



# WESTSIDE SUBWAY EXTENSION

## Traffic Impact Analysis Report



August 2010





## Table of Contents

- 1.0 INTRODUCTION/SUMMARY.....1-1**
  - 1.1 Existing (Year 2006) Setting ..... 1-1
  - 1.2 Future (Year 2035) Setting ..... 1-2
- 2.0 PROJECT DESCRIPTION.....2-1**
  - 2.1 No Build Alternative ..... 2-1
  - 2.2 TSM Alternative ..... 2-1
  - 2.3 Build Alternatives ..... 2-1
    - 2.3.1 Alternative 1—Westwood/UCLA Extension ..... 2-2
    - 2.3.2 Alternative 2—Westwood/Veterans Administration (VA) Hospital  
Extension ..... 2-2
    - 2.3.3 Alternative 3—Santa Monica Extension ..... 2-2
    - 2.3.4 Alternative 4—Westwood/VA Hospital Extension plus West Hollywood  
Extension ..... 2-4
    - 2.3.5 Alternative 5—Santa Monica Extension plus West Hollywood Extension ..... 2-4
    - 2.3.6 Stations and Segment Options ..... 2-6
    - 2.3.7 Option 1—Wilshire/Crenshaw Station Option ..... 2-1
    - 2.3.8 Option 2—Wilshire/Fairfax Station East Option ..... 2-1
    - 2.3.9 Option 3—Wilshire/La Cienega Station Option ..... 2-2
    - 2.3.10 Option 4—Century City Station and Segment Options ..... 2-2
    - 2.3.11 Option 5—Westwood/UCLA Station Options ..... 2-3
    - 2.3.12 Option 6—Westwood/VA Hospital Station Option ..... 2-4
  - 2.4 Base Stations ..... 2-4
  - 2.5 Other Components of the Build Alternatives ..... 2-5
    - 2.5.1 Traction Power Substations ..... 2-5
    - 2.5.2 Emergency Generators ..... 2-5
    - 2.5.3 Mid-Tunnel Vent Shaft ..... 2-5
    - 2.5.4 Trackwork Options ..... 2-6
    - 2.5.5 Rail Operations Center ..... 2-8
    - 2.5.6 Maintenance Yards ..... 2-8
  - 2.6 Minimum Operable Segments ..... 2-9
    - 2.6.1 MOS 1—Fairfax Extension ..... 2-9
    - 2.6.2 MOS 2—Century City Extension ..... 2-9
- 3.0 EXISTING CONDITIONS .....3-1**
  - 3.1 Regional Transportation Network ..... 3-1
    - 3.1.1 Freeways ..... 3-1
    - 3.1.2 Arterials ..... 3-2
    - 3.1.3 CMP Monitoring Locations ..... 3-6
    - 3.1.4 Programmed Roadway Improvements ..... 3-8
  - 3.2 Existing Intersection Traffic Volumes and Levels of Service ..... 3-8
    - 3.2.1 Data Collection Effort ..... 3-14
    - 3.2.2 Level of Service Methodology ..... 3-15
    - 3.2.3 Existing Levels of Service Analysis ..... 3-16
- 4.0 FUTURE TRAFFIC CONDITIONS .....4-1**
  - 4.1 Regional Transportation Performance Measures ..... 4-1



4.2 Study Area Intersections.....4-3

4.2.1 Methodology.....4-3

4.2.2 Base Year Model Development .....4-3

4.2.3 Future Year (2035) VISUM Model Development .....4-7

4.2.4 Synchro Analysis.....4-11

4.2.5 Incorporation of Pedestrian Volumes.....4-11

4.2.6 Incorporation of Heavy Vehicles.....4-12

4.2.7 Incorporation of Transit Services.....4-12

4.2.8 No Build Traffic Forecasts and Level of Service Analysis.....4-12

4.2.9 TSM Traffic Forecasts and Level of Service Analysis .....4-13

4.2.10 Future Build Alternative Traffic Forecasts and Level of Service Analysis.....4-19

4.2.11 Build Alternatives Traffic Forecast Summary.....4-48

**5.0 IMPACT ASSESSMENT .....5-1**

5.1 Regional Impact Assessment .....5-1

5.1.1 No-Build Alternative .....5-1

5.1.2 TSM Alternative .....5-1

5.1.3 Future Build Alternatives (Alternatives 1—5, MOS 1, MOS 2) .....5-1

5.1.4 CMP Impact Criteria and Assessment .....5-1

5.2 Intersection Methodology and Impact Criteria .....5-2

5.3 Impact Determination .....5-2

5.3.1 No Build Impact Determination .....5-2

5.3.2 TSM Impact Determination .....5-3

5.3.3 Alternative 1 + MOS 1. MOS 2 Impact Determination .....5-3

5.3.4 Alternative 2 Impact Determination .....5-3

5.3.5 Alternative 3 Impact Determination.....5-3

5.3.6 Alternative 4 Impact Determination.....5-4

5.3.7 Alternative 5 Impact Determination.....5-4

**6.0 MITIGATION MEASURES .....6-1**

6.1 Alternative 3 Mitigation Measures.....6-1

6.2 Alternative 5 Mitigation Measures.....6-1

6.3 CEQA Determination .....6-1

6.3.1 Future Year 2035 No Build Alternative .....6-2

6.3.2 TSM Alternative .....6-2

6.3.3 Alternative 1 + MOS 1. MOS 2.....6-2

6.3.4 Alternative 2 .....6-2

6.3.5 Alternative 3 .....6-2

6.3.6 Alternative 4 .....6-2

6.3.7 Alternative 5 .....6-2

## List of Tables

Table 2-1. Alternatives and Stations Considered .....	2-7
Table 2-2. Mid-Tunnel Vent Shaft Locations .....	2-6
Table 2-3. Special Trackwork Locations .....	2-7
Table 3-1. Traffic Volumes for Key Arterial Segments in the Study Area.....	3-6
Table 3-2. Level of Service Definitions for Signalized Intersections .....	3-16
Table 4-1. Year 2035 Performance Measures for Project Alternatives .....	4-2
Table 4-2. Peak Hour VISUM Model Link Volume Validation .....	4-7
Table 4-3. Peak Hour VISUM Model Turning Movement Validation .....	4-7
Table 4-4. Year 2035 7-Hour Peak Period Metro Model Trips by Travel Mode .....	4-8
Table 4-5. Year 2035 AM Peak Hour Study Area Auto Trips by Type.....	4-9
Table 4-6. Year 2035 PM Peak Hour Study Area Auto Trips by Type .....	4-9
Table 4-7. Year 2035 AM and PM Peak Hour Vehicle-Miles Traveled.....	4-10
Table 4-8. Level of Service Improvement as Compared with Future Year 2035 No Build Scenario.....	4-21
Table 5-1. Westside Subway Extension Traffic Impact Criteria.....	5-2
Table 5-2. Impact Summary Table .....	5-4

## List of Figures

Figure 1-1. Study Area Population and Employment Densities (2006).....	1-3
Figure 1-2. Study Area Population and Employment Densities (2035).....	1-4
Figure 2-1. Alternative 1—Westwood/UCLA Extension .....	2-3
Figure 2-2. Alternative 2—Westwood/Veterans Administration (VA) Hospital Extension .....	2-3
Figure 2-3. Alternative 3—Santa Monica Extension.....	2-4
Figure 2-4. Alternative 4—Westwood/VA Hospital Extension plus West Hollywood Extension.....	2-5
Figure 2-5. Alternative 5—Santa Monica Extension plus West Hollywood Extension .....	2-5
Figure 2-6. Station and Alignment Options .....	2-8
Figure 2-7. Option 1—No Wilshire/Crenshaw Station Option .....	2-1
Figure 2-8. Option 2—Fairfax Station Option.....	2-1
Figure 2-9. Option 3—La Cienega Station Option.....	2-2
Figure 2-10. Century City Station Options .....	2-3
Figure 2-11. Option 5—Westwood/UCLA Station Options .....	2-4
Figure 2-12. Option 6—Westwood/VA Hospital Station North .....	2-4
Figure 2-13. Location of the Rail Operations Center and Maintenance Yards .....	2-8
Figure 2-14. UP Railroad Rail Bridge .....	2-9
Figure 2-15. Maintenance Yard Options .....	2-9
Figure 3-1. Study Intersection Locations.....	3-9
Figure 3-2. Existing Intersection Levels of Service .....	3-18
Figure 4-1. Validation Screenlines.....	4-6
Figure 4-2. Change in VMT Compared to the No Build Alternative .....	4-11
Figure 4-3. Future Year 2035 No Build/TSM Intersection Levels of Service .....	4-14
Figure 4-4. Year 2035 Alternative 1 Intersection Levels of Service.....	4-22
Figure 4-5. Year 2035 MOS 1 Intersection Levels of Service .....	4-27
Figure 4-6. Year 2035 MOS 2 Intersection Levels of Service .....	4-32
Figure 4-7. Year 2035 Alternative 2 Intersection Levels of Service.....	4-38
Figure 4-8. Year 2035 Alternative 3 Intersection Levels of Service.....	4-43
Figure 4-9. Year 2035 Alternative 4 Intersection Levels of Service.....	4-49
Figure 4-10. Year 2035 Alternative 5 Intersection Levels of Service.....	4-54



## **Acronyms and Abbreviations**

Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act (PRC 21000-21177)
EIR	environmental impact report
EIS	environmental impact statement
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
LOS	level of service
LRTP	Long Range Transportation Plan
Metro	Los Angeles County Metropolitan Transportation Authority
MOS	minimum operable segment
NEPA	National Environmental Policy Act (42 USC 4321-4347)
SCAG	Southern California Association of Governments
TAZ	Traffic Analysis Zone
UCLA	University of California, Los Angeles
VHD	vehicle hours of delay
VHT	vehicle hours traveled
VMT	vehicle miles traveled
vph	vehicles per hour





## **1.0 INTRODUCTION/SUMMARY**

This report presents the result of the traffic impact analysis conducted in support of the Westside Subway Extension DEIS/EIR. A total of 192 key intersections in the Study Area comprised of locations in close proximity to potential station locations as well as at the convergence of congested major arterials were analyzed under Existing Conditions, Future 2035 No Build and seven Future 2035 Build Alternatives. A detailed traffic operations analysis was conducted for each of the study intersections to:

Determine existing congestion levels during peak travel hours;

Forecast future congestion levels with anticipated regional growth and projected transit service; and

Assess the potential for significant/adverse impacts of the Westside Extension on vehicular congestion

The Westside Subway Extension's potential congestion-reducing benefit to the Study Area and surrounding region by reducing vehicle trips and overall delay experienced by motorists was also evaluated.

### **1.1 Existing (Year 2006) Setting**

Approximately five percent of the population (504,000 people) and 10 percent of the jobs (479,000 employees) in Los Angeles County are concentrated in the project's Study Area. Population and employment densities in the Study Area are among the highest in the metropolitan region, averaging approximately 13,100 persons per square mile and 12,500 jobs per square mile. These high population and employment concentrations make the Study Area one of the densest places to live and work in the County.

2006 population and employment densities by Traffic Analysis Zone (TAZ) are displayed in Figure 1-1. As shown, population density is uniformly high with only a handful of TAZs falling below 5,000 persons per square mile. Study Area employment density demonstrates a similar pattern, with a majority of TAZs generating over 5,000 jobs per square mile. The greatest employment densities in the Study Area are found along the Wilshire and Santa Monica Boulevard Corridors.

This high density is especially apparent to drivers as they attempt to travel in and through the Study Area during the peak travel periods. Under existing conditions, a majority of the study locations are operating at deficient levels of service. The current population and employment densities result in severe peak period congestion throughout the Study Area. The heavy congestion experienced is not limited to freeway travel, but extends to surface street travel as well. Drivers experience substantial delay at major intersections along the Wilshire and Santa Monica Boulevard corridors.

According to the Southern California Association of Governments' (SCAG's) forecasts, population density in the Study Area will increase from approximately 13,100 to 14,400 persons per square mile and from 12,500 to 14,000 jobs per square mile by 2035. This represents an increase of 10 percent in population density and a 12 percent increase in employment density. 2035 population and employment densities by TAZ are illustrated in Figure 1-2.



## **1.2 Future (Year 2035) Setting**

As a result of the increases in both population and employment density, drivers will continue to experience severe congestion within the Study Area in 2035 without any substantial infrastructure improvements. Major intersections, especially along the major east-west corridors, currently operating at deficient levels of service will worsen by 2035.

The high population and employment densities and peak period levels of congestion in the Study Area create a viable setting for the Westside Subway Extension. The proposed Westside Subway Extension Project has the ability to reduce vehicle trips and congestion within the Study Area and the region as a whole. The availability of a grade-separated transit option on the Westside can change drivers' mode choice and reduce vehicle trips on arterials that are already experiencing traffic over their intended capacity. These reductions would result in measurable improvements in delay at major study intersections and reductions in driver travel times within the Study Area.

As part of a detailed traffic operations analysis, an extensive data collection effort was undertaken to assess existing peak hour conditions at 192 intersections within the Study Area. Changes in peak hour congestion resulting from the projected increase in population and employment throughout the region were forecasted with the Metro Regional Travel Demand Model and were then refined using a sub-area VISUM model to project turning movement volumes at the selected study intersections for the Year 2035 Scenarios. This report outlines the methodology and results of the traffic operations analysis conducted for the Westside Subway Extension Project.

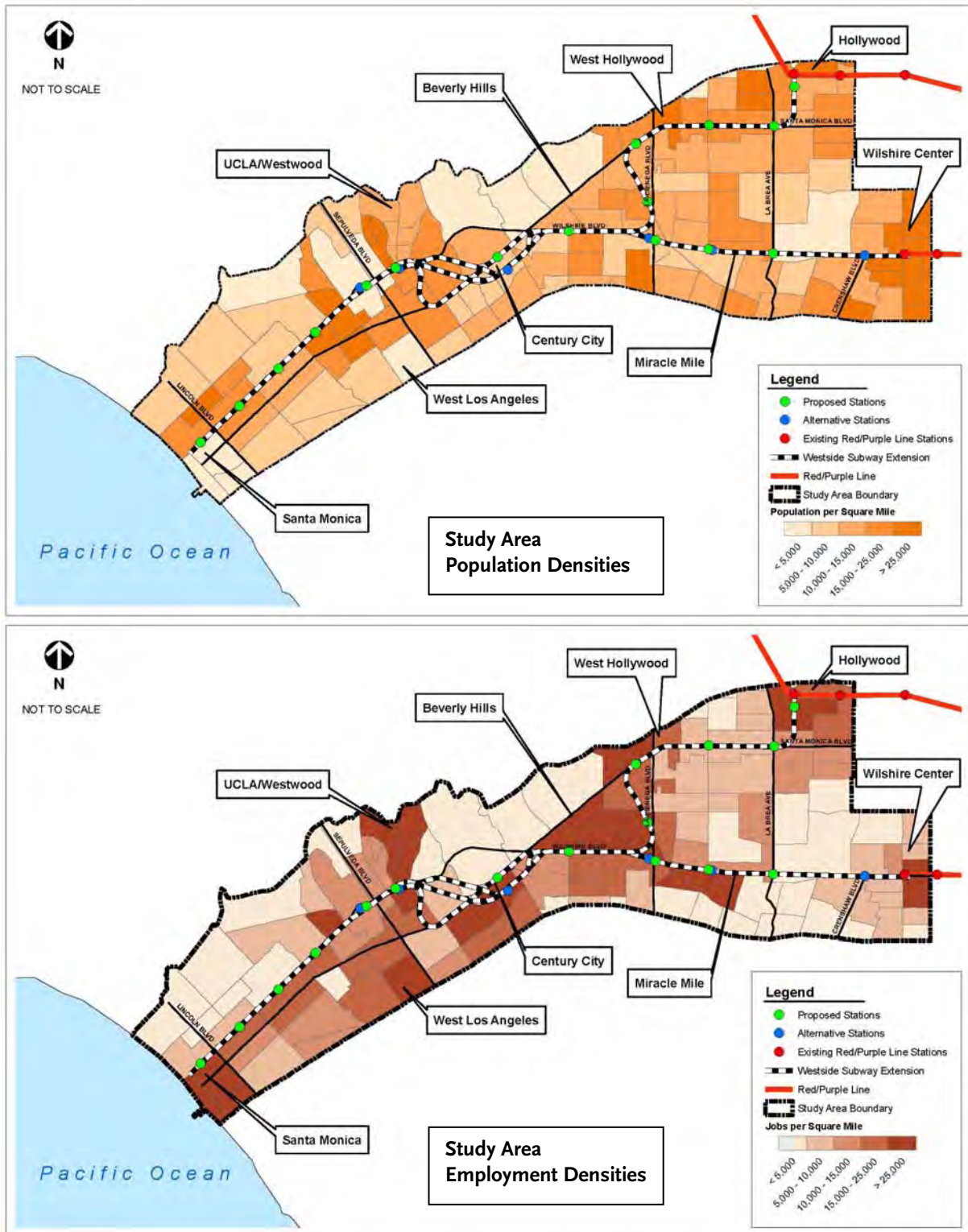


Figure 1-1. Study Area Population and Employment Densities (2006)

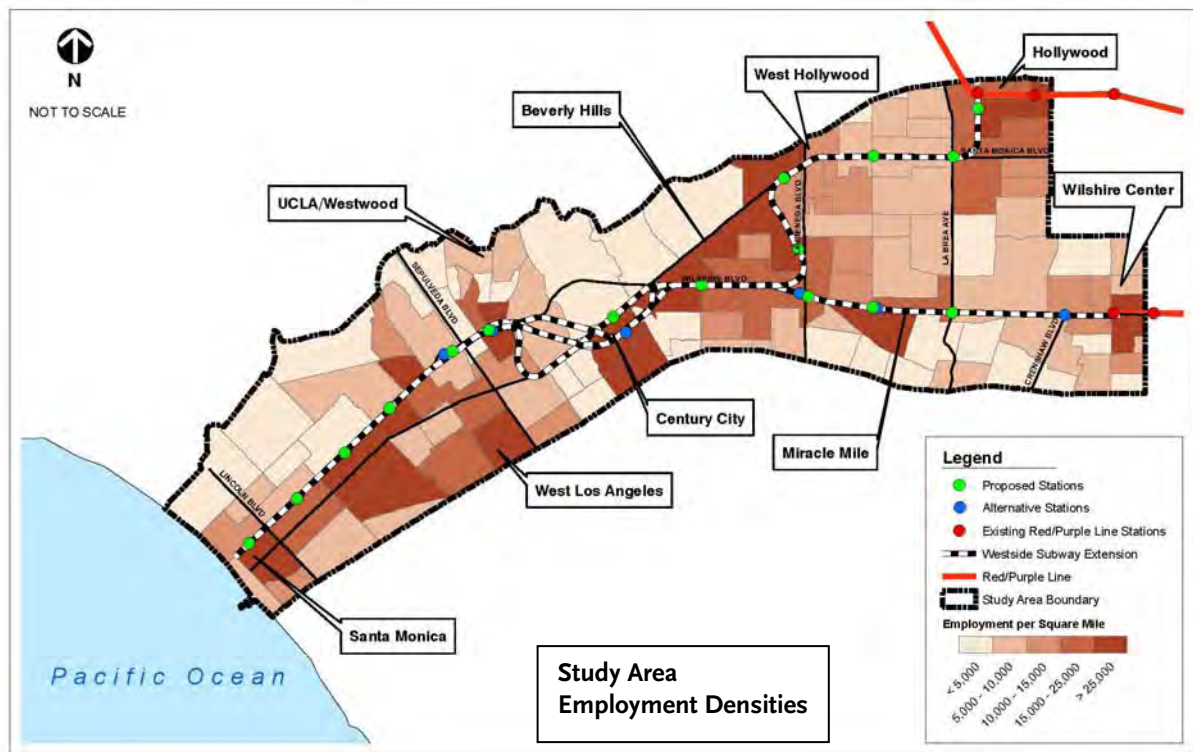
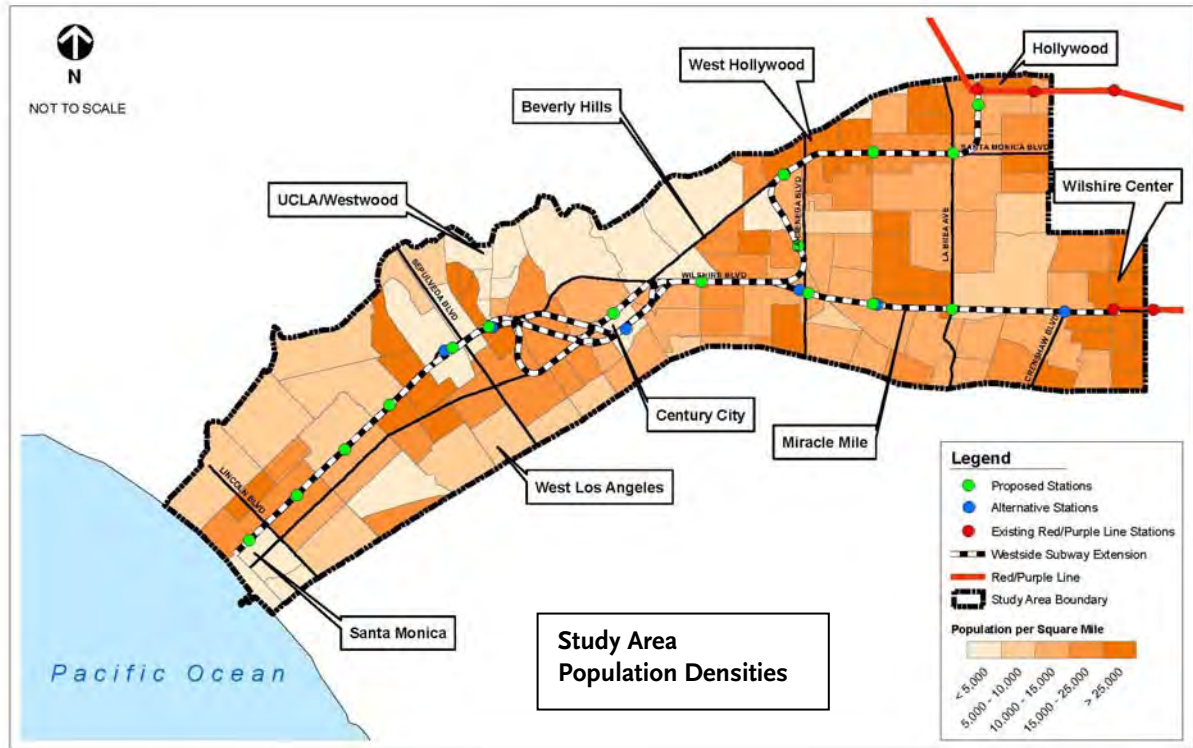


Figure 1-2. Study Area Population and Employment Densities (2035)



## **2.0 PROJECT DESCRIPTION**

This section describes the alternatives that have been considered to best satisfy the Purpose and Need and have been carried forward for further study in the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR). Details of the No Build, Transportation Systems Management (TSM), and the five Build Alternatives (including their station and alignment options and phasing options (or minimum operable segments [MOS]) are presented in this chapter.

### **2.1 No Build Alternative**

The No Build Alternative provides a comparison of what future conditions would be like if the Project were not built. The No Build Alternative includes all existing highway and transit services and facilities, and the committed highway and transit projects in the Metro LRTP and the SCAG RTP. Under the No Build Alternative, no new transportation infrastructure would be built within the Study Area, aside from projects currently under construction or projects funded for construction, environmentally cleared, planned to be in operation by 2035, and identified in the adopted Metro LRTP.

### **2.2 TSM Alternative**

The TSM Alternative emphasizes more frequent bus service than the No Build Alternative to reduce delay and enhance mobility. The TSM Alternative contains all elements of the highway, transit, Metro Rail, and bus service described under the No Build Alternative. In addition, the TSM Alternative increases the frequency of service for Metro Bus Line 720 (Santa Monica–Commerce via Wilshire Boulevard and Whittier Boulevard) to between three and four minutes during the peak period.

In the TSM Alternative, Metro Purple Line rail service to the Wilshire/Western Station would operate in each direction at 10-minute headways during peak and off-peak periods. The Metro Red Line service to Hollywood/Highland Station would operate in each direction at five-minute headways during peak periods and at 10-minute headways during midday and off-peak periods.

### **2.3 Build Alternatives**

The Build Alternatives are considered to be the “base” alternatives with “base” stations. Alignment (or segment) and station options were developed in response to public comment, design refinement, and to avoid and minimize impacts to the environment.

The Build Alternatives extend heavy rail transit (HRT) service in subway from the existing Metro Purple Line Wilshire/Western Station. HRT systems provide high speed (maximum of 70 mph), high capacity (high passenger-carrying capacity of up to 1,000 passengers per train and multiple unit trains with up to six cars per train), and reliable service since they operate in an exclusive grade-separated right-of-way. The subway will operate in a tunnel at least 30 to 70 feet below ground and will be electric powered.

Furthermore, the Build Alternatives include changes to the future bus services. Metro Bus Line 920 would be eliminated and a portion of Line 20 in the City of Santa Monica would be eliminated since it would be duplicated by the Santa Monica Blue Bus Line 2. Metro Rapid



Bus Line 720 would operate less frequently since its service route would be largely duplicated by the Westside Subway route. In the City of Los Angeles, headways (time between buses) for Line 720 are between 3 and 5 minutes under the existing network and will be between 5 and 11.5 minutes under the Build Alternatives, but no change in Line 720 would occur in the City of Santa Monica segment. Service frequencies on other Metro Rail lines and bus routes in the corridor would be the same as for the No Build Alternative.

### **2.3.1 Alternative 1—Westwood/UCLA Extension**

This alternative extends the existing Metro Purple Line from the Wilshire/Western Station to a Westwood/UCLA Station (Figure 2-1). From the Wilshire/Western Station, Alternative 1 travels westerly beneath Wilshire Boulevard to the Wilshire/Rodeo Station and then south-westerly toward a Century City Station. Alternative 1 then extends from Century City and terminates at a Westwood/UCLA Station. The alignment is approximately 8.60 miles in length.

Alternative 1 would operate in each direction at 3.3-minute headways during morning and evening peak periods and at 10-minute headways during midday. The estimated one-way running time is 12 minutes 39 seconds from the Wilshire/Western Station.

### **2.3.2 Alternative 2—Westwood/Veterans Administration (VA) Hospital Extension**

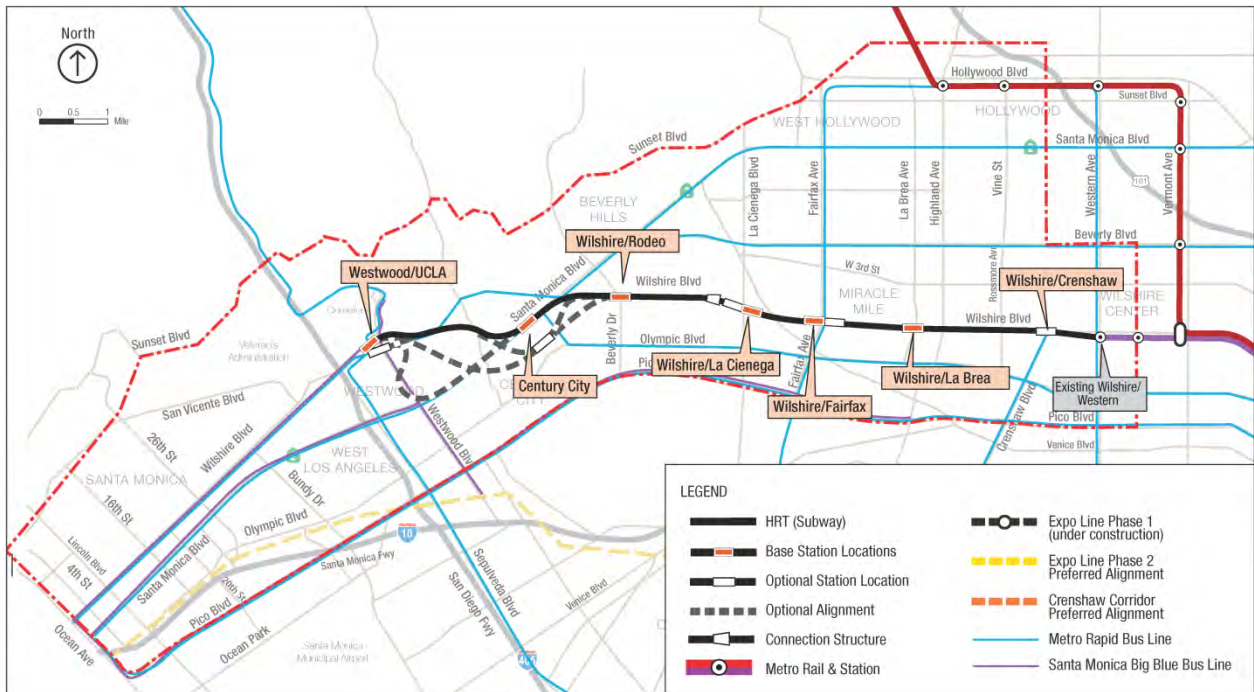
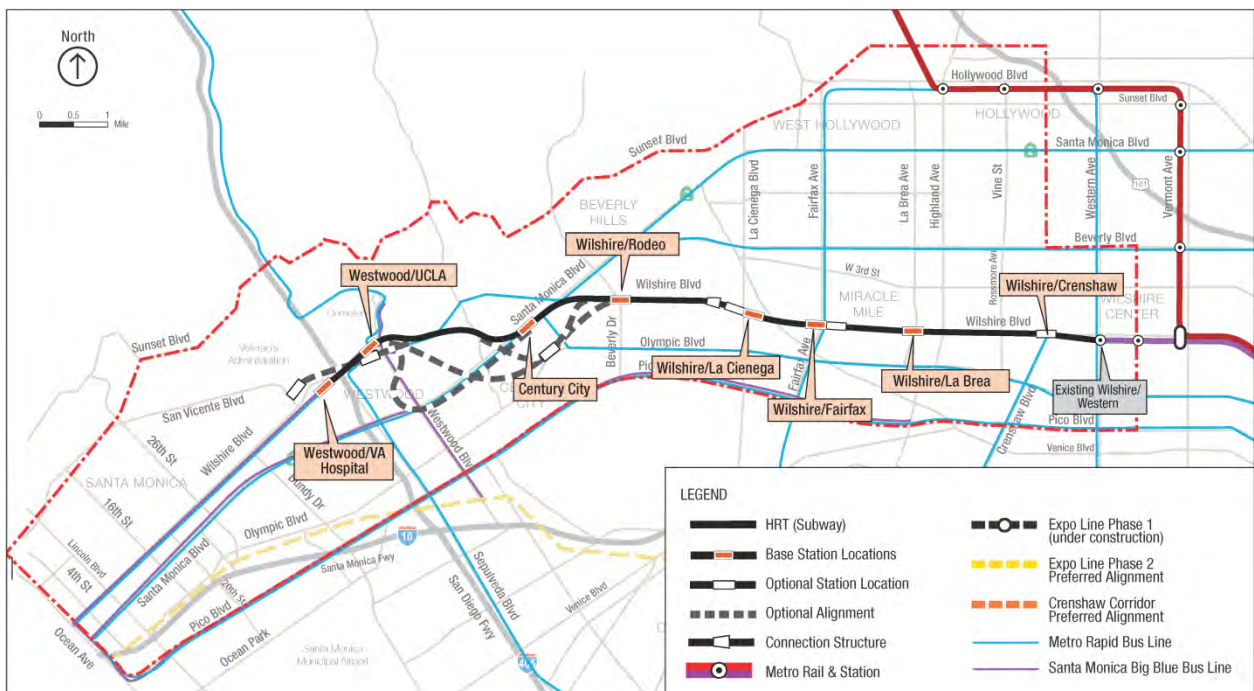
This alternative extends the existing Metro Purple Line from the Wilshire/Western Station to a Westwood/VA Hospital Station (Figure 2-2). Similar to Alternative 1, Alternative 2 extends the subway from the Wilshire/Western Station to a Westwood/UCLA Station. Alternative 2 then travels westerly under Veteran Avenue and continues west under the I-405 Freeway, terminating at a Westwood/VA Hospital Station. This alignment is 8.96 miles in length from the Wilshire/Western Station.

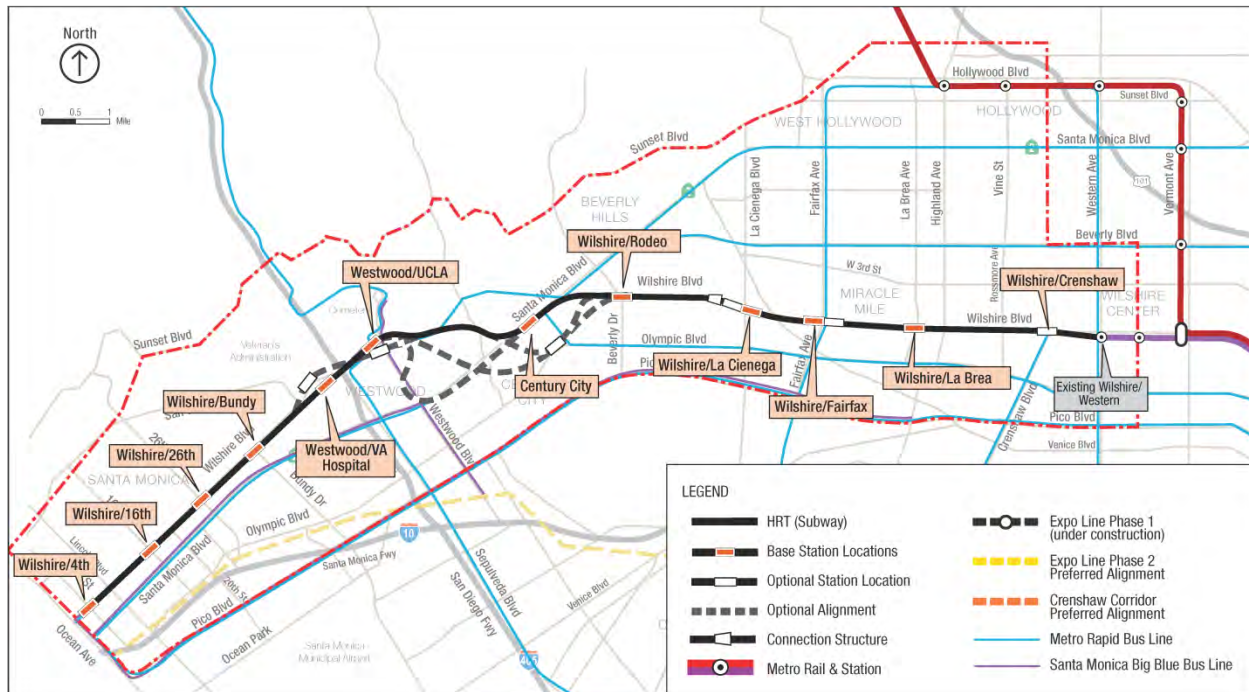
Alternative 2 would operate in each direction at 3.3-minute headways during the morning and evening peak periods and at 10-minute headways during the midday, off-peak period. The estimated one-way running time is 13 minutes 53 seconds from the Wilshire/Western Station.

### **2.3.3 Alternative 3—Santa Monica Extension**

This alternative extends the existing Metro Purple Line from the Wilshire/Western Station to the Wilshire/4th Station in Santa Monica (Figure 2-3). Similar to Alternative 2, Alternative 3 extends the subway from the Wilshire/Western Station to a Westwood/VA Hospital Station. Alternative 3 then continues westerly under Wilshire Boulevard and terminates at the Wilshire/4th Street Station between 4th and 5th Streets in Santa Monica. The alignment is 12.38 miles.

Alternative 3 would operate in each direction at 3.3-minute headways during the morning and evening peak periods and operate with 10-minute headways during the midday, off-peak period. The estimated one-way running time is 19 minutes 27 seconds from the Wilshire/Western Station.


**Figure 2-1. Alternative 1—Westwood/UCLA Extension**

**Figure 2-2. Alternative 2—Westwood/Veterans Administration (VA) Hospital Extension**



**Figure 2-3. Alternative 3—Santa Monica Extension**

### 2.3.4 Alternative 4—Westwood/VA Hospital Extension plus West Hollywood Extension

Similar to Alternative 2, Alternative 4 extends the existing Metro Purple Line from the Wilshire/Western Station to a Westwood/VA Hospital Station. Alternative 4 also includes a West Hollywood Extension that connects the existing Metro Red Line Hollywood/Highland Station to a track connection structure near Robertson and Wilshire Boulevards, west of the Wilshire/La Cienega Station (Figure 2-4). The alignment is 14.06 miles long.

Alternative 4 would operate from Wilshire/Western to a Westwood/VA Hospital Station in each direction at 3.3-minute headways during morning and evening peak periods and 10-minute headways during the midday off-peak period. The West Hollywood extension would operate at 5-minute headways during peak periods and 10-minute headways during the midday, off-peak period. The estimated one-way running time for the Metro Purple Line extension is 13 minutes 53 seconds, and the running time for the West Hollywood from Hollywood/Highland to Westwood/VA Hospital is 17 minutes and 2 seconds.

### 2.3.5 Alternative 5—Santa Monica Extension plus West Hollywood Extension

Similar to Alternative 3, Alternative 5 extends the existing Metro Purple Line from the Wilshire/Western Station to the Wilshire/4th Station and also adds a West Hollywood Extension similar to the extension described in Alternative 4 (Figure 2-5). The alignment is 17.49 miles in length. Alternative 5 would operate the Metro Purple Line extension in each direction at 3.3-minute headways during the morning and evening peak periods and 10-minute headways during the midday, off-peak period. The West Hollywood extension would operate in each direction at 5-minute headways during peak periods and 10-minute headways during the midday, off-peak period. The estimated one-way running time for the

Metro Purple Line extension is 19 minutes 27 seconds, and the running time from the Hollywood/Highland Station to the Wilshire/4th Station is 22 minutes 36 seconds.

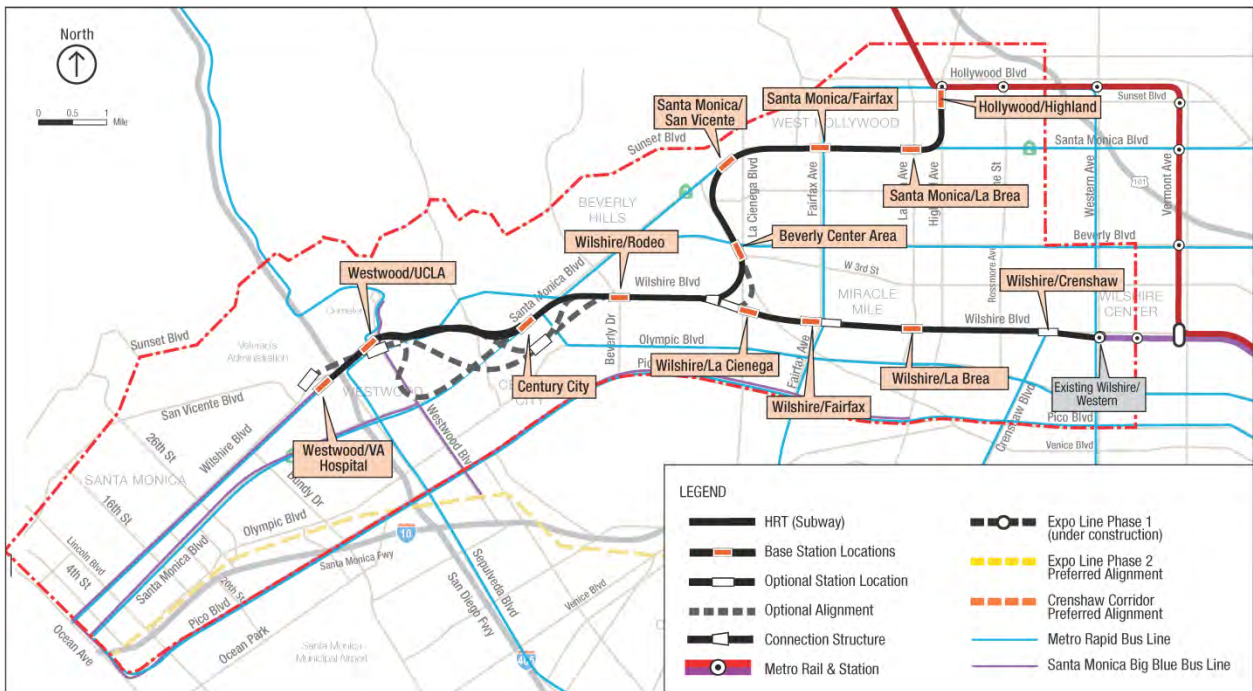


Figure 2-4. Alternative 4—Westwood/VA Hospital Extension plus West Hollywood Extension

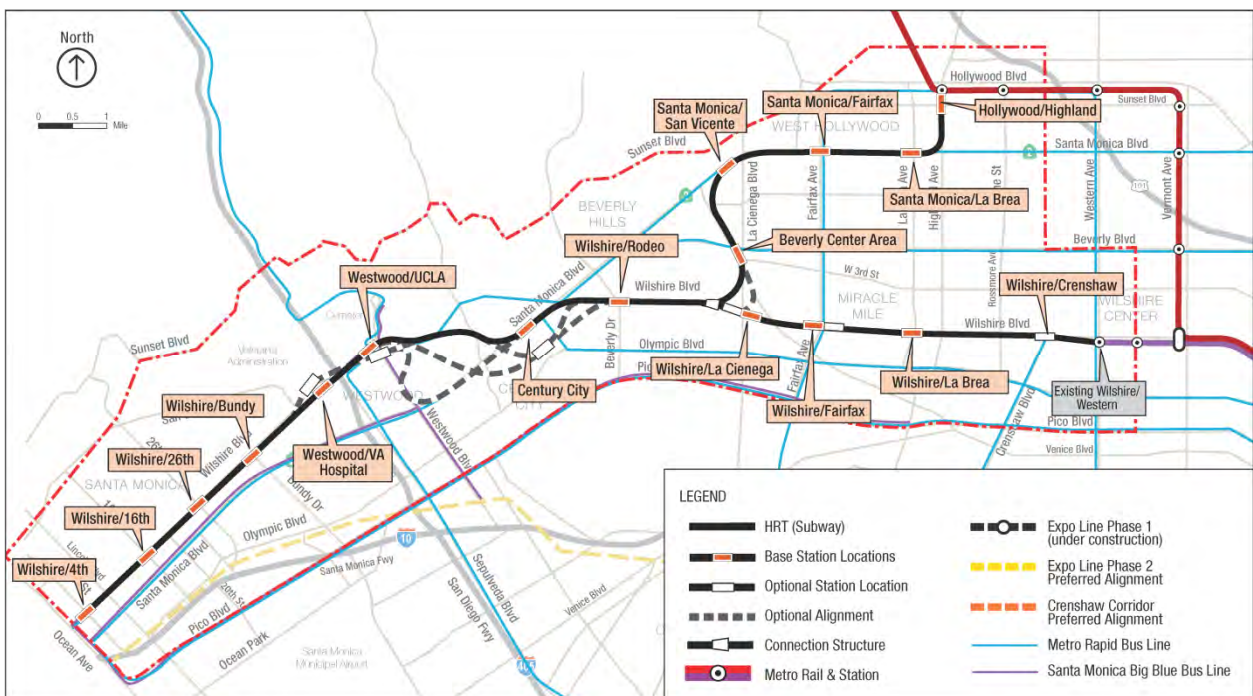


Figure 2-5. Alternative 5—Santa Monica Extension plus West Hollywood Extension



### **2.3.6 Stations and Segment Options**

HRT stations consist of a station “box,” or area in which the basic components are located. The station box can be accessed from street-level entrances by stairs, escalators, and elevators that would bring patrons to a mezzanine level where the ticketing functions are located. The 450-foot platforms are one level below the mezzanine level and allow level boarding (i.e., the train car floor is at the same level as the platform). Stations consist of a center or side platform. Each station is equipped with under-platform exhaust shafts, over-track exhaust shafts, blast relief shafts, and fresh air intakes. In most stations, it is anticipated that only one portal would be constructed as part of the Project, but additional portals could be developed as a part of station area development (by others). Stations and station entrances would comply with the *Americans with Disabilities Act of 1990*, Title 24 of the California Code of Regulations, the California Building Code, and the Department of Transportation Subpart C of Section 49 CFR Part 37.

Platforms would be well-lighted and include seating, trash receptacles, artwork, signage, safety and security equipment (closed-circuit television, public announcement system, passenger assistance telephones), and a transit passenger information system. The fare collection area includes ticket vending machines, fare gates, and map cases.

Table 2-1 lists the stations and station options evaluated and the alternatives to which they are applicable. Figure 2-6 shows the proposed station and alignment options. These include:

- Option 1—Wilshire/Crenshaw Station Option
- Option 2—Fairfax Station Option
- Option 3—La Cienega Station Option
- Option 4—Century City Station and Alignment Options
- Option 5—Westwood/UCLA Station Option
- Option 6—Westwood/VA Hospital Station Option

**Table 2-1. Alternatives and Stations Considered**

Stations	Alternatives				
	1	2	3	4	5
	Westwood/ UCLA Extension	Westwood/ VA Hospital Extension	Santa Monica Extension	Westwood/ VA Hospital Extension Plus West Hollywood Extension	Santa Monica Extension Plus West Hollywood Extension
<b>Base Stations</b>					
Wilshire/Crenshaw	•	•	•	•	•
Wilshire/La Brea	•	•	•	•	•
Wilshire/Fairfax	•	•	•	•	•
Wilshire/La Cienega	•	•	•	•	•
Wilshire/Rodeo	•	•	•	•	•
Century City (Santa Monica Blvd)	•	•	•	•	•
Westwood/UCLA (Off-street)	•	•	•	•	•
Westwood/VA Hospital		•	•	•	•
Wilshire/Bundy			•		•
Wilshire/26th			•		•
Wilshire/16th			•		•
Wilshire/4th			•		•
Hollywood/Highland				•	•
Santa Monica/La Brea				•	•
Santa Monica/Fairfax				•	•
Santa Monica/San Vicente				•	•
Beverly Center Area				•	•
<b>Station Options</b>					
1—No Wilshire/Crenshaw	•	•	•	•	•
2—Wilshire/Fairfax East	•	•	•	•	•
3—Wilshire/La Cienega (Transfer Station)	•	•	•	•	•
4—Century City (Constellation Blvd)	•	•	•	•	•
5—Westwood/UCLA (On-street)	•	•	•	•	•
6—Westwood/VA Hospital North		•	•	•	•





### 2.3.7 Option 1—Wilshire/Crenshaw Station Option

Base Station: Wilshire/Crenshaw Station—The base station straddles Crenshaw Boulevard, between Bronson Avenue and Lorraine Boulevard.

Station Option: Remove Wilshire/Crenshaw Station—This station option would delete the Wilshire/Crenshaw Station. Trains would run from the Wilshire/Western Station to the Wilshire/La Brea Station without stopping at Crenshaw. A vent shaft would be constructed at the intersection of Western Avenue and Wilshire Boulevard (Figure 2-7).

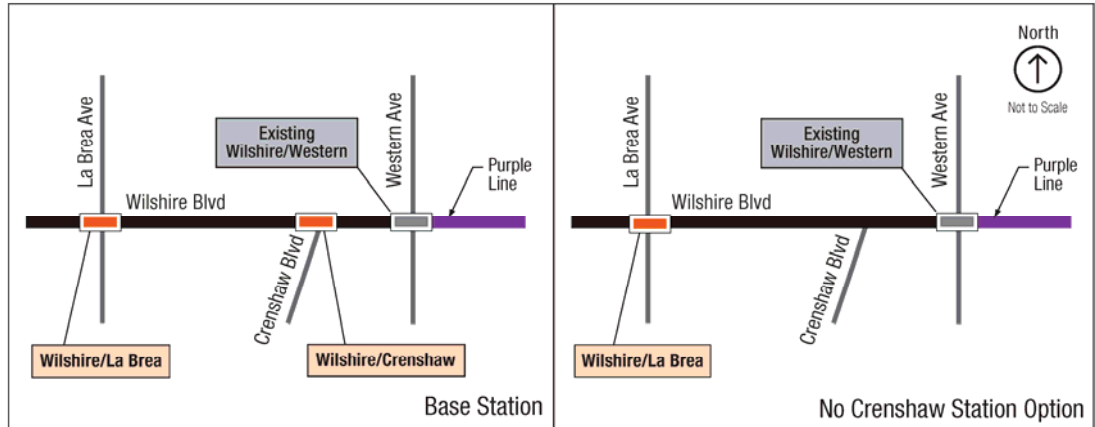


Figure 2-7. Option 1—No Wilshire/Crenshaw Station Option

### 2.3.8 Option 2—Wilshire/Fairfax Station East Option

Base Station: Wilshire/Fairfax Station—The base station is under the center of Wilshire Boulevard, immediately west of Fairfax Avenue.

Station Option: Wilshire/Fairfax Station East Station Option—This station option would locate the Wilshire/Fairfax Station farther east, with the station underneath the Wilshire/Fairfax intersection (Figure 2-8). The east end of the station box would be east of Orange Grove Avenue in front of LACMA, and the west end would be west of Fairfax Avenue.

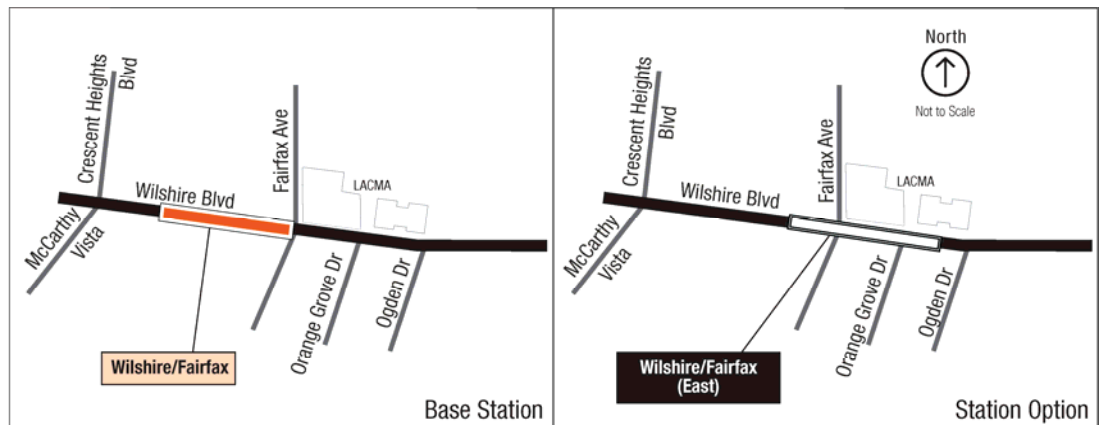


Figure 2-8. Option 2—Fairfax Station Option



### 2.3.9 Option 3—Wilshire/La Cienega Station Option

**Base Station: Wilshire/La Cienega Station**—The base station would be under the center of Wilshire Boulevard, immediately east of La Cienega Boulevard. A direct transfer between the Metro Purple Line and the potential future West Hollywood Line is not provided with this station. Instead, a connection structure is proposed west of Robertson Boulevard as a means to provide a future HRT connection to the West Hollywood Line.

**Station Option: Wilshire/La Cienega Station West with Connection Structure**—The station option would be located west of La Cienega Boulevard, with the station box extending from the Wilshire/Le Doux Road intersection to just west of the Wilshire/Carson Road intersection (Figure 2-9). It also contains an alignment option that would provide an alternate HRT connection to the future West Hollywood Extension. This alignment portion of Option 3 is only applicable to Alternatives 4 and 5.

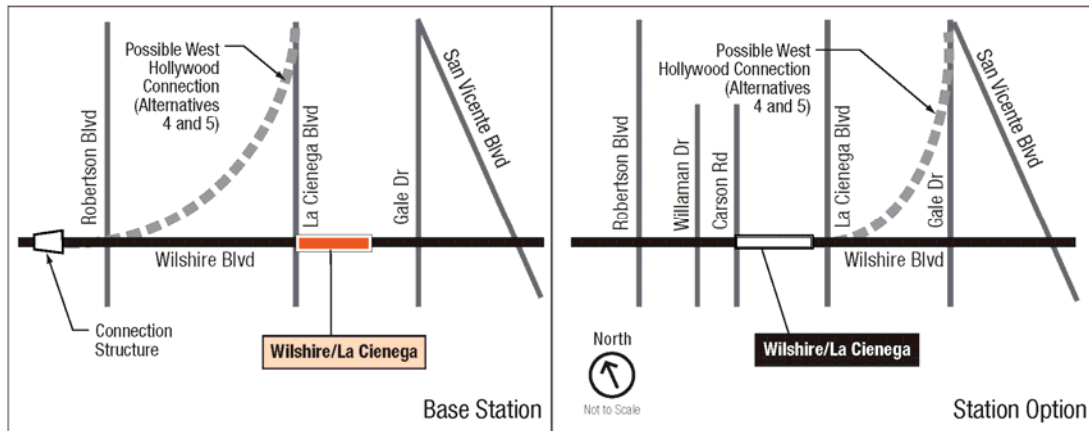


Figure 2-9. Option 3—La Cienega Station Option

### 2.3.10 Option 4—Century City Station and Segment Options

#### 2.3.10.1 Century City Station and Beverly Hills to Century City Segment Options

**Base Station: Century City (Santa Monica) Station**—The base station would be under Santa Monica Boulevard, centered on Avenue of the Stars.

**Station Option: Century City (Constellation) Station**—With Option 4, the Century City Station has a location option on Constellation Boulevard (Figure 2-10), straddling Avenue of the Stars and extending westward to east of MGM Drive.

**Segment Options:** Three route options are proposed to connect the Wilshire/Rodeo Station to Century City (Constellation) Station: Constellation North and Constellation South. As shown in Figure 2-10, the base segment to the base Century City (Santa Monica) Station is shown in the solid black line and the segment options to Century City (Constellation) Station are shown in the dashed grey lines.

#### 2.3.10.2 Century City to Westwood Segment Options

Three route options considered for connecting the Century City and Westwood stations include: East, Central, and West. As shown in Figure 2-10, each of these three segments would be accessed from both Century City Stations and both Westwood/UCLA Stations. The



base segment is shown in the solid black line and the options are shown in the dashed grey lines.

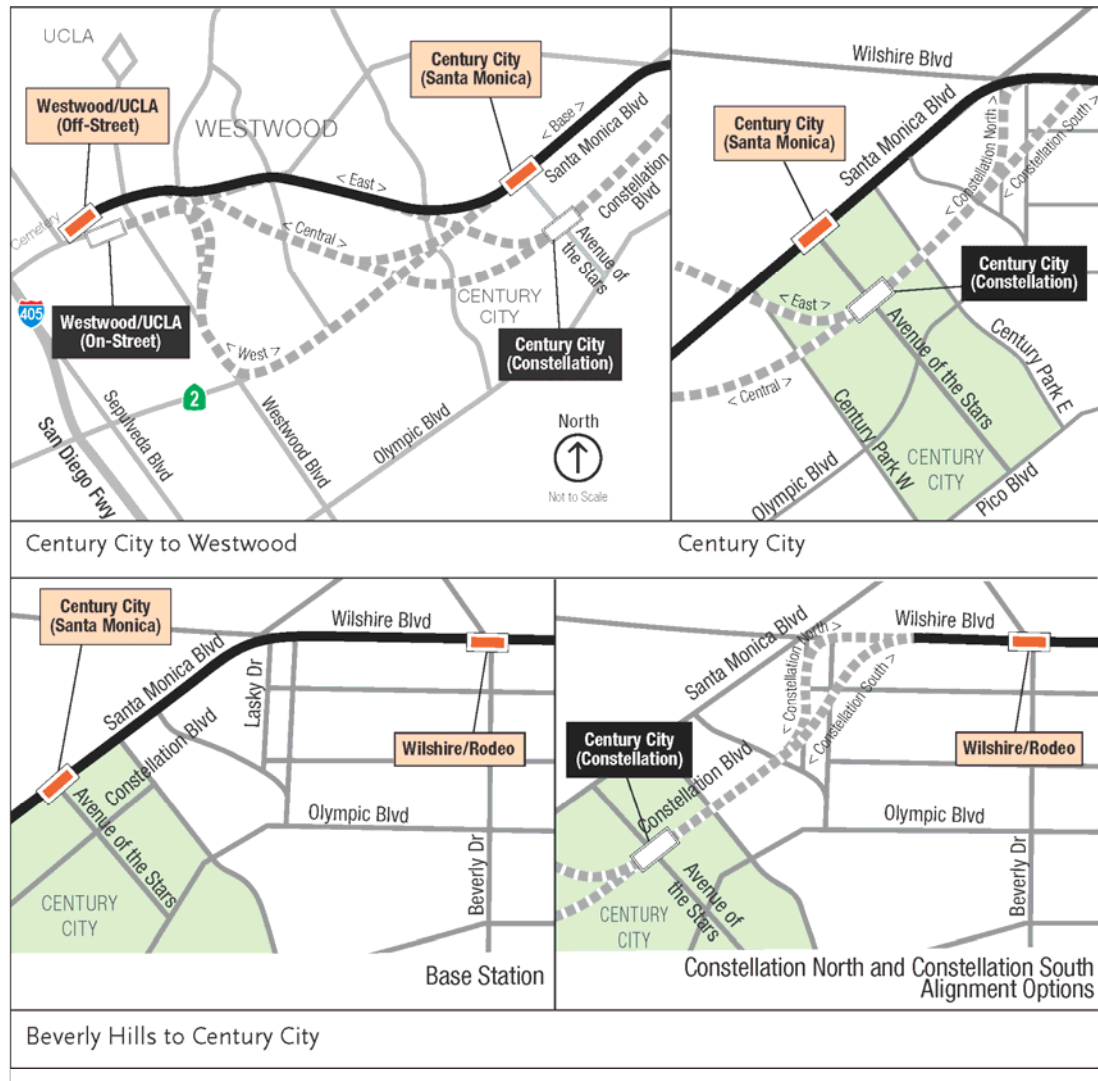


Figure 2-10. Century City Station Options

### 2.3.11 Option 5—Westwood/UCLA Station Options

**Base Station:** Westwood/UCLA Station Off-Street Station Option—The base station is located under the UCLA Lot 36 on the north side of Wilshire Boulevard between Gayley and Veteran Avenues.

**Station Option:** Westwood/UCLA On-Street Station Option—This station option would be located under the center of Wilshire Boulevard, immediately west of Westwood Boulevard (Figure 2-11).

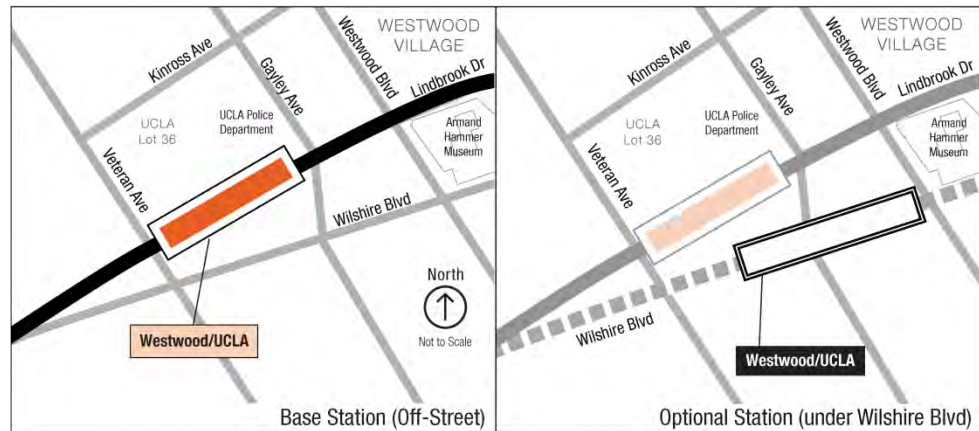


Figure 2-11. Option 5—Westwood/UCLA Station Options

### 2.3.12 Option 6—Westwood/VA Hospital Station Option

**Base Station: Westwood/VA Hospital**—The base station would be below the VA Hospital parking lot on the south side of Wilshire Boulevard in between the I-405 exit ramp and Bonsall Avenue.

**Station Option: Westwood/VA Hospital North Station**—This station option would locate the Westwood/VA Hospital Station on the north side of Wilshire Boulevard between Bonsall Avenue and Wadsworth Theater. (Shown in Figure 2-12)

To access the Westwood/VA Hospital Station North, the alignment would extend westerly from the Westwood/UCLA Station under Veteran Avenue, the Federal Building property, the I-405 Freeway, and under the Veterans Administration property just east of Bonsall Avenue.

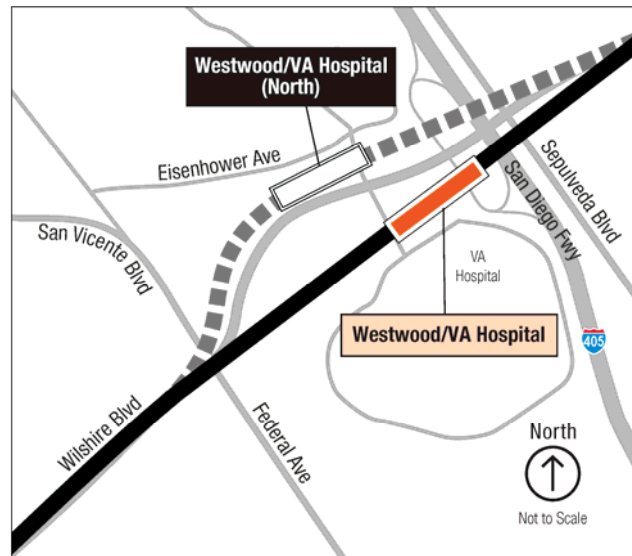


Figure 2-12. Option 6—Westwood/VA Hospital Station North

## 2.4 Base Stations

The remaining stations (those without options) are described below.

**Wilshire/La Brea Station**—This station would be located between La Brea and Cloverdale Avenues.

**Wilshire/Rodeo Station**—This station would be under the center of Wilshire Boulevard, beginning just west of South Canon Drive and extending to El Camino Drive.



Wilshire/Bundy Station—This station would be under Wilshire Boulevard, east of Bundy Drive, extending just east of Saltair Avenue.

Wilshire/26th Station—This station would be under Wilshire Boulevard, with the eastern end east of 26th Street and the western end west of 25th Street, midway between 25th Street and Chelsea Avenue.

Wilshire/16th Station—This station would be under Wilshire Boulevard with the eastern end just west of 16th Street and the western end west of 15th Street.

Wilshire/4th Station—This station would be under Wilshire Boulevard and 4th Street in Santa Monica.

Hollywood/Highland Station—This station would be located under Highland Avenue and would provide a transfer option to the existing Metro Red Line Hollywood/Highland Station under Hollywood Boulevard.

Santa Monica/La Brea Station—This station would be under Santa Monica Boulevard, just west of La Brea Avenue, and would extend westward to the center of the Santa Monica Boulevard/Formosa Avenue.

Santa Monica/Fairfax Station—This station is under Santa Monica Boulevard and would extend from just east of Fairfax Avenue to just east of Ogden Drive.

Santa Monica/San Vicente Station—This station would be under Santa Monica Boulevard and would extend from just west of Hancock Avenue on the west to just east of Westmount Drive on the east.

Beverly Center Area Station—This station would be under San Vicente Boulevard, extending from just south of Gracie Allen Drive to south of 3rd Street.

## **2.5 Other Components of the Build Alternatives**

### **2.5.1 Traction Power Substations**

Traction power substations (TPSS) are required to provide traction power for the HRT system. Substations would be located in the station box or in a box located with the crossover tracks and would be located in a room that is about 50 feet by 100 feet in a below grade structure.

### **2.5.2 Emergency Generators**

Stations at which the emergency generators would be located are Wilshire/La Brea, Wilshire/La Cienega, Westwood/UCLA, Westwood/VA Hospital, Wilshire/26th, Highland/Hollywood, Santa Monica/La Brea, and Santa Monica/San Vicente. The emergency generators would require approximately 50 feet by 100 feet of property in an off-street location. All would require property acquisition, except for the one at the Wilshire/La Brea Station which uses Metro's property.

### **2.5.3 Mid-Tunnel Vent Shaft**

Each alternative would require mid-tunnel ventilation shafts. The vent shafts are emergency ventilation shafts with dampers, fans, and sound attenuators generally placed at both ends of a station box to exhaust smoke. In addition, emergency vent shafts could be used for station cooling and gas mitigation. The vent shafts are also required in tunnel segments with more



than 6,000 feet between stations to meet fire/life safety requirements. There would be a connecting corridor between the two tunnels (one for each direction of train movement) to provide emergency egress and fire-fighting ingress. A vent shaft is approximately 150 square feet; with the opening of the shaft located in a sidewalk and covered with a grate about 200 square feet.

**Table 2-2. Mid-Tunnel Vent Shaft Locations**

Alternative/Option	Location
Alternatives 1 through 5, MOS 2	Part of the connection structure on Wilshire Boulevard, west of Robertson Boulevard
Alternatives 2 through 5	West of the Westwood/VA Hospital Station on Army Reserve property at Federal Avenue and Wilshire Boulevard
Option 4 via East route	At Wilshire Boulevard/Manning Avenue intersection
Option 4 to Westwood/UCLA Off-Street Station via Central route	On Santa Monica Boulevard just west of Beverly Glen Boulevard
Option 4 to Westwood/UCLA On-Street Station via Central route	At Santa Monica Boulevard/Beverly Glen Boulevard intersection
Options 4 via West route	At Santa Monica Boulevard/Glendon Avenue intersection
Options 4 from Constellation Station via Central route	On Santa Monica Boulevard between Thayer and Pandora Avenues
Option from Constellation Station via West route	On Santa Monica Boulevard just east of Glendon Avenue

### 2.5.4 Trackwork Options

Each Build Alternative requires special trackwork for operational efficiency and safety (Table 2-3):

Tail tracks—a track, or tracks, that extends beyond a terminal station (the last station on a line)

Pocket tracks—an additional track, or tracks, adjacent to the mainline tracks generally at terminal stations

Crossovers—a pair of turnouts that connect two parallel rail tracks, allowing a train on one track to cross over to the other

Double crossovers—when two sets of crossovers are installed with a diamond allowing trains to cross over to another track

**Table 2-3. Special Trackwork Locations**

Station	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
	Westwood/ UCLA Extension	Westwood/ VA Hospital Extension	Santa Monica Extension	Westwood/VA Hospital Extension Plus West Hollywood Extension	Santa Monica Extension Plus West Hollywood Extension
<b>Special Trackwork Locations—Base Trackwork Alternatives</b>					
Wilshire/Crenshaw	None	None	None	None	None
Wilshire/La Brea	Double Crossover	Double Crossover	Double Crossover	Double Crossover	Double Crossover
Wilshire/Fairfax	None <i>MOS 1 Only; Terminus Station with Tail tracks</i>	None <i>MOS 1 Only; Terminus Station with Tail tracks</i>	None <i>MOS 1 Only; Terminus Station with Tail tracks</i>	None <i>MOS 1 Only; Terminus Station with Tail tracks</i>	None <i>MOS 1 Only; Terminus Station with Tail tracks</i>
Wilshire/La Cienega	None	None	None	None	None
<i>Station Option 3 - Wilshire/La Cienega West</i>	Turnouts	Turnouts	Turnouts		
Wilshire/Robertson Connection Structure	Equilateral Turnouts—for future West Hollywood connection	Equilateral Turnouts—for future West Hollywood connection	Equilateral Turnouts—for future West Hollywood connection	Equilateral Turnouts	Equilateral Turnouts
Wilshire/Rodeo	None	None	None	None	None
Century City	Double Crossover <i>MOS 2 Only; Terminus Station with Double Crossover and tail tracks</i>	Double Crossover <i>MOS 2 Only; Terminus Station with Double Crossover and tail tracks</i>	Double Crossover <i>MOS 2 Only; Terminus Station with Double Crossover and tail tracks</i>	Double Crossover <i>MOS 2 Only; Terminus Station with Double Crossover and tail tracks</i>	Double Crossover <i>MOS 2 Only; Terminus Station with Double Crossover and tail tracks</i>
Westwood/UCLA	End Terminal with Double Crossover and tail tracks	Double Crossover	Double Crossover	Double Crossover	Double Crossover
Westwood/VA Hospital	N/A	End Terminal with Turnouts and tail tracks	Turnouts	End Terminal with Turnouts and tail tracks	Turnouts
Wilshire/Bundy	N/A	N/A	None	N/A	None
Wilshire/26th	N/A	N/A	None	N/A	None
Wilshire/16th	N/A	N/A	None	N/A	None
Wilshire/4th	N/A	N/A	End Terminal with Double Crossover. Pocket Track with Double Crossover, Equilateral Turnouts and tail tracks	N/A	End Terminal with Double Crossover, Pocket Track with Double Crossover, Equilateral Turnouts and tail tracks
Hollywood/ Highland	N/A	N/A	N/A	Double Crossover and tail tracks	Double Crossover and tail tracks
Santa Monica/La Brea	N/A	N/A	N/A	None	None
Santa Monica/Fairfax	N/A	N/A	N/A	None	None
Santa Monica/ San Vicente	N/A	N/A	N/A	Double Crossover	Double Crossover
Beverly Center	N/A	N/A	N/A	None	None
<b>Additional Special Trackwork Location (Optional Trackwork)</b>					
Wilshire/Fairfax	Double Crossover	Double Crossover	Double Crossover	Double Crossover	Double Crossover
Wilshire/La Cienega	Double Crossover	Double Crossover	Double Crossover	Double Crossover	Double Crossover
Wilshire/ Rodeo	Pocket Track	Pocket Track	Pocket Track	Pocket Track	Pocket Track
Wilshire/26th	N/A	N/A	Double Crossover	N/A	Double Crossover



### 2.5.5 Rail Operations Center

The existing Rail Operations Center (ROC), shown on the figure below, located in Los Angeles near the intersection of Imperial Highway and the Metro Blue Line does not have sufficient room to accommodate the new transit corridors and line extensions in Metro’s expansion program. The Build Alternatives assume an expanded ROC at this location.

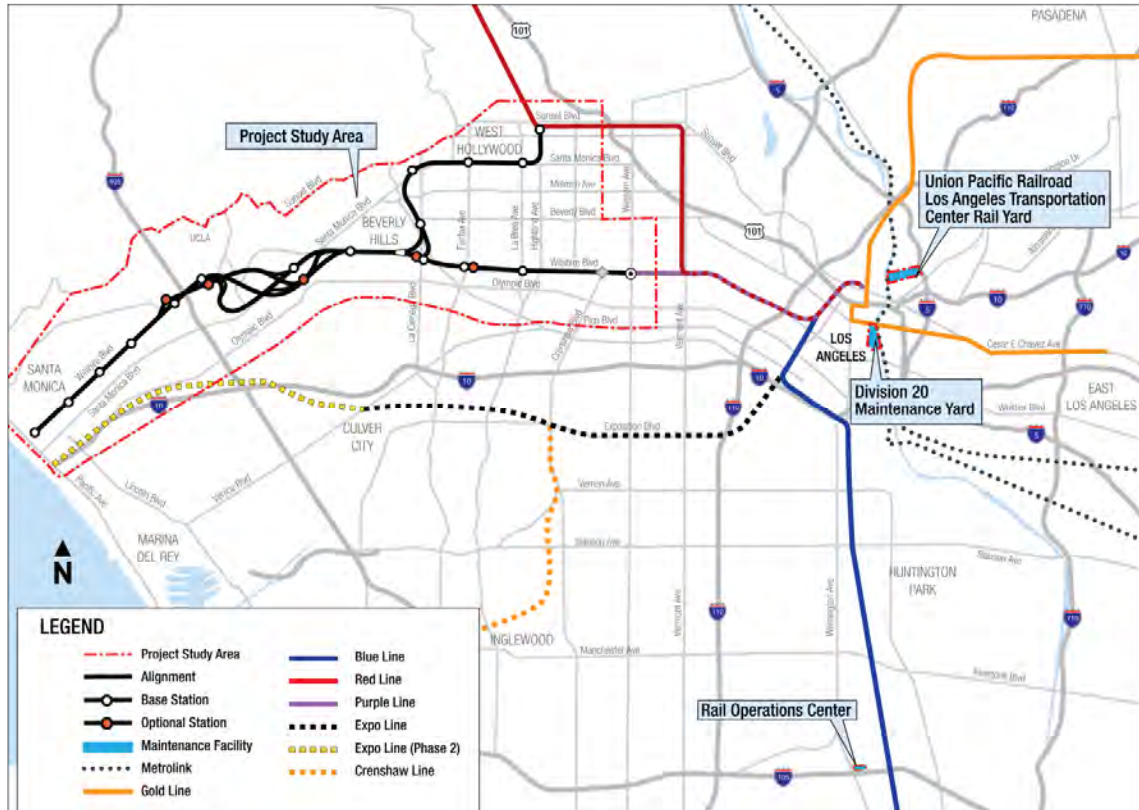


Figure 2-13. Location of the Rail Operations Center and Maintenance Yards

### 2.5.6 Maintenance Yards

If any of the Build Alternatives are chosen, additional storage capacity would be needed. Two options for providing this expanded capacity are as follows:

The first option requires purchasing 3.9 acres of vacant private property abutting the southern boundary of the Division 20 Maintenance and Storage Facility, which is located between the 4th and 6th Street Bridges. Additional maintenance and storage tracks would accommodate up to 102 vehicles, sufficient for Alternatives 1 and 2.

The second option is a satellite facility at the Union Pacific (UP) Los Angeles Transportation Center Rail Yard. This site would be sufficient to accommodate the vehicle fleet for all five Build Alternatives. An additional 1.3 miles of yard lead tracks from the Division 20 Maintenance and Storage Facility and a new bridge over the Los Angeles River would be constructed to reach this yard (Figure 2-14).


**Figure 2-14. UP Railroad Rail Bridge**

**Figure 2-15. Maintenance Yard Options**

## 2.6 Minimum Operable Segments

Due to funding constraints, it may be necessary to construct the Westside Subway Extension in shorter segments. A Minimum Operable Segment (MOS) is a phasing option that could be applied to any of the Build Alternatives.

### 2.6.1 MOS 1—Fairfax Extension

MOS 1 follows the same alignment as Alternative 1, but terminates at the Wilshire/Fairfax Station rather than extending to a Westwood/UCLA Station. A double crossover for MOS 1 is located on the west end of the Wilshire/La Brea Station box, west of Cloverdale Avenue. The alignment is 3.10 miles in length.

### 2.6.2 MOS 2—Century City Extension

MOS 2 follows the same alignment as Alternative 1, but terminates at a Century City Station rather than extending to a Westwood/UCLA Station. The alignment is 6.61 miles from the Wilshire/Western Station.





### **3.0 EXISTING CONDITIONS**

This section presents an assessment of existing traffic conditions in the project Study Area. The analysis of existing weekday AM and PM peak hour traffic conditions at 192 key intersections located in close proximity to potential station locations as well as at the convergence of congested major arterials provides a basis for the assessment of future traffic conditions.

The Westside is currently characterized by pronounced peak hour congestion that is exacerbated by a heavy concentration of jobs as compared to the region as a whole. The Westside jobs-housing imbalance has reached a point where eastbound travel in the afternoon/early evening (3:00 to 7:00 PM) is severely impacted on the Santa Monica Freeway or any of the east-west arterials serving the Study Area. Travel speeds<sup>1</sup> during these hours are typically less than 10 mph. By virtue of this ubiquitous congestion, all known “short cuts” such as collector or even local streets have lost their viability and any significant traffic accident in the Study Area (or subregion) can result in areawide gridlock. Accordingly, travel time reliability has diminished dramatically over the past years.

Population and employment densities in the Study Area are among the highest in the metropolitan region. This high density is especially apparent to drivers as they attempt to travel in and through the Study Area during the peak travel periods. Peak periods in the Study Area are atypical, lasting longer on weekdays than in many areas of the country, and on weekends. Under existing conditions, a majority of the 192 study locations are operating at deficient levels of service, especially among major east-west corridors.

The existing conditions analysis includes a description of key Study Area streets and highways, intersection and segment traffic volumes, and current intersection and roadway operating conditions.

#### **3.1 Regional Transportation Network**

The Study Area is generally well served by a roadway network of arterial streets and freeways, which provide options for travel both north/south and east/west. However, the Study Area contains some of the most congested arterial streets in the County. The built environment throughout the Study Area lacks right-of-way for the construction of new roadways and severely limits the expansion of existing facilities.

##### **3.1.1 Freeways**

Two freeways traverse the Study Area. The San Diego Freeway (I-405) runs north/south through the Study Area just west of Westwood and UCLA and provides the primary access to/from the north and south. The Santa Monica Freeway (I-10) runs just outside the Study Area until Santa Monica city limits but parallels key east-west arterials and provides regional access from the east. Both freeways are widely recognized as some of the most congested in both the Los Angeles region and the nation, and experience high traffic volumes throughout the day, well beyond the traditional peak travel hours. The Study Area freeway network is described below.

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<sup>1</sup> Source: LADOT and Caltrans traffic conditions data.



I-10 Freeway (Santa Monica Freeway)—The Santa Monica Freeway is a major east/west freeway that traverses the southern portion of the Study Area. It extends from the Pacific Ocean and the City of Santa Monica on the west to Downtown Los Angeles and beyond on the east. Near the proposed project alignment, the Santa Monica Freeway provides five lanes of travel in each direction, including auxiliary lanes. The ramps that lie in the Study Area include the Cloverfield Boulevard, 20th Street and Lincoln Boulevard on- and off-ramps, the 4th/5th Street off-ramps, and the 4th Street on-ramps. Peak hour conditions along the Santa Monica Freeway within or adjacent to the Study Area are generally congested in both directions, with a higher volume of traffic traveling west in the AM peak and east in the PM peak. For this reason, observations of eastbound and westbound on-ramps indicate greater congestion in the peak direction.

I-405 Freeway (San Diego Freeway)—The San Diego Freeway is a major north/south freeway that connects the San Fernando Valley to West Los Angeles, the South Bay area, and Orange County. In the Study Area, the San Diego Freeway provides five to six lanes of travel in each direction, including a southbound carpool lane and auxiliary lanes. The ramps that lie in the Study Area include the Sunset Boulevard, Wilshire Boulevard, Santa Monica Boulevard, and Olympic/Pico Boulevard on- and off-ramps and the Montana Avenue off-ramp. Peak hour conditions along the San Diego Freeway are generally congested in both directions. Because the Study Area is jobs rich, the directional flow in the AM peak heavily favors the southbound direction north of the Study Area and the northbound direction south of the Study Area.

**3.1.1.1 Daily Traffic Volumes**

This section describes freeway volumes at key interchanges and segments in the Study Area.

I-10 Freeway (Santa Monica Freeway)—In the Study Area, the average daily (weekday) traffic<sup>2</sup> on the Santa Monica Freeway varies between 148,000 vehicles at the Lincoln Boulevard interchange, 192,000 vehicles at the Cloverfield Boulevard interchange, and 244,000 vehicles at the Bundy Drive interchange. At key interchanges south of the Study Area, average daily traffic varies between 260,000 vehicles at the Overland Avenue Interchange, 267,000 vehicles at the Robertson Boulevard Interchange, 277,000 vehicles at the La Brea Avenue Interchange, and 291,000 vehicles at the Crenshaw Boulevard interchange.

I-405 Freeway (San Diego Freeway)—In the Study Area, the average daily (weekday) traffic on the San Diego Freeway varies between 319,000 vehicles at the Olympic Boulevard interchange, 302,000 vehicles at the Santa Monica Boulevard interchange, 289,000 vehicles at the Wilshire Boulevard interchange, 281,000 vehicles at the Montana Avenue off-ramp, and 283,000 vehicles at the Sunset Boulevard interchange.

**3.1.2 Arterials**

The Study Area contains some of the most congested streets in Los Angeles County. The high population and employment densities in the Study Area have resulted in eastbound and westbound directional travel being congested during both the AM and PM peak periods. The arterials in the Study Area serve the employment centers as well as local and regional travel. In addition, they are used as alternates to the I-10 and I-405 freeways during non-recurrent delays such as accidents, breakdowns, lane closures and other random events. Key

<sup>2</sup> 2008 Traffic Volumes on California State Highways, State of California Department of Transportation, Traffic Operations Division.



east/west arterials include Hollywood, Sunset, Santa Monica, Beverly, Wilshire, Olympic, and Pico Boulevards and Melrose Avenue. Key north/south arterials include Crenshaw, La Cienega, San Vicente, Robertson, Beverly Glen, Westwood, Sepulveda, and Lincoln Boulevards; Western, La Brea, and Fairfax Avenues; and Bundy Drive. These key arterials can be classified as one of two street types: a Major Class II Highway or a Secondary Highway. A Major Class II Highway is defined as a 104' right-of-way (ROW), 12' sidewalks, 13' curb lanes (off-peak parking, peak through), four full-time through lanes, and one dedicated left turn lane/median. A Secondary Highway is defined as a 90' ROW, 10' sidewalks, 19' curb lanes (all day parking), four full-time through lanes, and one dedicated left turn lane/median. The key Study Area arterials are described below.

**3.1.2.1 Major East/West Arterials (Listed from North to South)**

**Hollywood Boulevard**—Hollywood Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from Laurel Canyon Boulevard on the west to Sunset Boulevard on the east. In the Study Area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

**Sunset Boulevard**—Sunset Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from the Pacific Coast Highway on the west to Grand Avenue in Downtown Los Angeles to the east. In the Study Area, it generally has two full-time travel lanes in each direction, with the parking lane used as a travel lane during peak periods in some locations. Dedicated left-turn lanes are provided at most major intersections.

**Santa Monica Boulevard**—Santa Monica Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from Ocean Avenue in Santa Monica on the west to Sunset Boulevard in the Silver Lake neighborhood of Los Angeles on the east. In the Study Area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

**Melrose Avenue**—Melrose Avenue is a major east/west arterial that is classified as a Secondary Highway. It extends from Doheny Drive on the west to Hoover Street on the east. In the Study Area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

**Beverly Boulevard**—Beverly Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from Santa Monica Boulevard in Beverly Hills on the west to Glendale Boulevard near Downtown Los Angeles on the east. In the Study Area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

**Wilshire Boulevard**—Wilshire Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from Ocean Avenue in Santa Monica on the west to Grand Avenue in Downtown Los Angeles on the east. In the Study Area, it generally has two full-time travel lanes in each direction, with the parking lane used as a travel lane during peak periods in many locations. Dedicated left-turn lanes are provided at most major intersections.

**Olympic Boulevard**—Olympic Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from 5th Street in Santa Monica on the west to Downtown Los Angeles and further on the east. In the Study Area, it generally has two to three full-time travel lanes in each direction, with the parking lane used as a travel



lane during peak periods in some locations. Dedicated left-turn lanes are provided at most major intersections.

Pico Boulevard—Pico Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from Ocean Avenue in Santa Monica on the west to Central Avenue in Downtown Los Angeles on the east. In the Study Area, it generally has two full-time travel lanes in each direction, with the parking lane used as a travel lane during peak periods in many locations. Dedicated left-turn lanes are provided at most major intersections.

**3.1.2.2 Major North/South Arterials (Listed from East to West)**

Western Avenue—Western Avenue is a major north/south arterial that is classified as a Major Class II Highway. It extends from Los Feliz Boulevard on the north to San Pedro on the south. In the Study Area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at major intersections.

Crenshaw Boulevard—Crenshaw Boulevard is a major north/south arterial that is classified as a Major Class II Highway in the City of Los Angeles. It extends from Wilshire Boulevard on the north to the City of Rancho Palos Verdes on the south. In the Study Area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

La Brea Avenue—La Brea Avenue is a major north/south arterial that is classified as a Major Class II Highway and above Hollywood Boulevard it is classified as a Secondary Highway. It extends from La Brea Terrace on the north to Century Boulevard on the south. In the Study Area, it generally has two full-time travel lanes in each direction, with the parking lane used as a travel lane during peak periods in many locations. Dedicated left-turn lanes are provided at most major intersections.

Fairfax Avenue—Fairfax Avenue is a major north/south arterial that is classified as a Major Class II Highway north of Melrose Avenue, and Secondary Highway south of Melrose Avenue. It extends from Hillside Terrace on the north to La Cienega Boulevard on the south. In the Study Area, it has one to two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

La Cienega Boulevard—La Cienega Boulevard is a major north/south arterial that is classified as a Major Class II Highway. It extends from Sunset Boulevard on the north to El Segundo Boulevard on the south. In the Study Area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

San Vicente Boulevard—San Vicente Boulevard is a major north/south arterial that is classified as a Major Class II Highway. It extends from Sunset Boulevard on the north to Venice Boulevard on the south. North of Santa Monica Boulevard it becomes a Secondary Highway. In the Study Area, it generally provides two to three travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

Robertson Boulevard—Robertson Boulevard is a major north/south arterial that is classified as a Secondary Highway. It extends from Santa Monica Boulevard (Keith Avenue) on the north to Washington Boulevard on the south. In the Study Area, it generally provides one to two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.



**Beverly Glen Boulevard**—Beverly Glen Boulevard is a major north/south arterial classified as a Secondary Highway north of Wilshire Boulevard and Major Class II Highway south of Wilshire Boulevard. It extends from Ventura Boulevard on the north to Pico Boulevard on the south. In the Study Area, it generally provides one to two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

**Westwood Boulevard**—Westwood Boulevard is a major north/south arterial that is classified as a Major Class II Highway north of Santa Monica Boulevard, and Secondary Highway south of Santa Monica Boulevard. It extends from Le Conte Avenue and the UCLA campus on the north to just south of National Boulevard. In the Study Area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

**Sepulveda Boulevard**—Sepulveda Boulevard is a major north/south arterial that is classified as a Major Class II Highway. It extends from the 405 Freeway in the San Fernando Valley on the north to Artesia Boulevard in the City of Hermosa Beach on the south. In the Study Area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

**Bundy Drive**—Bundy Drive is a north/south arterial. In the City of Los Angeles, it is classified as a Collector north of Wilshire Boulevard and Secondary Highway south of Wilshire Boulevard. It extends from the hills above Sunset Boulevard on the north to Centinela Avenue on the south. In the Study Area, it generally has one to two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

**Lincoln Boulevard**—Lincoln Boulevard is a major north/south arterial that is classified as a Major Class II Highway. It extends from San Vicente Boulevard in Santa Monica on the north to Sepulveda Boulevard on the south. In the Study Area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.

### **3.1.2.3 Daily Traffic Volumes**

Daily traffic volumes along the Study Area arterials vary by segment. The highest daily traffic volumes for the major east/west and north/south arterials are presented in Table 3-1.



Table 3-1. Traffic Volumes for Key Arterial Segments in the Study Area

Street Name	Count Location	Total Daily Volume
<b>East/West Arterials</b>		
Wilshire Boulevard	west of Veteran Avenue	122,618
Santa Monica Boulevard	east of Cotner Avenue	68,277
Sunset Boulevard	east of La Cienega Boulevard	66,043
Hollywood Boulevard	at Laurel Canyon Boulevard	35,618 **
Olympic Boulevard	west of Cotner Avenue	59,388
Pico Boulevard	west of Cotner Avenue	46,152
<b>North/South Arterials</b>		
Western Avenue	south of Beverly Boulevard	38,245
Crenshaw Boulevard	at Olympic Boulevard	31,804 *
La Brea Avenue	south of Beverly Boulevard	47,440
Fairfax Avenue	south of Beverly Boulevard	36,724
La Cienega Boulevard	south of Beverly Boulevard	48,774
San Vicente Boulevard	east of La Cienega Boulevard	38,611
Beverly Glen Boulevard	at Wilshire Boulevard	20,429
Westwood Boulevard	at Holman Avenue	27,448
Sepulveda Boulevard	at Pico Boulevard	59,081 *
Bundy Drive	south of Pico Boulevard	59,022

Source: LADOT 2009 traffic count database, unless noted.

\* 2007 count. \*\*2008 count.

### 3.1.3 CMP Monitoring Locations

The 2004 Congestion Management Program [CMP] for Los Angeles County (Metro, July 2004) requires that traffic impact analyses be conducted for select regional facilities based on the quantity of project traffic expected to use these facilities when an environmental assessment is prepared for a project. This section lists the locations that will be included in the countywide congestion management analysis. No analysis is conducted as part of this report.

The CMP Highway and Roadway System for Los Angeles County extends more than 1,000 miles, including approximately 500 miles of freeways, 400 miles of state-maintained arterials, and 100 miles of locally-maintained arterials. The CMP Highway and Roadway System includes facilities that meet the following criteria:

All existing state highways (both freeways and arterials)

Principal arterials, defined as: routes that complete gaps in the state highway system; routes providing connectivity with the CMP systems in adjacent counties; or routes along major inter-jurisdictional travel corridors providing primary, high volume or multimodal transportation.



**3.1.3.1 Freeway Mainline Stations**

The 2004 Congestion Management Program (CMP) for Los Angeles County lists the following locations in or near the Study Area as the freeway mainline monitoring stations for the countywide congestion management analysis:

I-10 at Lincoln Boulevard (CMP Station 1010)

I-10 east of Overland Avenue (CMP Station 1011) (south of the Study Area)

I-10 east of La Brea Avenue (CMP Station 1012) (south of the Study Area)

I-405 north of Venice Boulevard (CMP Station 1070) (south of the Study Area)

I-405 south of Mulholland Drive (CMP Station 1071) (north of the Study Area)

All of the locations listed, except I-10 at Lincoln Boulevard, experienced poor operating conditions (level of service [LOS] E or worse) during one or both peak hours according to year 2003 volumes in the CMP.

**3.1.3.2 Arterial Monitoring Stations**

The 2004 CMP for Los Angeles County lists the following locations in the Study Area as the arterial monitoring stations for the countywide congestion management analysis:

Santa Monica Boulevard & Wilshire Boulevard (City of Beverly Hills)

Wilshire Boulevard & La Cienega Boulevard (City of Beverly Hills)

Santa Monica Boulevard & Bundy Drive (City of Los Angeles)

Santa Monica Boulevard & Highland Avenue (City of Los Angeles)

Santa Monica Boulevard & Westwood Boulevard (City of Los Angeles)

Wilshire Boulevard & La Brea Avenue (City of Los Angeles)

Wilshire Boulevard & Sepulveda Boulevard (City of Los Angeles)

Wilshire Boulevard & Western Avenue (City of Los Angeles)

Wilshire Boulevard & Beverly Glen Boulevard (City of Los Angeles)

Lincoln Boulevard & Pico Boulevard (City of Santa Monica)

Santa Monica Boulevard & Cloverfield Boulevard (City of Santa Monica)

Santa Monica Boulevard & Lincoln Boulevard (City of Santa Monica)

Wilshire Boulevard & 26th Street (City of Santa Monica)

Santa Monica Boulevard & Doheny Drive (City of West Hollywood)

Santa Monica Boulevard & La Cienega Boulevard (City of West Hollywood)

Most of the locations experienced acceptable operating conditions (LOS D or better) during both the AM and PM peak periods according to year 2003 volumes in the CMP.

Santa Monica Boulevard & Wilshire Boulevard, Santa Monica Boulevard & Highland Avenue, Wilshire Boulevard & Sepulveda Boulevard, Santa Monica Boulevard & Doheny Drive, and Santa Monica Boulevard & La Cienega Boulevard all experienced poor operating



conditions (LOS E or worse) during one or both peak hours according to year 2003 volumes in the CMP.

### **3.1.4 Programmed Roadway Improvements**

This section describes the programmed roadway improvements in the Study Area. The only planned roadway improvement in the Study Area is the I-405 Northbound High Occupancy Vehicle (HOV) lane in Sepulveda Pass. This project will consist of a 10-mile northbound HOV lane on I-405 through Sepulveda Pass from I-10 (Santa Monica Freeway) to US 101 (Ventura Freeway). A southbound HOV lane opened for service in portions: between US 101 and Sunset Boulevard in 2002 and south of I-10 in 2009.

Local jurisdictions are not planning any major roadway expansion projects through 2035. Because of the level of buildout and density in the Study Area, local jurisdictions have generally determined through their policies that congestion relief improvements should focus on travel demand management along with increased ride sharing and transit usage rather than highway/arterial physical improvements, such as road widening or new roadways. In a number of cases, local communities that desire to eliminate cut-through and neighborhood traffic to support more livable downtown or commercial areas are supporting initiatives to limit roadway capacity or to slow traffic flow, leaving transit improvements as the only viable alternative to reduce traffic volumes and congestion-related delays.

In the cities on the Westside, policy-makers have taken strong positions against the wholesale widening of streets and narrowing of sidewalks to accommodate more travel lanes. Localized Transportation System Management (TSM) improvements, such as additional turn lanes or signal phasing changes, have been supported, but the arterial network in the Westside is essentially built out. In this highly urbanized area, the types of transportation improvements that have the support of the policy makers include intelligent transportation systems projects and livable communities programs. Future increases in travel demand will have to be accommodated by making the existing highway network work better where possible in conjunction with increased usage of transit and other (i.e., non-motorized) modes of transportation.

## **3.2 Existing Intersection Traffic Volumes and Levels of Service**

A total of 192 key intersections in the Study Area—at locations in close proximity to potential station locations as well as at the convergence of congested major arterials—were included to represent existing conditions from a traffic operations perspective. This section describes the existing conditions at the study intersections and details the methodology used to conduct the analysis. The 192 study intersections are shown in

Figure 3-1. The jurisdictions affected by the Westside Subway Extension include the Cities of Los Angeles, Beverly Hills, West Hollywood and Santa Monica, and the County of Los Angeles. Each jurisdiction was consulted throughout the scoping process and assisted in the selection of study intersections.



Figure 3-1. Study Intersection Locations

WESTSIDE SUBWAY EXTENSION



Figure 3-1. Study Intersection Locations (continued)

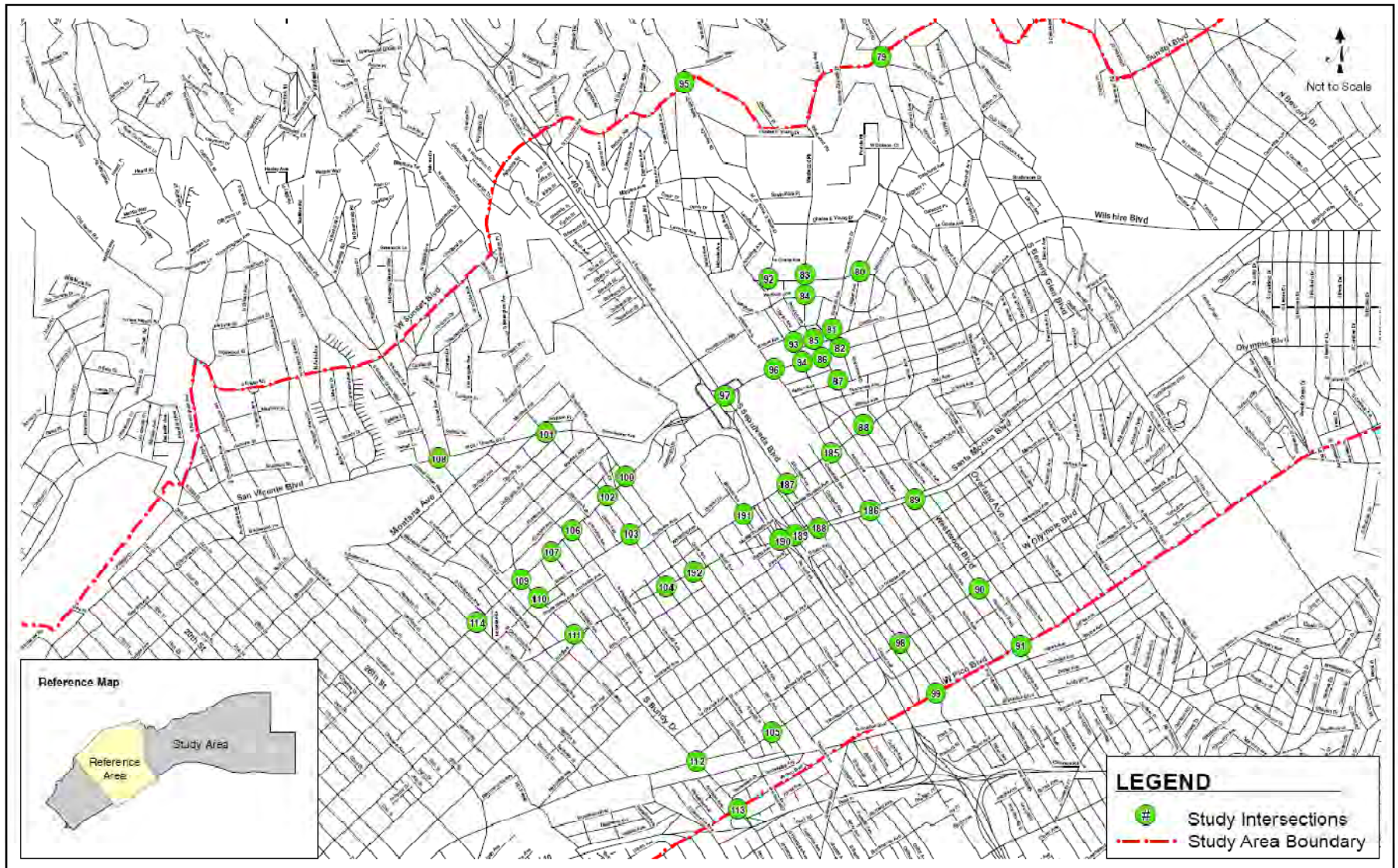


Figure 3-1. Study Intersection Locations (continued)

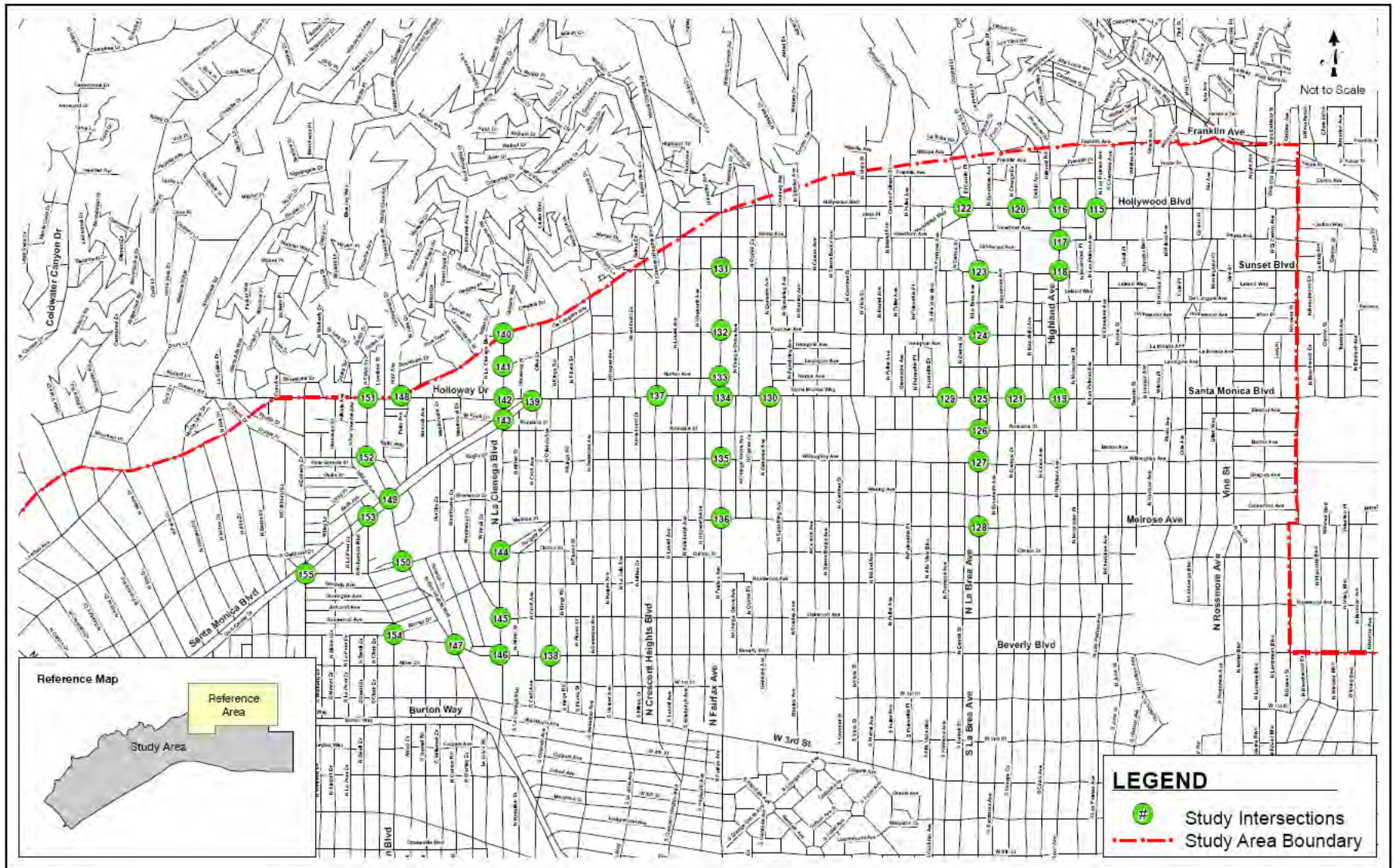


Figure 3-1. Study Intersection Locations (continued)

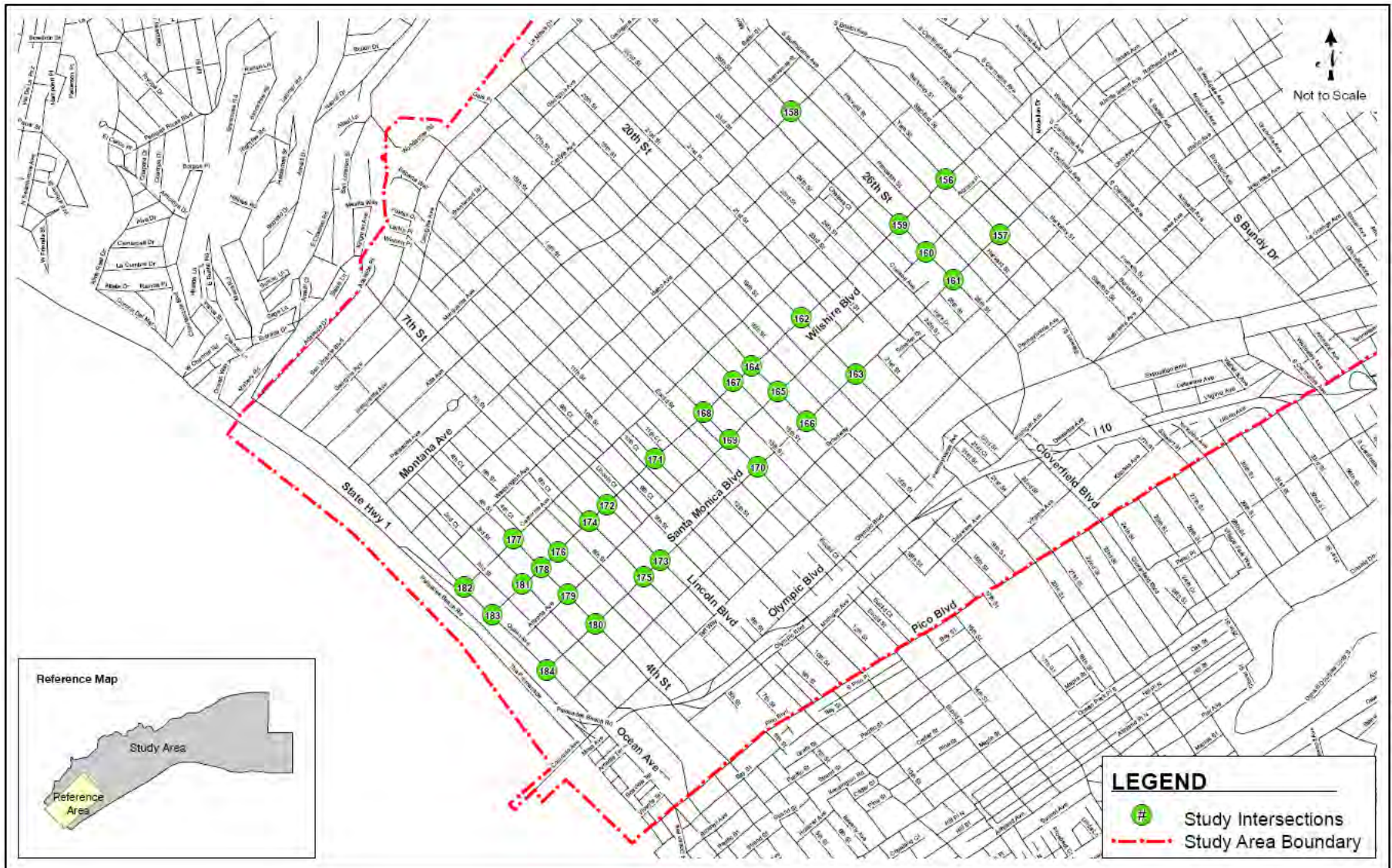


Figure 3-1. Study Intersection Locations (continued)

**WESTSIDE SUBWAY EXTENSION**



**3.2.1 Data Collection Effort**

Detailed AM and PM peak period intersection turning movement counts were conducted in April 2009, May 2009, and January 2010 to represent existing traffic volumes on a typical weekday throughout the Study Area. For some intersections, Fall 2008 counts were obtained from the Wilshire Bus Rapid Transit (BRT) EIR. Counts were taken during typical weekday peak hours from 7:00 to 9:00 AM and 4:00 to 6:00 PM. Traffic counts used in the existing conditions analysis are included in Appendix A. Each analyzed location was field checked to verify lane configurations and signal phasing. Signal timing plans for each study intersection were received from affected jurisdictions.

In addition to the collection of traffic data, pedestrian and bicycle activity was observed at study intersections in close proximity to potential station locations. Peak period pedestrian and bicycle volumes were recorded at study intersections adjacent to and up to a close walking distance from a potential station location. Appendix A contains pedestrian and bicycle counts taken at the 65 study intersections in close proximity to potential station locations.

**3.2.1.1 Existing Traffic Volumes**

The existing traffic volumes at the 192 study intersections for the analyzed peak hours are shown in Appendix A.

**3.2.1.2 Existing Pedestrian Volumes**

High pedestrian activity (established as peak hour volumes of 500 or more pedestrians crossing at a study intersection during a peak hour) was observed around these potential station locations:

Wilshire/Fairfax

Wilshire/Rodeo

Century City

Westwood/UCLA

Wilshire/4th

Santa Monica/La Brea

Santa Monica/Fairfax

Santa Monica/San Vicente

Beverly Center

Intersections with high pedestrian activity may experience additional vehicle delay for drivers making unprotected left and right-turn movements. This is due to drivers yielding to pedestrians before traveling through the intersection. High pedestrian activity also results in additional pedestrian “walk calls” (the number of times pedestrians push the button to cross the street), which can increase time allotted to walk phases and associated red phases for vehicles.

Overall, the highest levels of pedestrian activity were recorded in the Westwood/UCLA station area, followed by Downtown Beverly Hills and downtown Santa Monica.



Westwood/UCLA is a major employment center. Students, faculty and staff frequent the area around the station location, resulting in the highest pedestrian activity in the Study Area. Pedestrian activity was also significant in downtown Beverly Hills, Downtown Santa Monica, and along the Santa Monica Boulevard corridor in West Hollywood. Currently, pedestrians experience little difficulty crossing arterials in these areas, as all major intersections are signalized with pedestrian walk phases and crosswalks. A number of intersections have treatments that further enhance the pedestrian experience.

### **3.2.2 Level of Service Methodology**

The commonly accepted operational analysis methodology from *2000 Highway Capacity Manual* (HCM) (Transportation Research Board, 2000) was used to estimate delay and corresponding LOS at each study intersection. The operations analysis methodology rates intersection conditions based on the average delay, measured in seconds, experienced by drivers.

LOS is a qualitative measure used to describe the condition of traffic flow, ranging from LOS A (free flow conditions) to LOS F (congested conditions), with LOS E representing the theoretical maximum capacity of a link or intersection before gridlock occurs. Table 3-2 provides LOS definitions for signalized intersections using the HCM methodology. Weekday AM and PM peak hours were selected for analysis because they represent the most critical periods of traffic congestion in the Study Area. The LOS definitions and ranges of delay shown in the following table represent average conditions for all vehicles at an intersection across an entire hour. Delays longer than the average condition are experienced by motorists on certain movements and/or during peak times within the peak hour.

Generally, the minimum acceptable LOS for any intersection in an urbanized area is LOS D. The affected jurisdictions for the Westside Extension Transit Corridor Study Area all consider LOS D the minimum acceptable LOS. Therefore, LOS D will serve as the minimum acceptable standard for the Westside Extension Transit Corridor project.

**Table 3-2. Level of Service Definitions for Signalized Intersections**

Level of Service	Control Delay (seconds/vehicle)	Interpretation*
A	$\leq 10.0$	This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low density.
B	$> 10.0$ and $\leq 20.0$	This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.
C	$> 20.0$ and $\leq 35.0$	These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.
D	$> 35.0$ and $\leq 55.0$	At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	$> 55.0$ and $\leq 80.0$	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures are frequent occurrences.
F	$> 80.0$	This level, considered unacceptable by most drivers, often occurs with oversaturation; that is, when arrivals flow rates exceed the capacity of the intersection. It may also occur at high volume-to-capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Source: Highway Capacity Manual, Transportation Research Board, 2000.

\* Level of service interpretation was derived from Highway Capacity Manual 1994, Transportation Research Board, 1994.

### 3.2.3 Existing Levels of Service Analysis

The Synchro 6.0 software suite was used to develop Study Area roadway and intersection network for traffic analysis. Synchro is common traffic simulation software based on procedures outlined in the Transportation Research Board's 2000 Highway Capacity Manual (HCM). The Synchro model was constructed by drawing the roadway network using aerial photography as a background. The number of lanes and the location of lane additions and drops were confirmed by field observations. Additional detail was incorporated into the Synchro network (posted speed limits, grades, etc.) to better reflect observed field conditions. Traffic signal-related information such as phasing and initial timings (minimum green, maximum green, distance or “gap” between vehicles, etc.) for the signalized intersections was obtained from the affected agencies or during field visits to the site. Additional detail such as turn pocket lengths, saturation flow and intersection spacing was coded based on field measurements. Once the model was developed, AM and PM peak hour intersection turning movement counts and pedestrian volumes were added and the delay and delay-based LOS for each study location was calculated.

The results of the analysis of existing weekday morning and afternoon peak hour conditions at the 192 study intersections are summarized in Appendix B-1. Level of service is illustrated graphically in Figure 3-2. Detailed LOS calculations are provided in Appendix C-1. 112 of the 192 analyzed intersections (58 percent) are operating at an acceptable LOS D or better in the



morning and afternoon peak hours. The remaining 80 intersections (42 percent) operate at LOS E or F (deficient LOS) during one or both analyzed peak hours. Morning and afternoon peak period delay and corresponding LOS at each study intersection is shown in the table.

Under current conditions, most major intersections in the Study Area are operating at deficient levels of service during the peak hours. The delay experienced by drivers on the Westside will only continue to increase in the future, as both population and employment density in the Study Area continue to rise. These future increases will be discussed in the following chapter.

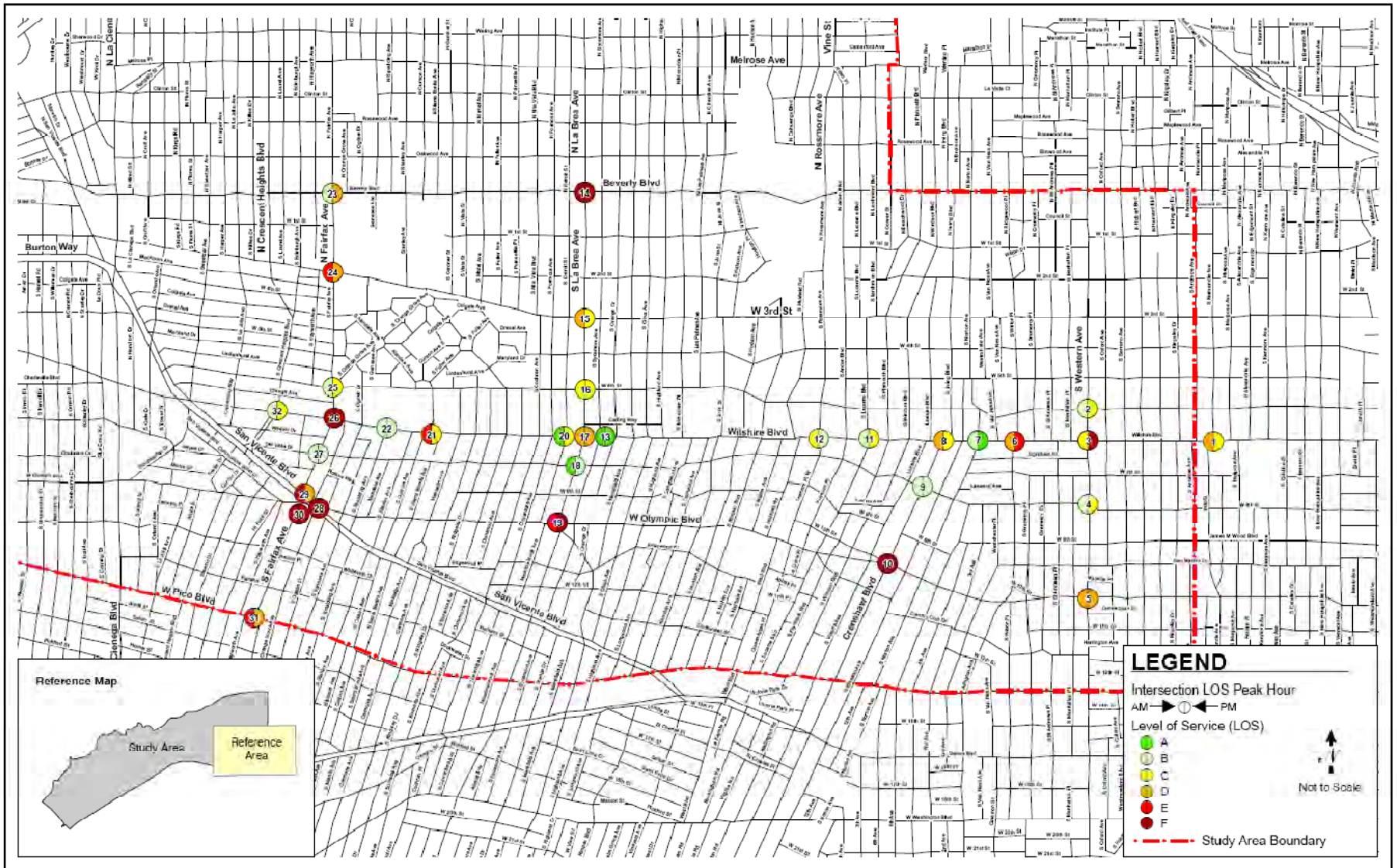


Figure 3-2. Existing Intersection Levels of Service



Figure 3-2. Existing Intersection Levels of Service (continued)

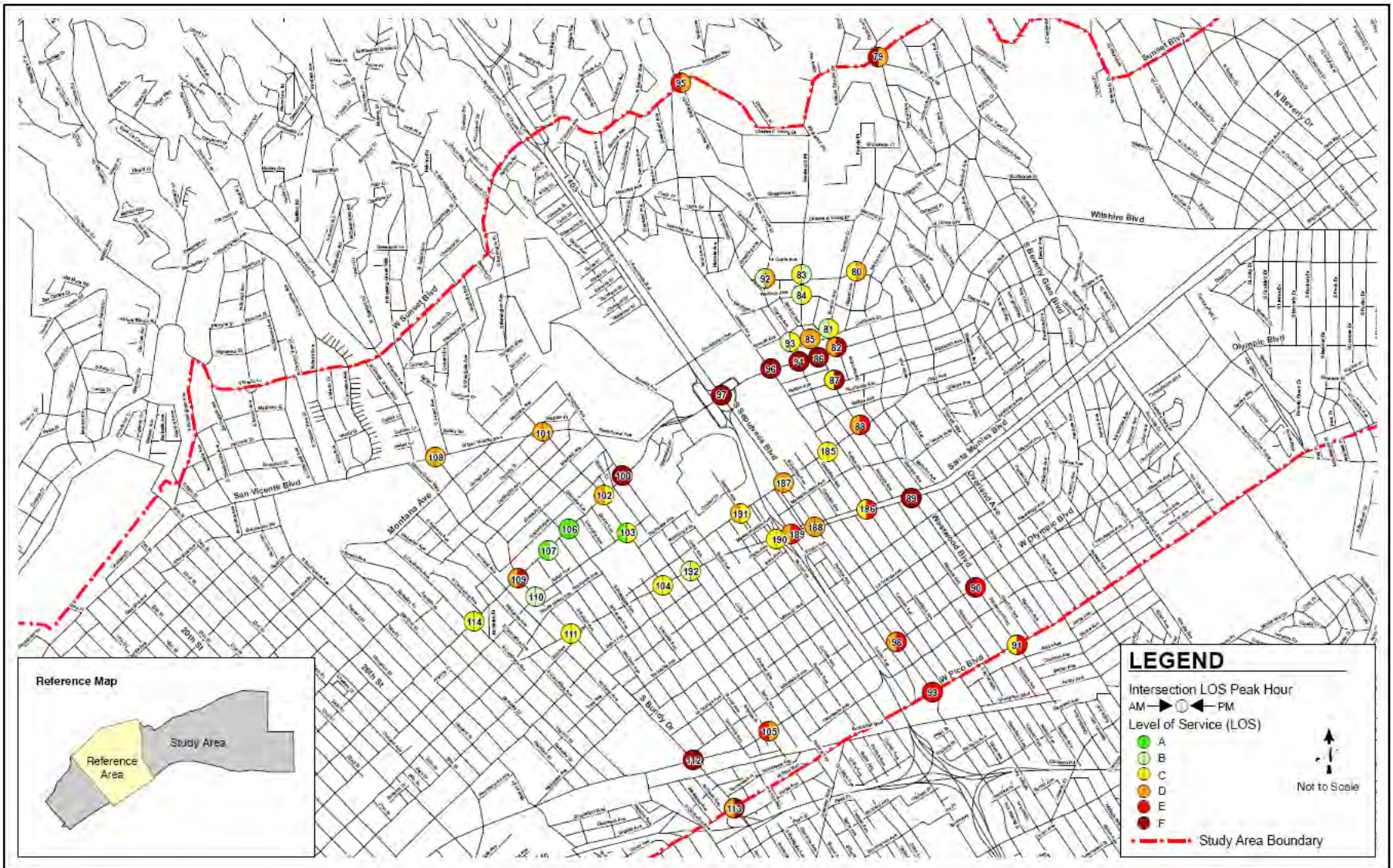


Figure 3-2. Existing Intersection Levels of Service (continued)

**WESTSIDE SUBWAY EXTENSION**

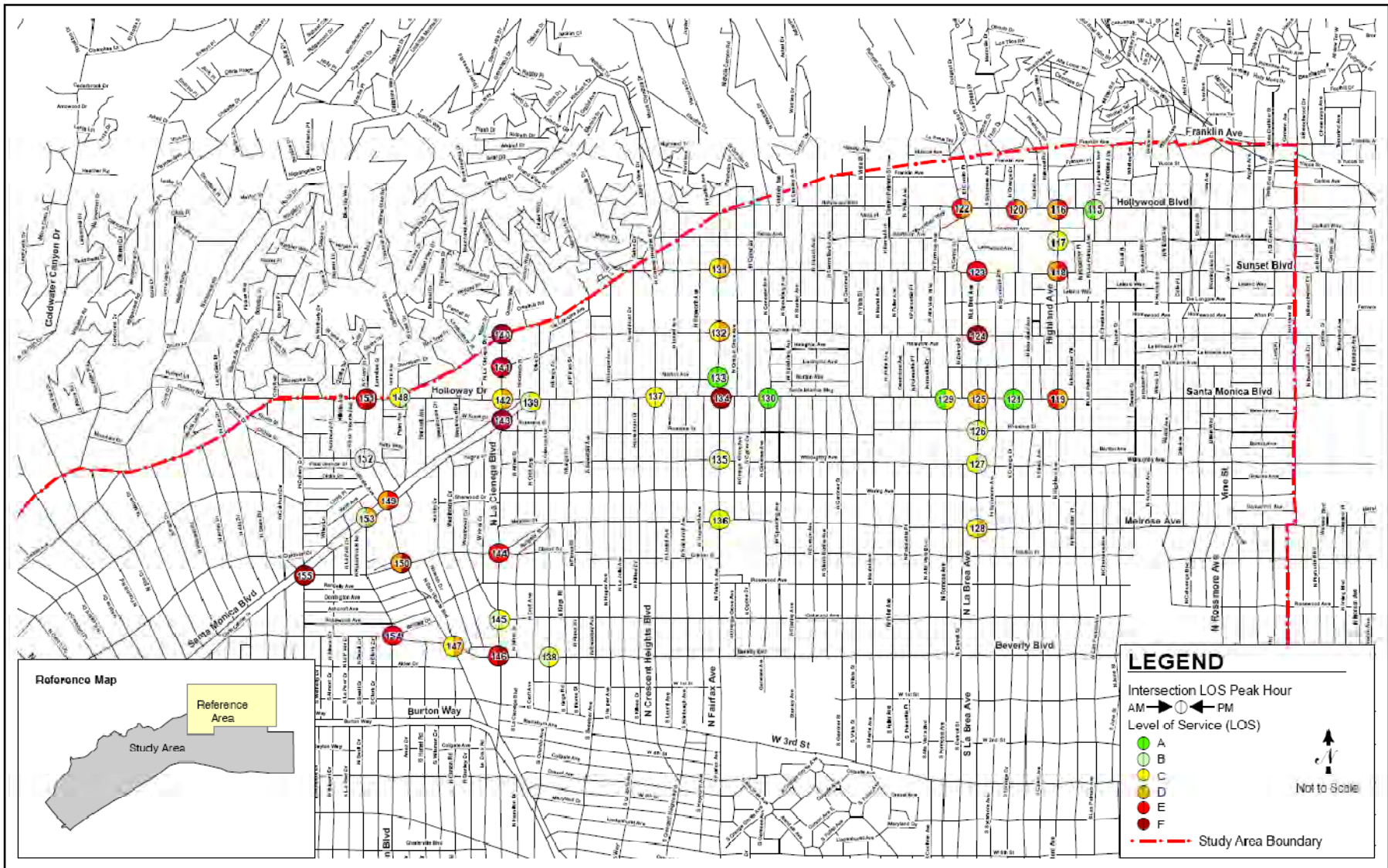


Figure 3-2. Existing Intersection Levels of Service (continued)

WESTSIDE SUBWAY EXTENSION

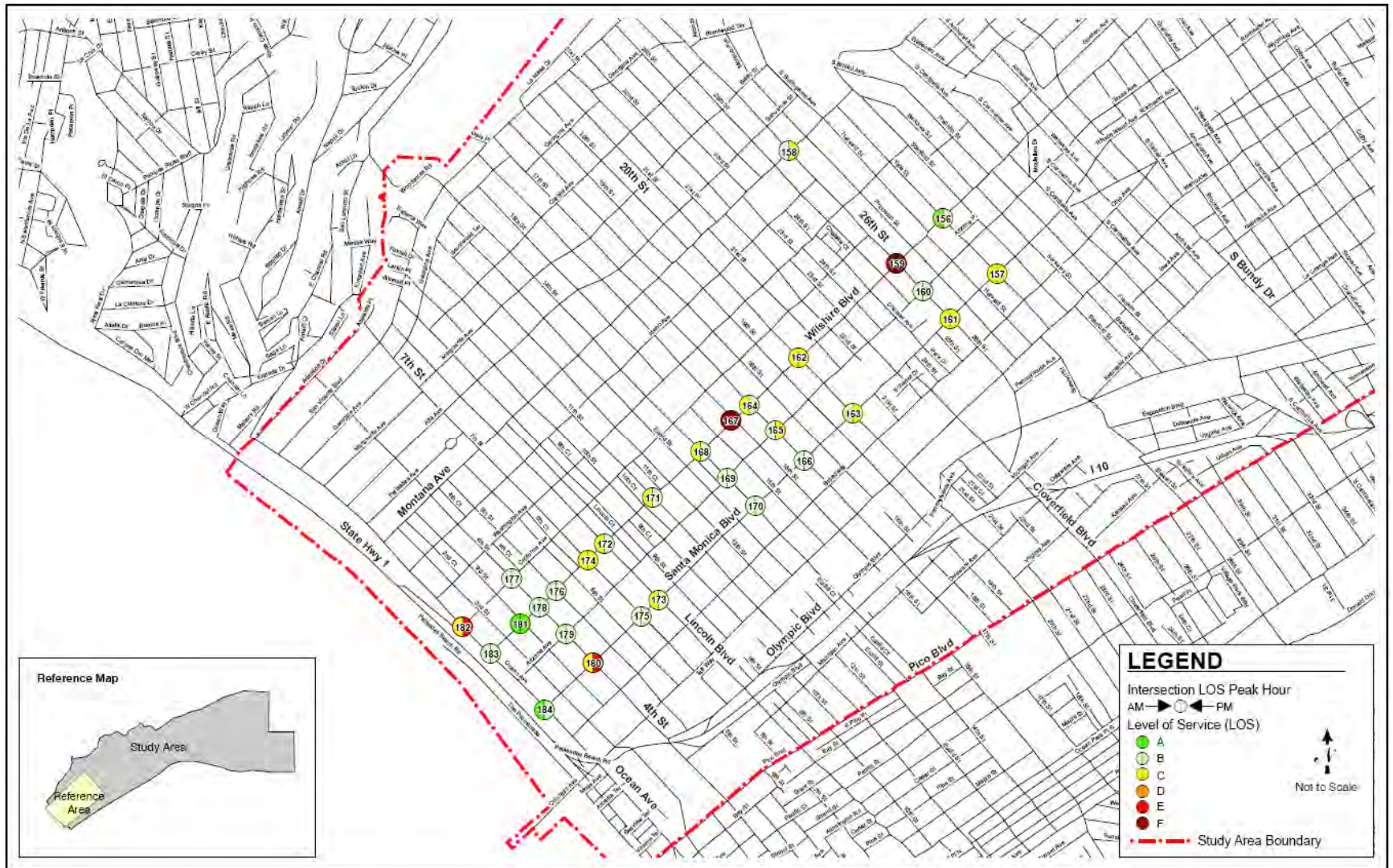


Figure 3-2. Existing Intersection Levels of Service (continued)



## **4.0 FUTURE TRAFFIC CONDITIONS**

By 2035, the population and employment density in the Study Area will increase by 10 and 12 percent, respectively. This will result in increases in the overall delay of motorists attempting to travel within and through the Westside. Intersections currently operating at deficient levels of service will worsen as a result of increased vehicular traffic, few planned transportation improvements and the lack of grade-separated transit alternatives throughout the Study Area.

The high population and employment densities and peak period levels of congestion in the Study Area create a viable setting for the Westside Subway Extension. The proposed Westside Subway Extension Project has the ability to reduce vehicle trips and congestion within the Study Area and the region as a whole. The availability of a grade-separated transit option on the Westside can change drivers' mode choice and reduce vehicle trips on arterials that are already experiencing traffic over their intended capacity. A detailed traffic operations analysis was conducted for 192 key intersections to forecast future congestion levels with anticipated regional growth and similar transit service as today (No Build) and the benefits of the Westside Subway Extension on vehicular congestion (Build Alternatives).

This section presents future traffic conditions in the Study Area and begins with a brief discussion of regional and Study Area performance measures projected using the Metro Regional Travel Demand Model. For the assessment of Study Area intersection performance, the Metro Regional Travel Demand Model, in combination with a customized sub-area VISUM model, were used to develop intersection turning movement forecasts, while corresponding levels of service were analyzed with Synchro. The model development, including validation and calibration, and the forecasted turning movements per alternative along with future traffic operating conditions are detailed in this chapter.

### **4.1 Regional Transportation Performance Measures**

The projected regional travel changes that would result from the different Project Alternatives compared to the Future Year 2035 No Build Scenario both for Los Angeles County as a whole as well as for the Study Area have been summarized in Table 4-1. These data are direct outputs of the Metro Regional Travel Demand Model. Compared to the Future Year 2035 No Build Alternative, the project Build Alternatives would not result in major changes in countywide or Study Area performance measures.

Even without major changes in countywide or Study Area performance measures, the data indicates that the Build Alternatives would have beneficial effects on regional transportation network by reducing VMT, VHT, and peak hour vehicle trips. Overall, there is little percentage change between the Build Alternatives and the No Build/TSM Alternatives because total travel demand within the county and Study Area is so significantly greater than the comparatively small reduction affected by a Build Alternative.

**Table 4-1. Year 2035 Performance Measures for Project Alternatives**

Measure	No Build	TSM	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	MOS 1	MOS 2
<b>Regional</b>									
VMT	504,651,236	504,622,466	504,510,630	504,478,371	504,478,074	499,379,904	504,281,492	504,315,228	504,563,698
VHT	29,204,905	29,182,039	29,150,448	29,176,362	29,167,001	28,920,955	29,150,499	29,177,868	29,147,101
Average vehicle speed (mph)	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3
<b>Study Area</b>									
VMT	5,056,227	5,055,329	5,032,417	5,032,719	5,021,729	5,023,750	5,014,584	5,048,050	5,040,354
VHT	246,759	246,454	243,846	244,018	242,453	242,773	241,837	245,986	244,920
Average Speed (mph)	20.5	20.5	20.6	20.6	20.7	20.7	20.7	20.5	20.6
AM Peak VMT	1,143,472	1,142,863	1,137,069	1,136,954	1,131,944	1,132,786	1,130,979	1,140,207	1,138,340
AM Peak VHT	64,766	64,646	63,754	63,692	63,055	63,147	62,876	64,459	63,986
AM Peak Average Speed (mph)	17.7	17.7	17.8	17.9	18.0	17.9	18.0	17.7	17.8
AM Peak Vehicle Trips	214,110	213,617	212,321	211,885	211,636	211,693	211,336	213,257	212,517
PM Peak VMT	1,703,535	1,703,247	1,694,792	1,696,797	1,692,156	1,693,159	1,691,390	1,700,564	1,700,050
PM Peak VHT	108,494	108,308	106,863	107,165	106,360	106,530	106,141	108,048	107,671
PM Peak Average Speed (mph)	15.7	15.7	15.9	15.8	15.9	15.9	15.9	15.7	15.8
PM Peak Vehicle Trips	260,320	260,045	258,764	258,707	258,300	258,365	257,979	259,697	259,023

Source: Metro Travel Demand Model

VMT = vehicle miles traveled VHT = vehicle hours traveled          mph = miles per hour



## **4.2 Study Area Intersections**

This section details the development of traffic forecasts for each Project Alternative and analyzes intersection level of service. A travel demand model for the Westside Subway Extension was developed using a combination of the updated Metro regional travel demand model and the VISUM modeling software. The VISUM model provides additional land use and roadway network detail within the project Study Area.

In order to determine the potential changes in Study Area traffic conditions for Project Alternatives, future conditions were first assessed without the Project. This section describes Future Year 2035 No Build turning movement volumes at study intersections; the subsequent chapter describes intersection LOS. The 192 study intersections assessed for Future Year 2035 No Build conditions were the same as those assessed for Existing Traffic Conditions.

### **4.2.1 Methodology**

The Metro Regional Travel Demand Model focuses on estimating regional travel for all of Los Angeles County. The Metro Regional Travel Demand Model receives its demographic inputs from the Southern California Association of Governments (SCAG) Regional Travel Demand Model. The Metro Regional Travel Demand Model produces regional travel flows based on a standard four-step modeling process. Since the proposed project will focus on a localized area along the proposed heavy rail transit alignment alternatives, the regional model would need to be supplemented by a more refined sub-area model for use in this study.

To improve on the level of detail in the forecasting process, the VISUM modeling software was used to extract a sub-area of the regional model and enhance its level of detail. VISUM has the same standard features as traditional travel demand models as well as other features that allow it to capture the local-scale distributional effects of roadway improvements and land use changes more accurately. VISUM is capable of refining regional travel patterns to match observed traffic volumes and can utilize a wide range of sophisticated assignment algorithms to assign trips to the network based on roadway link capacity as well as turning movement capacities. Therefore, the regional model was used as a macro-level planning tool for trip generation, trip distribution, and mode split, while the VISUM model was used for detailed trip assignment in the sub-area.

### **4.2.2 Base Year Model Development**

The first step in the forecasting process was to develop a base year AM and PM peak hour VISUM model for the project Study Area. This process involved: (1) data collection, (2) regional model refinement and sub-area extraction, (3) VISUM model development, and (4) VISUM model calibration and validation. Data collection was conducted as part of the existing conditions analysis.

#### **4.2.2.1 Regional Model Refinement and Sub-Area Extraction**

The base year Metro Regional Travel Demand Model was refined by Fehr & Peers to ensure macro-level traffic patterns were reasonable prior to their refinement in VISUM. The roadway network was modified to include all arterial roadways within the project Study Area. Additionally, the roadway network was reviewed to ensure each roadway's facility type, free-flow speed, and number of lanes matched field observations.



A sub-area extraction was then performed on the Metro Regional Travel Demand Model to obtain AM and PM peak hour origin-destination auto trip tables for the project Study Area. This process involved drawing a cordon around the Study Area to capture the destination of trips leaving the Study Area and the origin of trips entering the Study Area. These trips were then aggregated into singular zones, representing points at which vehicles can enter and exit the Study Area. Since the Metro Regional Travel Demand Model produces 3-hour AM and 4-hour PM peak period forecasts, peak period to peak hour factors were developed based on traffic counts collected in the Study Area. The AM and PM peak period sub-area trip tables were factored by 0.38 and 0.30, respectively. The resulting trip tables were the source of peak hour macro-level traffic patterns in the Study Area that were refined in VISUM.

#### **4.2.2.2 Existing VISUM Model Development**

Using aerial photography and field data, a VISUM model was developed for the project Study Area for base year (2009) conditions. The VISUM model was coded with the same attributes typically entered in a regional demand model, such as roadway speeds and capacities, which were based on values coded in the Metro Regional Travel Demand Model and field observation. Detailed characteristics, such as intersection control and turn movement capacities not typically specified in a regional demand model, were also coded in the VISUM model. The additional detail results in a greater understanding of traffic diversion as a result of roadway improvements and land use changes and greater confidence in the resulting forecasts.

Like standard travel demand models, a traffic analysis zone (TAZ) structure was developed for the VISUM model that corresponds to the TAZ system from the Metro Travel Demand Model. TAZs that corresponded to locations where trips enter and exit the network were included along with intermediate “driveway” TAZs that account for traffic originating and terminating in the Study Area. This TAZ system maintains balanced traffic volumes, which are critical in the development of origin-destination trip tables for use in VISUM.

The existing TAZ structure from the Metro Regional Travel Demand Model was then disaggregated in VISUM in order to more accurately forecast traffic volumes for intersection-level analysis. Following the disaggregation of the TAZs, centroid connectors were reconnected at mid-block locations in order to facilitate the flow of traffic onto project Study Area roadways. The existing 112 TAZs in the regional model which represented the project Study Area were disaggregated into a total of 187 TAZs in the VISUM model.

Unlike standard travel demand models, the VISUM model does not include zonal land use data as an input. Instead, the origin-destination trip tables from the refined base year Metro Travel Demand Model were imported into VISUM. Additionally, the existing peak hour traffic volumes were imported into the VISUM model since VISUM has the ability to adjust origin-destination trip tables to match observed volumes by utilizing the relation of link or turning movement traffic volumes and the macro-level traffic patterns from the regional model. The matrix adjustment module (TFlowFuzzy) in VISUM was executed to iteratively adjust the origin-destination trip tables from the regional model to first match the observed intersection approach and departure traffic counts and then again to match the observed intersection turning movement traffic counts.

The TFlowFuzzy process is based on matrix correction research by Zuylen/Willumsen, Bosserhoff, and Rosinowski. The process uses complex vector analysis with the matrix



values used as weights for the origin-destination relations. The matrix correction procedure finds a solution to match the traffic counts. Therefore, it is not necessary that the traffic counts and the origin-destination trip table represent the same year. The end result is a refined origin-destination (AM and PM peak hour) trip table based on the macro-level trip distribution and assignment results from the Metro Regional Demand Model, as well as actual field counts.

#### **4.2.2.3 Existing VISUM Model Calibration and Validation**

The most critical static measurement of the accuracy of any travel model is the degree to which it can approximate actual traffic counts in the base year. For a model to be considered accurate and appropriate for use in traffic forecasting, it must replicate actual conditions to within a certain level of accuracy.

A sub-area validation was performed on the base year VISUM model to ensure the model produces traffic forecasts that reasonably resemble observed traffic counts obtained in the project Study Area in 2009. Traffic forecasting models are typically calibrated by adjusting model parameters until they are validated by applying a set of criteria that compare model volumes to actual counts. In order to more accurately forecast future traffic volumes, the base year VISUM model was calibrated and validated to 1,391 intersection approach and departure link volumes as well as to 1,211 intersection turning movement volumes. Model link volumes were also compared to traffic counts along 22 model validation screenlines, as shown on Figure 4-1.

Caltrans has established guidelines for determining whether a model is valid and acceptable for forecasting future year traffic volumes. The sub-area validation results were compared to the following validation thresholds discussed in *Travel Forecasting Guidelines* (Caltrans 1992):

The two-way sum of the volumes on all roadway links for which counts are available should be within 10 percent of the counts.

All of the roadway screenlines should be within the maximum desirable deviation of at least 100 percent.

At least 75 percent of the roadway links for which counts are available should be within the maximum desirable deviation, which ranges from approximately 15 to 60 percent depending on total volume (the larger the volume, the less deviation is permitted).

The correlation coefficient between the actual ground counts and the estimated traffic volumes should be greater than 88 percent.

Although not stated in the Caltrans standards, an additional Fehr & Peers validation guideline was applied to the sub-area model:

The percent root mean square (RMSE) should not exceed 40 percent.

The results for AM and AM peak hour conditions are summarized in Table 4-2 and Table 4-3 below, while the detailed spreadsheets are presented in Appendix A.

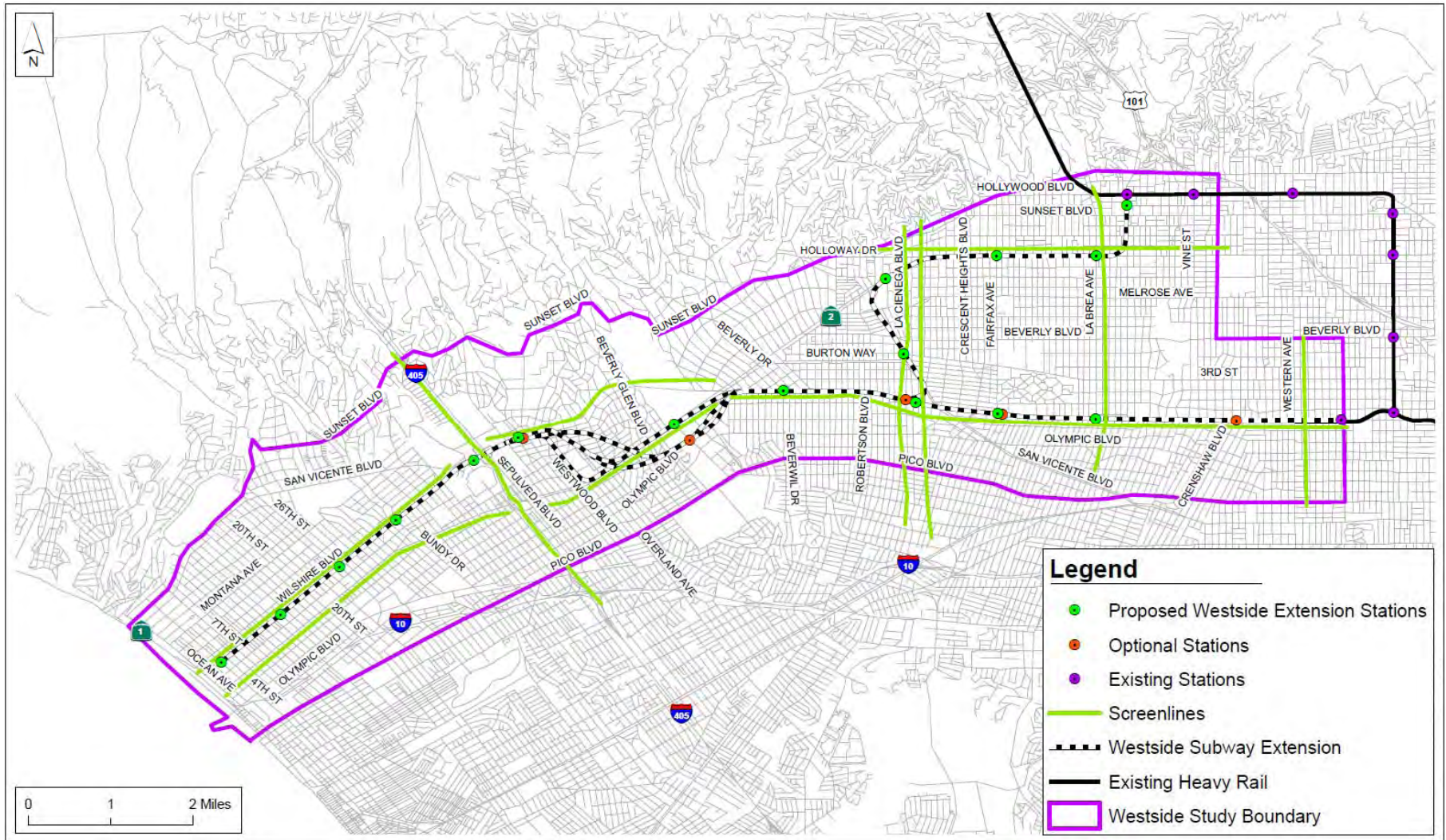


Figure 4-1. Validation Screenlines

WESTSIDE SUBWAY EXTENSION

**Table 4-2. Peak Hour VISUM Model Link Volume Validation**

Validation Statistic	Threshold	AM Peak Hour	PM Peak Hour
Model/count ratio	Within 10%	0.96	0.96
Percent of screenlines within Caltrans maximum deviation	100%	100%	100%
Percent of turns within Caltrans maximum deviation	> 75%	92%	92%
Percent RMSE	< 40%	18%	17%
Correlation coefficient	> 0.88	0.98	0.99

Source: Fehr & Peers, 2010

**Table 4-3. Peak Hour VISUM Model Turning Movement Validation**

Validation Statistic	Threshold	AM Peak Hour	PM Peak Hour
Model/count ratio	Within 10%	0.96	0.96
Percent of turns within Caltrans maximum deviation	> 75%	88%	87%
Percent RMSE	< 40%	23%	22%
Correlation coefficient	> 0.88	0.99	0.99

Source: Fehr & Peers, 2010

As shown in Table 4-2, both the AM and PM peak hour models passed all the validation criteria at the link level. Additionally, a model-to-count ratio of 0.96 indicates the magnitude of trips in the Study Area is appropriate, while validating along all screenlines indicates the directionality of trips in the Study Area is appropriate.

As shown in Table 4-3, the VISUM model meets or exceeds the guidelines for model accuracy in the AM and PM peak hours at the turning movement level. Therefore, the VISUM model is considered to be valid to 2009 traffic counts and appropriate for use in forecasting Future Year 2035 turning movement volumes.

#### 4.2.3 Future Year (2035) VISUM Model Development

The next step in the forecasting process was to develop Future Year 2035 AM and PM peak hour VISUM models for the No Build and each Build Alternative based on the Existing Conditions calibrated/validated VISUM model. Future Year 2035 origin-destination trip tables were first developed for each alternative with the use of the Future Year 2035 Metro Regional Travel Demand Model. This ensured the VISUM models reflected the anticipated growth in the Study Area by year 2035 as estimated by the Metro Regional Travel Demand Model.

Since the Future Year 2035 Metro Regional Travel Demand Model was derived from the base year Metro Travel Demand Model, the same roadway network modifications made to the base year Metro Travel Demand Model were incorporated into the 2035 Metro Travel Demand Model. The Future Year 2035 origin-destination auto trip tables were then assigned to the modified 2035 roadway network to produce 3-hour AM and 4-hour PM peak period forecasts. A summary of the 7-hour peak period Metro Travel Demand Model trip tables for all modes of travel are presented in Table 4-4, which shows the total trips for the No Build Alternative and the difference in trips between the No Build Alternative and each of the Build Alternatives.



Table 4-4. Year 2035 7-Hour Peak Period Metro Model Trips by Travel Mode

Alternative	Bus Trips	Rail Trips	Auto Trips	Walk/Bike Trips
No Build	764,483	333,440	35,871,537	3,926,744
<b>Difference From No Build Scenario</b>				
TSM	2,009	-31	-1,399	-569
Alternative 1	-10,046	23,205	-10,906	-2,248
Alternative 2	-11,431	26,476	-12,434	-2,610
Alternative 3	-14,422	33,412	-16,025	-2,957
Alternative 4	-12,865	29,565	-13,520	-3,174
Alternative 5	-16,254	37,674	-17,815	-3,596
MOS 1	-2,836	6,710	-3,080	-787
MOS 2	-7,443	17,376	-8,001	-1,928

Source: Fehr & Peers, 2010

As shown in Table 4-4, the Build Alternatives reduce the number of auto, bus, and walk/bike trips in the Future Year 2035 Metro Regional Travel Demand Model while the total number of trips remain relatively unchanged, indicating a shift in mode of travel rather than an overall change in the total number of trips. Under the TSM Alternative, a relatively small number of auto trips would be reduced from the No Build as compared to any Build Alternatives. Additionally, approximately 45% of new rail trips with the Build Alternatives are shifted from the existing bus system to the expanded rail system. The rest of the rail trips would shift from auto and a small amount from walk and bike.

A sub-area extraction was then performed on the Future Year 2035 Metro Regional Travel Demand Model to obtain AM and PM peak hour origin-destination auto trip tables for the project Study Area. This process involved using the same cordon used in the base year model development to capture the destination of trips leaving the model and the origin of trips entering the model. Since the Future Year 2035 Metro Regional Travel Demand Model also produces 3-hour AM and 4-hour PM peak period forecasts, the same peak period to peak hour factors developed for the base year were used. The AM and PM peak period sub-area trip tables were factored by 0.38 and 0.30, respectively.

The resulting trip tables were compared to the trip tables from the base year Metro Regional Travel Demand Model to ensure a reasonable growth (or decline) in traffic between individual origin-destination pairs. If an unrealistic growth or decline was observed between an origin and destination, the flow between the origin-destination pair was adjusted. A summary of the AM and PM peak hour Study Area auto trip tables are presented in Table 4-5 and Table 4-6, respectively, which show the total trips for the No Build Alternative and the difference in trips between the No Build Alternative and each of the Build Alternatives.



Table 4-5. Year 2035 AM Peak Hour Study Area Auto Trips by Type

Alternative	Internal Trips	One Trip End in the Study Area	Cut-Through Trips	Total Trips
No Build	5,363	14,557	17,796	37,717
<b>Difference From No Build Scenario</b>				
TSM	-13	-480	310	-183
Alternative 1	-226	-1,563	224	-1,565
Alternative 2	-449	-1,776	251	-1,973
Alternative 3	-400	-2,074	195	-2,279
Alternative 4	-473	-1,944	340	-2,077
Alternative 5	-618	-2,155	374	-2,400
MOS 1	-92	-761	186	-667
MOS 2	-213	-1,379	419	-1,173

Source: Fehr & Peers, 2010

Table 4-6. Year 2035 PM Peak Hour Study Area Auto Trips by Type

Alternative	Internal Trips	One Trip End in the Study Area	Cut-Through Trips	Total Trips
No Build	7,967	13,771	20,928	42,666
<b>Difference From No Build Scenario</b>				
TSM	235	-509	626	352
Alternative 1	-124	-1,432	517	-1,039
Alternative 2	-97	-1,515	513	-1,100
Alternative 3	-206	-1,814	442	-1,577
Alternative 4	-231	-1,723	562	-1,393
Alternative 5	-418	-1,922	440	-1,901
MOS 1	152	-775	348	-275
MOS 2	-209	-1,088	485	-812

Source: Fehr & Peers, 2010

As shown in Table 4-5 and Table 4-6, the Build Alternatives reduce the total number of auto trips in the Future Year 2035 Metro Regional Travel Demand Model, with a majority of the decrease coming from trips with one trip end in the Study Area. Cut-through trips account for approximately 50% of the growth in vehicle trips between the base year and the Future Year 2035 No Build Alternative, and cut-through trips also increase under all Build Alternatives in the AM and PM peak hours. Auto trips with their origin and destination in the Study Area (internal trips) generally decrease under the Build Alternatives.

The Future Year 2035 AM and PM peak hour origin-destination trip tables for the VISUM models were then developed by adding the difference between the base and future year trip tables from the Metro Regional Travel Demand Model to the refined existing origin-destination trip tables were developed during the VISUM calibration/validation process.



The approach described above is consistent with other model adjustment techniques like the “difference method,” which applies the following formula:

$$\text{Adjusted Future Volume} = \text{Field Count} + (\text{Model Future Volume} - \text{Model Base Volume})$$

However, instead of applying the adjustment at the link or turning movement level, the adjustment is applied at the origin-destination level to better reflect the model’s growth predictions.

The Existing calibrated/validated VISUM model was then modified to include the northbound HOV lane on I-405 assumed in the Future Year 2035 Metro Regional Travel Demand Model. No other future roadway improvements were included in the Future Year 2035 Metro Regional Travel Demand Model in the Study Area. The final Future Year 2035 origin-destination trip tables were then assigned for the No Build and each of the Build Alternatives and the resulting link volumes for the No Build Alternative were compared to base year link volumes to ensure the growth was reasonable. The resulting link volumes for the Build Alternatives were compared to link volumes for the No Build Alternative to ensure the growth (or decline) was reasonable. Subsequently, the turning movement volumes for the No Build and Build Alternatives were adjusted through the use of the “difference method” to account for Existing VISUM model deviation from observed traffic counts.

The AM and PM peak hour vehicle-miles traveled (VMT) results from the 2035 VISUM model are shown in Table 4-7, which show the AM and PM peak hour VMT for the No Build Alternative and each Build Alternative, and the difference in VMT between the No Build Alternative and each of the Build Alternatives. This difference is shown in Figure 4-2.

As shown in Table 4-7, the VMT generally decreases from the No Build Alternative to each of the Build Alternatives. Increases in VMT reported for several alternatives during the PM peak hour are due to the additional cut-through trips traveling through the Study Area as projected by the Metro Regional Travel Demand Model.

**Table 4-7. Year 2035 AM and PM Peak Hour Vehicle-Miles Traveled**

Alternative	AM Peak Hour	AM Peak Hour	PM Peak Hour	PM Peak Hour
	VMT	VMT Delta	VMT	VMT Delta
No Build	350,090	-	380,492	-
<b>Difference From No Build Scenario</b>				
TSM	349,625	-465	382,125	1,633
Alternative 1	346,001	-4,089	378,721	-1,771
Alternative 2	344,839	-5,251	378,725	-1,768
Alternative 3	344,020	-6,070	376,857	-3,635
Alternative 4	344,973	-5,117	378,040	-2,453
Alternative 5	343,283	-6,806	376,211	-4,281
MOS 1	348,841	-1,249	381,089	597
MOS 2	346,369	-3,720	379,355	-1,138

Source: Fehr & Peers, 2010. Values shown do not include cut-through trips that do not have an origin or destination within the Study Area.

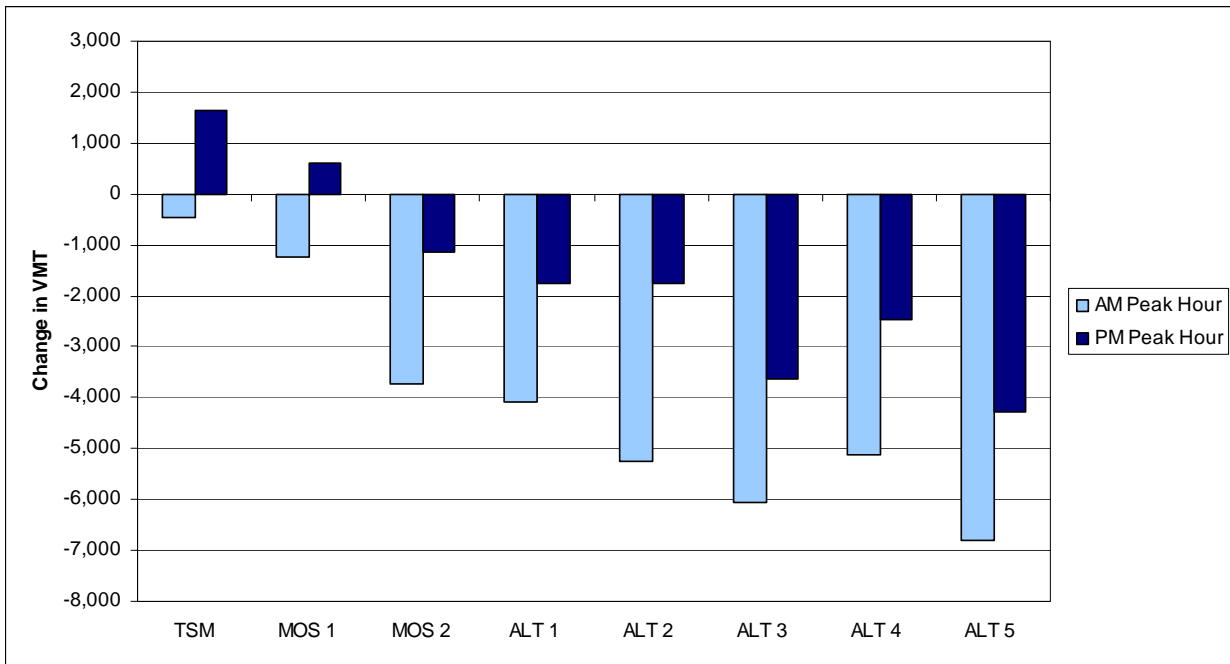


Figure 4-2. Change in VMT Compared to the No Build Alternative

#### 4.2.4 Synchro Analysis

The Synchro 6.0 software suite was used to develop the Study Area roadway and intersection network for the previously completed Existing Conditions traffic analysis. The model network developed for the Existing Conditions traffic analysis was also used for the future year 2035 No Build scenario. The Synchro model network was constructed by drawing the roadway network using aerial photography as a background. The number of lanes and the location of lane additions and drops were confirmed by field observations. Additional detail was incorporated into the Synchro model network (posted speed limits, grades, etc.) to better reflect observed field conditions. Traffic signal-related information such as phasing and initial timings (minimum green, maximum green, distance or “gap” between vehicles, etc.) for the signalized intersections was obtained from the local agencies or during field visits to the site. Additional detail, such as turn pocket lengths, saturation flow and intersection spacing was coded based on field measurements. Once the model network was developed, Future Year 2035 No Build AM and PM peak hour intersection turning movement counts and pedestrian volumes were input into the model and the delay and delay-based level of service (LOS) calculations were completed for each Study Area intersection included in the model network.

#### 4.2.5 Incorporation of Pedestrian Volumes

##### 4.2.5.1 Future 2035 No Build Scenario

Existing pedestrian data collected at study intersections adjacent to potential station locations were added to the Synchro network to establish a future base for pedestrian volumes under the Future Year 2035 No Build scenario. These volumes were added to the Synchro network to account for additional vehicle delay at unprotected left and right turns as a result of pedestrian activity.

**4.2.5.2 Future Build Alternatives**

The project would result in additional pedestrian activity at intersections immediately adjacent to and within walking distance (typically one-quarter mile) of proposed station locations. Mode of access data from the Metro Regional Travel Demand Model along with future station site plans (locations of pedestrian ingress and egress) were used to determine the increase in pedestrians expected at each leg of an intersection adjacent to a proposed station entrance location. The pedestrian volumes were added to the Synchro network to account for additional vehicle delay at unprotected left and right turns as a result of increased pedestrian activity. Vehicle delay would also be affected by an increased number of pedestrian calls, which would increase time allotted to walk phases and associated red/yield phases for vehicles.

**4.2.6 Incorporation of Heavy Vehicles**

The Metro Regional Travel Demand Model did not include heavy vehicle trips (such as delivery trucks and tractor-trailers) as a part of the highway assignment. In the Existing Traffic Conditions analysis, these trips were accounted for because level of service analysis was calculated based on turning movement counts that were recorded at each of the study intersections, which included heavy vehicle trips. Therefore, to account for the assignment of heavy vehicle trips that was not included in the Metro Regional Travel Demand Model, 2%<sup>3</sup> of the incremental increase in volumes between Existing Conditions and Future Year 2035 No Build was applied to the Future Year 2035 No Build and all Build Alternative scenarios.

**4.2.7 Incorporation of Transit Services**

The Metro Regional Travel Demand Model did not include transit trips (such as buses) as a part of the highway assignment. In the Existing Traffic Conditions analysis, these trips were accounted for because level of service analysis was calculated based on turning movement counts that were recorded at each of the study intersections, which included transit (bus) trips. Therefore, to account for increased (or decreased) transit activity compared to the Existing Traffic Conditions scenario, the 2035 No Build transit network (including routes and headways) was reviewed and the net increase or decrease in trips were added to the through traffic at the affected intersections in the Future Year 2035 No Build and all Build Alternative scenarios.

**4.2.8 No Build Traffic Forecasts and Level of Service Analysis****4.2.8.1 Traffic Forecasts**

The weekday peak hour (AM and PM) Future Year 2035 No Build traffic forecasts projected at the 192 study intersections are shown in Appendix A.

**4.2.8.2 Level of Service Analysis**

Fifty-three of the 192 analyzed intersections (28 percent) are operating at an acceptable LOS D or better in the morning and afternoon peak hours. The remaining 139 intersections (72 percent) operate at LOS E or F (deficient LOS) during one or both analyzed peak hours. By 2035, the majority of study intersections will operate under congested conditions (LOS E or F) during peak hours without the Project.

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<sup>3</sup> In the absence of local classification data, 2% heavy vehicle trips is the default value in Exhibit 10-12 of the *2000 Highway Capacity Manual* (Transportation Research Board, 2000)



The model predicts that the majority of analyzed intersections along Wilshire and Santa Monica Boulevards will operate under deficient LOS in the future, resulting in significant delay for motorists traveling along east-west and north-south corridors in the Westside. These LOS results by peak hour are illustrated graphically in Figure 4-3.

Projected morning and afternoon peak period delay and corresponding LOS at each study intersection are contained in Appendix B-2.

Detailed LOS calculations are provided in Appendix C-2.

#### **4.2.9 TSM Traffic Forecasts and Level of Service Analysis**

##### **4.2.9.1 Traffic Forecasts**

The only improvement assumed under the TSM Alternative is increased bus service along Wilshire Boulevard. The weekday AM and PM peak hour Future Year 2035 TSM traffic forecasts indicate a net decrease of 183 total trips in the AM peak hour and a net increase of 352 total trips in the PM peak hour within the entire Study Area as compared with the Future No Build Scenario. This represents less than 1/10 of a percent difference in traffic volumes between the TSM and No Build Alternatives. The minimal change is the result of a nearly identical roadway and transit network (land use does not change). The effect of the TSM Alternative at individual study intersections would be nominal and the difference from the No Build Alternative is not statistically significant. Therefore, for the traffic operations LOS analysis, the TSM alternative is considered to be identical to the No Build Alternative.

##### **4.2.9.2 Level of Service Analysis**

No changes in level of service between the Future Year 2035 No Build Scenario and TSM Alternative are expected as a result of only a minor improvement to the transit service along Wilshire Boulevard. Level of service has been depicted in Figure 4-3.

Therefore, the same fifty-three of the 192 analyzed intersections (28 percent) would operate at an acceptable LOS D or better in the morning and afternoon peak hours. The remaining 139 intersections (72 percent) would operate at LOS E or F (deficient LOS) during one or both analyzed peak hours.

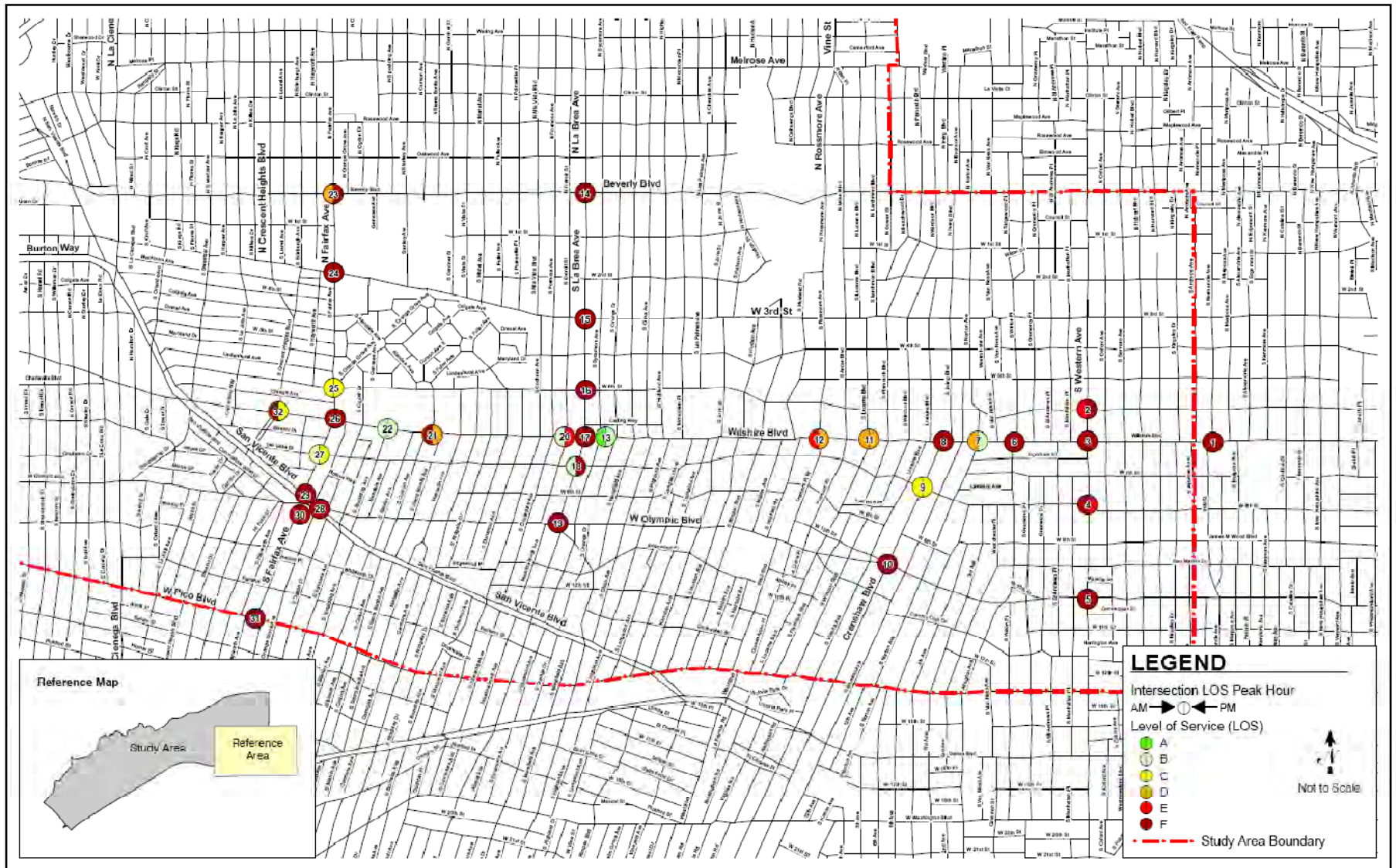


Figure 4-3. Future Year 2035 No Build/TSM Intersection Levels of Service

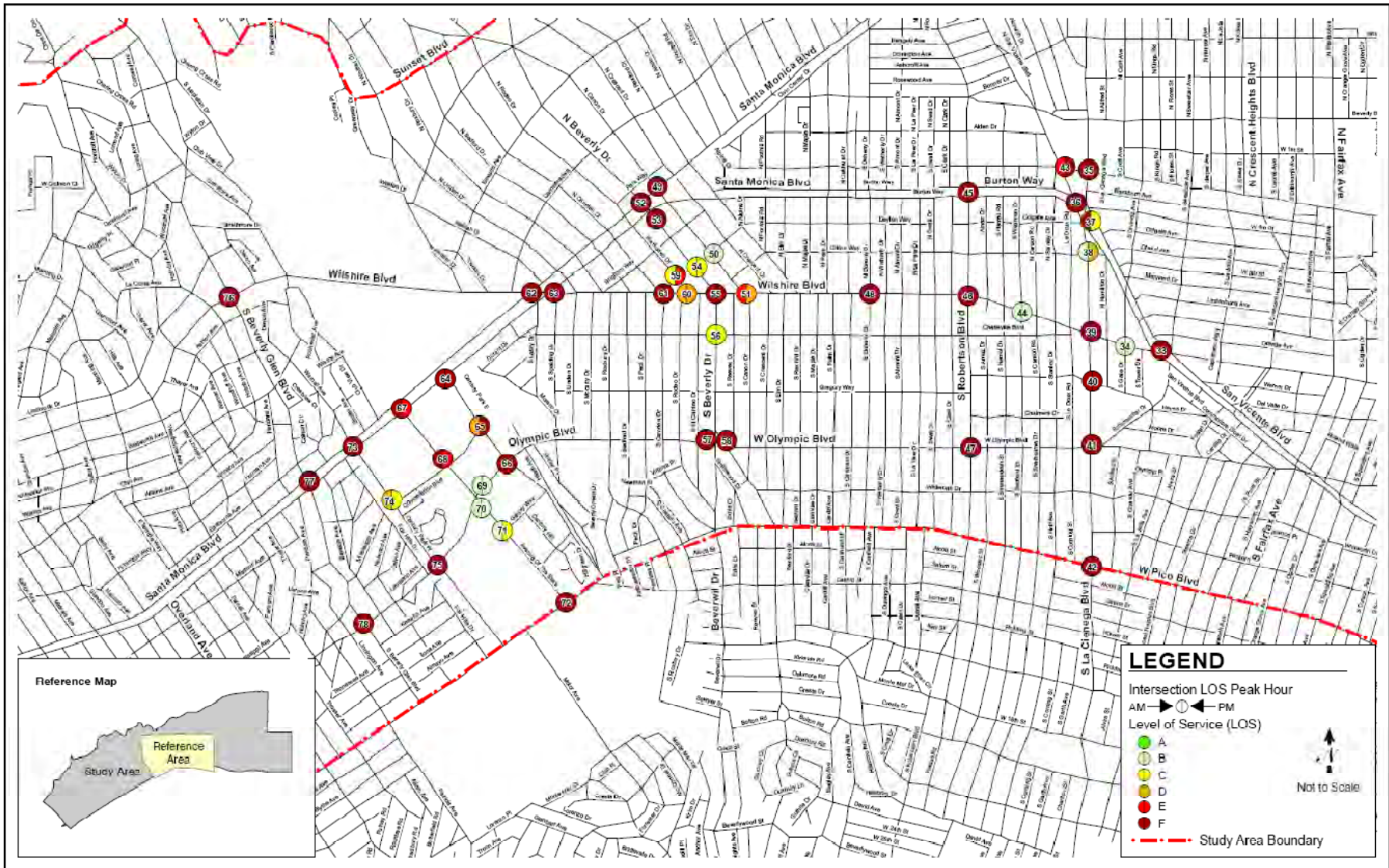


Figure 4-3. Future Year 2035 No Build/TSM Intersection Levels of Service (continued)

WESTSIDE SUBWAY EXTENSION

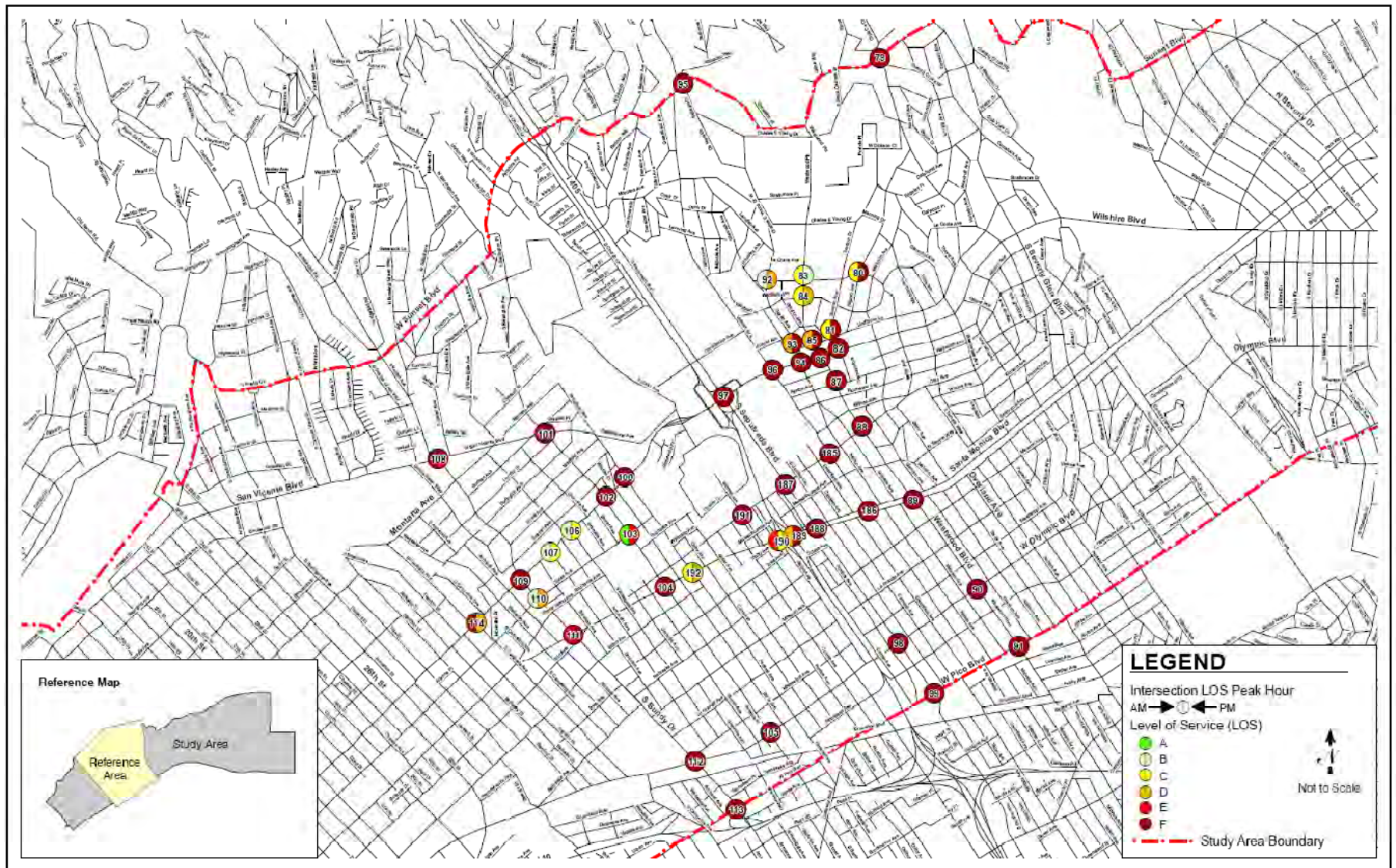


Figure 4-3. Future Year 2035 No Build/TSM Intersection Levels of Service (continued)

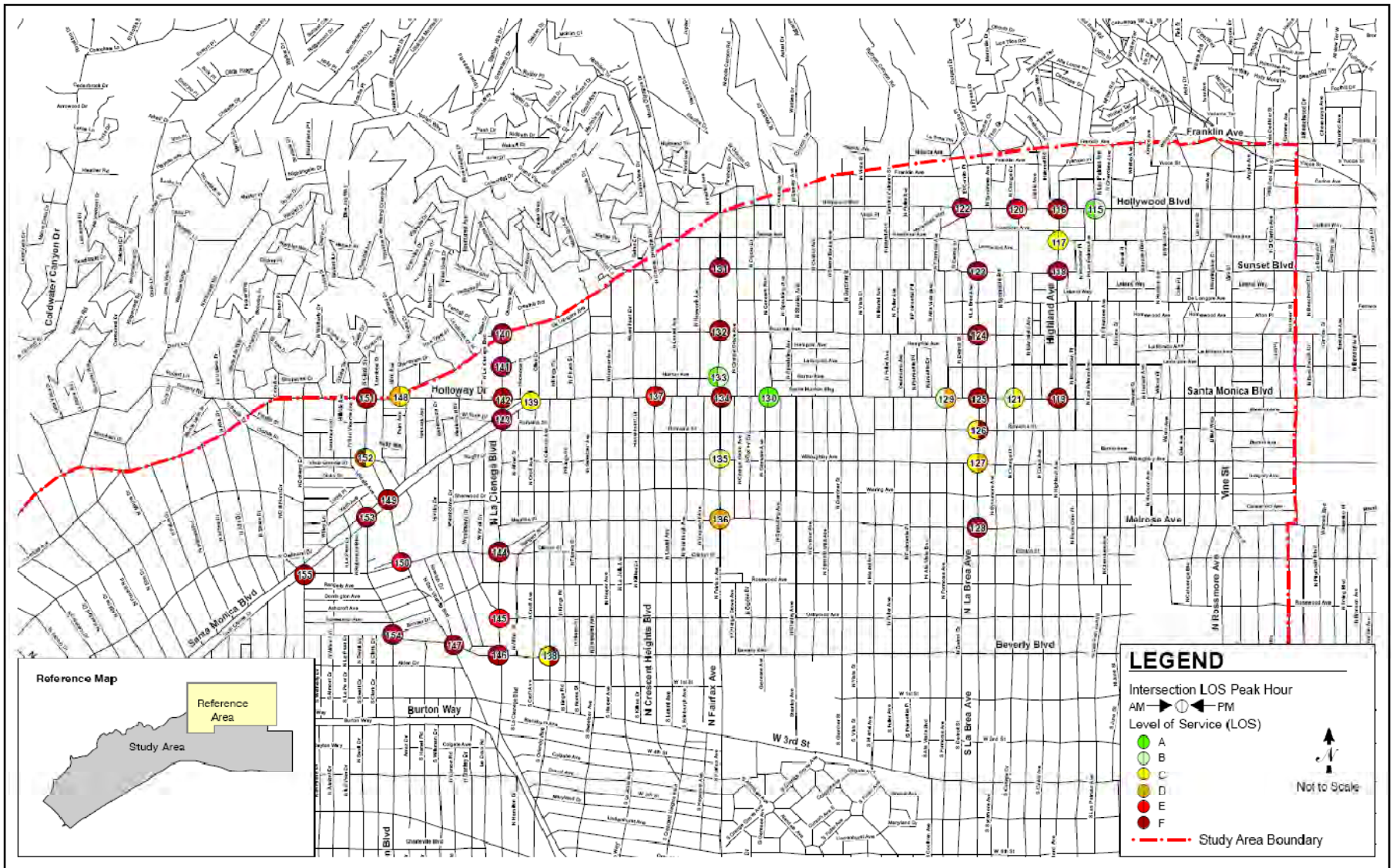


Figure 4-3. Future Year 2035 No Build/TSM Intersection Levels of Service (continued)

WESTSIDE SUBWAY EXTENSION

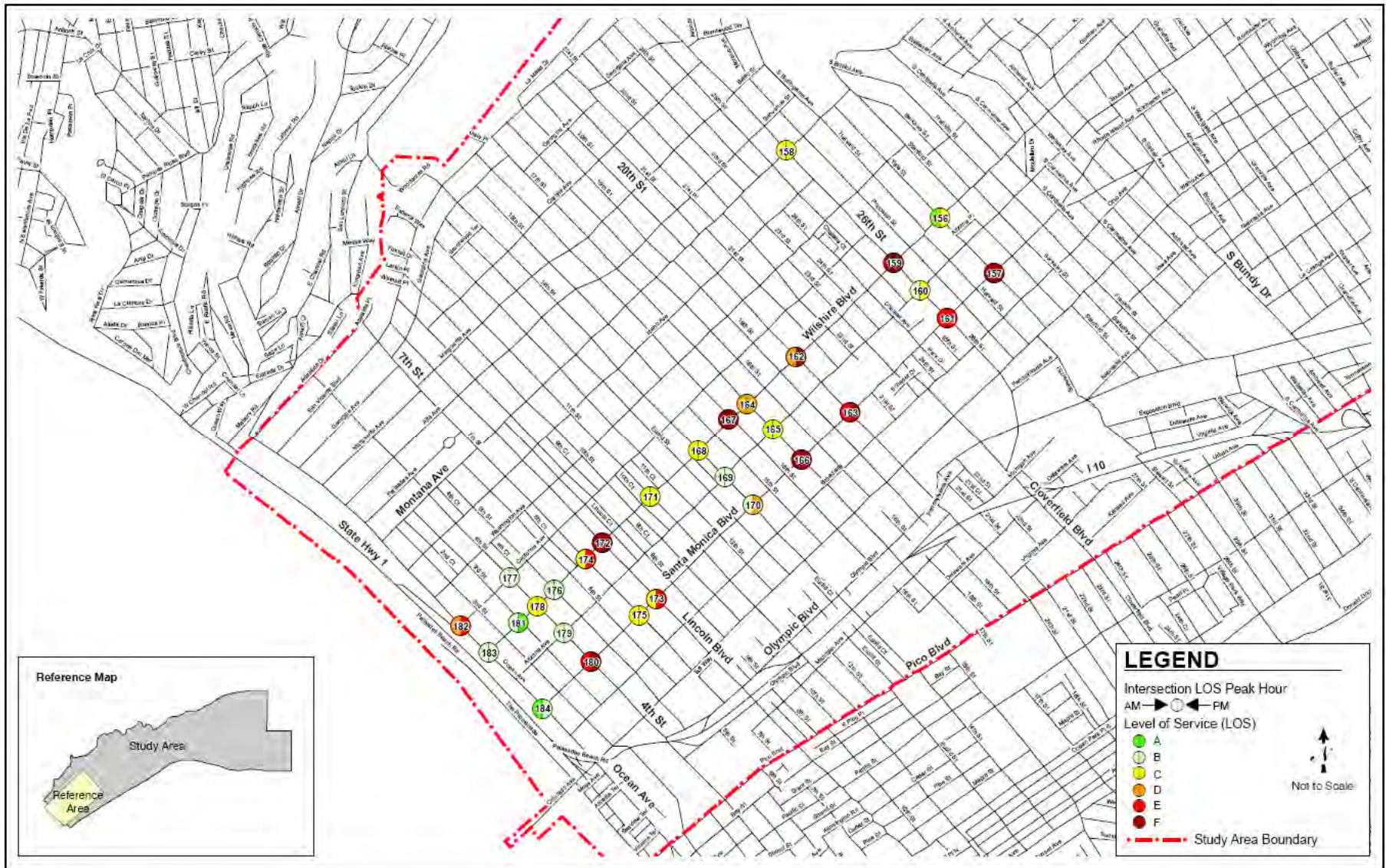


Figure 4-3. Future Year 2035 No Build/TSM Intersection Levels of Service (continued)