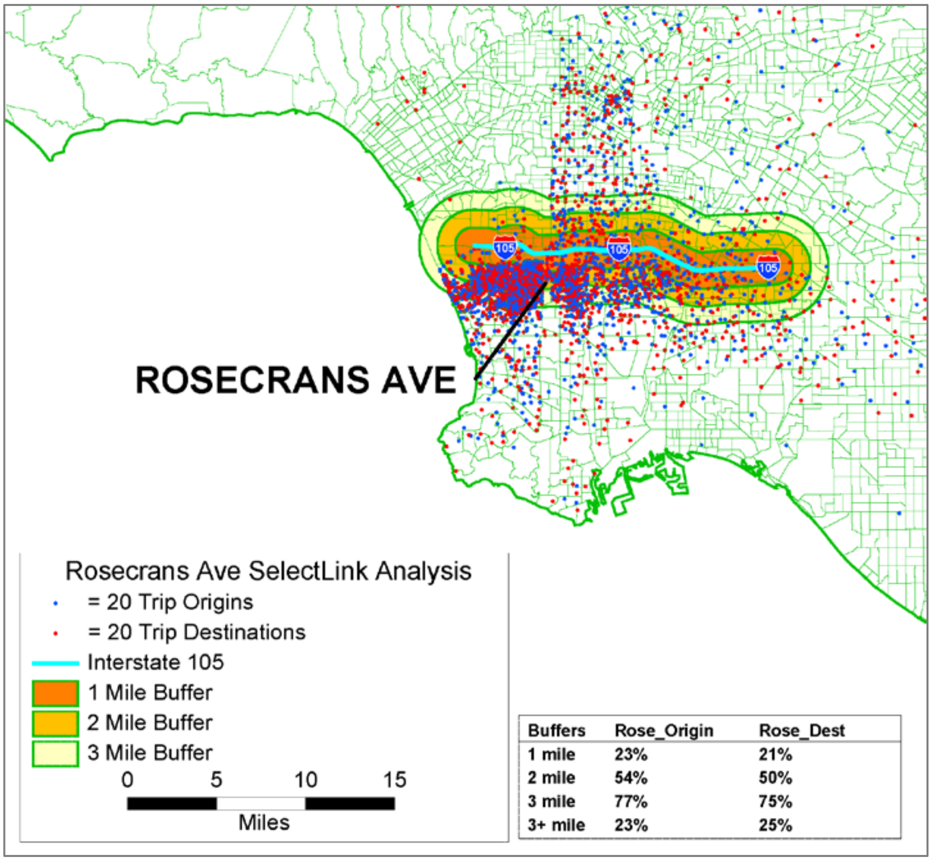


Buffers	Loc4W_Origin	Loc4W_Dest
1 mile	11%	30%
2 mile	18%	47%
3 mile	25%	58%
3+ mile	75%	42%

Source: SCAG Model, 2016

Figure 6.6 illustrates the results of the arterial select link analysis located along Rosecrans Avenue near Van Ness Avenue. The results show a significant concentration of trips starting and ending within three miles of the I-105 freeway, with much fewer origins and destinations occurring beyond the three-mile buffer. For trips at this location on Rosecrans Avenue at South Van Ness Avenue, the three-mile I-105 Study Area encompasses the majority of origin and destination zones (77% and 75%, respectively) for trips passing through this location. In other words, three-quarters of the trips that pass through this location both begin or end within the I-105 Study Area.

Figure 6.6 Arterial Trip Origins and Destinations



Source: SCAG Model, 2016

6.2 Trip Lengths

An analysis of eastbound and westbound travel shows that corridor users' average trip length is twice as long when using the freeway compared to major arterials (approximately 20 miles for freeway trips versus 10 miles for arterial trips). **Table 6.2** details the average trip lengths by origin zone, and **Table 6.3** shows average trip lengths by destination zone. Approximately half of eastbound and westbound travelers within the I-105 Study Area use I-105, while the other half use arterials.

Table 6.2 Trip Lengths by Origin Zone

Select Link Location	# of Trips *EB & WB*	% of Total Trips	Avg. Trip Length *miles*
West Century Boulevard	26,635	11%	8.58
West Imperial Highway	30,192	12%	9.62
I-105	130,381	52%	20.84
El Segundo Boulevard	31,218	12%	11.33
Rosecrans Avenue	32,003	13%	9.27
Total	**250,428**	**100%**	**15.52**

Table 6.3 Trip Lengths by Destination Zone

Facility	# of Trips *EB & WB*	% of Total Trips	Avg. Trip Length *miles*
West Century Boulevard	26,447	11%	8.58
West Imperial Highway	29,374	12%	9.45
I-105	132,460	53%	20.73
El Segundo Boulevard	30,482	12%	10.96
Rosecrans Avenue	30,979	12%	8.61
Total	**249,742**	**100%**	**15.42**

Source: SCAG Model, 2016

7.0 Complete Streets

The purpose of this section is to assess the active transportation and “Complete Streets” conditions of the I-105 Study Area. Complete Streets is a term used to describe roadways that are safe and accessible for all users, including bicyclists, pedestrians, transit users, motorists, and trucks. The State of California emphasized the importance of Complete Streets when they passed AB 1358, the California Complete Streets Act of 2008. AB 1358 requires local jurisdictions, when in the process of making major changes to their circulation elements of general plans, to identify how they will address the mobility needs of all roadway users. Soon after the passage of AB 1358, Caltrans issued Deputy Directive 64-R1 that recognizes that “all transportation improvements as opportunities to improve safety, access, and mobility for all travelers in California and recognizes bicycle, pedestrian, and transit modes as integral elements of the transportation system.”[13] The directive outlined a series of steps for Caltrans to institutionalize Complete Streets principles into planning, design, and funding efforts.

In 2014, the Metro Board adopted a Complete Streets Policy. While Metro does not own or operate the local roadways where Complete Streets principles can be applied, as the Regional Transportation Planning Authority (RTPA) for Los Angeles County, Metro is the programming authority for a variety of federal, state, and local funding sources. Metro’s Complete Streets Policy states the following, which demonstrates Metro’s commitment to supporting the principles of Complete Streets principles in local projects:

> *“Metro expresses its commitment to work with partner agencies and local jurisdictions to plan and fund Complete Streets that provide safe, comfortable, and convenient travel along and across streets (including streets, roads, transit facilities, highways, bridges, and other portions of the transportation system) through a comprehensive, integrated transportation network that serves all categories of users, including pedestrians, users and operators of public transit, bicyclists, persons with disabilities, seniors, children, motorists, users of green modes, and movers of commercial goods.”*

Complete Streets assessments must be sensitive to the context at the local level, and is therefore difficult to assess for a subregional focus area as large as the I-105 Study Area. The I-105 CSS will continue the Complete Streets needs assessment in future tasks, focusing on key corridors for more detailed analysis. For Task 4 of the I-105 CSS, the Complete Streets Assessment contains an assessment of the active transportation infrastructure and usage, an overview of transit ridership, a discussion of the factors that influence mode choice, and the multi-modal accessibility within the I-105 Study Area, and some of the common barriers to transit, bicycling, and walking in the I-105 Study Area. The I-105 CSS will continue the Complete Streets needs assessment in future tasks (Task 6 Development and Evaluation of Improvement Scenarios), focusing on key corridors for more detailed analysis.

The complete streets assessment contains the following sections:

- Active Transportation
  - Bicycle and Pedestrian Facilities
  - Walking and Bicycling Mode Share
  - Bicycle and Pedestrian Volumes
- Transit

[13] Deputy Directive DD-64-R1, California Department of Transportation, October 2008

- Demographic Factors Influencing Commute Patterns
- Multi-Modal Accessibility
  - First and Last Mile Connections to Transit
  - Origin and Destination Accessibility

7.1 Active Transportation

Active transportation generally refers to bicycle and pedestrian transportation, but can also include other wheeled devices such as scooters, wheel chairs, and skateboards. Active transportation is an important mode of transportation for short trips and to connect to other modes, most notably transit. Additionally, bicycle and pedestrian accommodation is often central to complete streets discussions due to the vulnerability of those modes. This section outlines the availability of bicycle and pedestrian facilities and data on active transportation trips in the I-105 Study Area.

7.1.1 Bicycle and Pedestrian Facilities

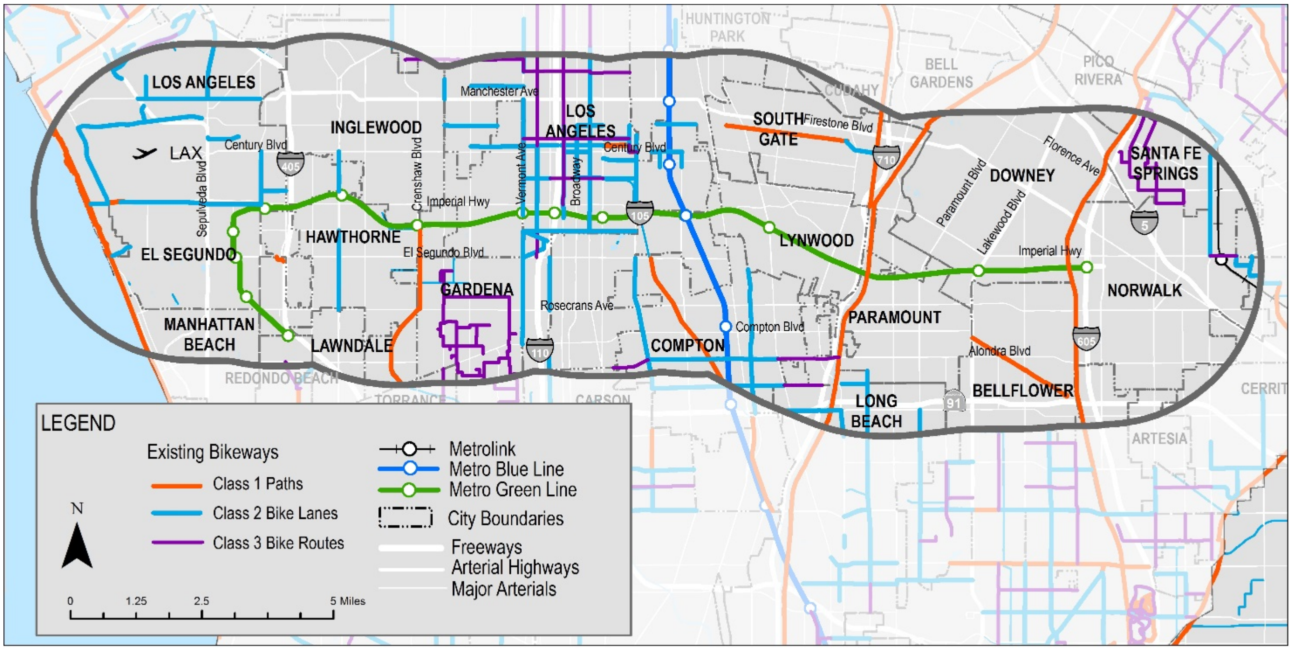
While most streets in the urbanized portion of LA County have sidewalks, there are some streets that lack sidewalks and many have sidewalks that are impassable, especially for people with disabilities, due to disrepair or obstructions. Unfortunately, there is no centralized inventory of functional sidewalks in LA County. However, there is better data on the presence of dedicated bike facilities; SCAG maintains a consolidated list of bicycle facilities for the six county region, based on input from local jurisdictions (see **Table 7.1**). **Figure 7.1** displays the existing bicycle facilities in the Study Area.

Table 7.1 Bicycle Facility Mileage by Type

Facility Type	Miles in LA County	Miles in I-105 Study Area
Class 1 – Path	346	36
Class 2 – Bike lanes	1,054	89
Class 3 – Bike route	612	41
Class 4 – Cycle Track	7	0

Source: SCAG 2016, Self-Reported by Local Jurisdictions

Figure 7.1 Existing Bicycle Facilities in I-105 Study Area

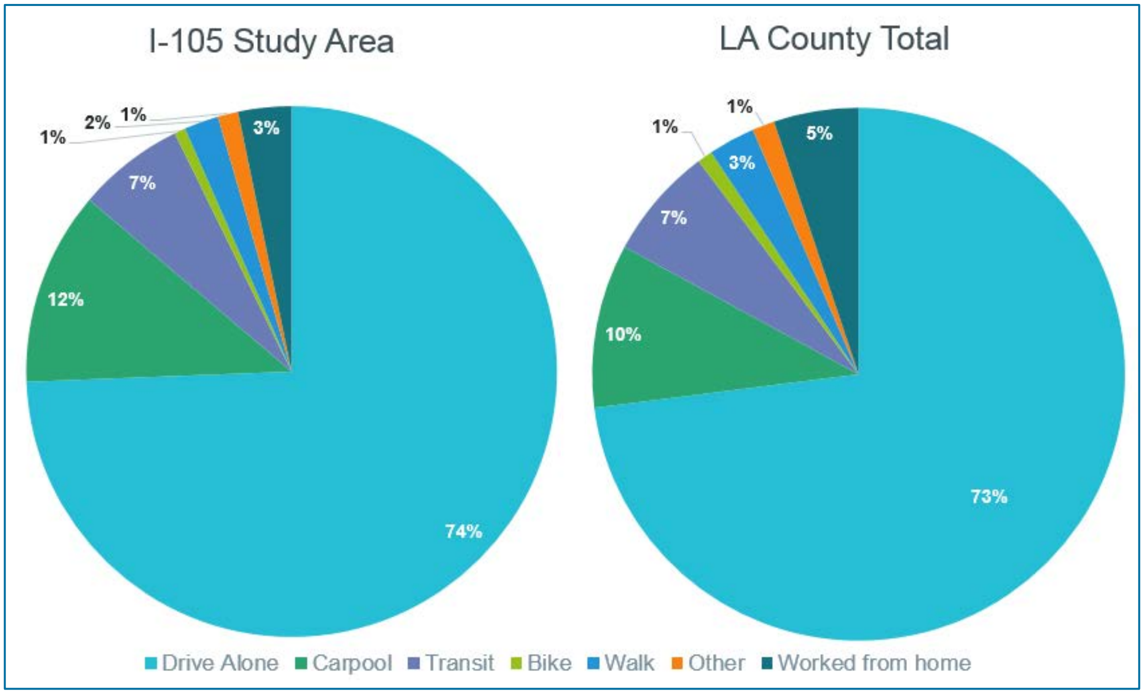


7.1.2 Walking and Bicycling Mode Share

Mode choice for residents of the I-105 Study Area is similar to the Los Angeles County average. In the I-105 Study Area, in 2015, 2% of residents used walking as their primary means to work while 1% bicycled (See **Figure 7.2**). The walk commute mode share is slightly lower than the LA County average, likely due to the fact that the jobs and housing are concentrated in different areas within the corridor. While the bicycling commute mode share in LA County is modest, at 0.9%, it has seen a 56% increase since 2006.[14] **Figure 7.3 and Figure 7.4** highlight the bicycle and pedestrian commute mode share, respectively, for Census Block Groups in the I-105 Study Area. Some parts of the I-105 Study Area have bicycle commute mode shares exceeding 15%, specifically in Lawndale and Bellflower. Roughly 50% of employees who live in the area near Loyola Marymount University in the Westchester neighborhood of Los Angeles walk to work. However, the prevalence of Census Block Groups that have higher bike and walk mode shares is lower in the I-105 Study Area than the LA County average; over 2% of all Census Blocks Groups in the I-105 Study Area have bike commute mode shares over 5%, compared to 5% of block groups countywide, and 3% have walk commute mode shares over 10%, compared to 5% countywide.

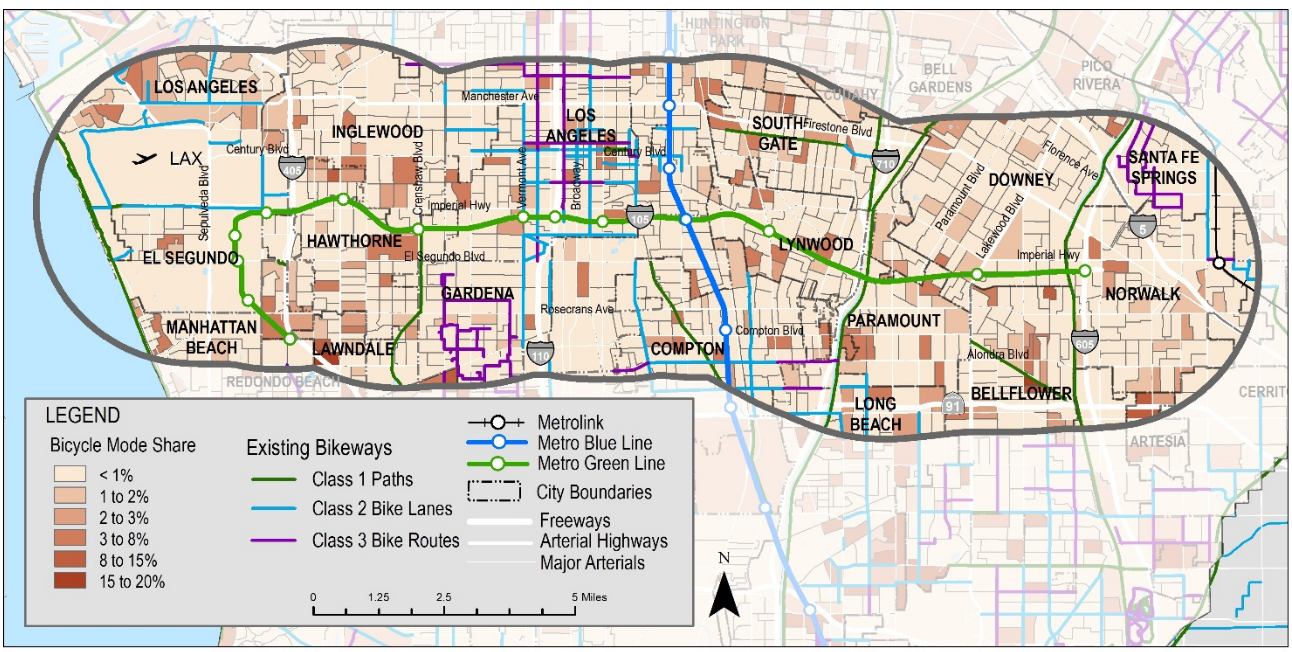
[14] American Community Survey, 2006 and 2015

Figure 7.2 Mode share for commute trips



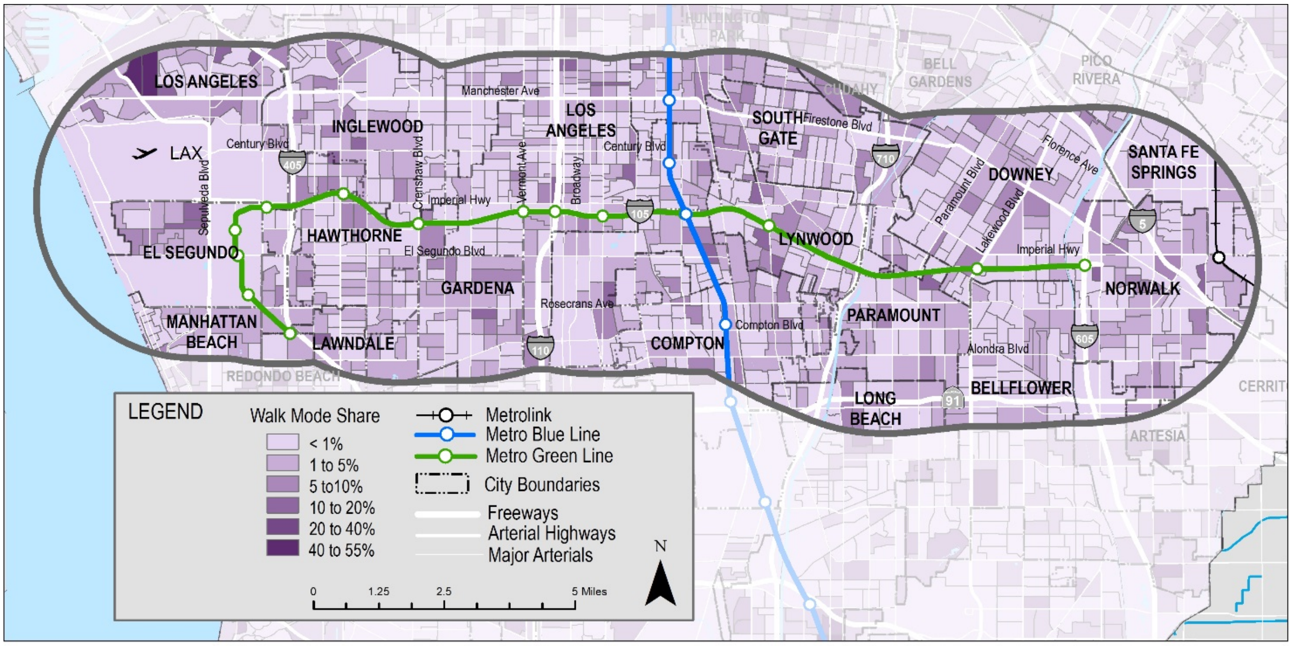
Source: ACS 2015, 5-year estimates.
*Other includes Taxicab, Motorcycle, and "Other means"

Figure 7.3 Bicycle Commute Mode Share in I-105 Study Area



Source: American Community Survey, 2015 5-year Estimates

Figure 7.4 Walk Commute Mode Share in I-105 Study Area



Source: American Community Survey, 2015 5-year Estimates

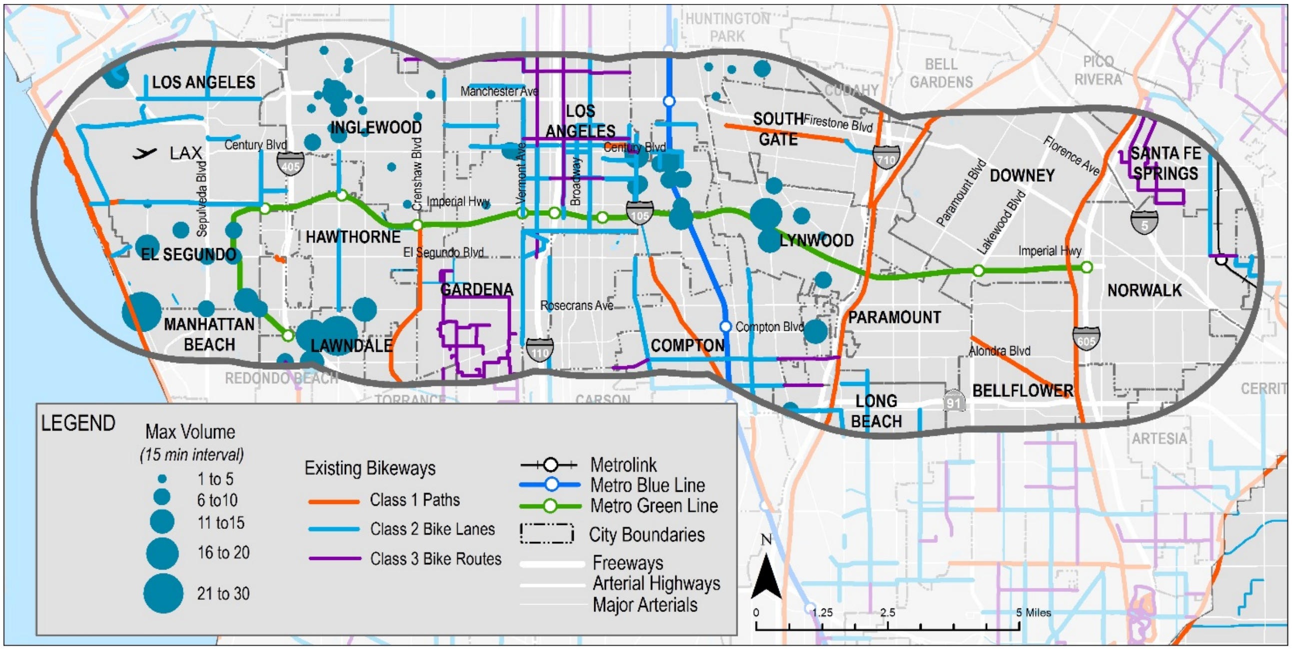
7.1.3 Bicycle and Pedestrian Volumes

Commute mode share estimates often under represent the importance of active transportation because they ignore other utilitarian trips and linked commute and non-commute trips. For instance, while a traveler may use a private vehicle or transit as their primary mode to travel the largest distance, biking and walking may be used at the beginning or the end of the journey. Discussed below in **Section 7.4**, walking is the most common means of transportation transit riders use to access public transit, and even people who drive may start or end their trip as a pedestrian. Furthermore, commute trips make up a relatively small portion of all trips. In contrast to the Census data, the California Household Travel Survey (CHTS) captures travel behavior from a sample of the population for all trips. An analysis of the 2012 CHTS for Los Angeles County estimate the bicycle mode share in LA County for all trips is 1.2% and 11.2% for walking trips.[15]

SCAG, in partnership with UCLA, maintains a Bicycle Data Clearinghouse (BDC) for the region. The data in the BDC is supplied by the organizer of the count, normally a local city or a regional advocacy organization (e.g., the Los Angeles County Bicycle Coalition). There are 76 count locations in the I-105 Study Area; **Figure 7.5** shows the count locations and the maximum volume observed during a 15 minute interval.

[15] California Household Travel Survey, 2012.

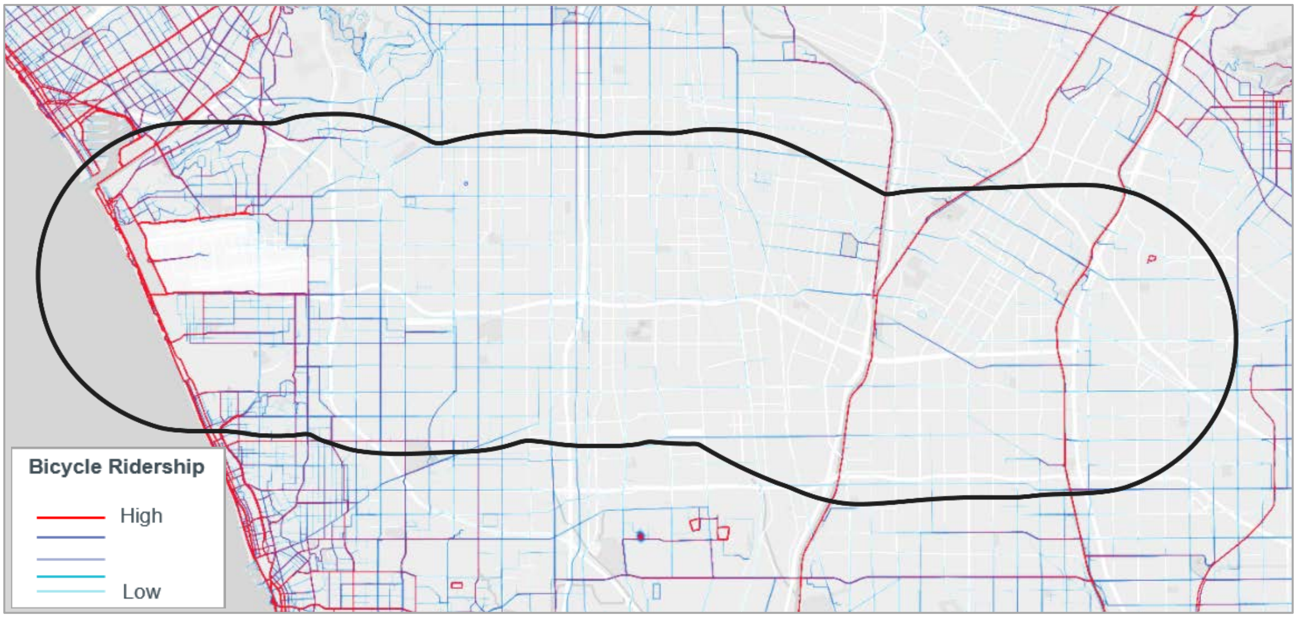
Figure 7.5 Active Transportation Count Locations and Data in Study Area



Source: SCAG/UCLA Bicycle Data Clearinghouse

There is also limited data on bicycle and walking route selection in the I-105 Study Area. Strava, a fitness tracking application popular for runners and cyclists, releases anonymized data collected from users worldwide. **Figure 7.6** shows a heatmap of activity in and around the I-105 Study Area. With some exceptions, there is very little Strava activity near the Census Block Groups with high levels of bicycle commute mode share. This a criticism of using fitness tracking applications for data collection: Strava users tend to be bicycling for recreational purposes and favor the bike paths (LA River Path, San Gabriel River Path, and beach path) or roadways to access the paths. The Strava heatmap shows virtually no activity in the north/central part of the I-105 Study Area, an area that has high numbers of bicycle collisions. It should be noted that Strava is a fitness application popular with recreational runners and cyclists. It represents a small subset of pedestrians, runners, and bicyclists and does not fully reflect active transportation usage in the area. **Figure 7.6** shows that there is little Strava data in the central part of the study area, which likely represents the lack of application of fitness tracking in this area as opposed to a general lack of bicycle usage. Nevertheless, it can provide an indication of popular locations for recreational bicycling and running where fitness tracking is being used.

Figure 7.6 Strava Heatmap of Bicycle Usage in I-105 Study Area



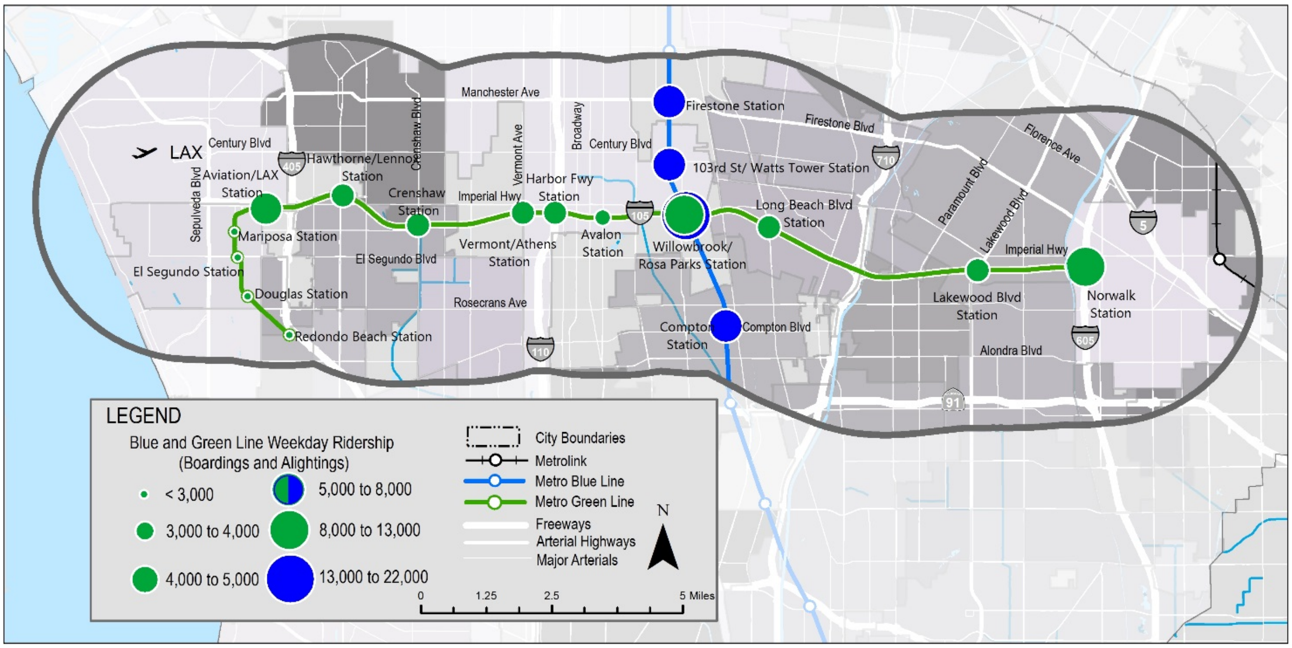
Source: Strava, Inc. Strava Labs 2017 heatmap

7.2 Transit

Transit is an important part of Complete Streets. The section below summarizes some of the transit data discussed above in **Section 3.0.**

Two of the Los Angeles Metropolitan Transportation Authority's (Metro) rail lines have stations in the I-105 Study Area. The Blue Line has higher per station ridership than the Green Line within the I-105 Study Area, but some Green Line stations, such as WIllowbrook/Rosa Parks, Aviation/LAX, and Norwalk have significant daily ridership. **Figure 7.7** shows the station locations for the Blue and Green Lines and highlights the total weekday boardings and alightings.

Figure 7.7 Metro Rail Ridership by Station, Average Weekday Boardings and Alightings



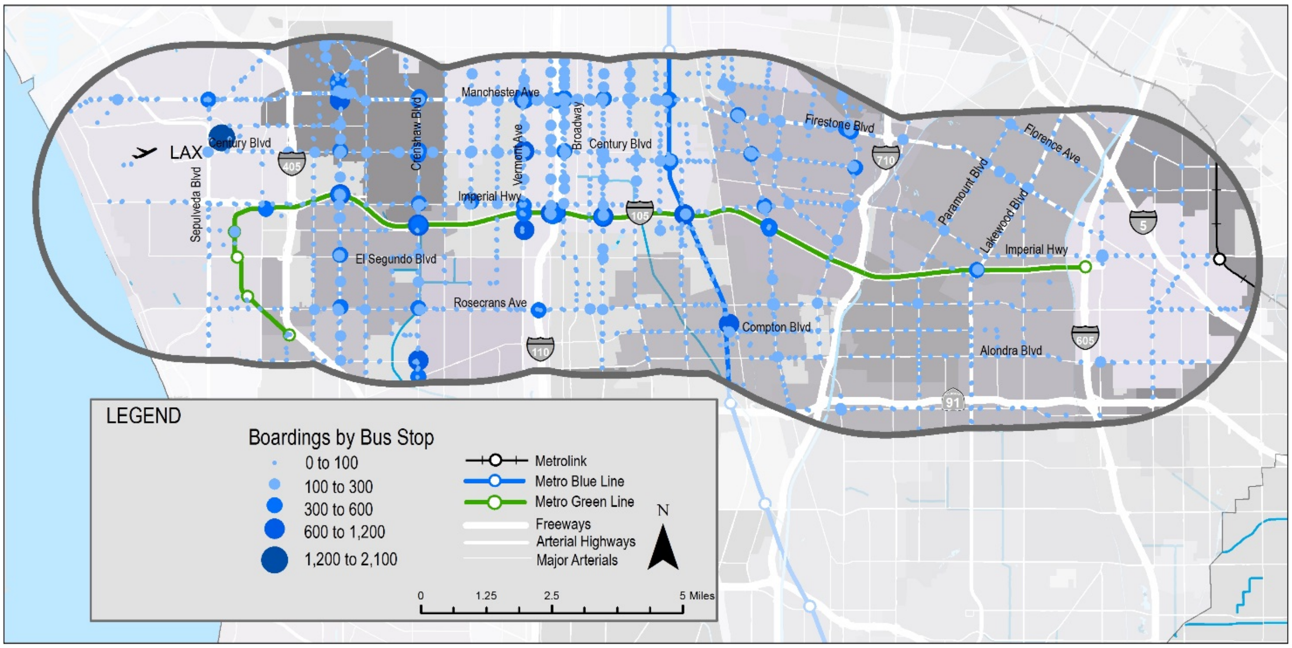
Source: LA Metro, October 2017

The I-105 Study Area represents a significant proportion of Metro's countywide bus ridership. The I-105 Study Area bus stops contribute to over 12% of all weekday boardings in Metro's bus system, but contains 16% of Metro's bus stops and 14% of the population of LA County. Average boardings by bus stop is displayed in **Figure 7.8**. Unsurprisingly, some of the more productive lines, in terms of ridership per stop,[16] are the Metro Rapid lines and the Metro Silver Line. The Metro Rapid 754 on Vermont Avenue and 757 on Western Avenue have high ridership per stops in the Study Area. Route 115, an east/west route which traverses the entire corridor on Manchester/Firestone, features the highest total daily ridership in the Study Area as well as the greatest total number of bus stops.

North/South Metro bus lines show greater ridership on average in the Study Area. There are multiple potential reasons for this. All Metro Rapid routes run north/south and four directly feed Metrorail stops on the Green Line. Fewer Metro routes run parallel to I-105 in the Study Area; the Metro Green Line and municipal/local operators offer service for east and westbound transit trips. However, as noted above, east/west route 115 has the highest total ridership in the Study Area, followed by route 117 on Century Blvd.; two local routes with many stops and frequent service. Frequent service is one of many factors that influence transit ridership. **Figure 7.9** highlights average frequency, by Metro bus line, in the morning period during weekends.

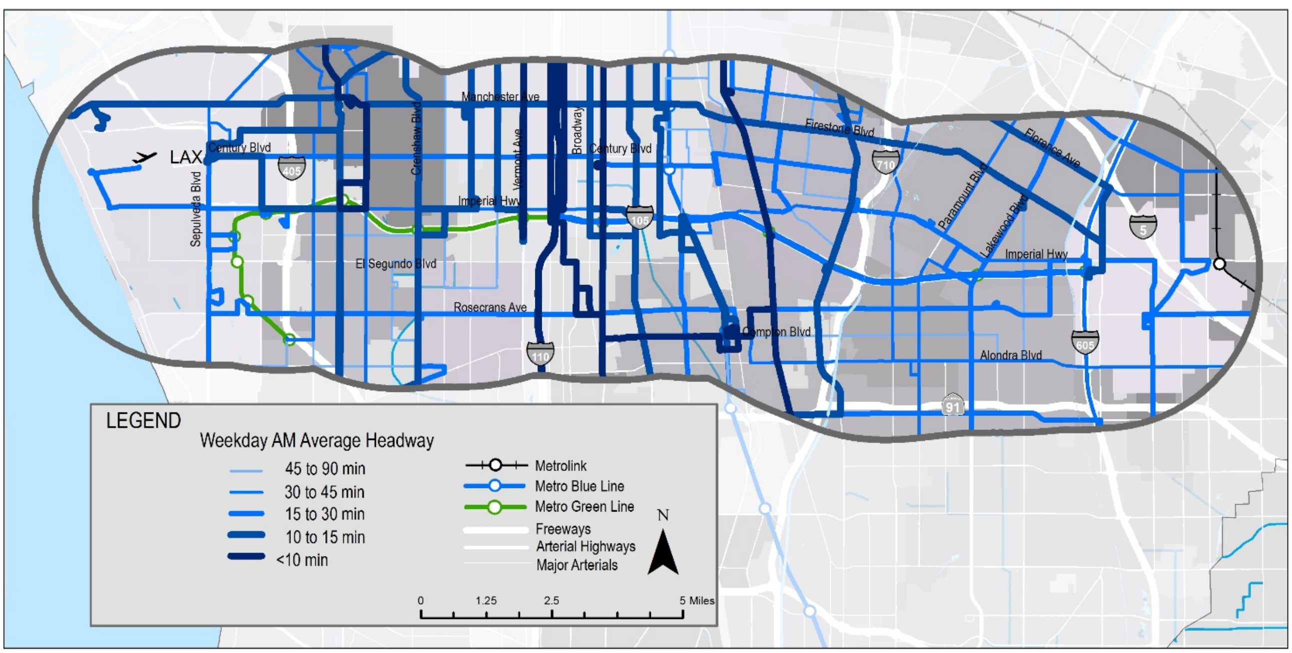
[16] This analysis does not include vehicle revenue hours or revenue miles in the analysis of productivity.

Figure 7.8 Metro Bus Ridership in Study Area by Stop, Average Weekday Boardings



Source: LA Metro, October 2017 Ridership Data

Figure 7.9 Metro Bus Frequency by Line, Average AM Headways



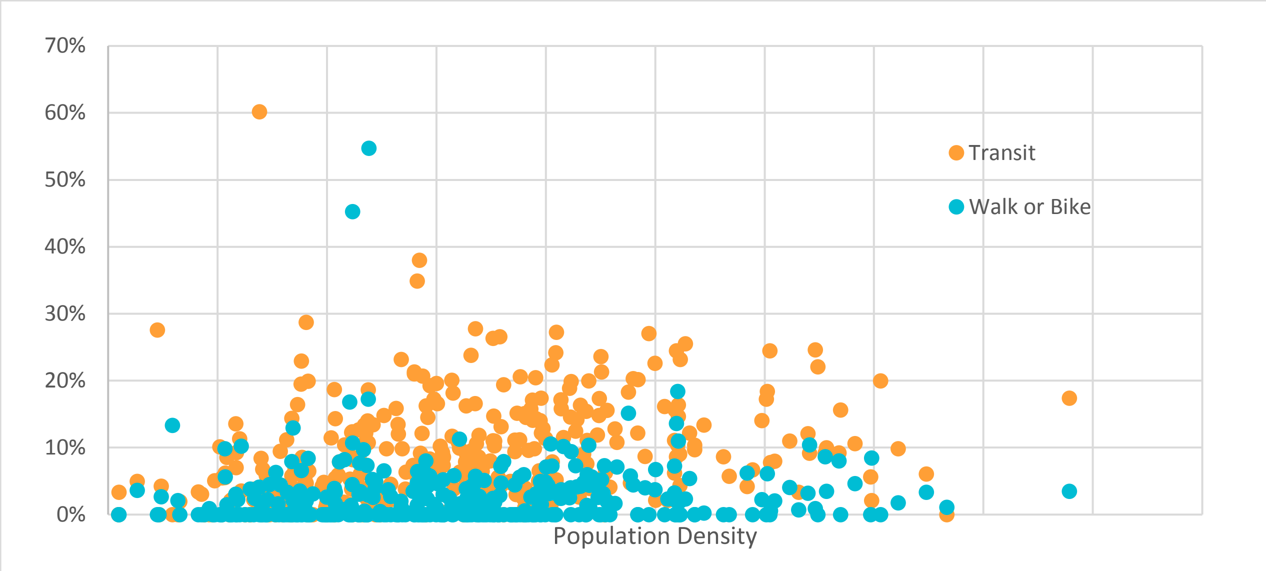
Source: LA Metro, October 2017 Frequency Data

7.3 Demographic Factors Influencing Commute Patterns

This section explores the relationship between socioeconomic characteristics of an area and the propensity of the residents to walk, bike, or take transit to work. **Figure 7.10 through Figure 7.14** compare five different variables against the percent of households in a Census Block Group that walk or bike (combined) or take transit as their primary mode of transportation to work in the I-105 Study Area. There are many factors that contribute to mode choice, and this only looks at commute mode choice, so these comparisons are not intended to full explain the region's mode choice. The five variables are:

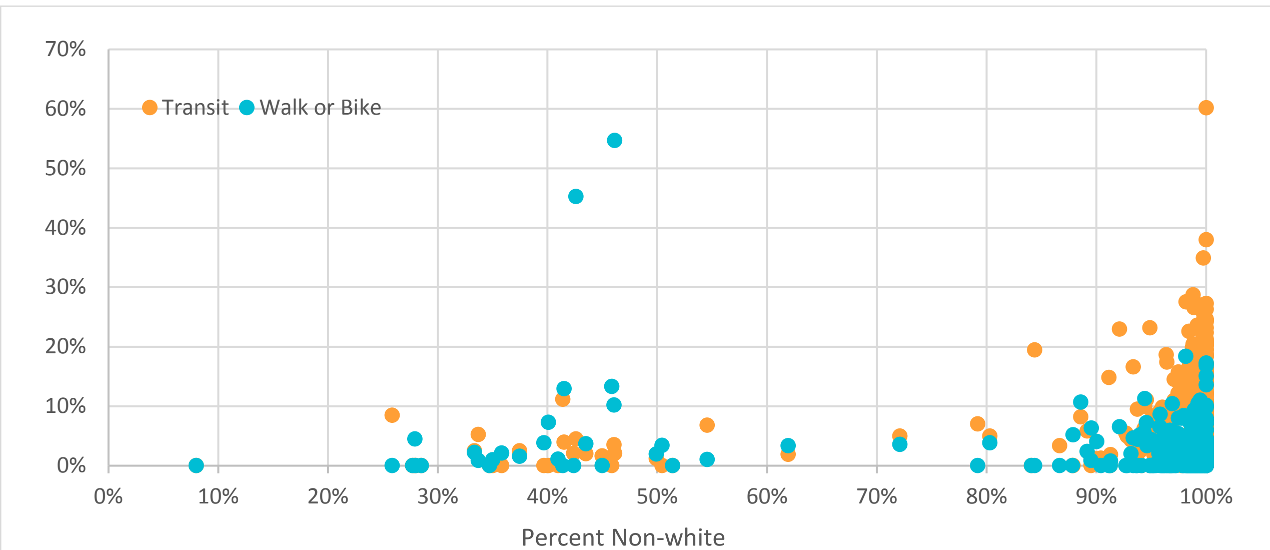
- Population density **(Figure 7.10)** – As research suggests, it appears that as population density increases, transit commute mode share increases a bit and then plateaus. Low-density areas are clearly not great for transit commuters; however, density is not the only factor driving commute mode share for transit (or active transportation).
- Percent non-white **(Figure 7.11)** – while the percent minority appears correlated with higher rates of active transportation and transit, the chart really demonstrates the fact that the I-105 Study Area has many Census Block Groups with non-white populations exceeding 90%.
- Median household income **(Figure 7.12) –** this chart shows an interesting but subtle trend median income and transit commute mode share: Census Block Groups with higher and lower median incomes tend to have higher transit commute mode shares than middle income.
- Percent of households with income below poverty level **(Figure 7.13)** - there is a subtle but apparent correlation between the percent of households below the poverty level and transit commute mode share. There some outliers because this is not the only factor influencing transit ridership; some Census Block Groups with zero percent of households below the poverty level having higher commute mode shares.
- Percent of households with zero cars **(Figure 7.14) –** zero vehicles in the house has a small impact on transit commute modeshare; as the percent of households with zero vehicles increases, the prevalence of low transit commute modeshares decreases.

Figure 7.10 Non-Auto Journey to Work and Population Density



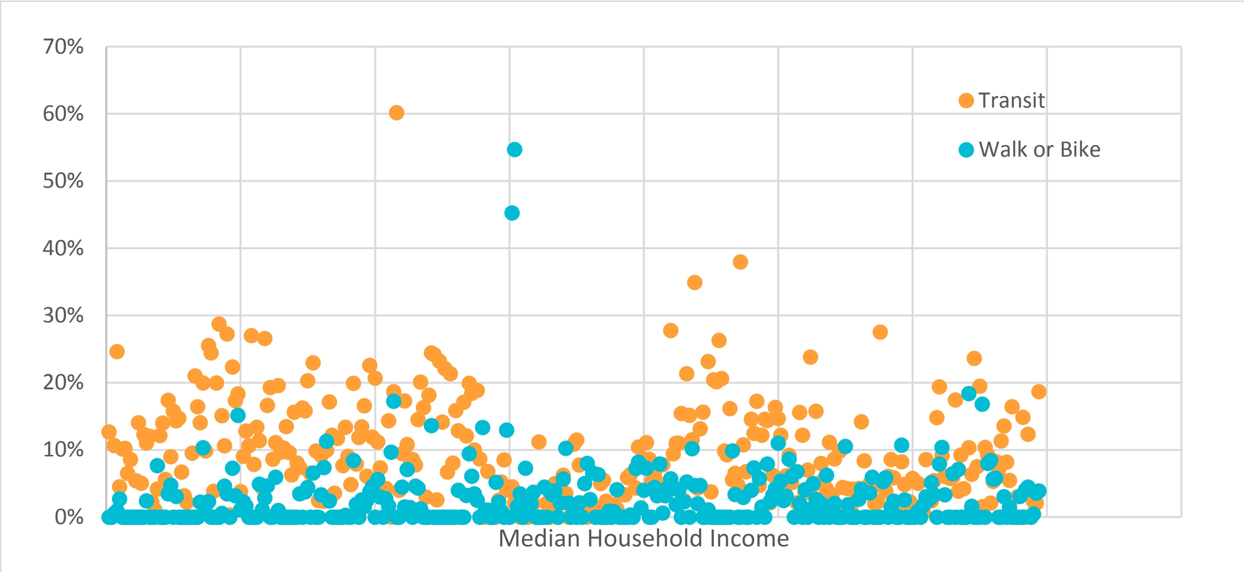
Source: ACS 2015, 5-year estimates

Figure 7.11 Non-Auto Journey to Work and Percent Non-White



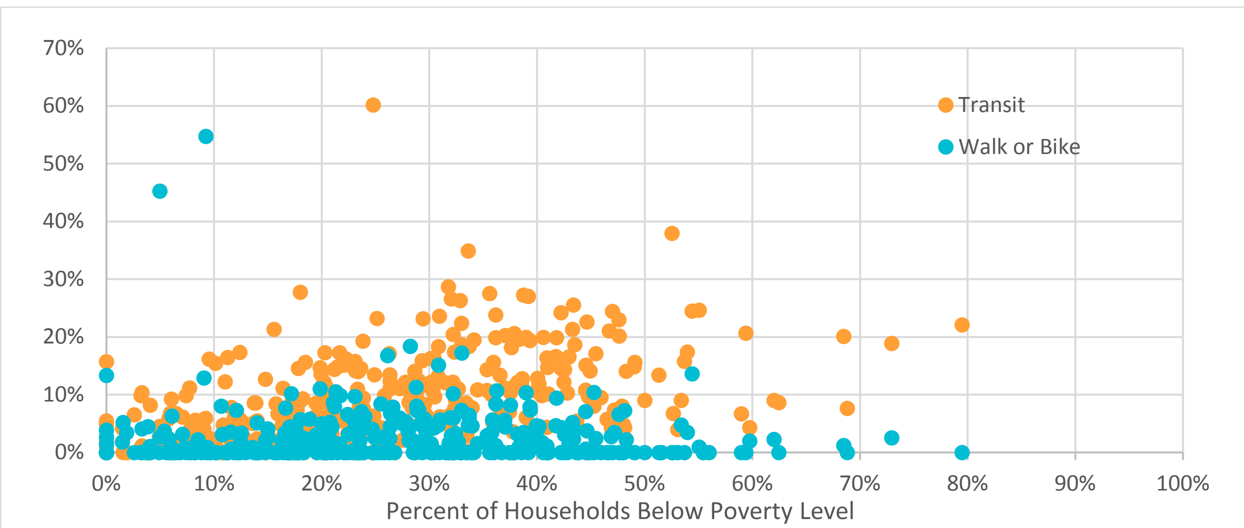
Source: ACS 2015, 5-year estimates

Figure 7.12 Non-Auto Journey to Work and Median Income



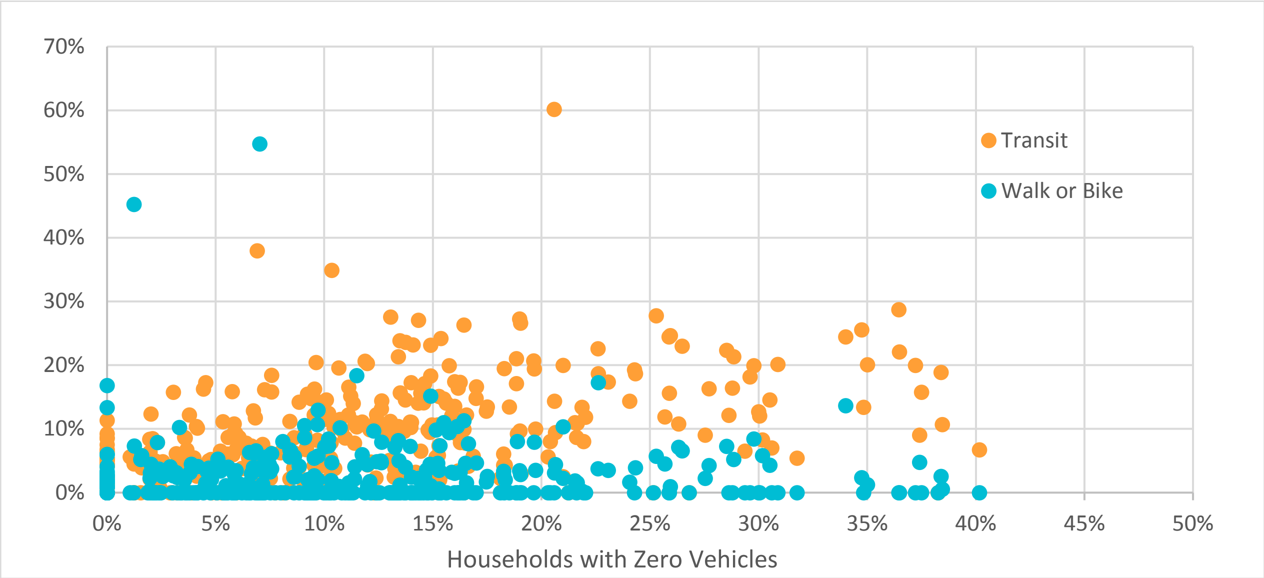
Source: ACS 2015, 5-year estimates

Figure 7.13 Non-Auto Journey to Work and Percent Below Poverty Level



Source: ACS 2015, 5-year estimates

Figure 7.14 Non-Auto Journey to Work and Percent Zero Car Households



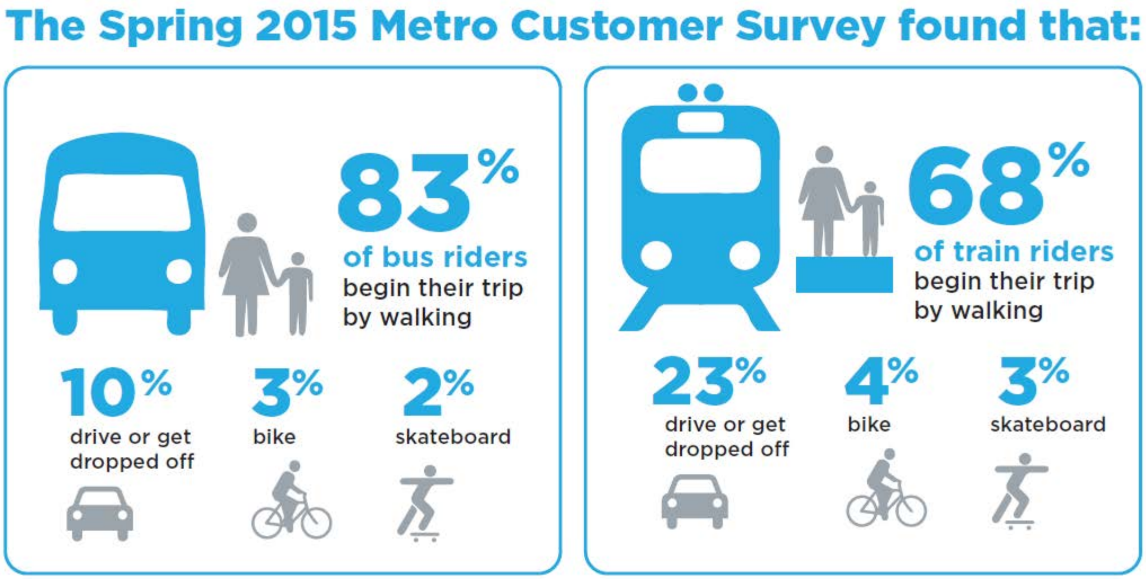
Source: ACS 2015, 5-year estimates

7.4 Multi-Modal Accessibility

7.4.1 First and Last Mile Connections to Transit

As mentioned above, walking and bicycling play an important role for connecting transit riders from their home or work to buses and trains. Metro's 2015 Customer Survey found that 83% of bus riders and 68% of train riders begin their trip by walking, with an additional 3% bicycling to buses and 4% bicycling to trains (See **Figure 7.15**).

Figure 7.15 Connecting to LA Metro Transit



Source: LA Metro Active Transportation Strategic Plan, Appendix A, citing data from 2015 survey

Metro adopted their First/Last Mile Strategic Plan in 2014 in order to provide resources and policy framework to address how transit riders get to transit (the first mile) and access their final destination (the last mile).[17] To implement the recommendations included in the Strategic Plan, Metro intends to create specific First/Last Mile plans for each existing fixed guideway station and will incorporate First/Last Mile efforts in future station construction. First/Last Mile planning efforts were recently completed for each Blue Line station in the I-105 Study Area as well two existing Green Line stations and several planning Crenshaw Line stations in Inglewood.

One way to quantify First/Last mile connectivity is to measure the density of bicycle facilities around the station area. While this does not accurately describe the conditions that bicyclists experience, it can be used to compare efforts or investments in First/Last Mile infrastructure. **Table 7.2** shows that the station areas in the I-105 Study Area have few surrounding Class 1 (path) and Class 2 (bike lanes) than the county average.

Table 7.2 Bicycle Facility Density around Fixed Guideway Stations

Bicycle Facility Density	I-105 Study Area	LA County
Class 1 or 2 bikeway mileage within ½ mile of fixed guideway transit (miles/stop)	0.9	1.4

Source: SCAG 2016, Self-Reported by Local Jurisdictions

7.4.2 Origin and Destination Accessibility

Another measure of transit accessibility is the proximity of high quality transit services to population groups or employment centers. However, the definition of what qualifies as a high quality transit service varies. Two often used definitions are fixed guideway services or fixed route systems with peak headways of 15 minutes or less. **Table 7.3** shows the population and jobs "accessible" to high quality transit in the I-105 Study Area using both definitions: within one-half mile of fixed guide transit stations and within one-quarter mile of bus routes with morning peak headways of less than 15 minutes. In the I-105 Study Area, 14% of jobs and 10% of households are within one half mile of a fixed guideway transit station, and 44% of jobs and 40% of households are within one-quarter mile of frequent bus service (or fixed guideway service). It should be noted that this study includes only data from Metro; frequency information was not available from municipal operators. Therefore, there are large areas where municipal transit providers operate which may have frequent enough service to qualify as "high quality" for the bus services.

Table 7.3 Transit Accessibility Measures

Performance Measure	Number accessible	% of I-105 Study Area
Jobs near transit		
• Within ½ mile of fixed guideway transit	65,451	14%
• Within ½ mile of fixed guideway transit and ¼ mile of 15 min headway buses	202,914	44%

[17] Metro First/Last Mile https://www.metro.net/projects/sustainability-first-last/

Performance Measure	Number accessible	% of I-105 Study Area
Households near transit		
• Within ½ mile of fixed guideway transit	40,906	10%
• Within ½ mile of fixed guideway transit and ¼ mile of 15 min headway buses	187,856	47%

Source: SCAG 2016 RTP/SCS (jobs), ACS 2015, 5-year Estimates (households)

Table 7.4 displays the social equity performance measures related to transit accessibility, for minority households, low-income households, and aging populations. For minority and low-income households, the transit service provided in the I-105 Study Area is accessible by a greater percentage than the I-105 Study Area as a whole (shown in **Table 7.3**). For populations over 65, the percentage is lower; efforts to better serve senior populations

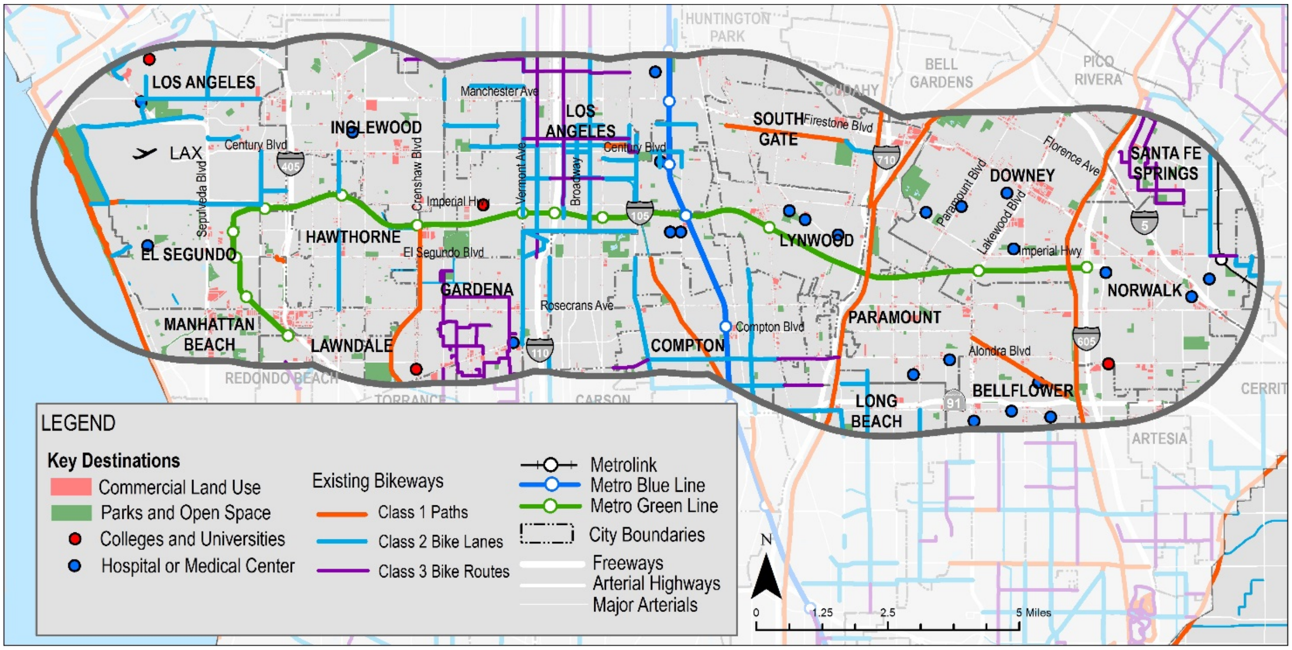
Table 7.4 Transit Equity Measures

Performance Measure	Number accessible	% of I-105 Study Area
Non-white population near transit		
• Within ½ mile of fixed guideway transit	152,016	12%
• Within ½ mile of fixed guideway transit and ¼ mile of 15 min headway buses	639,610	49%
Low-income households near transit		
• Within ½ mile of fixed guideway transit	18,361	11%
• Within ½ mile of fixed guideway transit and ¼ mile of 15 min headway buses	83,048	52%
Population over 65 near transit		
• Within ½ mile of fixed guideway transit	11,824	8%
• Within ½ mile of fixed guideway transit and ¼ mile of 15 min headway buses	57,528	40%

Source: SCAG 2016 RTP/SCS (jobs), ACS 2015, 5-year Estimates (households)

Figure 7.16 highlights some key destinations (commercial districts, parks, colleges, and hospitals) and their proximity to bicycle facilities. **Table 7.5** details the total number of key destinations accessible within one-quarter mile of a Class 1 or 2 bike facility as well as the percent accessible relative to the total destinations in the I-105 Study Area. The table highlights the fact that parks and recreational facilities are better served by bike facilities than other destination types.

Figure 7.16 Bicycle Facilities and Key Destinations



Source: SCAG 2016, Self-Reported by Local Jurisdictions. LA County Location Management System, 2016

Table 7.5 Destinations Accessible by Bike Lines or Paths

Destinations accessible within ¼ mile of Class 1 or 2 bikeways	# in I-105 Study Area	% of Destinations in Area
• Libraries	5	15%
• Schools	171	25%
• Health care facilities	114	24%
• Parks and Recreation	1,511 acres 75 locations	47% 34%

Source: SCAG 2016, Self-Reported by Local Jurisdictions. LA County Location Management System, 2016

7.5 Complete Streets Needs Assessment

This technical memorandum is the first step to identify the deficiencies in the I-105 Study Area related to Complete Streets. As noted before, a high level screening of the entire I-105 Study Area does not offer meaningful solutions to address barriers facing all roadway users. In later efforts as part of the I-105 CSS, specific corridors will be analyzed to identify specific barriers and recommended solutions. However, existing data sources and studies offer a high-level look at the Complete Streets deficiencies in the I-105 Study Area.

7.5.1 Barriers to Transit Usage

As noted previously, transit ridership in Southern California has decreased significantly over the past few years. There are many potential reasons for this decline, none of which tell the whole story. A recent study published by the UCLA Institute of Transportation Studies attributes much of the decline in ridership to a growth in car ownership.[18] The correlation between the increase in auto ownership and decline in per capita ridership throughout Southern California is strong; however, the root cause of the increase in car ownership is unknown. The causes may include a post-recession recovery, cheaper gas prices, increased numbers of licensed drivers, the rise of transportation network companies (e.g. Uber and Lyft), displacement caused by gentrification, and other contributing factors.

The Transit Center, in their 2016 study, categorizes transit users in three typologies: occasional riders, commuters, and all-purpose riders.[19] The study found that occasional riders make up the majority of transit riders (53%), but estimated they make only 13% of all transit trips nationwide. The frequent all-purpose riders make up less than 1/3 of transit riders, but make 55% of all transit trips. These categories of transit riders, as well as the “former riders” and “non-riders” are important to understand when addressing the barriers for transit usage. Frequent riders, former riders, and non-riders have different levels of satisfaction with various transit service aspects. Individuals have different perceptions of the importance of travel time, price, convenience, accessibility, safety, frequency, and other factors.

The Transit Center’s survey found that, of those riders who were “unlikely to recommend transit to others”, the most common reasons were that the frequency of service and travel times were inadequate. Safety and unpleasantness were not as important of factors. However, Metro’s surveys have found that for former riders and non-riders, safety is a major reason for not using transit, but for current riders, Metro’s recent on-board customer satisfaction survey found that most people feel safe on buses (90%) and trains (79%).[20] Interestingly, the on-board survey found that, among current riders, 15% of bus riders and 21% of train riders had experienced some form of sexual harassment. While safety, quality, and station amenities may be more important for certain segments of the transit riding population, speed, reliability, and accessibility are a consideration for all segments. Complete Streets practices have the potential to make transit more attractive and competitive with other modes.

7.5.2 Barriers to Walking and Bicycling

Common barriers to walking and bicycling include concerns over safety, distance, time, weather, and topography. The I-105 Study Area, and the region in general, has the climate and topography that make bicycling and walking attractive year round. Since many non-commute trips are less than three miles, travel time and distance should not be a limiting factor for certain trips. However, the lack of dedicated facilities for bicycling and high speeds and high volumes of auto and truck traffic create bicycling conditions in many parts of the I-105 Study Area that are not suitable for inexperienced riders. The South Bay Bicycle Master Plan found that 41% of bicyclists counted region-wide were riding on the sidewalk.[21] This suggests that bicyclists often do not feel safe sharing the roadway with vehicular traffic. Bicyclist and pedestrian safety is a major concern the I-105 Study Area**. Figure 7.17** displays the 2,524 collisions involving bicyclists and the 3,409 collisions involving pedestrians in the I-105 Study Area that resulted in the injuries.

The presence of high volumes of vehicles, especially heavy duty trucks, is also a deterrent to bicycling and walking. **Figure 7.18** displays LA Metro’s Countywide Strategic Truck Arterial Network (CSTAN) along with

[18] Falling Transit Ridership: California and Southern California, UCLA ITS, 2018

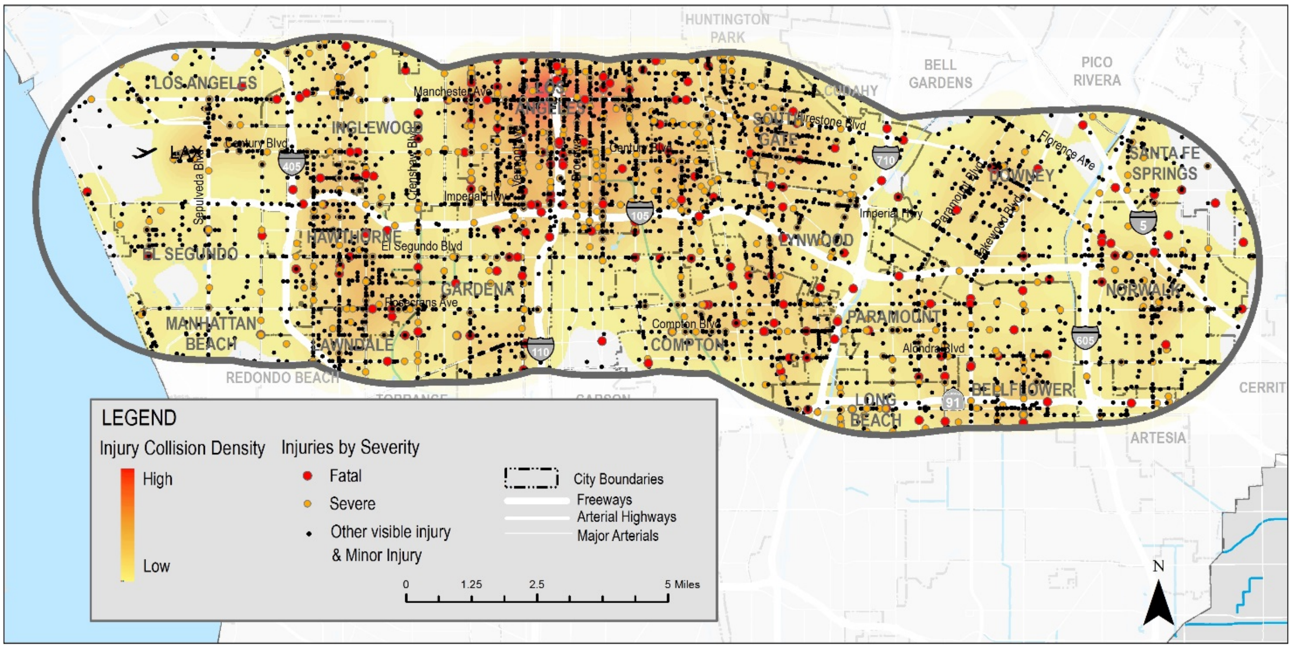
[19] Who’s on Board,

[20] Metro On-Board Survey Results + Trend Report, Fall 2017

[21] South Bay Bicycle Master Plan, Alta Planning + Design, 2011

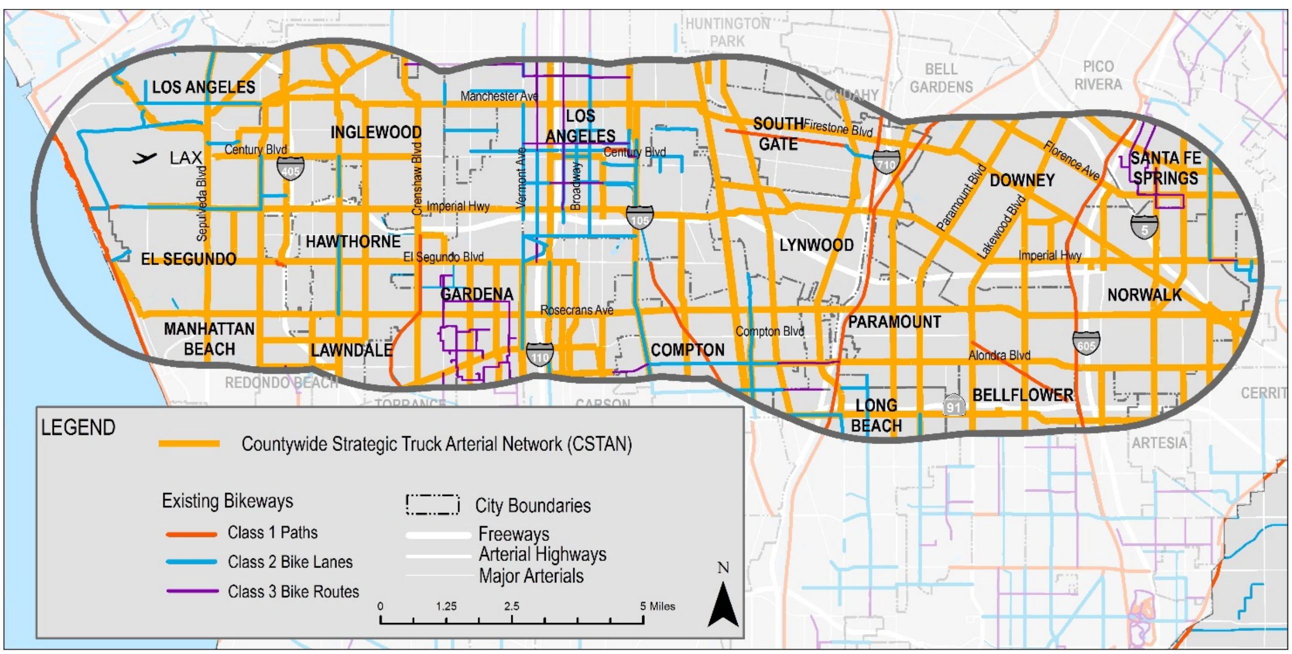
the existing bikeways. Many of the primary arterials in the I-105 Study Area are on the CSTAN and may experience heavier truck volumes than non-CSTAN roadways. Complete Streets principles apply to all modes and are sensitive to the local conditions. Highly travelled arterials and truck routes that carry significant truck volumes may not be good candidates for active transportation improvements, unless an alternative route cannot be identified.

Figure 7.17 Bicycle and Pedestrian Injury Collisions, 2012-2016



Source: SWITRS, 2012-2016

Figure 7.18 Truck Routes and Bike Facilities in I-105 Study Area



Source: LA Metro, 2015

A survey conducted as part of the South Bay Bicycle Master Plan found that the lack of on-street bike lanes was the biggest barrier preventing more utilitarian bicycling.[22] As displayed above in Figure 7.16, there are some dedicated bicycle facilities; however, there is a lack of connectivity between the bicycle facilities, few facilities travelling east/west, and few than connect to major transit hubs.

Several studies have been completed or are underway that examine the existing bicycle and pedestrian conditions in specific geographic areas and make recommendations for improvements. These studies, including the Gateway Cities Strategic Plan, the Metro Active Transportation Strategic Plan, the Metro Blue Line First Last Mile Plan, and others will be utilized to identify potential project ideas for the improvement scenarios. Metro recently completed the First Last Mile Plan for each Blue Line station.[23] The Plan included a walk audit surrounding each station and the identification of access barriers. The Plan identified the following barriers for the four stations in the I-105 Study Area:

- **Firestone Station:** The walk audit noted that the surrounding area lacks adequate sidewalks; many are narrow and have physical barriers that impede pedestrian access. Other barriers to walking to the station include missing crosswalks, lack of lighting, lack of curb ramps, and excessive litter and graffiti. The audit noted that bicyclists were observed riding on sidewalks; the surrounding area contains no dedicated bicycle facilities.

- **103rd St/Watts Tower Station:** There is a lack of dedicated bicycle facilities in the surrounding area and the sidewalks are of poor quality. Other specific barriers include uneven or narrow sidewalks, lack of crosswalks at specific locations, and excessive litter.

- **Willowbrook/Rosa Parks Station:** The existing pedestrian and bicycle infrastructure is lacking; there are no bicycle facilities leading directly to the station and the sidewalks are in poor condition and in some cases non-existent. Other barriers include unpleasant walking experience due to smell and littler, lack of trees, and lack of crosswalks. Pedestrians were observed crossing outside of crosswalks due to long blocks.

- **Compton Station:** There are no bicycle facilities adjacent to the station and the sidewalks are insufficient, with many corners lacking curb cuts, cracked pavement, narrow sidewalks, and sidewalk obstructions. Other barriers include poor lighting, faded or absent crosswalks, and litter and graffiti.

The Blue Line First Last Mile Plan makes recommendations for specific improvements to address the barriers to walking, biking, and taking transit to the Blue Line stations. These improvements will be incorporated into Task 6 of the I-105 CSS.

7.5.3 Corridor Needs Assessment

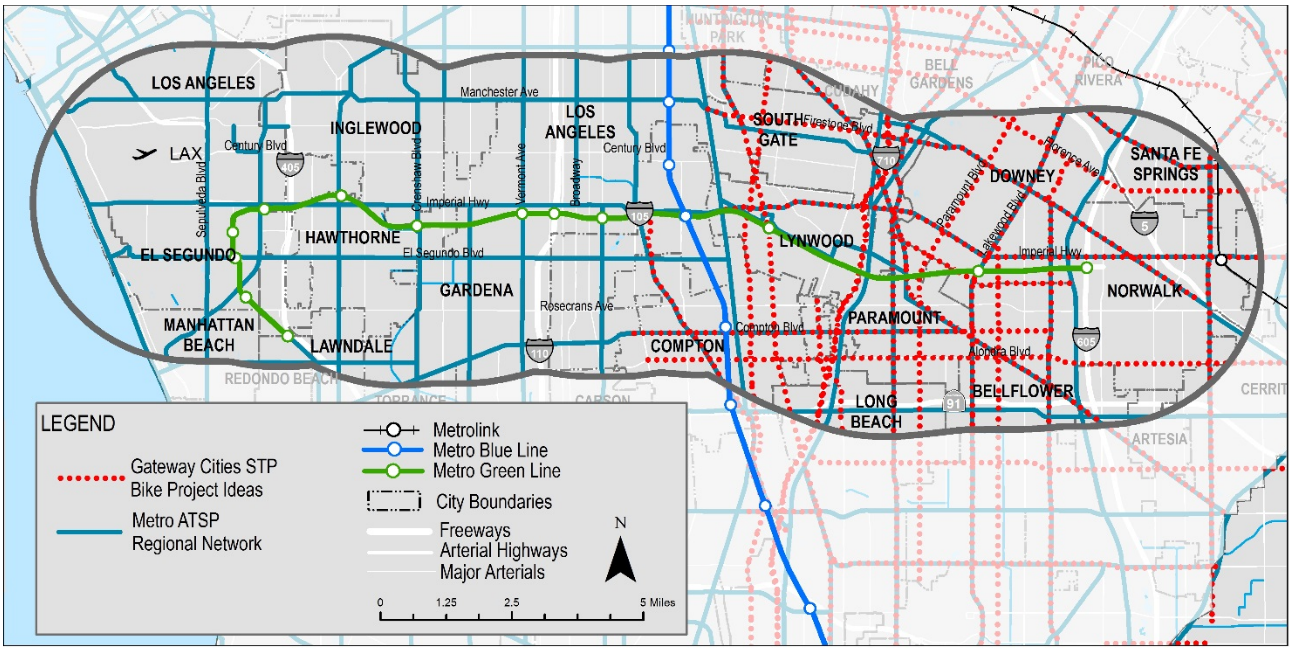
This memorandum provides a high-level overview of the existing Complete Streets conditions as well as barriers to biking and walking and use of transit. A selection of corridors will be identified, with input from local stakeholders, for a more robust and corridor oriented Complete Streets needs assessment as part of Task 6. **Figure 7.19,** which shows the proposed regional bicycle network from Metro's Active Transportation Plan and the significant bicycle project ideas from the Gateway Cities Strategic Transportation Plan, will be used as a starting point for identifying the potential corridors. These corridors were developed in close

[22] South Bay Bicycle Master Plan, Appendix D, Alta Planning + Design, 2011

[23] Metro Blue Line First Last Mile Plan, 2018

coordination with the Gateway Cities local jurisdictions and represent the most likely candidate corridors for implementation of some type of bicycle facilities in the Gateway Cities. The intent of the project ideas and candidate corridors is also to provide a network of interconnected facilities that span multiple jurisdictions rather than bicycle facilities that end at jurisdictional borders and do not connect or provide subregional continuity of travel. It is important to note that the project idea corridors are not necessarily along the arterial roadway shown on the map; each jurisdiction may choose an alignment along various roadways or paths as works best for each location, or ultimately they may choose to not implement a bicycle facility along the corridor. The I-105 CSS team will work with South Bay cities to identify a similar network of candidate corridors in the South Bay COG portion of the study area.

Figure 7.19 Regional Bicycle Project Ideas in I-105 Study Area



Source: Metro Active Transportation Strategic Plan, 2016. Gateway Cities Strategic Transportation Plan, 2015

8.0 Preservation Assessment

The purpose of this section is to inventory existing asset conditions for the State Highway System (along I-105), local arterials, and bridges within the I-105 Study Area. Limited data is available related to system preservation in the study area, but we were able to obtain information on arterial and freeway pavement conditions as well as bridges, and that information is presented in this section.

The preservation assessment contains the following sections:

- Existing Asset Conditions
  - State Highway System
  - Arterials
  - Bridges

8.1 Existing Asset Conditions

Federal Highway Administration (FHWA) established a set of performance measurement rules for State departments of transportation (State DOTs) and Metropolitan Planning Organizations (MPOs) to use as required by Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation (FAST) Act. The Pavement and Bridge Condition Performance Measures Final Rule, which went into effect on May 20, 2017, establishes measures for State DOTs to carry out the National Highway Performance Program (NHPP) and to assess the condition of pavements on the non-Interstate National Highway System (NHS); pavements on the Interstate System; and bridges carrying the NHS, including on- and off-ramps connected to the NHS. This replaces the Notice of Proposed Rule Making (NPRM).[24] The required collection frequency for Interstate pavement conditions is every year, while non-Interstate pavement conditions need to be collected every two years.

For background, the National Highway System (NHS) is a network of strategic highways within the U.S. and encompasses the Interstate Highway System and other roads (i.e., non-Interstate) serving strategic transport facilities (e.g., major airports, ports, rail or truck terminals, railway stations, pipeline terminals, etc.). In general, states are responsible for building and maintaining the highway system, while local agencies own and operate most local streets, collectors and minor arterials not classified as part of NHS.

The performance measures outlined in **Table 8.1** contribute to assessing the NHPP.

Table 8.1 Pavement and Bridge Condition Final Measures, 2017

Measure Area	Performance Measure	Effective Target Date[25]
National Performance Management	• Percentage of pavements of the Interstate System in Good condition	January 1, 2018

[24] https://www.fhwa.dot.gov/tpm/rule.cfm

[25] Caltrans is in the process of setting targets for NHS Pavement and Bridges and must set them by May 20, 2018. MPOs have 180 days from that date to either accept the State target or elect their own target. Caltrans will submit final targets to FHWA by October 2018.

Measures to Assess Pavement Condition	• Percentage of pavements of the Interstate System in Poor condition	
	• Percentage of pavements of the non-Interstate System in Good condition • Percentage of pavements of the non-Interstate System in Poor condition	January 1, 2018
National Performance Management Measures to Assess Bridge Condition	• Percentage of NHS bridges classified as in Good condition • Percentage of NHS bridges classified as in Poor condition	January 1, 2018

Source: Federal Highway Administration. https://www.fhwa.dot.gov/tpm/rule/170531pm2.pdf.

The FAST Act implements performance measure changes in these main areas:

- **Pavement**
  - **Significant progress:** The number of determinations triggering State DOT actions for not making significant progress towards achieving their target is now based on *each biennial* determination, instead of being based on two consecutive biennial determinations.
  - **Interstate pavement:** The number of determinations triggering penalty if below the minimum condition level has been changed from the Interstate pavement condition falling below minimum condition level for two consecutive years to just the *most recent year*. For the Interstate System, no more than 5% of the system is allowed to fall into “Poor” condition. The penalty requires the State DOT to obligate NHPP and transfer Surface Transportation Program (STP) funds. There is no minimum condition or penalty for non-Interstate NHS.
  - **Direction:** IRI, cracking percent, rutting, and faulting needs to be collected for at least one direction for both Interstate and non-Interstate segments. Previously, data needed to be collected in both directions for Interstate segments and at least one direction for non-Interstate segments.
  - **Missing, invalid, unresolved data:** Previously, missing, invalid, or unresolved data was considered “Poor”. Now, the Final Rule requires no more than 5% of segments be missing, invalid or unresolved.
- **Bridges**
  - **Minimum condition level:** No more than 10% of total deck area of NHS bridges should be classified as Structurally Deficient.
  - **Penalty:** If for three consecutive years the minimum condition is not met, the State DOT must obligate and set aside NHPP funds for eligible bridge projects on the NHS.

Each State DOT must establish 2-year and 4-year targets for each performance period. These targets must be reported to FHWA by October 1, 2018. Adjustments of the 4-year target are allowed at the mid-point of the performance period.

Separately, the California Transportation Commission issued Senate Bill (SB) 1, titled the Road Repair and Accountability Act of 2017. Among the requirements, Caltrans must include in their Transportation Asset Management Plan the condition targets for various assets that are included in the bill, and requires the Commission to hold Caltrans accountable to achieving those targets through regular reporting. These targets include, but are not limited to:

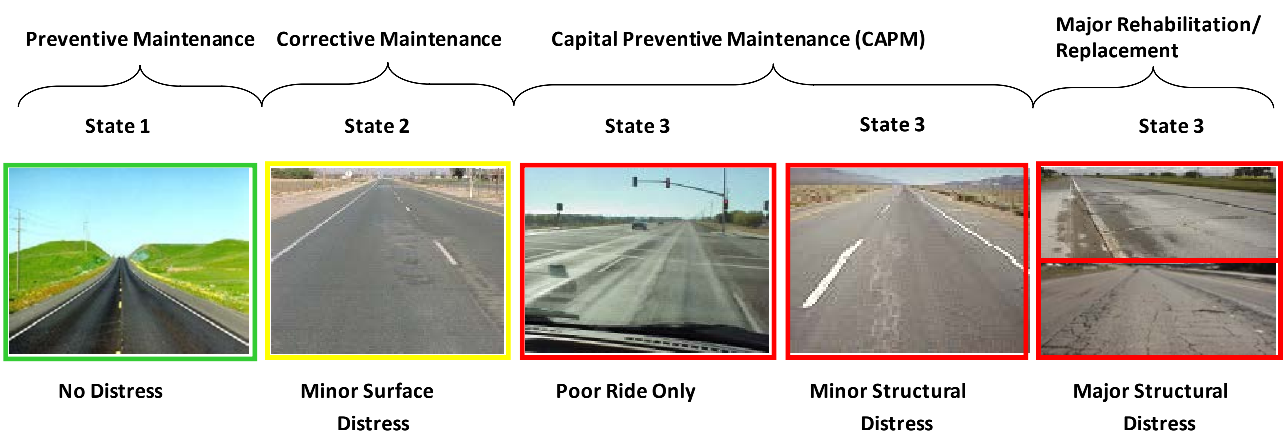
- 98% of pavement in good or fair condition;
- 90% of culverts (included with bridge performance measures) in good or fair condition; and
- 500 or more bridges fixed.

8.1.1 State Highway System

Caltrans' Office of Pavement Management is in charge of collecting, analyzing, and managing automated pavement condition survey data. They publish a State of the Pavement report every several years which reports pavement condition statewide and by districts based on the latest pavement condition information from PaveM, a "State of the Art" tool that stores high definition photo imagery from the Automated Pavement Condition Survey (APCS) to analyze every mile of pavement. PaveM is also used to predict future pavement conditions based on pavement history, current pavement condition, pavement improvement project information, traffic, and climate data.

Caltrans defines three states of pavement conditions as the following:

Figure 8.1 Caltrans Pavement Condition States



State 1: Good/excellent condition with few potholes or cracks ⇨ Preventive maintenance project

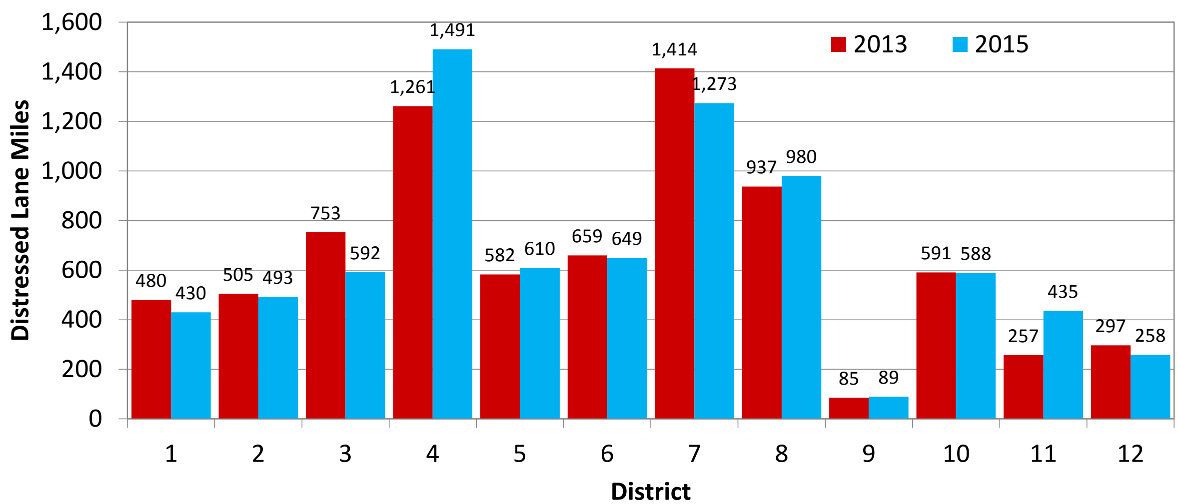
State 2: Fair condition with minor cracking or slab cracking ⇨ Corrective maintenance project

State 3: Poor condition with significant to extensive cracks or poor ride only ⇨ CAPM , rehabilitation or reconstruction project

Source: California Department of Transportation Division of Maintenance Pavement Program. 2015 State of the Pavement Report, December 2015.

The most recent State of the Pavement report, published in 2015, compares the number of distressed lane miles in each district in 2013 and 2015, as shown in **Figure 8.2**. In 2013, Caltrans District 7 (Ventura County and Los Angeles County) had the highest number of distressed lane miles (1,414 miles) among all districts. By 2015, District 7 was able to reduce this number to 1,273 distressed lane miles through preventative maintenance, rehabilitation, and reconstruction. The study area falls entirely within District 7 and this information is presented and will be further utilized when assessing performance measures in later tasks.

Figure 8.2 Distressed Lane Miles by District and Survey Year



Source: California Department of Transportation Division of Maintenance Pavement Program. 2015 State of the Pavement Report, December 2015.

One method of assessing pavement condition is the International Roughness Index (IRI) which measures pavement smoothness or ride quality. IRI is reported in inches per mile and generally 1-94 inches/mile is considered “Good” pavement quality, 95-170 inches/mile is considered “Acceptable”, and more than 170 inches/mile is deemed “Poor” pavement quality. For non-National Highway System (NHS) routes, the percent pavement with rough ride or “poor” rating has decreased every survey since 2007. Interstate freeways have also decreased every year but NHS routes that are non-interstate increased with the 2015 survey. This is mostly attributed to approximately 4,000 additional lane miles of non-NHS routes being added to the NHS system under the funding and authorization bill MAP-21. District 7 in **Table 8.2** shows an overall improvement in terms of IRI. The percentage of “good” condition lane miles increased from 29% in 2013 to 30% in 2015, while the percentage of “acceptable” condition lane miles increased from 50% to 51% and the percentage of “poor” condition lane miles decreased from 22% to 19%.

Table 8.2 International Roughness Index Distribution by District

District	2013 PCR Lane Miles							2015 PCR Lane Miles						
	1-94		95-170		>170		TOTAL*	1-94		95-170		>170		TOTAL*
District 1	828	37%	997	44%	422	19%	2,246	821	36%	1,091	48%	341	15%	2,253
District 2	2,078	54%	1,523	39%	269	7%	3,871	2,119	56%	1,452	38%	241	6%	3,812
District 3	2,041	49%	1,657	40%	476	11%	4,174	2,342	55%	1,509	35%	427	10%	4,279
District 4	1,837	33%	2,643	47%	1,124	20%	5,604	1,779	32%	2,518	45%	1,328	24%	5,625
District 5	1,363	45%	1,336	44%	332	11%	3,031	872	40%	1,040	47%	284	13%	2,197
District 6	3,110	56%	2,182	39%	272	5%	5,564	3,148	56%	2,220	39%	256	5%	5,623
District 7	1,665	29%	2,849	50%	1,238	22%	5,753	1,735	30%	2,896	51%	1,081	19%	5,712
District 8	2,795	45%	2,956	47%	528	8%	6,279	2,716	44%	2,932	47%	546	9%	6,194
District 9	1,297	72%	449	25%	66	4%	1,811	1,381	78%	368	21%	28	2%	1,777
District 10	1,519	46%	1,485	45%	310	9%	3,314	1,692	50%	1,388	41%	301	9%	3,381
District 11	1,894	49%	1,844	48%	128	3%	3,866	1,725	45%	1,834	48%	257	7%	3,816
District 12	501	27%	1,069	58%	266	15%	1,835	429	24%	1,164	64%	227	12%	1,820
Total	20,927	44%	20,990	44%	5,432	11%	47,350	20,760	45%	20,412	44%	5,317	11%	46,490

Note: IRI scale 1-94 inches per mile = Good; 95-170 = Acceptable; >170 = Poor. PCR = Pavement Condition Rating
* Excludes locations where IRI was not collected, bridges, and no Maintenance Service Level (MSL). Percentage is of district total.

Source: California Department of Transportation Division of Maintenance Pavement Program. 2015 State of the Pavement Report, December 2015.

Table 8.3 examines the changes in IRI from 2013 to 2015 in terms of NHS routes in Caltrans District 7. I-105 is considered an NHS-Interstate route. While the trend overall shows a decrease in “poor” condition lane miles (same as **Table 8.2**), this improvement can mainly be attributed to NHS-Interstate and Non-NHS routes. NHS routes that are non-interstate show an increase in “poor” condition lane miles and a decrease in “good’ condition lane miles.

Table 8.3 District 7 IRI Distribution by National Highway System, 2013 and 2015

	Total															
	NHS-Interstate				NHS Non-Interstate				Non-NHS				Total			
	1-94	95-170	>170	Total	1-94	95-170	>170	Total	1-94	95-170	>170	Total	1-94	95-170	>170	Total
2013 PCR*-Lane Miles	735	957	565	2,256	875	1,226	275	2,376	56	667	398	1,120	1,665	2,849	1,238	5,753
2013 %	32.6%	42.4%	25.0%		36.8%	51.6%	11.6%		5.0%	59.6%	35.5%		28.9%	49.5%	21.5%	
2015 PCR-Lane Miles	861	1,045	487	2,392	858	1,590	464	2,913	16	261	130	408	1,735	2,896	1,081	5,712
2015 %	36.0%	43.7%	20.4%		29.5%	54.6%	15.9%		3.9%	64.0%	31.9%		30.4%	50.7%	18.9%	

Note: PCR = Pavement Condition Rating

Source: California Department of Transportation Division of Maintenance Pavement Program. 2015 State of the Pavement Report, December 2015.

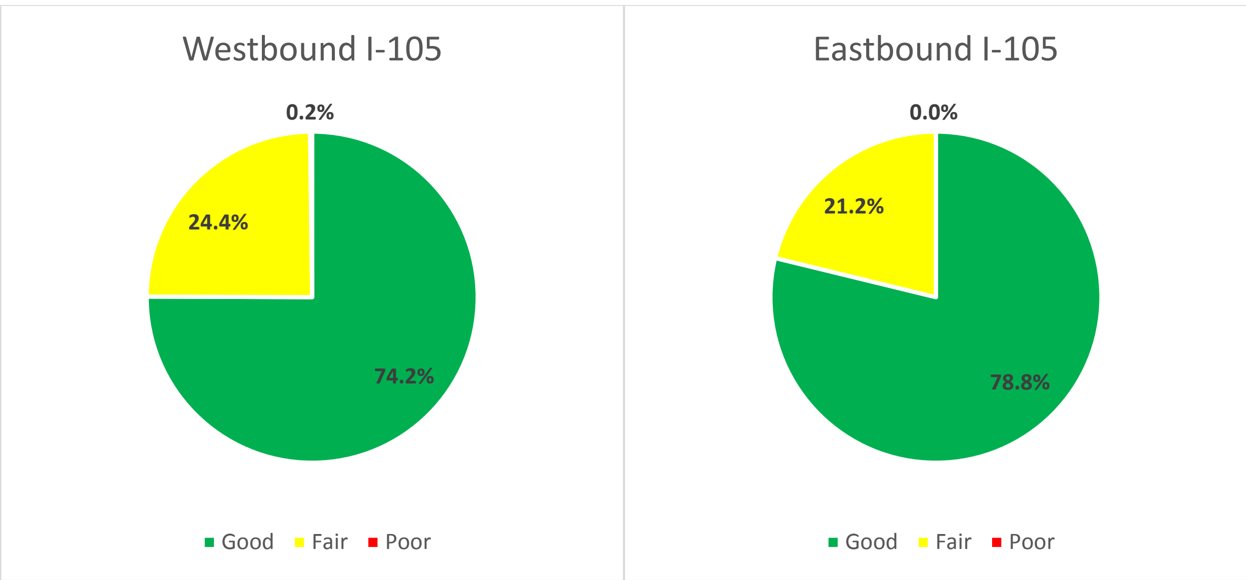
Table 8.4 shows source data collected between August 2015 and December 2015. The MAP-21 Condition Category Pre-Treatment indicates the MAP-21 category based on the assumed MAP-21 distribution of “Good”/”Fair”/”Poor” based on IRI, cracking and rutting (or faulting). 74.2% of the total lane miles on westbound I-105 is shown to be in “Good” condition, 24.5% in “Fair” condition, and 0.2% in “Poor” condition. Eastbound I-105 exhibits a similar trend, with 78.8% of the total lane miles in “Good” condition, 21.2% in “Fair” condition, and 0.0% in “Poor” condition. According to the average IRI (of the left and right wheelpath), 94.3% of the total lane miles of westbound I-105 is in “Good” condition, 4.2% is in “Acceptable” condition, and 1.5% is in “Poor” condition. The average IRI in the eastbound direction are slightly better, with 96.4% in “Good” condition, 1.9% in “Acceptable” condition, and 1.7% in “Poor” condition (see **Figure 8.3**).

Table 8.4 I-105 Freeway MAP-21 Pavement Condition Breakdown, 2015

Direction	MAP-21 Condition Category Pre-Treatment	Total Lane Miles	Percent of Freeway
Westbound	Good	47.87	74.2%
	Fair	15.78	24.5%
	Poor	0.13	0.2%
	Total	**64.54**	**98.8%***
Eastbound	Good	49.38	78.8%
	Fair	13.29	21.2%
	Poor	0.0	0.0%
	Total	**62.67**	**100%**

Note: 1.2% of the lane miles on westbound I-105 were not associated with a MAP-21 condition category.
Average IRI scale is as follows: Good = 1-94 IRI; Acceptable = 95-170 IRI; and Poor = IRI ≥ 170.
Source: California Department of Transportation, Division of Maintenance Office of Pavement Management. Pavement Condition (PaveM), 2015.

Figure 8.3 I-105 Freeway MAP-21 Pavement Condition Breakdown, 2015



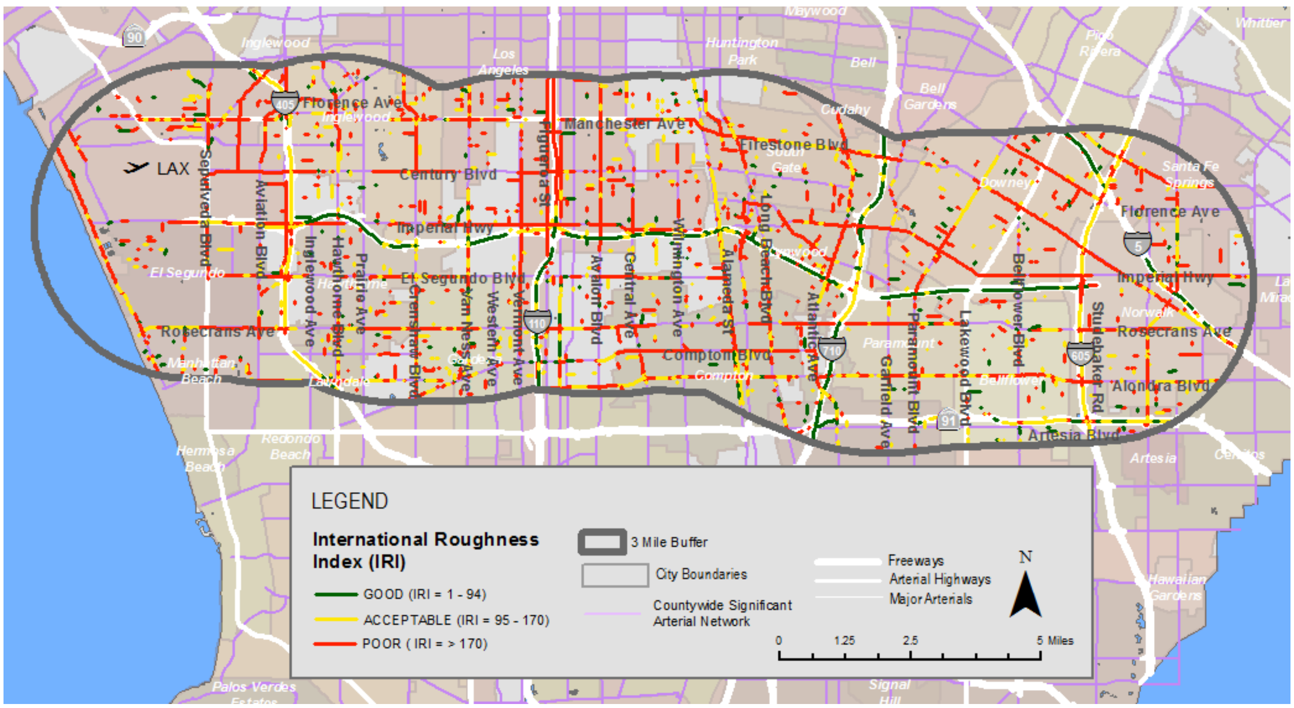
Source: California Department of Transportation, Division of Maintenance Office of Pavement Management. Pavement Condition (PaveM), 2015.

IRI, a uniform, calibrated roughness measurement for paved roadways is required by the Highway Performance Monitoring System (HPMS) in order to provide a measure of pavement surface condition that has nationwide consistency and comparability. Existing IRI values are reported to FHWA until they are replaced by new measured values. The lower functional systems (minor arterial in urban areas and collector in any area) have been placed in the "optional" category since there are situations where it may not be possible to obtain meaningful roughness measurements with profiling equipment[26]. **Figure 8.4** shows the bidirectional IRI for paved roadway segments included in the 2015 HPMS data set. Pavement conditions based on IRI are broken down in **Table 8.5 and Figure 8.6**. These rating categories differ from what is presented in **Table 8.4** in that they are based solely on IRI, whereas the statistics in **Table 8.3** are based off

[26] https://www.fhwa.dot.gov/policyinformation/hpms/fieldmanual/chapter5.cfm

a combination of IRI, cracking and rutting conditions. Pavement conditions for all highways and arterials reported within the I-105 Study Area shows that the majority of roadways (56.8%) are in “Poor” condition, 29.1% are listed as being in “Acceptable” condition, and only 14.1% (the majority of which fall on the I-105 freeway) are considered to be in “Good” condition. By breaking down the pavement condition within the I-105 Study Area by facility type, freeways (I-105, I-405, I-110, I-710, I-605, I-5, etc,) are shown to have much better conditions: 41.6% are in “Good” condition, 41.9% are in “Acceptable” condition, and 16.5% are in “Poor” condition. Arterials show the vast majority (72.2%) to be in “Poor” condition, with 24.8% in “Acceptable” condition and only 3% in “Good” condition. I-105 freeway alone has better than average pavement conditions. The majority of I-105 is reported to be in “good” condition (69.1%), with the exception being at the western and eastern ends of the highway; 22% of I-105 is reported to be in “Fair” condition and 9% in “Poor” condition.

Figure 8.4 International Roughness Index within I-105 Study Area, 2015



Source: Highway Performance Monitoring System, 2015.

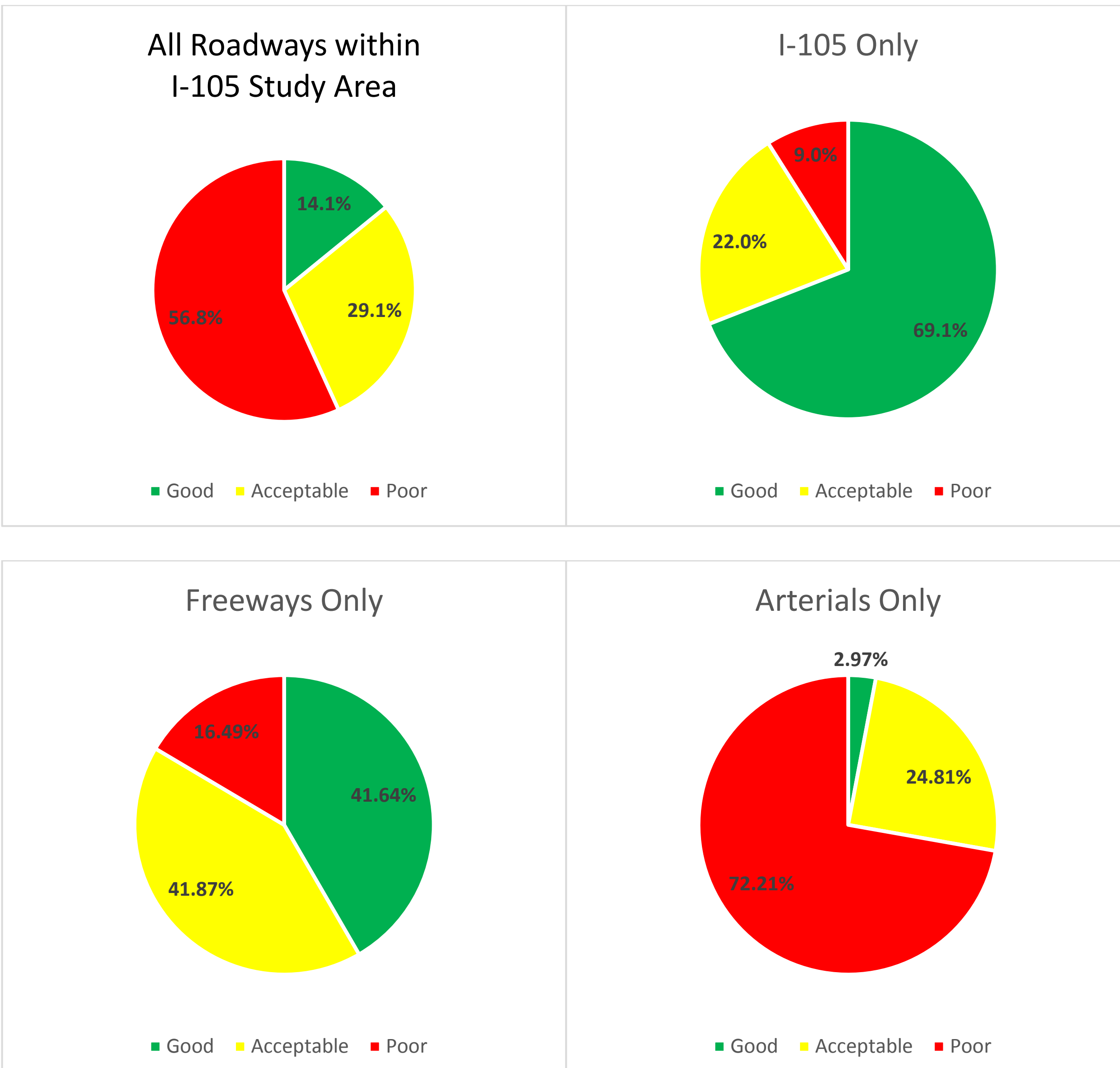
Table 8.5 International Roughness Index within I-105 Study Area Breakdown, 2015

Roadway	Average IRI	Total Miles	Percent of Roadway
All roadways within I-105 Study Area	Good	37.52	14.1%
	Acceptable	77.22	29.1%
	Poor	150.82	56.8%
	Total	**265.56**	**100.0%**
Freeways Only	Good	31.90	41.64%
	Acceptable	32.07	41.87%
	Poor	12.63	16.49%
	Total	**76.60**	**100.0%**
Arterials Only	Good	5.62	2.97%

	Acceptable	46.89	24.81%
	Poor	136.45	72.21%
	Total	**188.96**	**100.0%**
I-105 only	Good	10.38	69.1%
	Acceptable	3.30	22.0%
	Poor	1.35	9.0%
	Total	**15.03**	**100.0%**

Note: I-105 is 18.82 miles long. HPMS only captures IRI for 15.03 miles of the freeway.
Average IRI scale is as follows: Good = 1-94 IRI; Acceptable = 95-170 IRI; and Poor = IRI ≥ 170.
Source: Highway Performance Monitoring System, 2015.

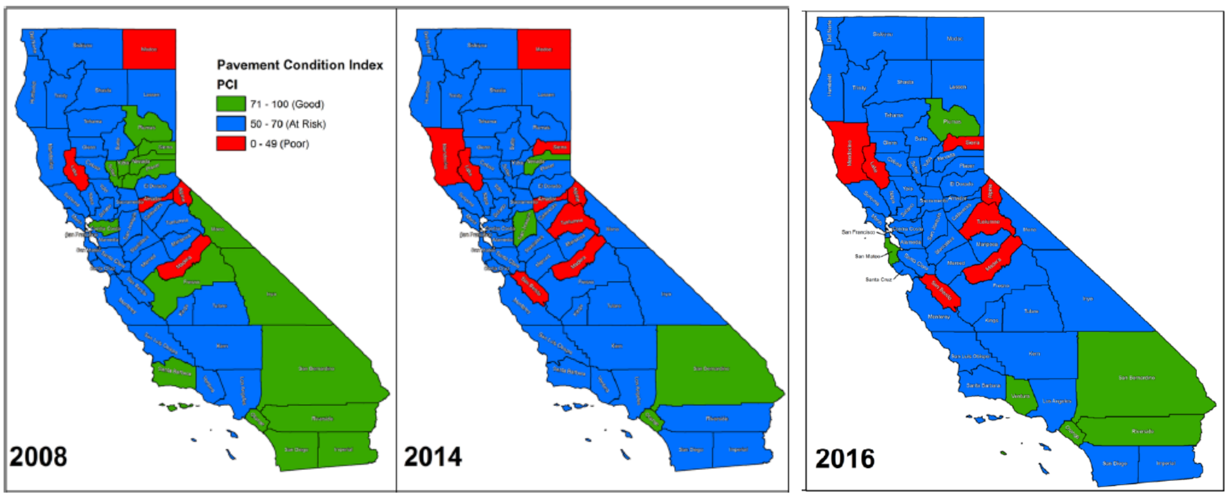
Figure 8.5 International Roughness Index within I-105 Study Area Breakdown, 2015



Source: Highway Performance Monitoring System, 2015.

Another method of measuring pavement condition is the Pavement Condition Index (PCI) measurement standard, which measures pavement surface distresses on a 0-100 scale. NCE produces a California Statewide Local Streets and Roads Needs Assessment every two years. **Figure 8.6** shows the average PCI by county from these reports and indicates that the evolution of the average PCI by county shows no significant change in Los Angeles County in the past eight years (remains at risk with an average PCI of 50-70). Meanwhile, Ventura County managed to improve their average PCI from At Risk to Good (71-100 PCI). This indicates that the majority of District 7 improvements can be attributed to Ventura County, not Los Angeles County.

Figure 8.6 Average Pavement Condition Index by County for 2008, 2014, and 2016



Source: NCE. California Statewide Local Streets and Roads Needs Assessment, 2014 and 2016.

According to the California Statewide Local Streets and Roads Needs Assessment report statistics shown in **Table 8.6**, the average weighted PCI in Los Angeles County remains stagnant at 66-67 PCI (upper end of the At Risk category). The increase from 66 to 67 PCI appears to have dropped the 10 year pavement need amount by approximately $1 billion. In Los Angeles County, only 20-40% of 10 year pavement needs have been met. The 10 year essential component needs is also reported. Essential components encompass additional safety and traffic components such as curb ramps, sidewalks, storm drains, streetlights, and signals required in the transportation network. The 10 year need amount has been steadily decreasing, which indicates a continued investment in essential components in Los Angeles County.

Table 8.6 Los Angeles County Local Streets and Roads Needs Assessment, 2012-2016

Year	Center Line Miles	Lane Miles	Area (sq. yd.)	Average Weighted PCI	10 Year Pavement Needs (millions)	10 Year Essential Component Needs (millions)
2012	21,375	49,879	458,903,871	66	$12,531	$6,210
2014	21,330	57,630	459,830,656	66	$12,971	$4,837
2016	21,015	57,404	457,128,791	67	$11,705	$4,408

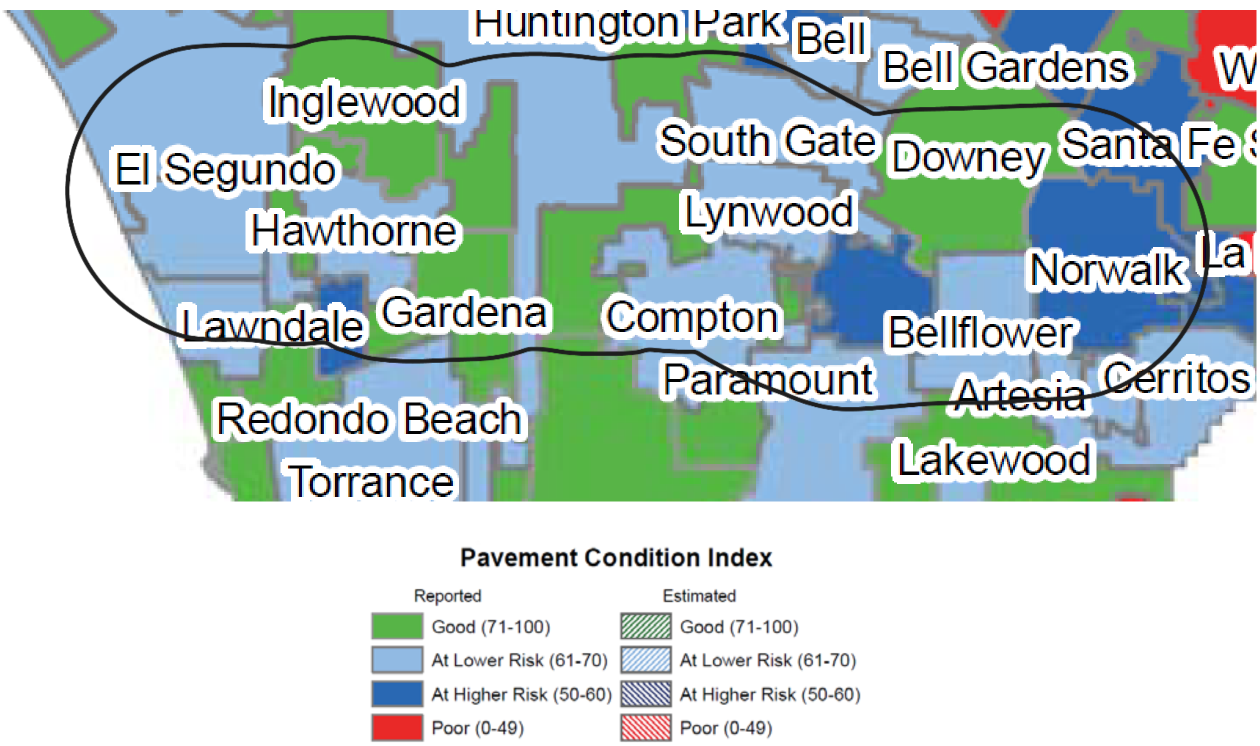
Source: NCE. California Statewide Local Streets and Roads Needs Assessment, 2012, 2014 and 2016.

8.1.2 Arterials

For the California Statewide Local Streets and Roads Needs Assessment report, local agencies are asked to fill out an online survey to provide updates on pavement condition data and other categories such as bridge data, safety, traffic, and regulatory data, as well as funding and expenditure projections. **Figure 8.7** and **Figure 8.8** show the reported and estimated PCI values from each city in the I-105 Study Area. Estimated PCI values represent the pavement condition of the last time the city was able to assess their pavement conditions. For example, the City of Torrance reported the local streets and roads to be in the 61-70 PCI category in 2014. By the 2016 update, the City had not yet reassessed the conditions of their roads, so the 2016 map uses 61-70 PCI as the estimated value.

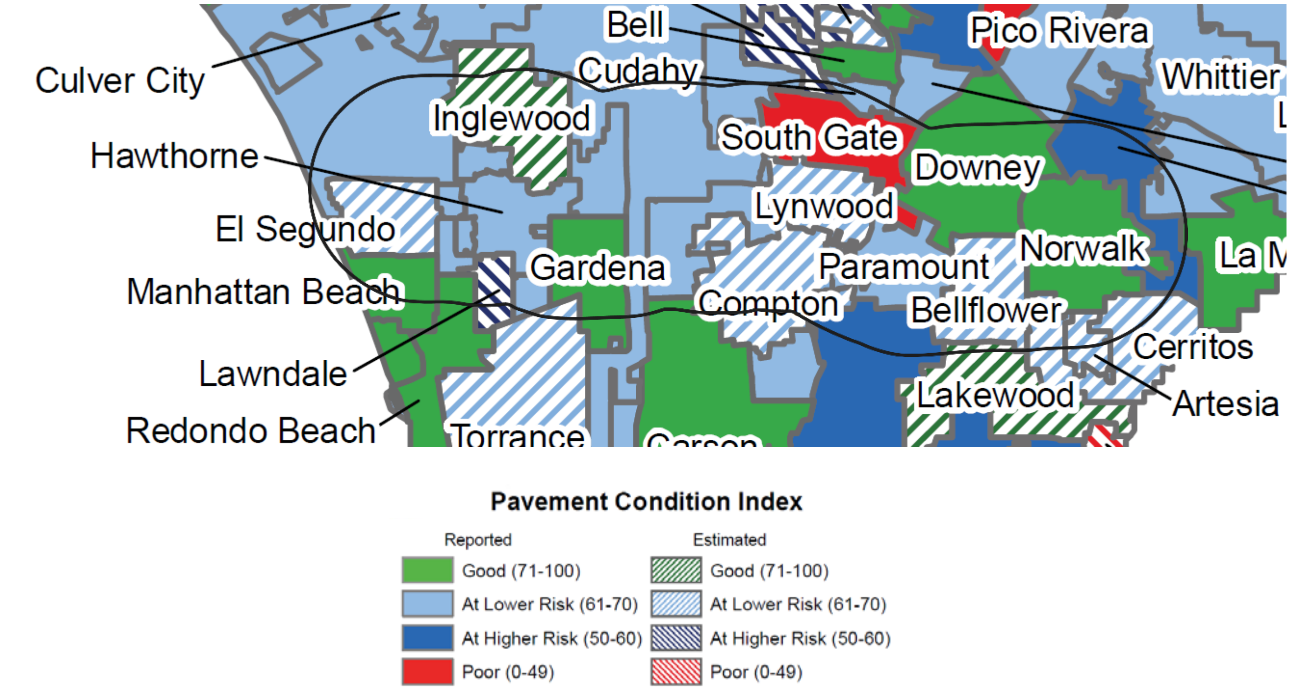
In 2014, of the 25 cities in the I-105 Study Area, six of them fell into “At Higher Risk” (50-60 PCI) and “Poor” (0-49 PCI) pavement condition categories: Huntington Park, Lawndale, Norwalk, Paramount, Pico Rivera, and Santa Fe Springs (see **Table 8.7**). By 2016, half of these cities were able to invest enough money into their road network to bump up their pavement condition category: Paramount and Pico Rivera went from “At Higher Risk” to “At Risk”, and Norwalk went from “At Higher Risk” to “Good”. Manhattan Beach also made significant roadway improvement investments and went from “At Lower Risk” to “Good”. Huntington Park, Lawndale, and Santa Fe Springs remained in the “At Higher Risk” category. Between 2014 and 2016, the City of Long Beach dropped from “At Lower Risk” to “At Higher Risk”, while the City of South Gate dropped from “At Lower Risk” to “Poor”. The City of South Gate is the only city in the I-105 Study Area with a “Poor” pavement condition rating. In 2016, there were a total of five cities that fell into “At Higher Risk” or “Poor” pavement condition categories.

Figure 8.7 Pavement Condition Index within I-105 Study Area, 2014



Source: NCE. California Statewide Local Streets and Roads Needs Assessment, 2014.

Figure 8.8 Pavement Condition Index within I-105 Study Area, 2016



Source: NCE. California Statewide Local Streets and Roads Needs Assessment, 2016.

Table 8.7 Pavement Condition Index within I-105 Study Area, 2014 and 2016

City	2014 PCI	2016 PCI
Artesia	61-70	61-70*
Bell Gardens	61-70	61-70
Bellflower	61-70	61-70*
Carson	71-100	71-100
Cerritos	61-70	61-70*
Compton	61-70	61-70*
Cudahy	61-70	61-70
Downey	71-100	71-100
El Segundo	61-70	61-70*
Gardena	71-100	71-100
Hawthorne	61-70	61-70
Huntington Park	50-60	50-60*
Inglewood	71-100	71-100*
Lawndale	50-60	50-60*
Long Beach	61-70	50-60
Los Angeles	61-70	61-70
Lynwood	61-70	61-70*
Manhattan Beach	61-70	71-100
Norwalk	50-60	71-100
Paramount	50-60	61-70
Pico Rivera	50-60	61-70
Redondo Beach	71-100	71-100

City	2014 PCI	2016 PCI
Santa Fe Springs	50-60	50-60
South Gate	61-70	0-49
Torrance	61-70	61-70*

* Indicates estimated PCI values. All others were reported.
Note: Green indicates cities where the PCI improved from 2014 to 2016, whereas red indicates cities where the PCI worsened from 2014 to 2016.
Source: NCE. California Statewide Local Streets and Roads Needs Assessment, 2014 and 2016.

Unincorporated Los Angeles County and the City of Los Angeles share the pavement conditions of individual roadway segments on dynamic webmaps. On these maps, users can assess the conditions of roadways in and around the I-105 Study Area that are maintained by the City of Los Angeles[27] and Los Angeles County.[28]

8.2 Bridges

Local bridges are also an integral part of the local streets and roads infrastructure. There are 12,501 local bridges (approximately 48% of the total) in California. Two bridge inventory data sets were used for this study. The first is the National Bridge Inventory database (NBI), which is collected by Caltrans on behalf of local agencies on a biennial basis and provided to FHWA to be included in the NBI database. The second type of bridge inventory data used is the local agency bridge inventory data gathered from the Statewide survey to collect data on short (less than 20 feet in length) and non-vehicular bridges which are excluded from the NBI database.

As shown in **Figure 8.9**, Los Angeles County contains by far the highest number of local bridges compared to all other counties in California, with a total of 1,470 bridges as of 2016. This represents almost 12% of all local bridges in the State. Each bridge is assigned a Sufficiency Rating (SR) on a scale of 0-100. The bridge sufficiency is a method of evaluating highway bridge data by calculating four separate factors to obtain a numeric value which is indicative of bridge sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient or deficient bridge. Sufficiency Rating is essentially an overall rating of a bridge's fitness for the duty that it performs based on factors derived from over 20 National Bridge Inventory data fields, including fields that describe its Structural Evaluation, Functional Obsolescence, and its essentiality to the public. A low Sufficiency Rating may be due to structural defects, narrow lanes, low vertical clearance, or any of many possible issues.[29] A score of 80 or less is required to be eligible for federal rehabilitation funding, while a score of 50 or less is required to be eligible for federal replacement funding[30].

The average sufficiency rating for the bridges in Los Angeles County remain steady at 84-85 between the years of 2012 and 2016. The number of bridges that fall below a 50 SR has increased from 28 in 2014 to 38 in 2016. The total bridge funding needed in Los Angeles County remains fairly consistent, at approximately $1.2 billion in 2016 (see **Table 8.8**).

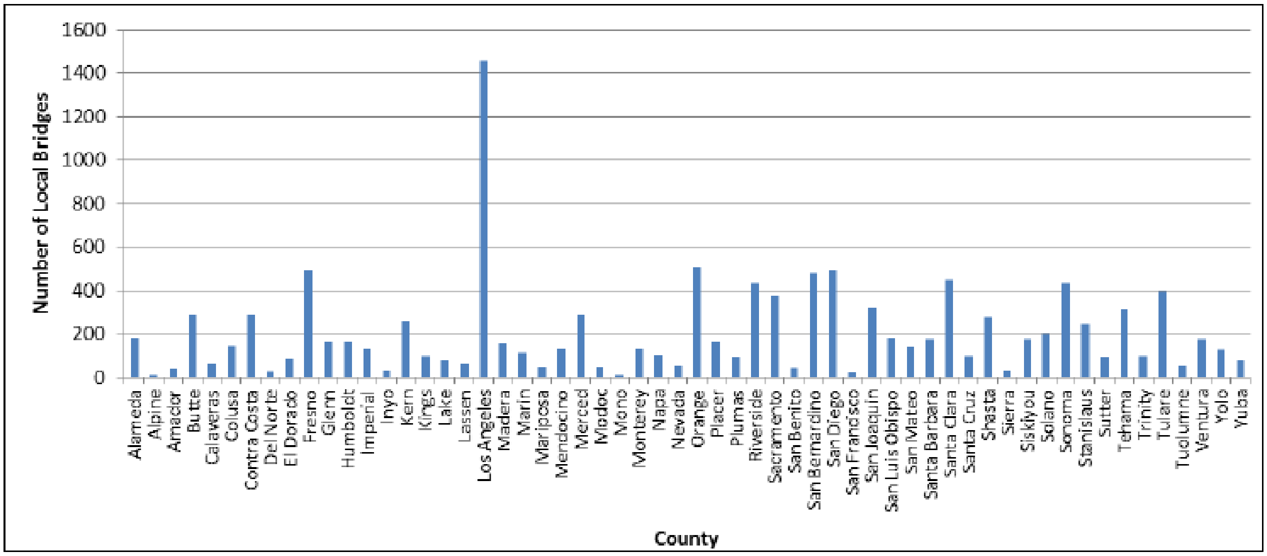
[27] Data.gov. City of Los Angeles Road Surface Condition Map

[28] Los Angeles County Department of Public Works. http://dpw.lacounty.gov/gmed/lacroads/Find.aspx

[29] http://nationalbridges.com/guide-to-ratings

[30] https://www.fhwa.dot.gov/bridge/0650dsup.cfm

Figure 8.9 Number of Local Bridges by County



Note: These counts includes cities within the county.
Source: NCE. California Statewide Local Streets and Roads Needs Assessment, 2016.

Table 8.8 Los Angeles County Bridge Needs Assessment, 2012-2016

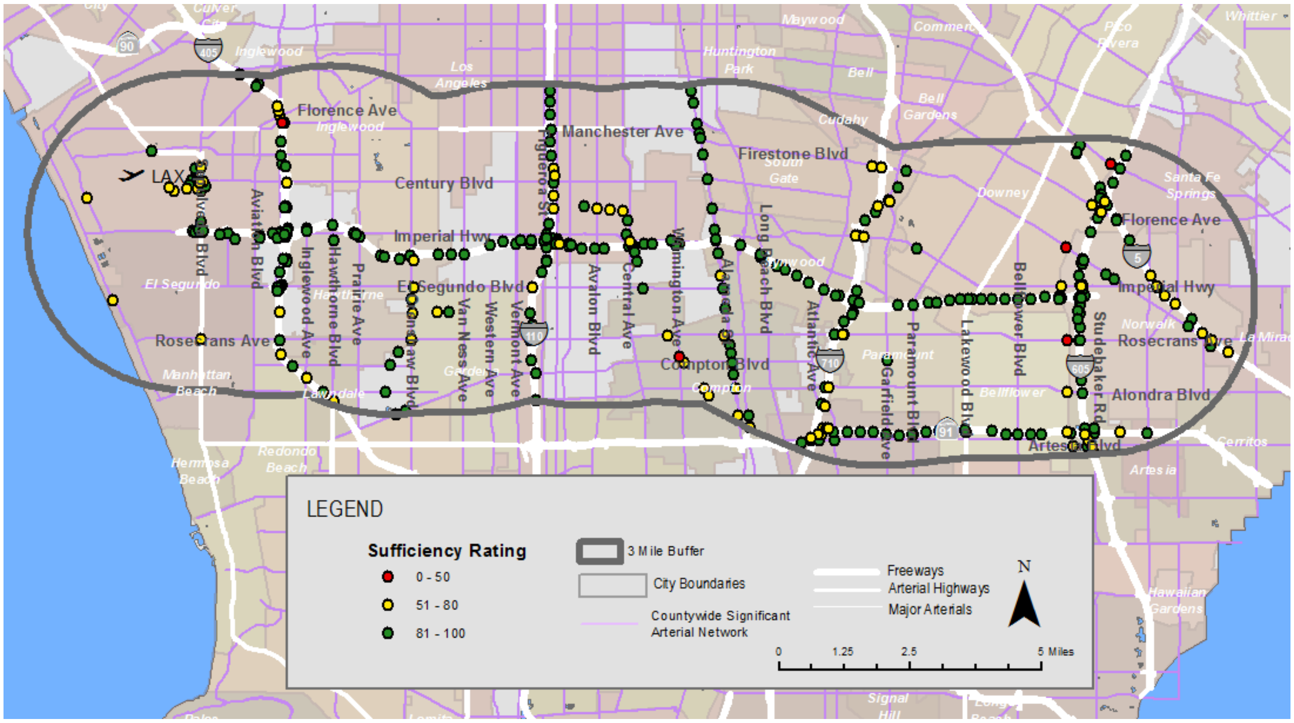
Year	Number of Bridges	Average Sufficiency Rating (SR)	Structures with SR ≤ 80	Structures with SR ≤ 50	Total Bridge Funding Needed (millions)
2012	1,456	85	451	28	$1,239
2014	1,456	85	451	28	$1,239
2016	1,470	84	456	38	$1,232

Source: NCE. California Statewide Local Streets and Roads Needs Assessment, 2012, 2014 and 2016.

According to the NBI, there are a total of 382 bridges in the I-105 Study Area as of January 11, 2017 (see **Figure 8.10**). Of these structures, five of them have a SR between 0 and 50 (1.3%), 86 are between 51 and 80 (22.5%), and 291 are between 81 and 100 (76.2%). The five deficient bridges are located on the following areas:

- I-405 at the intersection of Manchester Avenue in the City of Inglewood
- Wilmington Avenue over Compton Creek in the City of Compton
- Telegraph Road over the San Gabriel River in the City of Santa Fe Springs
- Firestone Boulevard over the San Gabriel River in the City of Downey
- Rosecrans Avenue over the San Gabriel River in the City of Bellflower

Figure 8.10 Sufficiency Ratings of Bridges in the I-105 Study Area, 2017



Source: U.S. DOT Bureau of Transportation Statistics. National Bridge Inventory, 2017.

9.0 Systemwide Performance

This section describes the evaluation framework created to quantify baseline conditions and evaluate future conditions and potential improvement scenarios. The sections below describe the goals and objectives and accompanying performance measures as well as how the I-105 Study Area transportation network currently performs relative to the established metrics.

9.1 I-105 CSS Goals, Objectives, and Performance Measures

This section outlines the evaluation framework established to evaluate potential improvement scenarios identified in the I-105 CSS. The I-105 CSS seeks to address the following broad corridor goals:

- **Mobility –** Improve multimodal mobility by reducing travel times and enhancing the efficiency and reliability of the multimodal corridor.
- **Accessibility & Equity –** Enhance system connectivity through improved access to non-single occupancy vehicle modes, to improve service to low-income and transit-dependent populations throughout the corridor; and to promote equitable distribution of investments throughout the study area.
- **Safety –** Improve corridor safety by promoting investments that address collision hotspots and help to reduce serious injuries and fatalities on the multimodal transportation system.
- **State of Good Repair –** Promote a state of good repair on the multimodal transportation system, improving and preserving existing system assets wherever possible.
- **Sustainability –** Promote a more sustainable, livable corridor by reducing harmful emissions and improving air quality and public health for all residents.

In order to make progress towards these goals, various objectives and associated performance measures were established to quantify the existing conditions and evaluate potential projects. In the scenario evaluation phase of the I-105 CSS, proposed improvements will be evaluated based on their ability to address these identified needs and objectives. **Table 9.1** below highlights the I-105 CSS objectives and how they relate to the broad corridor goals.

Table 9.1 I-105 CSS Objectives

Goals	Objectives
Mobility	• Improve multimodal system efficiency • Improve transit ridership • Reduce congestion
Accessibility & Equity	• Improve system connectivity and access to non-SOV modes • Increase service to social equity focus (SEF) populations • Promote geographic equity throughout the corridor
Safety	• Reduce safety collisions and hazards
State of Good Repair	• Improve & preserve system conditions
Sustainability	• Improve air quality and public health • Reduce emissions

Table 9.2 displays the selected performance measures, organized by goal, which will be the basis for the improvement scenario evaluation. These scenario evaluations will ultimately inform a proposed I-105 CSS Implementation Plan consisting of near-, mid-, and long-term corridor improvements that help further corridor goals, reflect stakeholder involvement and community needs, and can be integrated into SCAG's next RTP/SCS.

In Section 9.2 below, the baseline conditions are quantified in terms of these chosen performance measures as a basis for comparison to the future conditions and potential improvements.

Table 9.2 I-105 CSS Performance Measures

Goals	Performance Measures	Data & Tools
Mobility & Connectivity	• Transit ridership/mode share • High-occupant vehicle (HOV) mode share • Total person throughput • Travel time by mode • Vehicle/person hours of delay (VHD/PHD) • Truck VHD	• Travel Demand Model • Travel Demand Model/Aimsun • Travel Demand Model/Aimsun • Travel Demand Model/Aimsun • Travel Demand Model/Aimsun • Travel Demand Model
Accessibility & Equity	• Households within 1/2-mile of high quality transit access • Jobs within 1/2-mile of high quality transit access • Bicycle facility density within 1/2-mile of high quality transit access • Healthcare, schools and activity centers accessible by low-stress bicycle/pedestrian facilities • Travel time by mode for social equity focus (SEF) populations • SEF households with access to high quality transit • Geographic equity	• Travel Demand Model/GIS • Travel Demand Model/GIS • GIS • Open Street Map/GIS • Travel Demand Model • Travel Demand Model/GIS • Qualitative
Safety	• Serious injury crash rates (by mode) • Fatal collision rate (by mode)	• SWITRS/GIS • SWITRS/GIS
State of Good Repair	• Pavement in good, fair, and poor condition • NHS bridges in good, fair, and poor condition	• Caltrans, Jurisdictions/GIS • FHWA National Bridge Inventory
Sustainability	• Greenhouse gas (GHG) emissions • Air quality criteria pollutant emissions • Bicycle and walk mode share • Non-single occupant vehicle (SOV) mode share • Parks, recreation & open space accessible by low-stress bike/ped facilities, complete streets, and/or high quality transit • Vehicle miles traveled (VMT)	• Travel Demand Model • Travel Demand Model • Travel Demand Model • Travel Demand Model • Open Street Map/GIS • Travel Demand Model

Note: "Data & Tools" are potential data sources and may not be used in the ultimate evaluation of improvement scenarios

9.2 Existing Systemwide Performance

The following sections highlight the existing conditions in the I-105 Study Area based on the established performance measure framework, divided into the objectives that address the five CSS goals: Mobility, Accessibility and Equity, Safety, State of Good Repair, and Sustainability. Note that in upcoming tasks of this project, the team will use these performance measures to assess future transportation system performance with and without possible improvements. The future conditions for some measures cannot be forecasted or modeled; those performance measures indicated with a star in the below tables will be calculated for the future systemwide performance. Where possible, performance measurement with and without improvements will be conducted quantitatively where appropriate and robust data are available to conduct the assessments. For some of the performance measures, qualitative assessments will be performed consistent with the methodology used for similar analyses conducted for LA Metro, Caltrans and other agencies in Southern California.

9.2.1 Mobility Performance Measures

Three of the I-105 CSS objectives address mobility in the I-105 Study Area: Improve Multimodal System Efficiency, Improve Transit Ridership, and Reduce Congestion. Table 9.3 shows the system performance in terms of travel time, broken down by mode. A baseline estimate of person throughput cannot be calculated; this measure will be qualitative in the project evaluation phase of the I-105 CSS. Table 9.4 shows the baseline system performance in terms of transit ridership. The metrics include transit mode share and boardings. Table 9.5 displays baseline information related to truck and auto delay, as well as high occupant vehicle (HOV) mode share; three metrics that will be used to track progress towards the congestion reduction objective.

Table 9.3 Improve Multimodal System Efficiency

Measure	I-105 Study Area	Source
1) Total Person Throughput	Not available	
2) Travel Time By Mode (minutes)*		
• Auto – SOV	7.9	SCAG RTP/SCS 2016 Model
• Auto - HOV	8.1	
• Transit	Not available	
• Walk	30.3	
• Bike	14.1	

* Can be forecasted for future systemwide performance

Table 9.4 Improve Transit Ridership

Measure	I-105 Study Area	LA County / % of LA County	Source
3) Transit ridership/mode share			
• Daily Boardings	167,114	12.9%	LA Metro, 2017
• Commute Mode Share	7%	7%	ACS 2015 5-year Estimates

• All Trips Mode Share*	3.8%	3.9%	SCAG RTP/SCS 2016 Model

* Can be forecasted for future systemwide performance

Table 9.5 Reduce Congestion

Measure	I-105 Study Area	LA County / % of LA County	Source
4) Daily Auto Vehicle Hours of Delay (VHD)*	181,163	10%	SCAG RTP/SCS 2016 Model
5) Truck Vehicle Hours of Delay (daily)*	10,949	13%	SCAG RTP/SCS 2016 Model
6) High Occupant Vehicle (HOV) Mode Share			
• Commute trips	11.8%	9.9%	ACS 2015 5-year Estimates
• All trips*	Not Available	43.4%	SCAG RTP/SCS 2016 Model

* Can be forecasted for future systemwide performance

9.2.2 Accessibility and Equity Performance Measures

Accessibility and equity is measured by the objectives of improving system connectivity and increasing service to social equity focus (SEF) populations. Table 9.6 shows the existing performance of the I-105 transportation system with regards to multimodal access to key destinations, jobs, and housing. These performance metrics can be used to evaluate the extent to which the proposed projects improve connectivity and accessibility. Table 9.7 highlights how the existing system is serving SEF populations. The performance measures capture transit accessibility and travel time characteristics for SEF populations.

Table 9.6 Improve System Connectivity

Measure	I-105 Study Area	% of Study Area	Source
7) Healthcare, schools, and activity centers accessible within ¼ mile of Class 1, 2, or 4 bikeways			
• Libraries	5	15%	LA County LMS
• Schools	171	25%	
• Health care facilities	114	24%	
8) Jobs near transit			
• Within ½ mile of fixed guideway transit*	65,451	14%	SCAG RTP/SCS 2016 Model
• Within ½ mile of fixed guideway transit and ¼ mile of 15 min headway buses	202,914	44%	
9) Households near transit			
• Within ½ mile of fixed guideway transit*	40,906	10%	ACS 2015 5-year Estimates
• Within ½ mile of fixed guideway transit and ¼ mile of 15 min headway buses	187,856	47%	

10) Bicycle facility density near transit			
• Within ½ mile of fixed guideway transit (miles/stop)	0.9	1.41	SCAG 2017

* Can be forecasted for future systemwide performance

Table 9.7 Increase service to Social Equity Focus (SEF) populations

Measure	I-105 Study Area	% of I-105 Study Area	Source
11) Travel time by mode for SEF populations	Not available at this time		
12) SEF households (HH) near transit			
Non-white population near transit			
• Within ½ mile of fixed guideway transit	152,016	12%	ACS 2015 5-year Estimates
• Within ½ mile of fixed guideway transit and ¼ mile of 15 min headway buses	639,610	49%	ACS 2015 5-year Estimates
Low-income households near transit			
• Within ½ mile of fixed guideway transit	18,361	11%	
• Within ½ mile of fixed guideway transit and ¼ mile of 15 min headway buses	83,048	52%	
Population over 65 near transit			
• Within ½ mile of fixed guideway transit	11,824	8%	
• Within ½ mile of fixed guideway transit and ¼ mile of 15 min headway buses	57,528	40%	

9.2.3 Safety Performance Measures

The one objective under the Safety goal is to reduce safety hazards and collisions. The baseline data needed to track progress towards these objectives is included in Table 9.8, including the serious and fatal injuries by mode.

Table 9.8 Reduce safety hazards and collisions

Measure	I-105 Study Area	% LA County	Source
13) Serious Injuries by Mode			
• Vehicle serious injuries (Average per year)	279.6	12%	SWITRS, 2012 - 2016
• Bicycle serious injuries	29.2	12%	
• Pedestrian serious injuries	87.8	15%	
14) Fatal Injuries by Mode			

• Vehicle fatal injuries	76.4	12%	SWITRS, 2012 - 2016
• Bicycle fatal injuries	6.4	20%	
• Pedestrian fatal injuries	31.8	14%	

9.2.4 State of Good Repair Performance Measures

Table 9.9 shows the baseline conditions in the I-105 Study Area in terms of system preservation. The metrics highlight the existing conditions of bridges and pavement.

Table 9.9 Improve system conditions (preservation)

Measure	I-105 Study Area	LA County	Source
15) NHS bridges in good, fair, and poor condition	Good: 76.2% Fair: 22.5% Poor: 1.3%	Good: 66.4% Fair: 31% Poor: 2.6%	National Bridge Inventory, 2017 / California Statewide Local Streets and Roads Needs Assessment, 2016.
16) Pavement in good, fair, and poor condition	Good: 14.1% Fair: 29.1% Poor: 56.8%	Good: 30%* Fair: 51%* Poor: 19%*	Highway Performance Monitoring System, 2015. Based on International Roughness Index / Caltrans State of the Pavement Report, 2015

*For Caltrans District 7, including Los Angeles and Ventura counties

9.2.5 Sustainability Performance Measures

There are two objectives that address sustainability goals: improving air quality and public health, and reducing emissions. Table 9.10 displays the baseline system performance for public health and livability. The metrics track the accessibility of parks and recreation and the prevalence of bicycling and walking. Table 9.11 highlights the metrics that quantify emission reductions and air quality improvements. These metrics are primarily related to reducing vehicle miles traveled (VMT) and single occupant vehicle (SOV) trips; associated air quality and emissions benefits are related to reducing VMT and SOV trips.

Table 9.10 Improve air quality and public health

Measure	I-105 Study Area	% of Destinations in Study Area	Source
17) Parks, recreation, and open space accessible by low-stress bike/ped facilities, complete streets, and/or high quality transit			
• Within ½ mile of fixed guideway transit*	200 acres 27 locations	6% 12%	LA County Dept of Parks and Recreation LA County Location Management System
• Within ¼ mile of Class 1, 2, or 4 bikeways	1,511 acres 75 locations	47% 34%	
18) Bicycle and walk mode share/trips*		**% of LA County**	
• Bike Commute Mode Share	0.7%	0.9%	ACS 2015, 5-year Estimates

• Bike All Trips Mode Share	1.7%	1.2%	SCAG RTP/SCS 2016 Model / CHTS 2012
• Pedestrian Commute Mode Share	2.1%	2.8%	ACS 2015, 5-year Estimates
• Pedestrian All Trips Mode Share	17.4%	11.2%	SCAG RTP/SCS 2016 Model / CHTS 2012

* Can be forecasted for future systemwide performance

Table 9.11 Reduce Emissions

Measure	I-105 Study Area	% of LA County / LA County	Source
19) Vehicle Miles Traveled (VMT)*			
• Auto VMT	27,300,000	12%	SCAG RTP/SCS 2016 Model
• Truck VMT	1,580,000	12%	
20) Greenhouse Gas Emissions	Not available at this time		
21) Air quality criteria pollutants			
22) Non-SOV mode share			
• Commute Mode Share	26%	27%	ACS 2015, 5-year Estimates
• All Trips Mode Share*	60.8%	59.8%	SCAG RTP/SCS 2016 Model

* Can be forecasted for future systemwide performance

10.0 Summary of Findings

The Current Conditions Assessment for the I-105 CSS provides an overview of the existing transportation system conditions and needs. Some of the key findings from this report are summarized in this section by mode or topic area.

10.1.1 Roadway Assessment

The key characteristics of the I-105 freeway and major arterial system in the study area are summarized in this section.

I-105 Freeway Summary

- The freeway has a clear pattern of directionality in terms of volumes, speeds and congestion/bottlenecks, with the greatest congestion and highest volumes (and lowest speeds) occurring westbound in the AM peak period and eastbound in the PM peak period. These directional patterns are due to land uses along the freeway as well as commute patterns and trip origins and destinations to facilities along the freeway corridor.

- Overall highest peak hour volumes occur in the westbound direction, especially in the AM peak hour when there is little congestion and speeds are high. During that time period, traffic flow exceeds 2,100 vehicles per hour, which is near capacity of the system (but it is still operating well during this period in this direction).

- High congestion occurs at various points along the I-105, often related to confluence of arterial on-ramps or freeway interchanges, as well as geometric conditions such as lane drops, weaving sections, or ramp merges and diverges.

- The eastbound direction of I-105 operates generally very well in the AM peak with high speeds and very little congestion. In the westbound direction, significant portions of the freeway have low speeds and bottleneck and congestion

- Both the eastbound and westbound directions of I-105 experience more congestion than the AM peak hour, with the PM peak eastbound experiencing the most congestion, which occurs from 2 PM to 8 PM in the segment from west of I-110 to Long Beach Boulevard.

- The peak HOV lane volumes at the two Caltrans study locations are consistent at around 1,000 vehicles per peak hour, although other daily counts show a variation in HOV flow at other locations along the corridor. The average vehicle occupancy in the HOV lanes is around 2.1 persons per vehicle (compared to only 1.1 persons per vehicle in the general purpose lanes).

- During the AM peak hours, the HOV lane speeds are generally consistent and are higher than the PM peak hours, with speeds over 60 mph in the morning and over 50 mph in the afternoon. However, the PM peak hour speeds in the HOV lanes indicate more fluctuation and congestion, especially in the PM peak hour, when speeds drop to under 40 mph in one location (between Vermont and I-110) and to just over 40 mph from I-710 to Lakewood Boulevard.

- The person throughput in the HOV lanes is relatively high, at over 2,800 persons per hour maximum during the AM peak hour in the westbound direction at the two Caltrans study locations.
- I-105 east of I-710 is a major route for Port-related trucks and it carries approximately 20,700 total Heavy Duty Trucks today, with 6.600 of those being Port truck trips (nearly one third of the trucks in this portion of the study area are Port-related trucks). To the west of I-710 the Port truck component is extremely small and 94 percent of the truck trips are regional trucks and not related to the Port.

Arterial System Summary

The arterial system in the I-105 Study Area experiences high demand and congestion, in terms of travel time, vehicle miles traveled (VMT), and delay, in various locations throughout the corridor. Some of the key trends include:

- In terms of total Vehicle Miles Traveled, the arterials that carry the greatest volume of vehicles include Firestone Boulevard, Vermont Avenue, Western Avenue, Van Ness Avenue, Rosecrans Boulevard, Sepulveda Boulevard, and Lakewood Boulevard.
- Arterials that carry higher volumes also tend to have greater delay. Arterials with the highest total daily vehicle hours of delay include Firestone Boulevard, Imperial Highway, Lakewood Boulevard Manchester Avenue, Van Ness Avenue, and small segments of Long Beach Boulevard and Garfield Avenue.
- Arterials with the highest travel time indexes, where travel times are significantly higher than free-flow conditions, are Lakewood Boulevard, Bellflower Boulevard, Imperial Highway, Rosecrans Avenue, and Artesia Boulevard.
- During the PM peak hour, the eastbound travel times are higher, matching the eastbound congestion found on I-105, thus indicating a general eastbound pattern of demand and resultant congestion in the afternoon peak period throughout the corridor.

10.1.2 Transit Assessment

The transit assessment presents an overview of the rail and bus services in the I-105 Study Area. Some of the key findings from this effort include:

- Commute mode share for transit trips is equal to the County average, however, parts of the Study Area, particularly in South Los Angeles in the central/north portion of the Study Area adjacent to the Blue Line, have very high rates of transit commuters.
- Other modes are used for commuting in similar proportions to the County as a whole, with nearly three-quarters of all commute trips by drivers alone in their cars. In the Study Area, the rate of carpooling is slightly higher than the countywide average, while work at home is slightly lower.
- The Metro Blue and Green Line provide frequent and reliable service travelling east/west and north/south through the Study Area. While they are the most notable transit services in the corridor, they make up only 10% of Metro weekday trips in the Study Area and ridership on the Blue and Green Line has declined steadily over the past 5 years. The boardings are highest at Willowbrook,

the transfer station to the Blue Line, Norwalk, the eastern terminus, and at Aviation/LAX, an area of high employment.

- The Metro bus ridership in the Study Area represents more than 12% of Metro's weekday bus trips. While Metro has seen bus ridership decline in recent years, the ridership in the Study Area increased slightly between 2016 and 2017, though the increase was not uniform across the routes in the region. Total ridership is related to the frequency of the service, but there are many contributing factors. Rapid buses and express buses see higher ridership per stop, but frequent local services parallel to I-105 (Routes 115 and 117) have the highest total ridership in the study area.

- Two Metrolink routes stop at the Norwalk/Santa Fe Springs station, offering 30 minute service to Union Station every 16 minutes (on average) in the morning peak period.

- The municipal and local transit operators offer complementary transit service particularly for east/west travel and for transit trips south of I-105. Ridership data on those services is currently being gathered.

10.1.3 Demographic and Land Use Assessment

The I-105 Study Area contains a diverse population and a diversity of land uses. Some key findings are summarized below.

- Roughly 14% of the County's population lives in the I-105 Study Area. The population living in the Study Area is predominately non-White (90%) and lower-income. Only 28% of the households have an income higher than $75,000, and 21% of the households have incomes below the federal poverty level (as compared to 17% in LA County as a whole). Thus, the percent of people below the poverty level is 20 percent higher in the I-105 Study Area than the County.

- As defined by the CalEviroscreen, 76% of the Census Tracts in the I-105 Study Area are considered "disadvantaged communities." In the central portion of the Study Area, much of that area is considered to be "most vulnerable" or trending toward most vulnerable on the CalEnviroscreen. These also tend to be the areas with the highest transit ridership and lowest income levels.

- Despite the high percentages of minorities, lower-income households and higher poverty level, the commute travel patterns and car ownership rates in the I-105 Study Area do not differ significantly from County averages.

- The majority of the land use in the I-105 Study Area is single-family residential, though there are pockets of high density residential towards the middle of the corridor in South Los Angeles, Paramount, Bellflower, Hawthorne, Inglewood, Lynwood, and South Gate. Industrial land uses make up a significant portion of the Study Area, with concentrations sprinkled throughout the corridor.

- The western and eastern ends of the I-105 Study Area have the greatest density of employment. The employment categories are similar to the County job profile, with the exception of a higher share of transportation/utilities jobs supporting LAX and surrounding industry, and a lower percentage of professional/business jobs, which tend to be clustered in business hubs elsewhere in the County.

- The I-105 Study Area has a diversity of activity centers and destinations spread throughout the corridor cities, including several colleges, many parks, shopping areas, and community resources.

10.1.4 Safety Assessment

The safety assessment summarizes trends in collisions involving passenger vehicles, bicycles, pedestrians and trucks and highlights areas of high collision frequency in the study corridor. The findings are separated for I-105 freeway and the arterial street network. Findings are also reported by mode.

I-105 Freeway Safety Findings

- Overall collision rates for I-105 are very similar to the statewide average for similar facilities.

- The I-105 Freeway experiences higher collision rates (per million vehicle miles travelled) in the eastbound direction than in the westbound direction. Eastbound, the I-105 collision rates for fatalities as well as fatalities plus injuries slightly exceeds the statewide average for similar facilities. Westbound, the rates for I-105 are lower than the statewide average for similar facilities. Overall the rates on I-105 are generally similar to statewide averages and the differences between the I-105 and statewide averages are small.

- Compared to other Los Angeles area freeways, I-105 collision rates slightly exceed the Los Angeles County average; it has a higher rate than some area freeways but is lower than others. For example, the collision rates on I-105 are higher than I-10, SR-60, US-101, I-210 locally, but lower than SR-91, I-110 and I-710.

- Collision hot-spots can be seen on I-105 westbound at various locations corresponding with interchanges with other freeways as well as selected arterial interchanges. Collison concentrations in the westbound direction occur at I-710, Long Beach Boulevard, I-110, Vermont Avenue and Crenshaw Boulevard. The highest spatial distribution of collisions per million vehicles in the westbound direction occurs at I-710. This location has a significantly higher rate than the other hot-spot locations, with a rate nearly double the other collision hot spots in the westbound direction.

- Collision hot-spots can be seen on I-105 eastbound at various locations corresponding with interchanges with other freeways as well as selected arterial interchanges. Collison concentrations are in the eastbound direction at Vermont/I-110, Central Avenue, Long Beach Boulevard and between Lakewood Boulevard and Bellflower Boulevard.

- Truck collisions are more highly concentrated on the west side of the study area west of I-710 due to this portion of I-105 acting as a key route for Port-related trucks and other trucks from the south to the north and east. The rate of truck related crashes has remained relatively stable over the analysis period.

- Collisions involving fatal crashes or severe injuries have not noticeably changed over the analysis period from 2012 to 2016 except for a one year spike in 2014. But the totals in 2016 are very similar to 2012/2013

- Unlike fatalities and severe injury rates that remain relatively stable, there is a clear upward trend in overall collisions involving injuries from 2012 to 2016. Minor injury crashes, in particular, experienced a significant increase from 2012 to 2016, from 204 in 2012 to nearly double that in 2016 of 388.

- Primary Collision Factors on I-105 Freeway and ramps (as reported by SWITRS data) are Unsafe Speed (60%), Improper turning (15%) and Unsafe Lane Change (13%).

Arterial Safety Findings

- Of all reported arterial collisions (involving all modes) between 2012 and 2016, 1% involved fatalities, 5% involved severe injuries, 26% other visible injuries and 68% minor injuries.

- Total injury collisions on arterials increased each year between 2012 and 2016 with minor injuries and fatalities showing a steady upward trend.

- Of the injury collisions involving bicycles, around 5% resulted in fatalities, 13% in severe injury, 38% in other visible injuries, and 44% in minor injuries. Over the five year period, arterial street injury collisions involving bicyclists have decreased steadily, though it is unclear if bicycle ridership in the Study Area increased or decreased during the period. Fatal collisions involving bicyclists, while a small number, were significantly higher in 2015 and 2016 than previous years.

- The number of arterial street injury collisions involving pedestrians have remained fairly consistent over the past five years. There has been some minor fluctuation in the severity of the collisions, but nothing that signifies a decreasing or increasing trend. Arterial collisions involving pedestrians make up just 12% of all injury collisions, but they make up 40% of all fatalities in arterial collisions in the Study Area. As a comparison, in LA County as a whole, during the same period, collisions involving pedestrians made up 9% of all collisions and 34% of fatalities.

- Collisions involving bicyclists and pedestrians are spread throughout the I-105 Study Area, however, the highest density of collisions in the I-105 Study Area are concentrated in neighborhoods of South Los Angeles around the interchange of I-105 and I-110.

- The highest concentration of truck collisions occurs in Gardena, southwest of the I-105 and I-110 interchange. Other areas of high truck collision frequency include Santa Fe Springs and along I-105 in Paramount, Bellflower, and Downey.

- Based on SWITRS reported data for arterials, the most common factors causing injury collisions are Unsafe Speed (27%), Automobile Right of Way (22%), and Improper Turning (11%). Speed is slightly less of a factor for arterial collisions, at 19%, while Automobile Right of Way (27%) and Traffic Signals and Signs (11%) are more commonly cited.

10.1.5 Corridor User Assessment

The corridor user assessment presents an overview of corridor user activity in the I-105 Study Area. Some of the key findings from this effort include:

- In the I-105 Study Area, nearly three-quarters of all commute trips are made by solo drivers, 12% are made my carpool, and 7% are made by transit. In some locations, such as the South Los Angeles and Unincorporated neighborhoods north of the Green Line, the commute mode share for transit is much higher. Despite the I-105 Study Area having a higher concentration of low-income populations than the County as a whole, vehicle ownership rates are similar to County averages.

- For the freeway mainline, roughly half of all the trip origins and destinations occur within the I-105 Study Area - an area of three miles around the freeway. The freeway results vary depending on location. For example, on the west end, in the westbound direction, almost 90% of the destinations are within the I-105 Study Area. Many of these travelers are going to the LAX for work or travel or to the employment clusters south of LAX in El Segundo and Manhattan Beach. Similarly, on the west end, in the eastbound direction, over 80% of the trip origins occur within three miles (representing people leaving the airport). In this analysis location, trip destinations are highly scattered around the region representing people leaving the airport area. In the middle portion of the corridor, approximately 50-60% of the freeway trip origins and destinations occur within three miles of the I-105.

- For the ramps, nearly all of the trips using the ramps are within three miles of the I-105 Freeway depending on whether we examine the trip origins or destinations. For example, for on-ramps, 70% to 100% of the trip origins are captured within three miles. This reflects people coming from home or work near the freeway to use the freeway. If located much further away and they will use another route rather than going out of the way to use the freeway. The destinations, not surprisingly, are far more dispersed as the users are taking longer trips using the freeway to a range of destinations.

- The three-mile I-105 Study Area (which is six miles from north side to south side) captures most of the arterial trip origins and destinations; approximately 75% of all arterial origins and destinations (O/D). Arterial trips are by definition more local than the trips on the freeway and are shorter. The remaining trips are shown to be very dispersed beyond three miles on each side.

- The I-105 Study Area captures a significant amount of the corridor travel origins and destinations on not only I-105 but also the key parallel arterials of Firestone Boulevard/Manchester Avenue, Century Boulevard, Imperial Highway, El Segundo Boulevard and Rosecrans Avenue.

- The average trip length for freeway trips is over 20 miles whereas the average trip length for arterial trips is generally 9 to 11 miles.

10.1.6 Complete Streets Assessment

The complete streets assessment presents an overview of the complete streets and active transportation conditions in the I-105 Study Area. Some of the key findings from this effort include:

- Data on bicycle and pedestrian volume is limited. There are some Census Block Groups in the I-105 Study Area with high rates of bicycling and walking to work; however, this provides no information on route selection and obstacles to address. Fitness applications, such as STRAVA, provide interesting data, but may not be as useful in lower-income communities or communities with low levels of recreational bicycling. SCAG's Bicycle Data Clearinghouse is useful but incomplete; when more data is available (especially real-time data), the data may be used for more informed planning decisions.

- Active transportation is key to supporting transit riders. Metro found that 83% of bus riders and 68% of train riders start their journey on foot. Only 10% of the households in the I-105 Study Area are within one-half mile of train station. Metro found that 4% of train riders bike to the station, but in the

I-105 Study Area, bike lanes and paths are not as prevalent around train stations compared to the rest of LA County.

- Only 14% of the jobs in the I-105 Study Area are within one-half mile of a fixed guideway station, but 44% are within one-quarter mile of high frequency LA Metro bus service.
- Compared to healthcare, schools, and libraries, parks and recreational opportunities are the destinations best served by low-stress bicycle facilities.
- There are many barriers to increasing transit and active travel mode share. Several recent studies have documented regional and even local barriers in the I-105 CSS Study Area to transit usage, bicycle and walking. Safety is a major concern for bicycling, and the lack of dedicated bicycle facilities is a hindrance to more bicycling in the I-105 Study Area. While there is little information on the availability of sidewalks in the I-105 Study Area, the Blue Line First Last Mile Plan highlights an abundance of inadequate sidewalks around the four Blue Line stations. The barriers to increased transit ridership depends on the type of transit user. Efforts to increase the speed, reliability, safety, and accessibility of transit may help transit compete more effectively with other modes.

10.1.7 Preservation Assessment

Based on available information on pavement conditions and bridge sufficiency ratings, the following general conclusions can be drawn regarding the condition of the I-105 Study Area roadways:

- In general, the I-105 freeway has better pavement quality than the local arterial system. Based on Caltrans' MAP-21 Condition Category Pre-Treatment rating, which takes into consideration International Roughness Index, cracking and rutting, approximately 75% of the I-105 freeway is considered to be in good conditions, with about 25% in fair condition and no portions in poor condition.
- Based on another data source, the Highway Performance Monitoring System (HPMS), which solely uses the International Roughness Index as a bases of measurement; considering all roadways in the I-105 Study Area (all freeways and arterials combined based on those which are included in the measurements), only 14% of the total roadway miles considered to be in good condition, with over 55% in poor condition. This likely reflects the funding shortages at the local level for roadway maintenance.
- Based on city-reported Pavement Condition Index (PCI), in 2016, five of the 25 cities in the I-105 Study Area fell into "At Higher Risk" (50-60 PCI) and "Poor" (0-49 PCI) pavement condition categories.
- The I-105 Study Area has 382 State and local bridges out of the 3,541 in Los Angeles County (11% of the total). The total bridge funding needed for Los Angeles County as of 2016 is $1.2 billion. If this is generally extrapolated to the I-105 Study Area, the need in the I-105 Study Area is over $100 million.
- A bridge sufficiency rating (SR) score of 80 or less is required to be eligible for federal rehabilitation funding, while a score of 50 or less is required to be eligible for federal replacement funding. Of the 382 bridges in the I-105 Study Area, five (1.3%) have a sufficiency rating of less than 50 and thus

are considered deficient and eligible for federal replacement funding, while 23% have a rating of between 51 and 80 and 76% have a sufficiency rating over 80.