

# 2

## EXISTING CONDITIONS

The State Route (SR) 87 corridor is a ten-mile multimodal corridor serving motorists, transit riders, cyclists, and pedestrians. The corridor has the following physical characteristics:

- SR 87 begins at SR 85 in the south and ends at US 101 in the north, as shown in Figure 2-1. The corridor has three system, or freeway-to-freeway, interchanges at SR 85, I-280, and US 101, and 11 interchanges providing access to mostly local roadways in the City of San Jose. The older portion of the freeway between SR 85 and I-280 was built in the 1970s, and the new section north of I-280 was completed in 2004.
- SR 87 has one carpool, or high-occupancy vehicle (HOV) lane, two general purpose (GP) lanes in each direction, and auxiliary lanes in some segments, as shown in Figure 2-2.
- In 1991, the VTA opened an LRT line south of downtown that traverses in the median of SR 87 for about 5.1 miles. The LRT system in downtown and through north San Jose was built in 1987.
- The Highway 87 Bikeway, a 4.1-mile bicycle path runs parallel to the freeway. The north end of the path traverses along the west side of SR 87 from the SR 87/ US 101 interchange in the north and ends around Branham Lane.
- Surrounding land uses along corridor comprise residential neighborhoods in the south and large employment centers in downtown San Jose and at the north end of corridor. The golden triangle area is a large employment center in the north of the corridor between US 101, SR 237, and I-880 in San Jose, Santa Clara, Sunnyvale, and Milpitas.
- Travel and congestion on the corridor show a distinct travel pattern with highly directional flows in the morning (AM) and evening (PM) peak periods. The Mineta San Jose International Airport at the Skyport Drive interchange, San Jose State University near downtown San Jose, the SAP Center, and the San Jose McEnery Convention Center, near the Santa Clara Street interchange, are other major destinations that contribute to congestion on the corridor.
- Environmental resources within the corridor may include archaeological resources, special-status plant or animal species, and parklands, among others. Any physical roadway improvements within the SR 87 corridor may adversely affect existing environmental resources. Refer to Appendix C.

### SECTION CONTENTS

- Existing Freeway Conditions
- Bicycle & Pedestrian Facilities
- Transit Services & Facilities
- All Modes Travel Time & Speed Comparison

Figure 2-1. Study Corridor Map

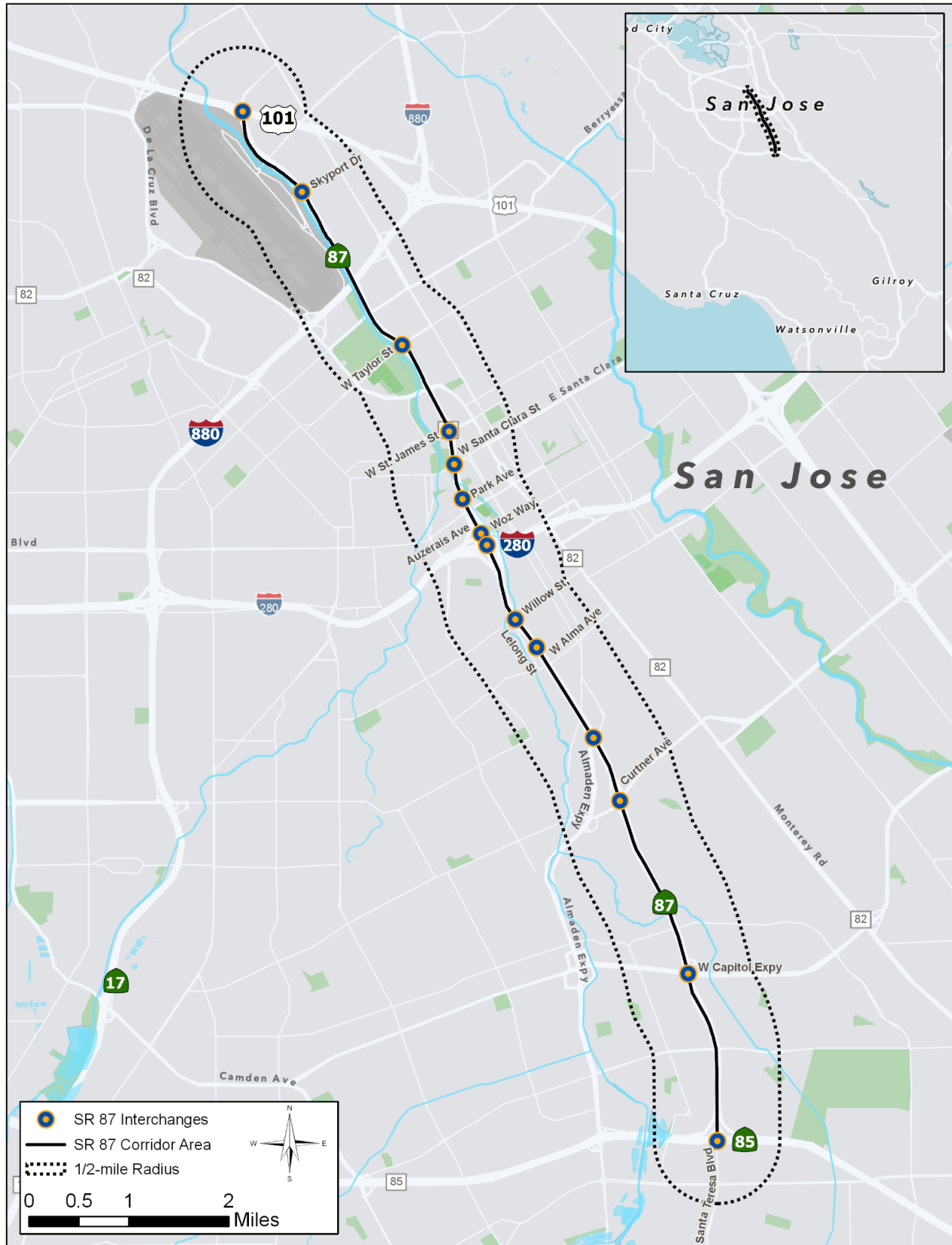
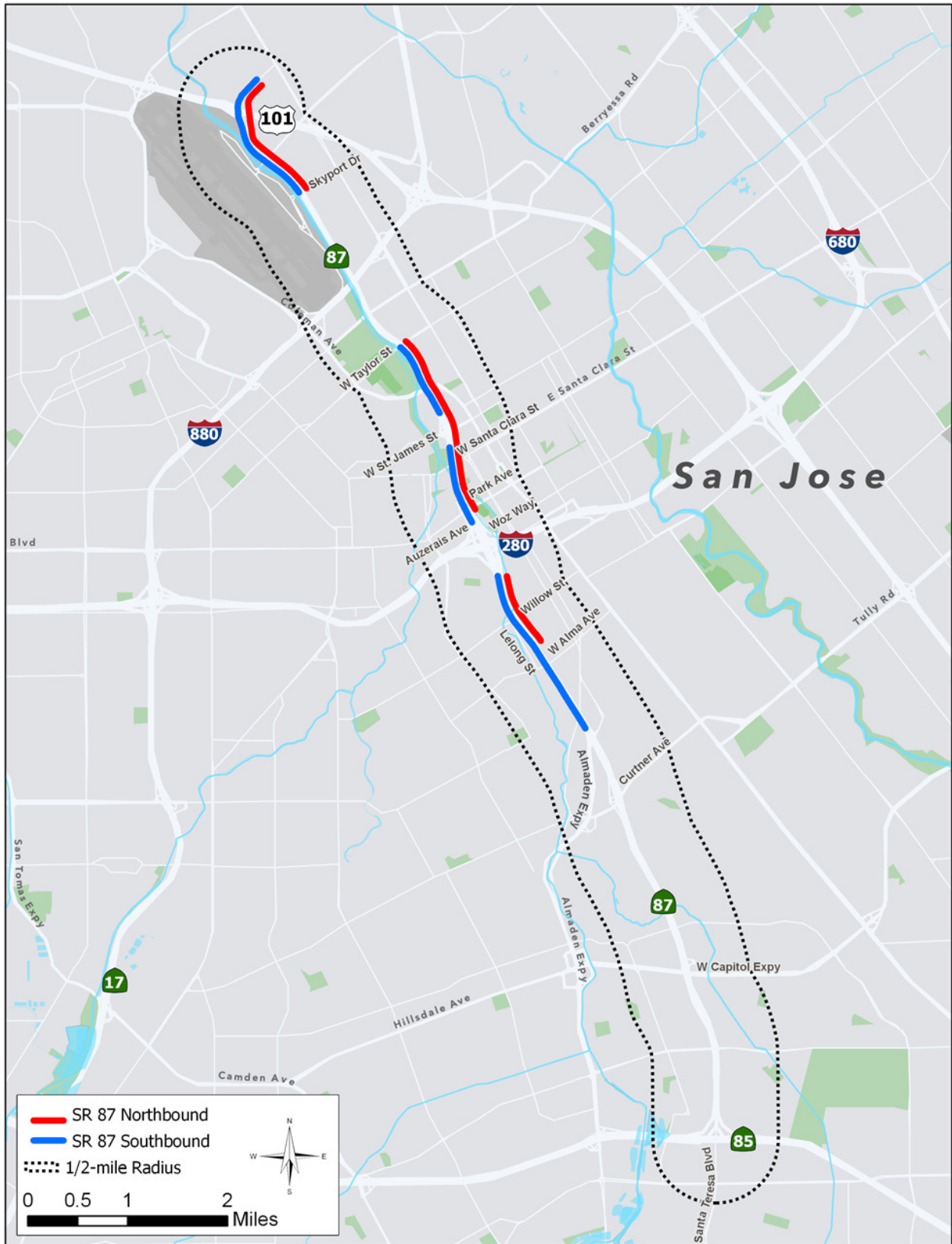


Figure 2-2. Existing Auxiliary Lanes





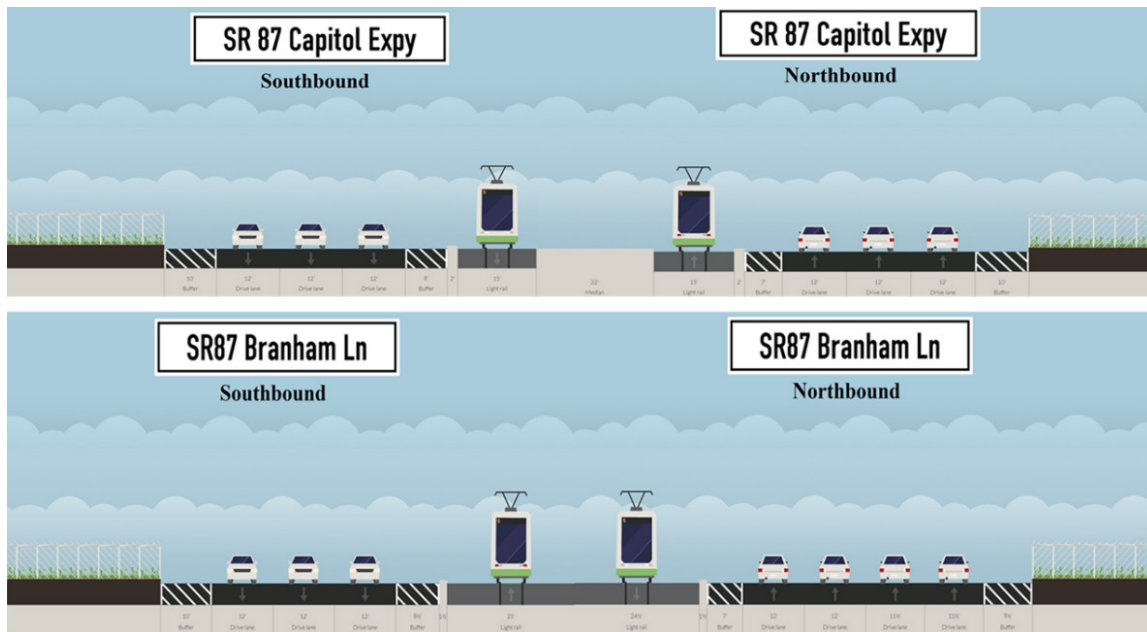
## 2.1 Existing Freeway Conditions

This section describes the physical attributes of the freeway mainline and interchanges, and the technology currently being used to manage traffic on SR 87. This discussion is followed by a detailed analysis of traffic volumes, speeds, and congestion.

### 2.1.1 SR 87 Mainline

SR 87 begins at SR 85 in the south and ends at US 101 in the north (refer to Figure 2-1). The SR 87 mainline has one HOV lane, two general purpose lanes, and auxiliary lanes in some segments (refer to Figure 2-2). The corridor has 11 interchanges providing access to mostly local roadways in the City of San Jose and three system interchanges, as further described in Section 3.1.2. An LRT line runs in the median of SR 87 for about 5.1 miles. Figure 2-3 shows a typical cross section of the freeway.

Figure 2-3. Typical Cross Section of the SR 87 Mainline



### 2.1.2 System Interchange Configuration

SR 87 has three system interchanges: SR 87/SR 85, SR 87/I-280 and SR 87/US 101. Each interchange, including type, lane configuration, and use of transportation technologies, is described in the following sections.

#### SR 87/SR 85 System Interchange

The SR 87/SR 85 interchange is located in a dense residential neighborhood at the southern end of the corridor (Figure 2-4). The ramps connecting the two freeways are controlled by meters, and all but one have HOV bypass lanes.



Figure 2-4. SR87/SR85 System Interchange

### SR 87/I-280 System Interchange

The SR 87/I-280 interchange is located in the densest area of San Jose. Downtown, San Jose State University, the SAP Center, and the San Jose McEnergy Convention Center are some of the main attractions near this interchange (Figure 2-5). This is a complete interchange, connecting to and from all directions on both freeways.



Figure 2-5.  
SR 87/I-280  
System Interchange

### SR 87/ US 101 System Interchange

The SR 87/US 101 interchange is located at the northern end of the freeway in an area dominated by offices and businesses (Figure 2-6). It is near and provides access to the Mineta San Jose International Airport. SR 87/US 101 is a partial interchange, as there is no connection from northbound US 101 to SR 87. The interchange has one HOV bypass lane on the northbound SR 87 ramp to northbound US 101.



Figure 2-6.  
SR 87/US 101 System  
Interchange

### 2.1.3 Other Interchanges

In addition to the three system interchanges, SR 87 has 11 interchanges. These are listed in Table 2-1 along with information on ramp meters, HOV bypass lanes, and over- and under-crossings.

Table 2-1. SR 87 Freeway Interchanges

Freeway Segment	Ramp Metering (Yes/No)	On-Ramp HOV Bypass Lane (Yes/No)	Crossings* OC (overcrossing) UC (undercrossing)
SR 87/ SR 85 Interchange	NB – No SB – Yes	NB – No SB – Yes	Chynoweth Avenue OC Branham Lane UC
Santa Teresa Blvd	NB – Yes	NB – No	OC
Capitol Expressway	NB – Yes SB – No	NB – No SB – No	Hillsdale Avenue OC Canoas Creek OC Carol Drive OC Hill Pond Drive OC
Curtner Avenue	NB – Yes SB – Yes	NB – Yes SB – No	OC
Almaden Expressway	NB – Yes SB – No Ramp	NB – Yes SB – No	Almaden Road OC
Alma Avenue	NB – Yes SB – No Ramp	NB – Yes SB – No	Willow Street OC Guadalupe River OC Caltrain Railroad UC Guadalupe River OC Virginia Street UC
SR 87/ I-280 Interchange	NB – No SB – No	NB – No SB – No	LRT OC Auzerais Avenue OC San Carlos Street OC
Park Avenue	NB – Yes	NB – Yes	San Fernando OC Santa Clara Street OC
Julian Street/ Saint James Street	NB – Yes SB Loop – Yes SB Diagonal – Yes	NB – Yes SB – No	Bassett Street OC LRT OC Ryland Street OC Coleman Avenue OC
Taylor Street	NB – Yes SB – Yes	NB – Yes SB – Yes	Hedding Street OC I-880 OC
Skyport Drive	NB – Yes SB – Yes	NB – Yes SB – Yes	Airport Parkway OC
SR 87/ US 101/ Charcot Avenue	NB – Yes US 101 SB – No Charcot to SB SR 87 – Yes	NB – Yes US 101 SB – No Charcot to SB SR 87 – Yes	Charcot Avenue OC

\* Streets and other facilities that SR 87 either crosses over or under

## 2.1.4 Transportation Technology Elements

Various transportation technologies are used on SR 87 to manage and monitor traffic. The following sections describe the current technologies, and

### Ramp Metering

Ramp metering is the most prevalent technology used on SR 87. With operational ramp meters at most locations, SR 87 is one of Santa Clara County's most complete corridors. Metering on the corridor is active in the morning peak period in the northbound direction and in the evening peak period in the southbound direction (Figure 2-7). A few select freeway-to-freeway connector ramps either have meters that are currently inactive or do not have meters because of severe congestion and queuing on these ramps.

The ramps without meters are as follows:

- I-280 SB to SR 87 NB
- I-280 NB to SR 87 NB
- SR 87 SB to I-280 SB
- US 101 SB to SR 87 SB

### Traffic Surveillance Cameras (Closed Circuit Television)

The California Department of Transportation (Caltrans) operates and maintains ten video traffic surveillance cameras along the SR 87 freeway. These cameras are used for remote video monitoring using ISDN (Integrated Services Digital Network) transmission.

### Changeable Message Signs

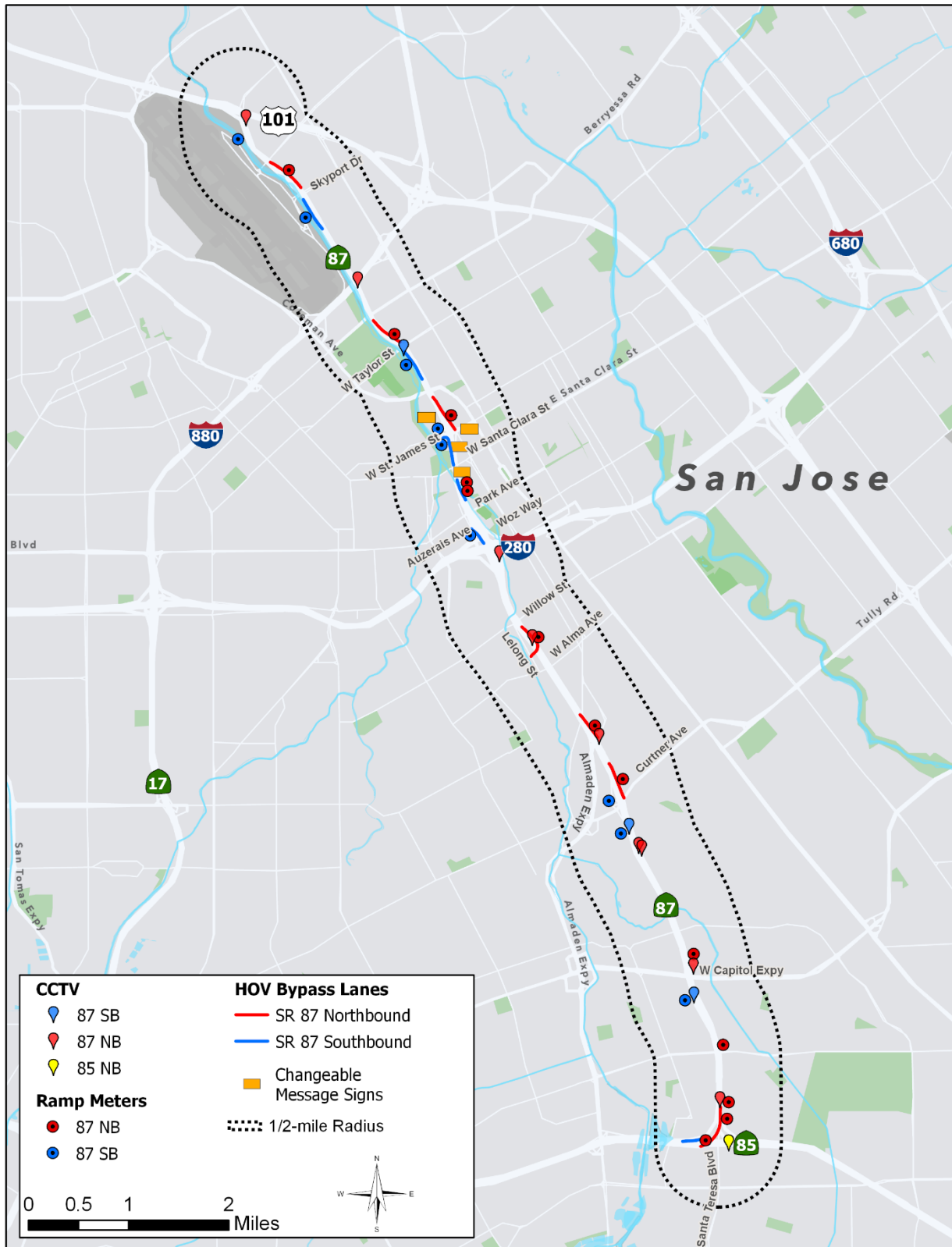
Changeable message signs are electronic signs that provide traveler information. There are four changeable message signs on SR 87 that are operated and maintained by the City of San Jose near the SAP Center close to downtown San Jose. The four signs provide motor information, such as guidance to parking facilities for the SAP Center.

Figure 2-8 shows the location of existing technology along SR 87.

Figure 2-7. Taylor Street On-Ramp to Southbound SR 87



Figure 2-8. Existing Technologies Along SR 87



## 2.1.5 Freeway Traffic Operating Conditions

The existing operating conditions on the corridor were assessed using available information from various sources, as shown in Table 2-2.

**Table 2-2. Data Sources Used to Assess Operating Conditions**

Type of Data	Description/Source	Date
Travel times and speeds	VTA Travel Time Runs – GPS Based	May 2017
Traffic volumes and heat maps	INRIX, Caltrans PeMs (with good detector health)	May 2016, 2017 October 2017
AADT	Caltrans Traffic Census Program	2016
Bottleneck locations and queues	Field Observations — GPS trackers VTA Travel Runs INRIX Heat Maps	May 2017
LOS data	VTA 2016 Monitoring and Conformance Report	October 2016
Roadway geometrics/ ramp metering locations	Google Earth Field Observations	2017
HOV lane usage	Caltrans HOV report	2014
Truck percentage	Caltrans Truck Volumes (Traffic Census Program)	2016
Incident data	SWITERS	2011–2016
Transit data	Swiftly	2017, 2018
Bicycle information	City of San Jose Parks, Recreation & Neighborhood Services	September 2017

### Traffic Volumes

Traffic volumes along SR 87 vary depending on direction, with heavy traffic in the northbound direction during the morning peak period and in the southbound direction in the evening peak period. Average annual daily traffic (AADT) volumes (both directions combined) range from 169,000 vehicles per day at Lelong Street to 87,000 vehicles per day at Airport Parkway. The observed AADT volumes are comparable to those on other State routes in the county, such as SR 85 and SR 237.

### Carpool Lane Usage

The number of vehicles using carpool lanes has been increasing every year, and HOV lanes are now reaching their capacity of 1,650 vehicles per hour. HOV decals, which allow eligible single-occupant vehicles (like zero emissions electric vehicles) in the HOV lanes, were introduced in 2011 in California. The VTA’s community survey results and field observations show that a considerable number of stickered vehicles using the HOV lanes are being driven by solo drivers. The percentage of vehicles using HOV lanes during both the morning and evening peak hours is summarized in Table 2-3.

Table 2-3. SR 87 Carpool Lane Usage

Direction Peak Hour	HOV Lane Limits	Percentage of Traffic using HOV Lane
Northbound AM	SR 85 to I-280	27%
	I-280 to US 101	30%
Southbound PM	US 101 to I-280	24%
	I-280 to SR 85	22%

Source: Peak Hour at Julian St (North of I-280), Branham Ln (South of I-280) from Caltrans PeMs, May 2017

### Truck Percentages

SR 87 is a designated truck route.<sup>1</sup> Table 2-4 summarizes the percentages of vehicles on various segments of SR 87 that are trucks; these range from a low 0.32% to a high 3.7% and are comparable to the truck percentages on other freeways in the Bay Area. Fewer trucks use the southern end of corridor because of restrictions on SR 85 between the US 101 south interchange and I-280 interchange.

Table 2-4. SR 87 Truck Volumes

Freeway Segment	Vehicle Volume	Truck Volume	Truck Percentage
San Jose, Jct. SR 85	119,000	381	0.32%
Curtner Ave	133,000	2,261	1.70%
Almaden Expressway	149,000	3,814	2.56%
San Jose, Jct. I- 280	169,000	4,039	2.39%
San Jose, Jct. I-280	123,000	4,552	3.70%
Jct. US 101	86,000	2,580	3.00%

### Freeway Mainline Level of Service

The VTA conducted a level of service (LOS) qualitative analysis on the mainline to assess its performance in terms of vehicle speed and congestion. SR 87 is a highly congested corridor with numerous freeway segments operating at LOS F.<sup>2</sup> The following operating conditions were observed:

- Northbound, 7 of 10 GP lane segments and 6 of 10 HOV lane segments operate at LOS F in the morning peak hour.
- Southbound, 6 of 10 GP lane segments operate at LOS F in the evening peak hour. All 10 HOV lane segments operate at LOS E or better.

Figure 2-9 illustrates LOS levels along the SR 87 mainline.

1. “Truck” is defined as a vehicle with more than two axels.

2. LOS standards use the letters A through F to rate roadway performance, with A being the best and F being the worst.

Figure 2-9. SR 87 Freeway Level of Service



## Freeway Mainline Travel Times, Speeds, and Congestion

The VTA conducted field observations and collected travel time information and speed data from “big data” sources, such as Caltrans’ Performance Measurement System (PeMs) and INRIX, to identify the locations of bottlenecks on the corridor. The field observations were used to verify the information from the data sources and to provide specific details on peak hour operations. The data sources and field observations revealed that congestion exists throughout both the entire morning and evening peak periods, which are between 6:00 AM and 9:00 AM and 3:00 PM and 7:00 PM, respectively.

The peak hours for the corridor are between 7:00 AM and 8:00 AM and 5:00 PM and 6:00 PM. In the AM northbound direction, both the GP lanes and HOV lane operate in congestion with speeds ranging from 17 to 21 mph and from 23 to 40 mph, respectively. In the PM southbound direction, GP lanes operate in congestion between US 101 and Curtner Avenue, with speeds ranging from 22 to 33 mph. However, the PM HOV lane is less congested, with speeds ranging from 39 to 52 mph. Table 2-5 summarizes the peak hour travel speeds on the mainline freeway segments.

Table 2-5. Peak Hour Operations on SR 87

Direction	Segment		Distance (miles)	Peak Hour	Travel Time (min)		Average Speed (mph)	
	Begin	End			GP	HOV	GP	HOV
NB	SR 85 Interchange	I-280	5.156	AM	17:56	13:25	17	23
				PM	6:22	6:00	49	52
	I-280	US 101	4.064	AM	11:43	6:09	21	40
				PM	3:57	3:40	62	64
SB	US 101	I-280	4.064	AM	3:47	3:56	70	62
				PM	10:54	8:21	22	39
	I-280	SR 85 Interchange	5.156	AM	4:38	4:31	67	68
				PM	9:24	5:56	33	52

## Existing Bottlenecks and Queues

The following section describes the location of the bottlenecks and queues in both the morning and evening peak periods by direction.

### NORTHBOUND MORNING PEAK

Congestion in both the GP and HOV lanes during the morning peak period is due to high volume of vehicles in the northbound direction. The average speed for the entire length of freeway in the GP lanes is about 20 mph. The HOV lane operates at 30 mph, except between the Almaden Expressway and San Carlos overcrossings.

Figure 2-10 illustrates the travel speed profile from the field observations of both GP and HOV lanes. Figure 2-11 shows the INRIX heat map for a typical weekday in May 2017. The INRIX data and field observations show bottlenecks at Capitol Expressway, Almaden Expressway, the Santa Clara Street/I-280 merge, and the US 101 off-ramp.

Figure 2-10. Morning Travel Speeds in General Purpose & HOV Lanes on Northbound SR 87

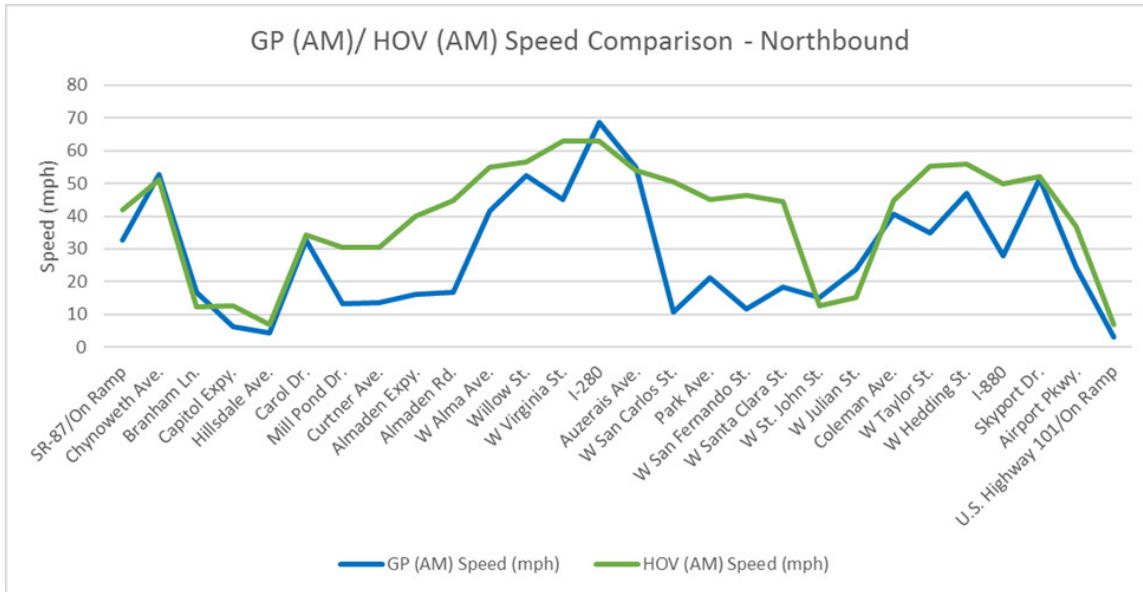
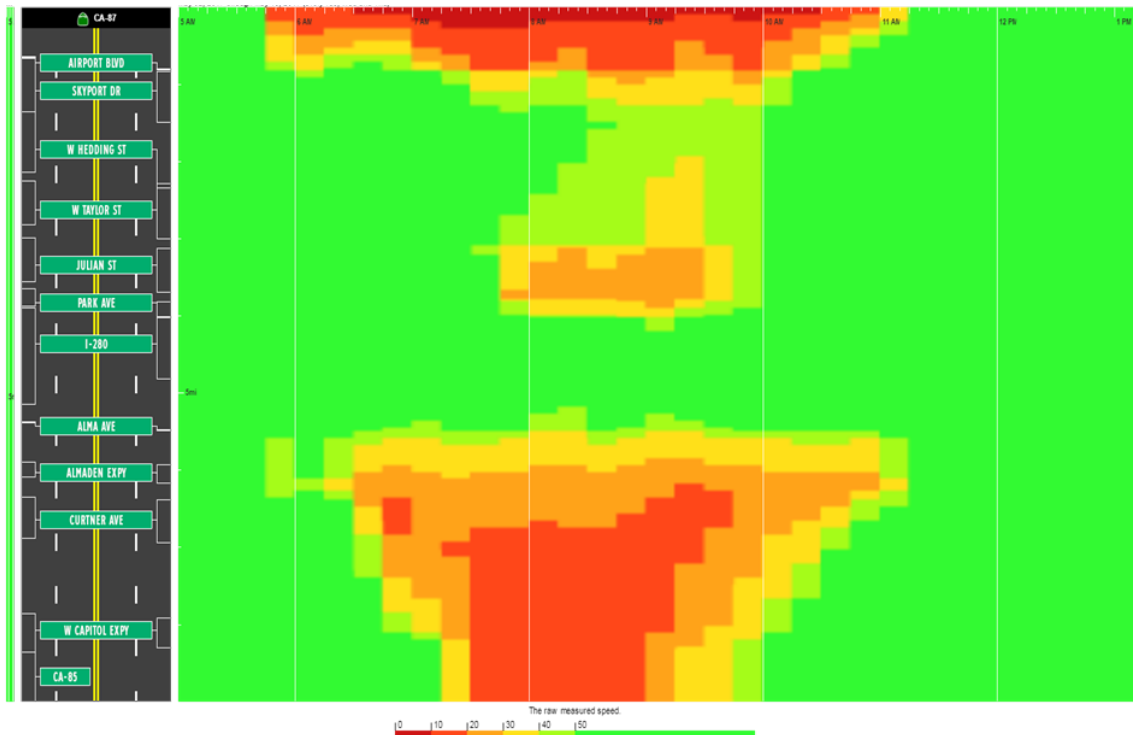


Figure 2-11. Average Weekday Morning Travel Speeds (MPH) on Northbound SR 87, May 2017



Source: INRIX, Averaged by 15 Minutes, May 2-18, 2017

**Capitol Expressway:** Congestion at Capitol Expressway is attributed to a high volume of traffic entering from SR 85 and from Capitol Expressway, and a reduction in capacity, due to a lane drop at Hillside Ave (Figure 2-12).

Figure 2-12. Morning Congestion Near Capitol Expressway



**Almaden Expressway:** Congestion at Almaden Expressway is attributed to a multitude of factors: backup from the I-280 off-ramp, a high volume of traffic entering from Almaden Expressway, and right lane overload caused by heavy merging and weaving between closely spaced on- and off-ramps. Queuing is observed on both Almaden Expressway as far back as Curtner Avenue (over ½ mile) and on the freeway mainline as far back as the SR 85 interchange (over 3 miles).

**Santa Clara Street/I-280 Merge:** The next bottleneck occurs in the downtown San Jose area just north of the merge with I-280. The congestion at this location is mainly attributed to a large number of vehicles entering the mainline from both northbound and southbound I-280. Backups are observed as far back as the middle of the SR 87/I-280 interchange and on both the northbound and southbound I-280 connectors extending back onto I-280 freeway mainline (Figure 2-13).

Figure 2-13. Morning Congestion at the SR 87/I-280 Interchange



Another factor adding to the congestion at this location is the off-ramp to Santa Clara Street and Auzerais Way via a collector-distributor road that exits from the freeway mainline at the middle of the I-280 interchange. The collector-distributor road first provides access to Auzerais Way and continues on to collect incoming traffic from the northbound and southbound I-280 connector ramps to SR 87. The off-ramp to Santa Clara Street is located within the merge with these two connector ramps, and the combined flows continue northbound to merge onto the SR 87 mainline. The location of the off-ramp to Santa Clara Street creates a complex weave section with up to five streams of traffic crossing each other in a short distance, as follows:

Freeway to Interchange Ramp:

- Northbound I-280 to Santa Clara Street
- Southbound I-280 to Santa Clara Street
- Northbound SR 87 collector-distributor road to Santa Clara Street

Freeway to Freeway Connector Ramps:

- Northbound I-280 to northbound SR 87
- Southbound I-280 to northbound SR 87

**US 101 On-Ramp:** Northbound SR 87 terminates by branching off to northbound US 101 and N. First Street-Charcot Avenue, with high volumes evenly splitting off to both destinations. There is minimal backup to N. First Street-Charcot Avenue, due an auxiliary lane between the Skyport Drive and N. First Street-Charcot Avenue off-ramp. Although the off-ramp to northbound US 101 has two GP lanes and one HOV lane, backup on the off-ramp is caused by ramp metering at the terminus of the ramp to manage congestion on the US 101 mainline.

### **SOUTHBOUND EVENING PEAK**

The southbound SR 87 GP lanes are congested between Skyport Drive and Curtner Avenue. Vehicle speeds start gradually increasing south of Almaden Expressway and continue increasing south of Curtner Avenue. The average speed for the entire length of freeway in the GP lanes is about 24 mph. The HOV lane operates above 50 mph, except at the Willow Street and Hillsdale Avenue overcrossings.

Figure 2-14 shows the field-observed travel speed profile for GP and HOV lanes in May 2018. Figure 2-15 shows the INRIX heat map for typical weekday in 2016. The INRIX data and field observations show GP lane bottlenecks at three locations: the SR 87/US 101/Charcot Avenue interchange, where I-880 crosses SR 87, and at the I-280 interchange area near downtown.

Figure 2-14. Evening Travel Speeds in General Purpose & HOV Lanes on Southbound SR 87

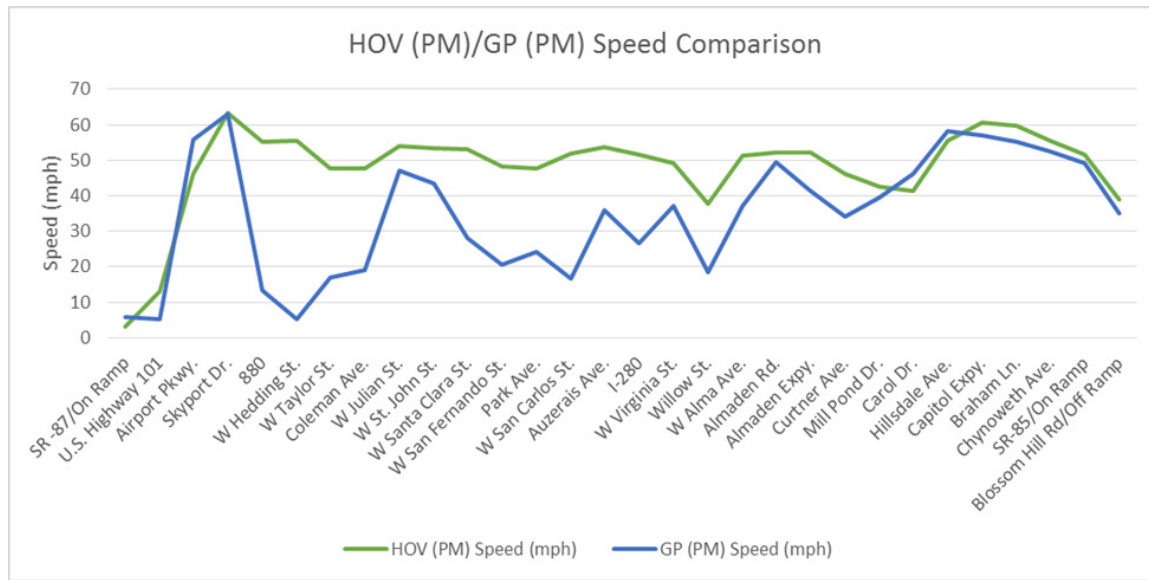
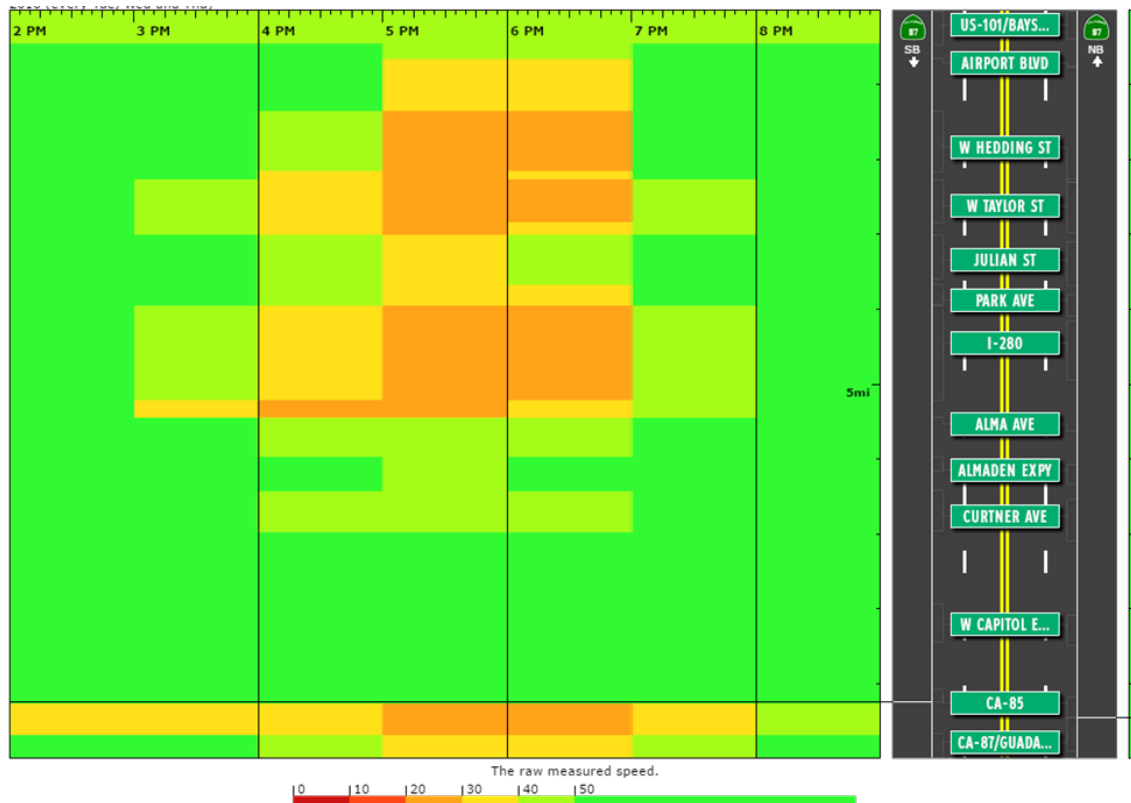


Figure 2-15. Average Weekday Evening Travel Speeds (MPH) on Southbound SR 87, 2016



Source: INRIX, Averaged by 1 Hour, 2016

**US 101:** The traffic flows at the northern end of the freeway corridor are fed by two high-demand on-ramps, one from southbound US 101 and one from N. First Street-Charcot Avenue. Backups occur on both ramps (Figure 2-16).

**Figure 2-16. Evening Congestion Near Mineta San Jose International Airport (SR 87/US 101/Charcot Avenue)**



On southbound US 101, queuing occurs at the diverge point of the off-ramp to southbound SR 87 from the US 101 mainline. This single-lane off-ramp does not have enough capacity to meet the demand, causing backups that extend to between Lawrence Expressway and the Mathilda Avenue interchange on the US 101 mainline.

Queuing on the N. First Street-Charcot Avenue on-ramp is mainly due to active ramp metering on this on-ramp to manage traffic on the southbound SR 87 mainline.

**I-880:** The crossing of I-880 is unique in Santa Clara County because it is the only crossing of two major freeways without any freeway-to-freeway access. This area is congested even though there is no interchange. The congestion is attributed to the discontinuity in lanes on the freeway mainline (a lane drop) at just south of Skyport Drive.

**I-280:** The southernmost bottleneck occurs just south of the I-280 merge with northbound SR 87. The congestion at this location is mainly attributed to a high number of vehicles entering the mainline from both northbound and southbound I-280. Backups are observed from the merge with I-280 back to somewhere between the Park Avenue and Julian Avenue overcrossings and on both the northbound and southbound I-280 connectors extending back onto I-280 freeway mainline (Figure 2-17).

Figure 2-17. Right-Lane Overload on Northbound SR 87 Approaching the I-280 Ramp



Another factor adding to the congestion at this location is the off-ramp to Alma Street-Leong Street via a collector-distributor road that exits off the freeway mainline at the middle of the I-280 interchange. The collector-distributor road exits off the SR 87 mainline and continues parallel for a short distance then merges with connector ramps from both northbound and southbound I-280, becoming a two lane on-ramp to SR 87. The off-ramp to Alma Street-Lelong Street is located before the on-ramp merges onto the SR 87 mainline. The location of access to Alma Street-Leong Street creates another complex weave section with up to four streams of traffic crossing each other in a short distance, as follows:

Freeway to Interchange Ramp:

- Northbound I-280 to Alma Street-Lelong Street
- Southbound I-280 to Alma Street-Lelong Street

Freeway to Freeway Connector Ramps:

- Northbound I-280 to SB SR 87
- Southbound I-280 to SB SR 87



## 2.2 Bicycle & Pedestrian Facilities

Providing high quality alternative modes of transportation for commuters along SR 87 is one possible key solution to reduce traffic congestion on SR 87 and maximize the capacity of existing roadway infrastructure. Bicycle commuting is a potential transportation alternative along SR 87, as two major trails exist near this corridor: the Highway 87 Bikeway and Guadalupe River Trail.

Safe, connected, convenient bicycle and pedestrian infrastructure around SR 87 also provides important first-last mile connections to and from local and regional rail and bus services that operate in the area, potentially reducing vehicle trips on SR 87. Planning for first-last mile connections should consider not only better pedestrian and bicycle infrastructure but also bicycle parking at transit stops; accommodation for bicycles on buses, light rail cars, and commuter trains; shared mobility devices such as bike share or scooter share; and clear signage and wayfinding for pedestrians and bicyclists.

This section describes existing bicycle and pedestrian facilities and current deficiencies in terms of safety and connectivity.

### 2.2.1 Existing Bicycle Trails and Bicycle Lanes

Various types of bicycle facilities currently serve or are planned in areas around the SR 87 corridor; these include multi-use paths or trails, cycle tracks, bike lanes, or signed bike routes, as described in Table 2-6. Two major trails, the Highway 87 Bikeway and the Guadalupe River Trail, run parallel to the freeway and serve North San Jose, central San Jose and downtown, and south San Jose, although both trail systems have deficiencies such as gaps, limited lighting, and limited wayfinding/signage. The Guadalupe River Trail connects the San Francisco Bay Trail in the North San Jose/Alviso area to Virginia Avenue south of downtown. The Highway 87 Bikeway connects Willow Street and areas around Tamien Station to Chynoweth Avenue north of SR 85. Existing bicycle facilities around SR 87 are shown in Figure 2-16.

**Table 2-6. Types of Bicycle Facilities**

Type of Bicycle Infrastructure	Description
Bicycle Paths/ Trails (Caltrans Class I)	Completely separated from streets. Provide two-way bicycle travel. Often shared with pedestrians.
Cycle Tracks (Caltrans Class IV)	Bicycle lane physically separated from motor vehicle traffic by a vertical barrier, such as an adjacent parking lane, median, or raised curb. May be one-way or two-way. Can be raised or level with auto travel lanes.
Bicycle Lanes (Caltrans Class II)	Provide dedicated roadway space for bicyclists, separate from motor vehicle traffic and parking lanes. Designated using striping, pavement markings and signs. Includes standard and buffered bike lanes.
Bicycle Routes/Sharrows (Caltrans Class III)	Streets specifically designated for bicyclists to share with motor vehicle traffic. Designated using signs. Bicyclists ride in the travel lane with motorists or on the shoulder. May include shared lane pavement markings (sharrows) or warning signage. Bicycle boulevards are an enhanced type of bicycle route: low-speed, low-volume streets optimized for bicyclists using traffic calming infrastructure, such as traffic circles.

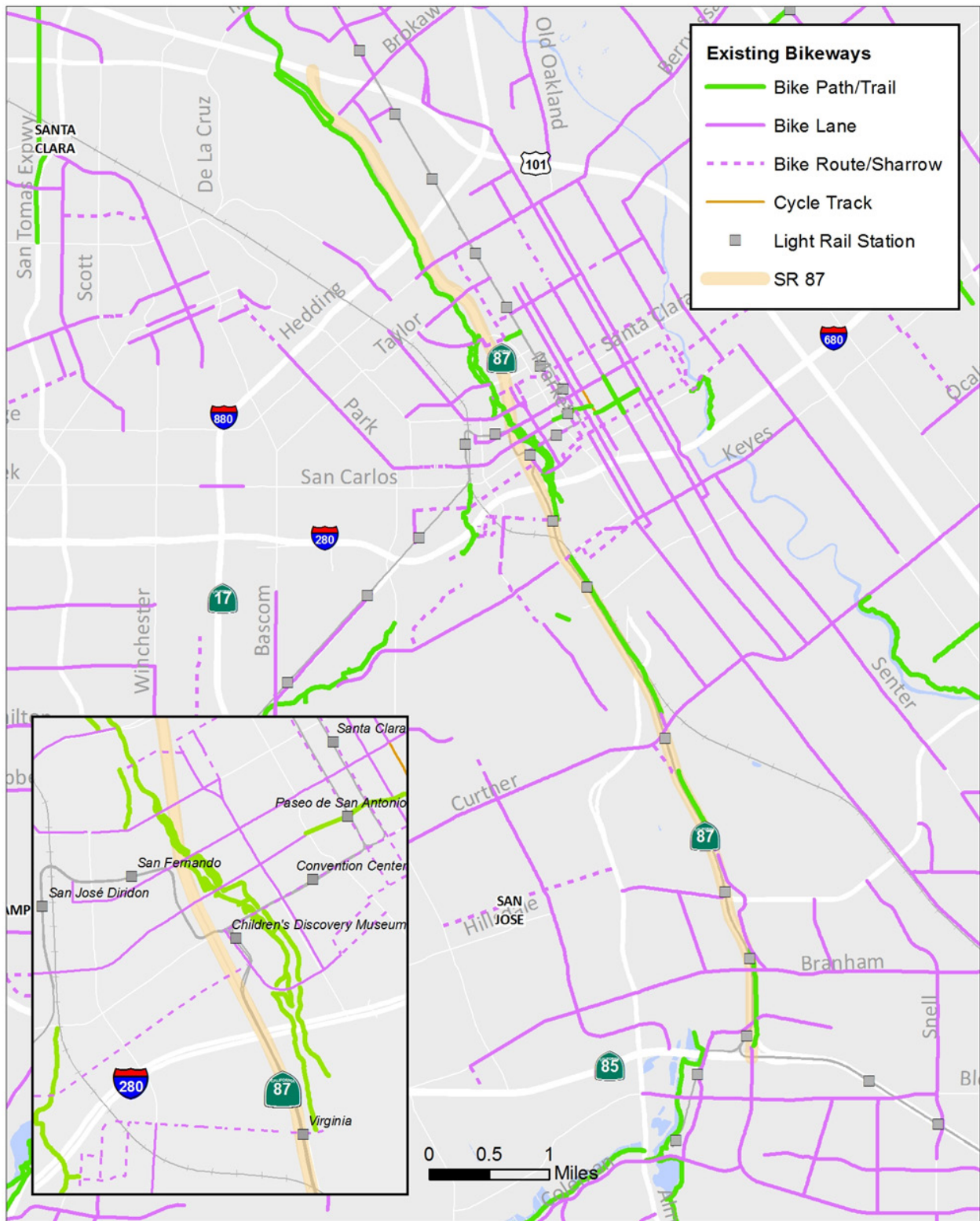
The Guadalupe River Trail is widely used by bicycle commuters. The City of San Jose collects trail counts every year for reporting and planning purposes. Table 2-18 shows bicycle and pedestrian counts collected at three locations along the Guadalupe River Trail in September 2017.

**Table 2-7. Bicycle and Pedestrian Counts at Three Locations Along Guadalupe River Trail**

Count Station (high volume sites only)	12-Hour Count	Annual Average Daily Traffic	Annual Volume
Guadalupe at River Park Towers	724	765	279,375
Guadalupe at Coleman Avenue	996	1,058	386,309
Guadalupe at River Oaks Pkwy	2,376	2,408	878,946

Source: City of San Jose Parks, Recreation, and Neighborhood Services, September 2017

Figure 2-18. Existing Bicycle Facilities Around SR 87



## Bicycle Level of Traffic Stress (LTS) Analysis

As a part of the VTA’s 2018 Countywide Bicycle Plan, VTA staff analyzed the level of bicycle traffic stress (LTS) for all roads in Santa Clara County. This LTS analysis considered the posted speed, number of lanes of traffic, and type of bikeway provided. Streets are graded on a scale, with 1 being the lowest stress and 4 being the highest stress. Table 2-8 describes the LTS categories.

Table 2-8. Bicycle LTS Categories

LTS Score	Definition
LTS 1	Most children feel comfortable bicycling.
LTS 2	The mainstream adult population feels comfortable bicycling.
LTS 3	Bicyclists who are considered “enthused and confident” but still prefer having their own dedicated space feel comfortable bicycling.
LTS 4	Only “strong and fearless” bicyclists feel comfortable. These roads have high speed limits, limited or non-existing bicycle lanes and signage, and large distances to cross at intersections.

Figure 2-19 shows the LTS analysis for areas around SR 87. As the map indicates, there is good north-south bicycle access along SR 87: trails such as the Guadalupe River Trail and the Highway 87 Bikeway are very low stress (LTS 1). However, it is very difficult to get to and from the trails without having to travel along or cross a high or very high stress road (LTS 3 or LTS4). Major barriers to the trails include streets with high traffic volumes and high speed limits. such as Story Road, Hillsdale Avenue, and Blossom Hill Road west of Almaden Expressway, all of which scored LTS 4. Improving these roads to provide low-stress bicycle connections to the trail system along SR 87 can increase the number of bicycle commuters, and ensure the City receives the full benefit of its significant investment in the trail system.

## Islands of Connectivity

Another way to look at bicycle access around SR 87 is to see how far one can travel on local roads and trails before having to cross a high-stress road (LTS 3 or LTS 4). As described in the prior section, LTS 3 and LTS 4 roads divide neighborhoods into small low-stress “islands of connectivity.” As a part of the Countywide Bicycle Plan, using GIS tools, staff identified small islands of low-stress areas. A map of the analysis results around SR 87 is shown in Figure 2-20. Each continuous, connected low-stress network is represented by a different color. The map illustrates how roadways along SR 87 are divided into small, isolated islands. There is no comprehensive and continuous low-stress bicycle network.

Figure 2-19. Level of Traffic Stress Scores for Roads Around the SR 87 Corridor

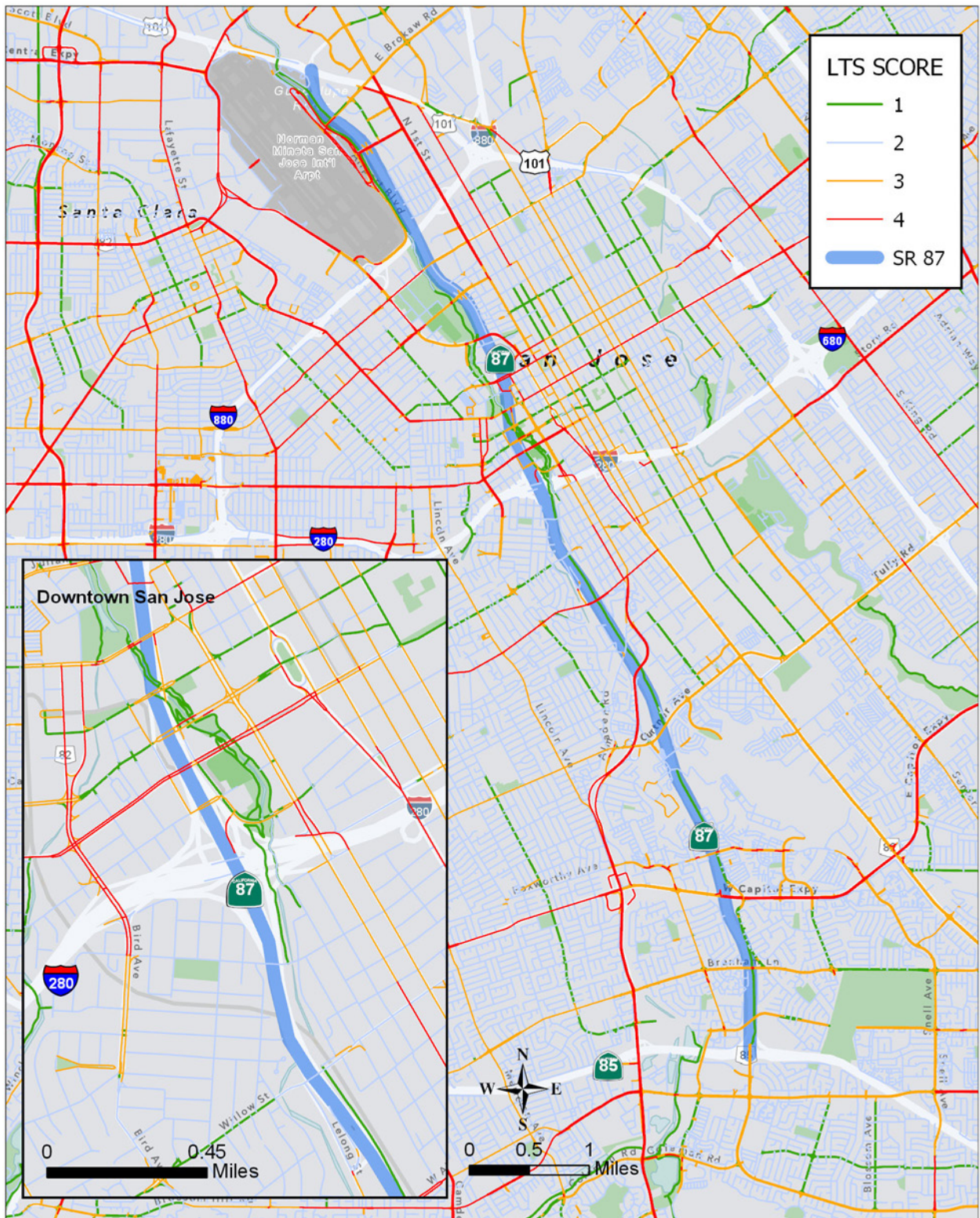
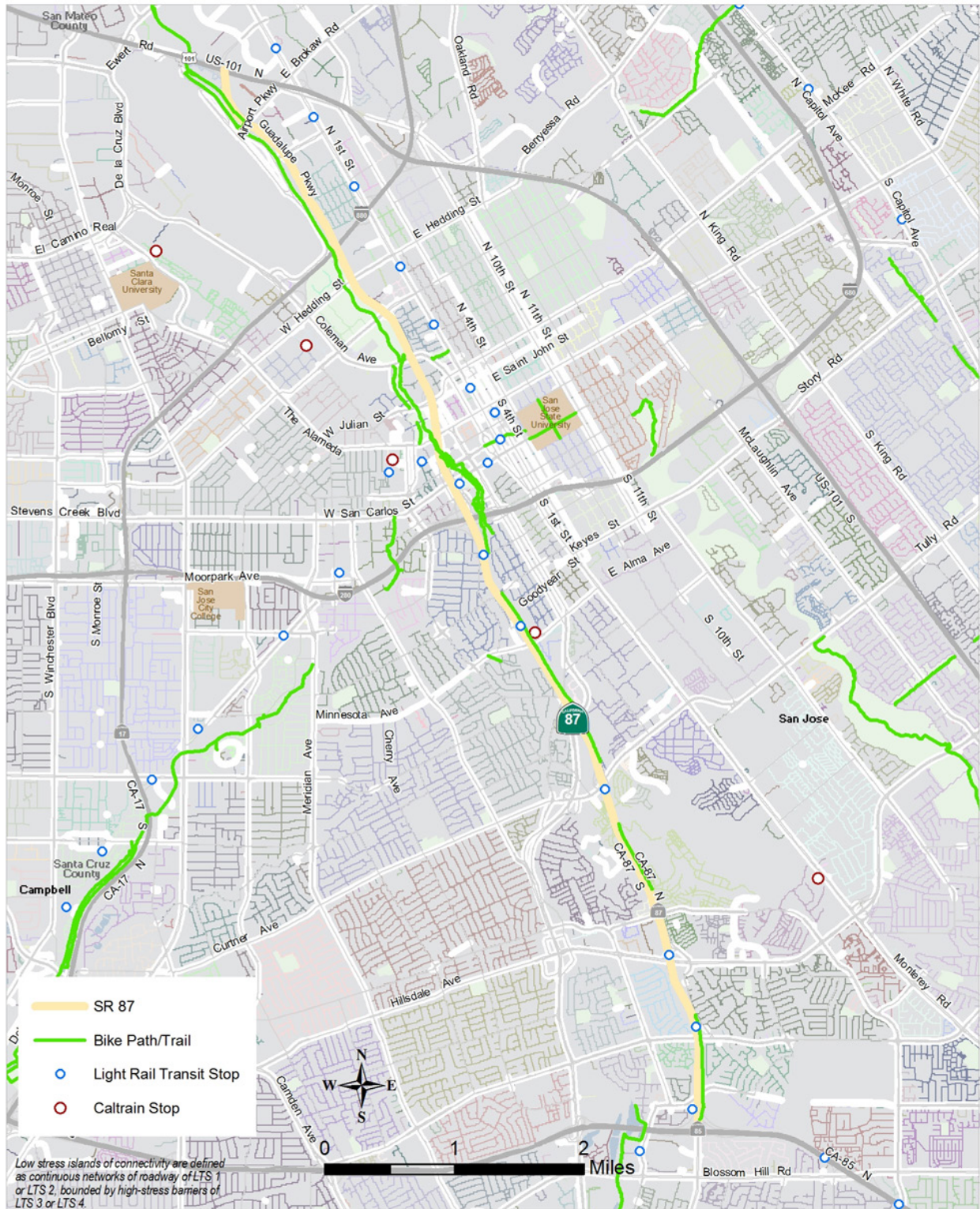


Figure 2-20. Islands of Connected, Comfortable, Low-Stress (LTS 1 or LTS 2) Bicycling Streets



## Bicycle and Pedestrian Collisions History

According to the Statewide Integrated Traffic Records System (SWITRS), in the five-year period between 2011 and 2016, 597 bicycle-vehicle and pedestrian-vehicle collisions occurred within one mile of the SR 87 corridor (Table 2-9). Out of these 597 bicycle and pedestrian collisions, 27 were fatal and 39 involved severe injury.

**Table 2-9. Number of Bicycle-Vehicle and Pedestrian-Vehicle Collisions within One Mile around the SR 87 Corridor (2011–2016)**

Severity of Injury	Bicycle Collision	Pedestrian collision	Total
Fatality	5	22	27
Severe Injury	18	21	39
Other Visible injury	135	94	229
Complaint of Pain	160	142	302
<b>Total</b>	<b>318</b>	<b>279</b>	<b>597</b>

Figure 2-21 is a hotspot analysis map of collisions within the SR 87 corridor study area. The map indicates areas with the greatest density of bicycle collisions:

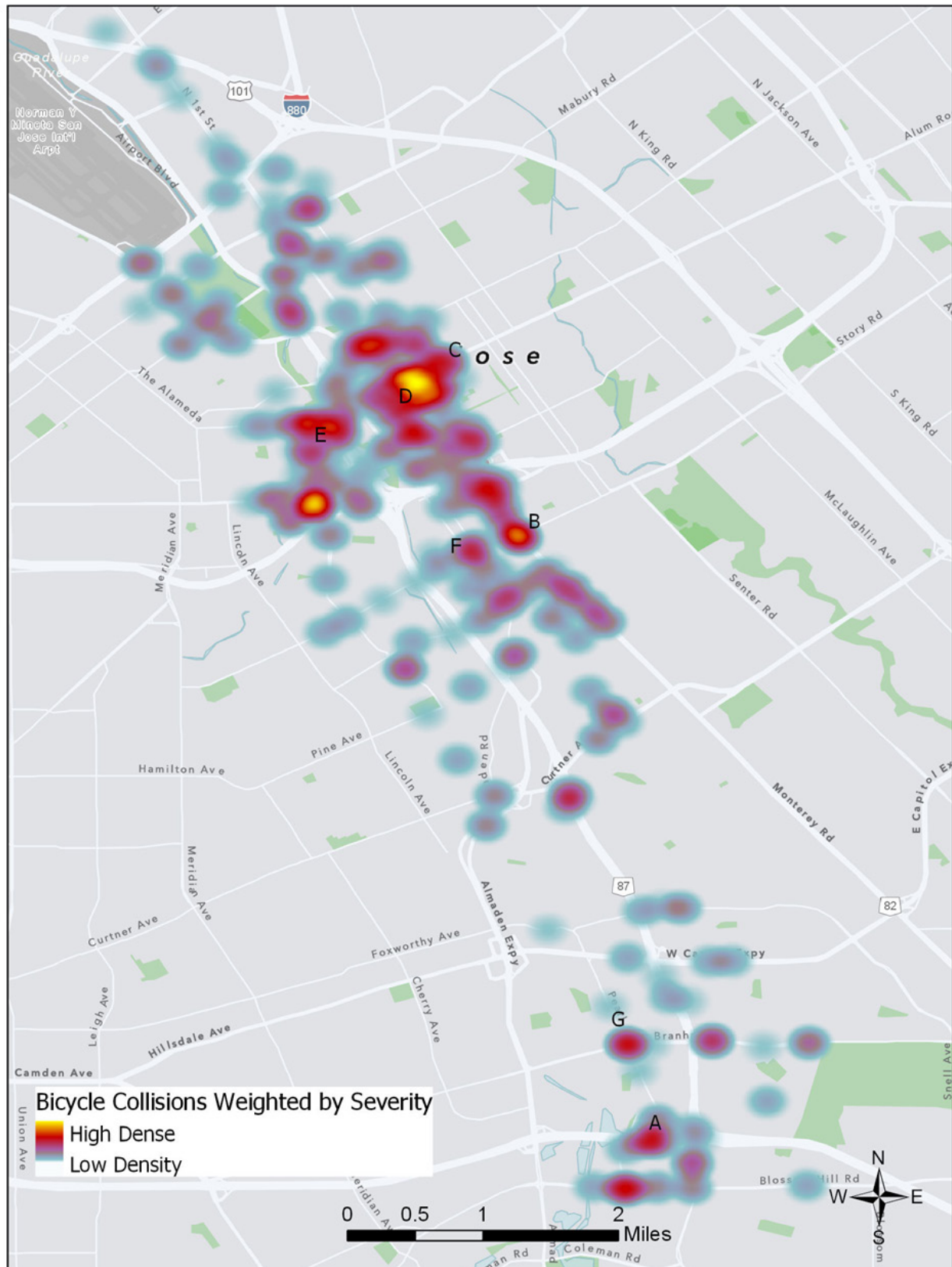
- A. Blossom Hill @ Winfield Boulevard
- B. Monterey Road @ Story Road
- C. Santa Clara Street @ 6th Street
- D. San Fernando Street @ 1st Street
- E. Bird Avenue @ Auzerais Avenue
- F. Keyes Street @ 1st Street
- G. Branham Lane @ Pearl Avenue

Figure 2-22 shows areas with the greatest density of pedestrian collisions:

- a. Monterey Road around Phelan Avenue
- b. Curtner Avenue @ Little Orchard Street
- c. Santa Clara Street @ 1st Street and 2nd Street
- d. San Fernando Street @ 3rd Street
- e. San Salvador Street @ 2nd Street

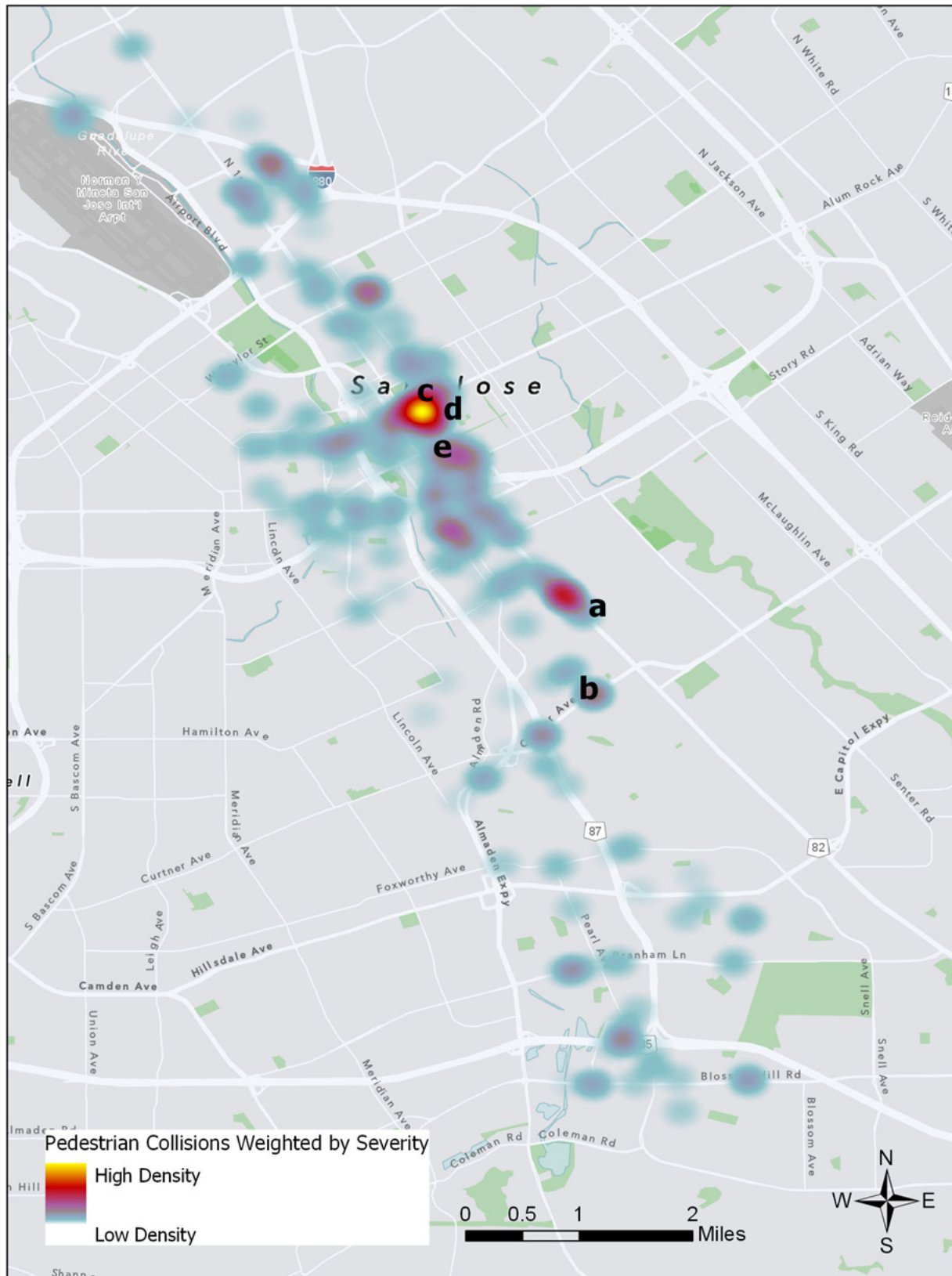
The high density of bicycle and pedestrian collisions at these areas compared to other parts of the county or city may be due to high walking and biking activity or hazardous conditions, or both. Infrastructure improvements to address deficiencies such as lack of lighting during dark hours, wide intersection crossings, inadequate markings at intersections, lack of bicycle lanes, etc., could potentially decrease the number of bicycle and pedestrian collisions. Educational and encouragement programs also play an important role in changing driving, biking, and walking behavior.

Figure 2-21. Bicycle Collisions Around SR 87 (2011–2016), Weighted By Collision Severity



Source: SWITRS

Figure 2-22. Pedestrian Collisions Around SR 87 (2011–2016), Weighted By Collision Severity



Source: SWITRS

## Homeless Encampments Along the SR 87 Corridor

The locations of homeless encampments along SR 87 were identified in August 2018. Among the survey responses, a commonly mentioned request was to enhance safety by moving out homeless encampments along the bike trail.

In general, homeless encampments have been observed sporadically along the trails, with higher concentrations near Almaden Expressway and Alma Avenue in San Jose, as shown in Figure 2-23. Some encampments were observed near the Park Avenue on- and off-ramps to SR 87.

The observed locations of homeless encampments are not static, and their conditions are dependent on timely cycles of removal. The public can report locations and request services from both the City of San Jose and Caltrans:

- For removal of litter and homeless encampments along the bicycle trails and local streets, go to <http://www.sanjoseca.gov/index.aspx?NID=3156>. Or contact the Homeless Concerns Hotline by calling 408-975-1440, or by email [homelessconcerns@sanjoseca.gov](mailto:homelessconcerns@sanjoseca.gov) to report a concern related to homelessness in San Jose.
- To request litter removal from the State highway system, the public can report electronically using the following link: <http://www.dot.ca.gov/hq/maint/mrsrsubmit/>.

## 2.2.2 Existing First-Last Bicycle Connections

### Bike Share

In the past few years, bike share has been introduced as a first-last-mile connection. Two bike share vendors currently operate in San Jose. Ford GoBike provides both docked and dockless bike share and is part of a larger Bay Area deployment, which includes bikes in San Francisco, Oakland, Berkeley, and Emeryville. Most of Ford GoBike's system is docked, but the vendor is piloting dockless bike share in north San Jose. Currently, Ford GoBike operates 24 docking stations around downtown San Jose and plans to add 18 more in the next two years, extending beyond Japantown in the north, The Alameda in the west, the eastern side of San Jose State in the east, and to Willow Street on the south side of downtown. Figure 2-24 shows the location of existing Ford GoBike docking stations around the study area.

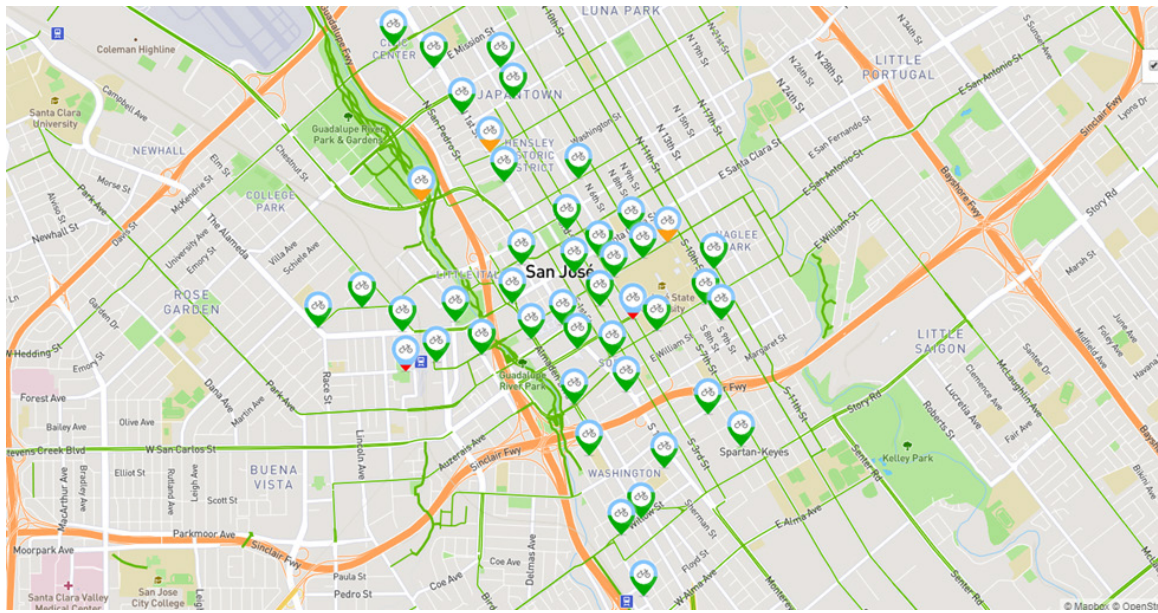
### Electric Scooters and Bikes

Starting in March 2018, electric bike (e-bike) and electric scooter (e-scooter) vendors began placing dockless e-bikes and e-scooters in downtown. LimeBike provides e-bike and e-scooter service all over the city, and Bird provides e-scooter service mostly in downtown (Figure 2-25). San Jose is in the process of developing a permit to regulate dockless personal mobility devices.

Figure 2-23. Observed Homeless Encampments Along SR 87



Figure 2-24. Ford GoBike Bike Share Docking Stations Around Downtown San Jose



Source: Ford GoBike

Figure 2-25. Bird Scooters in Downtown San Jose



Source: AP

## Bicycle Accommodation in Transit Cars and at Transit Stations

Bicycle-transit commuters need to be able to take their bicycles on-board transit vehicles or have access to secure bicycle parking in transit stations. All VTA buses and trains and Caltrain trains allow bicycles on-board.

Currently, two types of bicycle lockers are available in VTA and Caltrain transit stations: keyed lockers assigned to an individual user and first-come, first-served electronic lockers. Table 2-10 lists the number of secure bicycle lockers at transit stations near the SR 87 corridor. Providing adequate amounts of secure bicycle parking at transit stations could be an incentive for commuters along SR 87 to choose bike-transit as their mode of transportation.

Table 2-10. Bicycle Parking at Transit Stations Around the SR 87 Corridor

Station	Number of Electronic Lockers	Number of Keyed Lockers
Branham LRT Station	10	-
Tamien LRT Station	10	-
Tamien Caltrain Station	-	18
Ohlone LRT Station	10	10
Blossom Hill LRT Station	-	10
Curtner LRT Station	-	12
Capitol LRT Station	-	24
Almaden LRT Station	-	20
San Fernando LRT Station	-	3
Oakridge LRT Station	-	10
Diridon Caltrain Station	-	48
College Park Caltrain Station	-	-

### 2.2.3 Pedestrian Facilities and Access to Transit Stops

Better walking access to transit stops could encourage more commuters to take transit. One major goal of this study is identifying ways to shift the travel mode along SR 87 to more walking, biking, and transit. Currently, the multi-use trails such as the Guadalupe River Trail accommodate both bicyclists and pedestrians. For the purpose of this study, the existing pedestrian conditions were evaluated in a half-mile walkshed distance around VTA's light rail stations.

A walkshed is the actual walkable boundary around a certain destination. A walkshed is often defined by a half-mile or one-mile distance, and is often shown by an irregular shape instead of a circle because it depicts the actual walking distance instead of a linear distance and excludes barriers such as freeways. Figure 2-26 shows the half-mile walkshed and half-mile linear distance around Gish Light Rail Station.

Figure 2-26. Comparison of Half-Mile Walkshed Area and Half-Mile Radius Around Gish Light Rail Station



In the SR 87 study area, the pedestrian environment around VTA light rail stations is diverse. Stations north of downtown San Jose are surrounded by commercial land uses along major streets such as First Street and residential neighborhoods behind the commercial zone. Stations in downtown areas are surrounded by office and commercial buildings and multi-family houses. Stations south of I-280 are mainly surrounded by lower density residential neighborhoods.

Within the walkshed, different types of pedestrian deficiencies on roadways were identified. These include missing sidewalk, long distances between crosswalks, inadequate lighting—especially under the freeway, and a lack of medians at large intersections. Chapter 6 includes more detail about the identified deficiencies.



## 2.3 Transit Services & Facilities

This section describes available transit services and park and ride facilities along the SR 87 corridor and includes an analysis of transit operating speeds, ridership, and on-time performance.

### 2.3.1 Available Transit Services

The main public transit service offered along the SR 87 corridor is light rail operated by the VTA that runs in the median of the SR 87 freeway for about 5.3 miles between the SR 85 and I-280 interchanges. North of I-280, the LRT mainline connects at Woz Way and San Carlos Street to First Street, where it runs parallel to SR 87 up to the SR 87/US 101 interchange. In addition to LRT, several transit routes run along SR 87, and these are

- VTA Express Buses – 168 and 182 (routes partially run along SR 87)
- VTA Regular Buses – 64, 66, 68, and 82 (routes partially run along SR 87)
- Caltrain
- Altamont Commuter Express (ACE)<sup>3</sup>

<sup>3</sup> Caltrain and ACE are heavy commuter rails, running partially along SR 87: Caltrain, from Blossom Hill Station to San Jose Diridon, and ACE, from San Jose Diridon to Santa Clara Station and onward to the northeast. Both rail systems, although important for transportation in the region, do not significantly influence commuter patterns along SR 87 due to their long-distance commute purpose. Therefore, the focus of this report will be on the local transit routes, such as VTA light rail and express and regular buses.

### 2.3.2 Transit Service Performance

This section summarizes the operating speeds of transit services along the SR 87 corridor as well as occupancy and ridership. The data presented in this section is based on available information from the following sources:

- <http://www.vta.org/getting-around/light-rail-service-overview>
- <https://dashboard.goswift.ly/vta/live-map>
- <http://api.transitime.org/web/reports/index.jsp?a=vta>
- <http://www.vta.org/getting-around/vta-ridership>
- <http://data.vta.org/datasets/ridership>
- VTA Transit Sustainability Policy: Appendix A – Service Design Guidelines. February 2007
- VTA Transit Service Guidelines. April 2018
- VTA Transit Sustainability Policy: Light Rail Transit Service Guidelines. February 2007
- VTA Transit Sustainability Policy: Express Bus Transit Service Guidelines. February 2007
- VTA Transit Sustainability Policy: Local Bus Transit Service Guidelines. February 2007

Figure 2-27 shows existing transit along the SR 87 corridor.

### Operating Speeds

This section describes the operating speeds of the available transit services on the SR 87 corridor, including the constraint on speeds and actual measurements of speeds.

#### LIGHT RAIL VEHICLES

The travel speed of LRTs varies depending on the time of day, whether the rail track is separated from the rest of the roadway, and intersecting streets. Constraints on LRT travel speeds include the grade crossings at 17 signalized intersections along the corridor, even with the implementation of Transit Signal Priority (TSP).<sup>4</sup> LRT speeds are also constrained by the requirements of the California Public Utilities Commission (CPUC). The CPUC requires certain safety enhancement devices in the corridor (e.g., fencing along the trackway, controlled or clearly defined access points for pedestrians crossing the trackway, etc.). LRT travel speeds and intervals between LRTs (headways) are

Maximum allowed travel speed:

Freeway median: 55 mph

Downtown center plaza: 10 mph

Average operating travel speed: 25 mph

Average combined headway:

Peak: 5-10 minutes

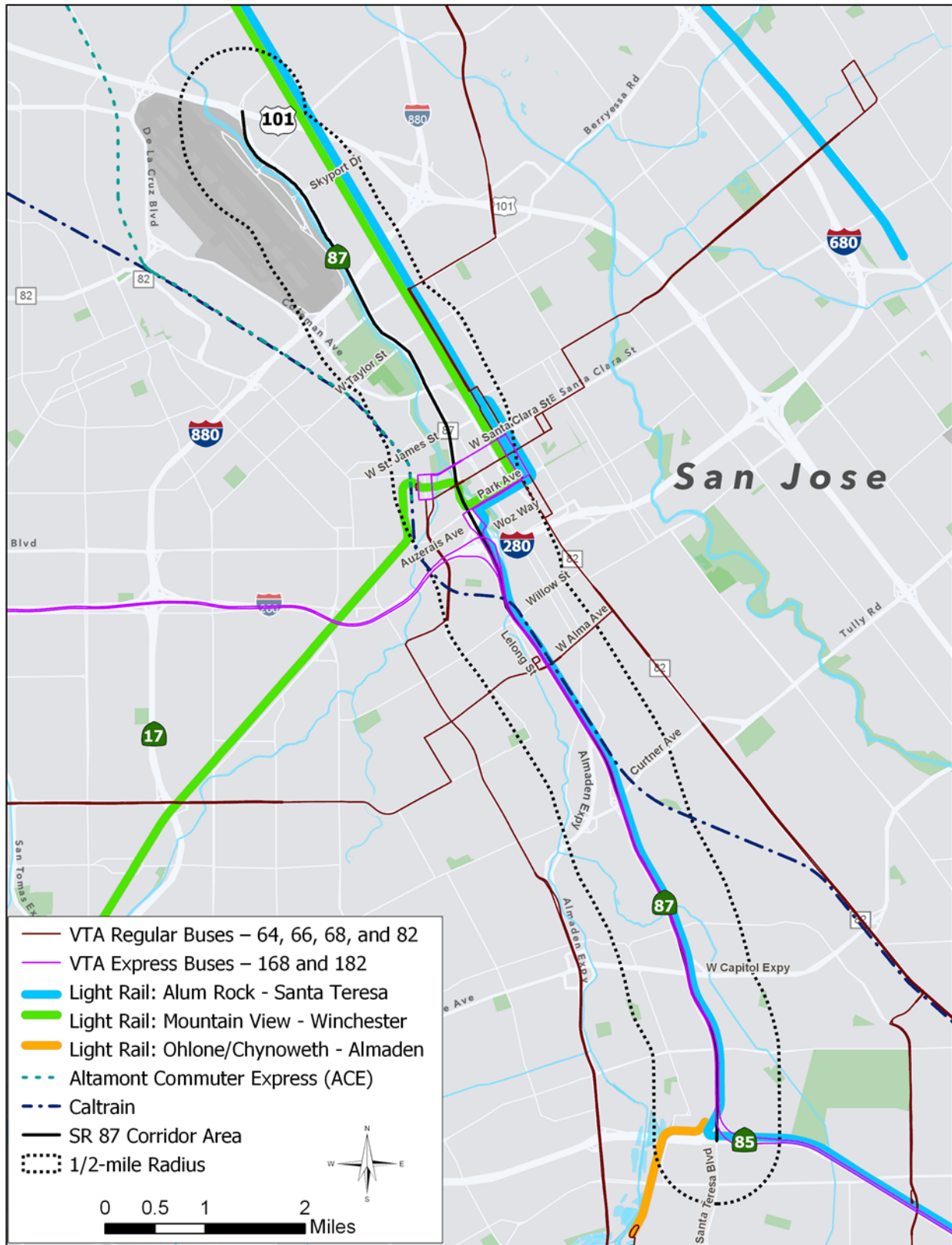
Off-peak: 15 minutes

Night/weekend: 30 minutes

---

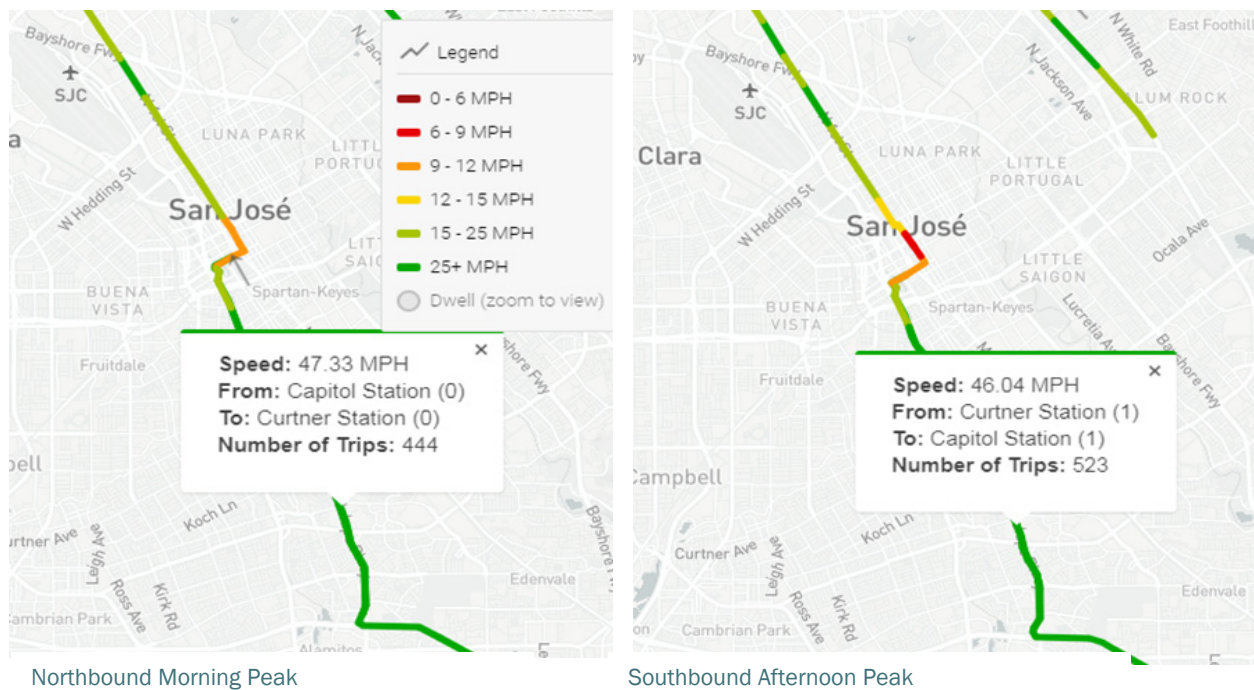
<sup>4</sup> Transit Signal Priority (TSP) is technology that modifies the normal signal operation process to reduce the dwell time of LRTs at traffic signals.

Figure 2-27. Existing Transit Routes Along the SR 87 Corridor



LRT 901, which runs in the corridor, reaches its highest speed south from I-280, where it runs within the median of SR 87, completely separated from traffic. Traveling northward through downtown from the Children’s Discovery Museum to St. James Park station, trains must slow down to an average of 6 to 10 mph as the tracks run at-grade with the busy sidewalks. North of St. James Park, the trains speed up to 25+ mph, as they run through the separated median of N. First Street and use TSP technology, which allows them to decrease the wait time before crossing the intersection. To visualize typical peak period travel speeds for LRTs, VTA staff retrieved route speed maps from Swiftly using 7:00 AM to 9:00 AM for the morning peak period and 4:00 PM to 6:00 PM for the afternoon peak period.<sup>5</sup> Figure 2-28 shows the average weekday travel speeds for LRT 901 between Capitol Station and Curtner Station.

**Figure 2-28. LRT 901 Average Weekday Travel Speed Profile**



### EXPRESS BUS

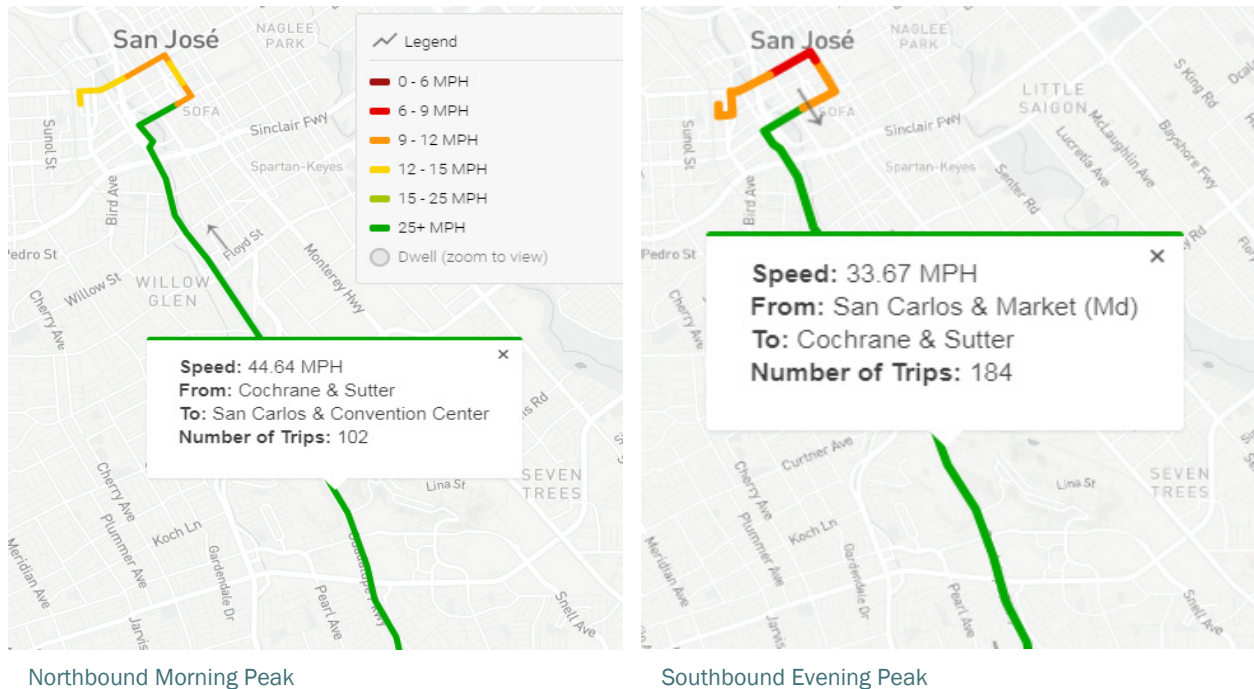
VTA express buses 168 and 182 run partially along the SR 87 corridor. The maximum and average travel speeds and headways for the express buses are

- Maximum travel speed: limited to the posted travel speed for the roadway
- Average operating travel speed: 25–50 mph
- Average combined headway: 15–60 minutes

<sup>5</sup> Swiftly is an online transit data portal that provides API sources and data analysis tools of a number of public transit agencies in the United States.

Express buses run in freeway carpool lanes, and their peak hour speed is limited to the speed in these lanes. Express bus 168, for example, allows riders to board at the Morgan Hill Caltrain Station and get off at the Convention Center and Downtown San Jose stops. Figure 2-29 shows the typical peak hour travel speeds of express bus 168.

Figure 2-29. Bus 168 Average Weekday Travel Speed Profile



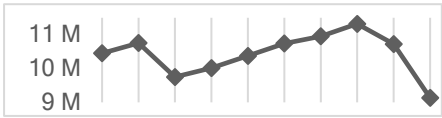

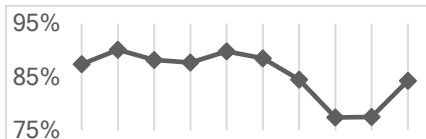
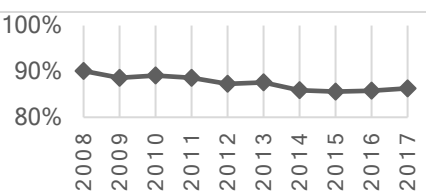
### LOCAL BUS

Local buses 64, 66, 68, and 82 run partially along SR 87. The maximum and average travel speeds and headways for the local buses on the corridor are as follows:

- Maximum travel speed: limited to the posted travel speed for the roadway
- Average operating travel speed: 20 mph
- Average Headway: 5–60 minutes

Table 2-11 summarizes transit performance and ridership in 2016 and 2017.

Table 2-11. VTA Bus and LRT Ridership and On-time Performance

Transit Performance	2016	2017	Trend (Yearly)
Light Rail Annual Ridership (millions)	10.72	9.13	
Bus Annual Ridership (millions)	32.20	29.06	
Light Rail Annual On-time Performance	77.5%	84.3%	
Bus Annual On-time Performance	85.8%	86.3%	

Source: Annual FY 2018 Transportation Systems Monitoring Program (TSMP) Draft Report, September 2018

### Occupancy and Ridership

The passenger vehicle capacity, seated and standing, for each transit vehicle type operating on the corridor is as follows:

Light Rail: 64 seated and 150 standing per coach

Express Bus: 50–60 (40-ft standard coach) and 80–90 (60-ft articulated coach)

Local Bus: 50–60 (40-ft standard coach)

Table 2-12 shows the average occupancy of LRTs during the peak hours on a typical weekday, based on the seated capacity.

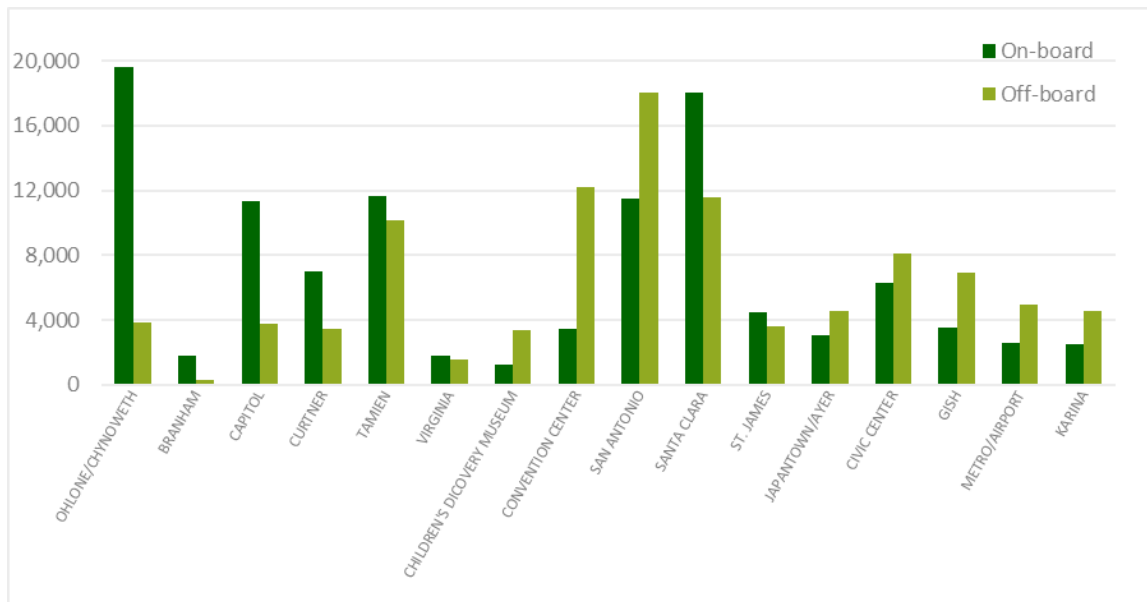
Table 2-12. Average Weekday Peak-Period Occupancy, Shown as a Percentage of Total Seated Capacity

Station	Northbound		Southbound	
	AM	PM	AM	PM
Ohlone-Chynoweth	41%	28%	13%	30%
Branham	45%	28%	18%	42%
Capitol	49%	29%	18%	45%
Curtner	51%	30%	19%	50%
Tamien	46%	28%	20%	53%
Virginia	47%	28%	18%	48%
Children’s Discovery Museum	46%	27%	17%	49%

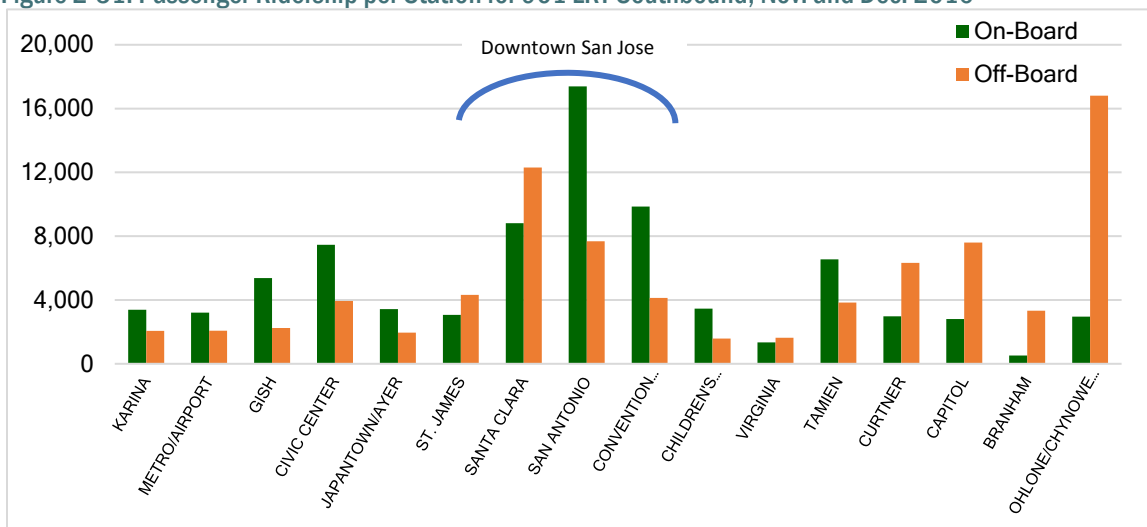
The seating occupancy of LRTs on the stretch between the Ohlone-Chynoweth and Children’s Discovery Museum stations barely exceeds 50% at any time. This guarantees commuters a comfortable ride even during the morning and evening rush.

Figures 2-30 and 2-31 further showcase transit ridership along SR 87. The figures show the aggregated ridership (both northbound and southbound) on LRT 901 for November and December 2016. As shown, the major origin and destination is downtown San Jose in both northbound and southbound directions. A relatively high ridership can also be observed at stations south of I-280, such as Ohlone/Chynoweth, Capitol, Curtner, and Tamien, located next to the relatively dense residential neighborhoods and park-and-ride lots.

**Figure 2-30. Passenger Ridership per Station for 901 LRT Northbound, Nov. and Dec. 2016**



**Figure 2-31. Passenger Ridership per Station for 901 LRT Southbound, Nov. and Dec. 2016**



### 2.3.3 Park-and-Ride Facilities

VTA offers park-and-ride lots to commuters choosing to use transit for a part of their trip. Park-and-ride lots allow commuters to leave their vehicles next to major transit routes or hubs generally free of charge and board a transit vehicle to complete their trip. Park-and-ride lots next to Caltrain stations, such as Diridon, offer daily parking for a fee.

In Santa Clara County, there are 38 VTA park-and-ride lots located near major transit centers and stations. Out of these 38, 21 lots are located within the City of San Jose with eight of them along SR 87. Table 2-13 and Figure 2-32 show the park-and-ride lots, their capacity, and locations.

It is apparent that not all park-and-ride lots are well used. From the eight lots located along SR 87 only three—Ohlone-Chynoweth, Diridon, and Tamien—are filled almost to capacity during the typical weekday; all others are heavily underused.

Table 2-13. Park-and-Ride Lots in the SR 87 Corridor

Park-and-Ride Lot Name	Total Capacity	Weekday Occupancy	% Occupancy	Breakdown		Pick-up Drop-off	Bicycle Lockers	Bicycle Racks	Transit Served
Almaden Light Rail Station	189	26	13.8%	Standard	138	7	10	0	13, 64, Light Rail
				Airport Parking	26				
				Compact	29				
				Motorcycle	0				
				Handicap	8				
				Handicap (Van)	0				
Blossom Hill Light Rail Station	511	208	40.7%	Standard	385	17	8	7	27, Light Rail
				Airport Parking	28				
				Compact	116				
				Motorcycle	0				
				Handicap	6				
				Handicap (Van)	4				
Braham Light Rail Station	271	48	17.7%	Standard	167	No	12	14	Light Rail
				Airport Parking	26				
				Compact	96				
				Motorcycle	8				
				Handicap	4				
				Handicap (Van)	4				

Park-and-Ride Lot Name	Total Capacity	Weekday Occupancy	% Occupancy	Breakdown		Pick-up Drop-off	Bicycle Lockers	Bicycle Racks	Transit Served
Capitol Light Rail Station	951	82	8.6%	Standard	928	13	12	7	37, 70, Light Rail
				Airport Parking	18				
				Compact	0				
				Motorcycle	0				
				Handicap	10				
				Handicap (Van)	0				
Curtner Light Rail Station	474	57	12.0%	Standard	420	No	12	0	26, Light Rail
				Airport Parking	24				
				Compact	54				
				Motorcycle	10				
				Handicap	7				
				Handicap (Van)	0				
Ohlone/Chynoweth Light Rail Station	549	522	95.1%	Standard	531	4	22	24	13, 102, Light Rail
				Airport Parking	20				
				Compact	0				
				Motorcycle	21				
				Handicap	18				
				Handicap (Van)	0				
San Jose / Diridon Caltrain Station	581	539	92.8%	Standard	529	No	24	0	22, 63, 64, 65, 68, 168, 180, 181, 522, ACE, Caltrain, Amtrak, Light Rail
				Airport Parking	0				
				Compact	38				
				Motorcycle	0				
				Handicap	12				
				Handicap (Van)	2				
Tamien Rail Station	275	251	91.3%	Standard	262	3	18	1	25, 82, Caltrain, Light Rail
				Airport Parking	21				
				Compact	0				
				Motorcycle	16				
				Handicap	8				
				Handicap (Van)	2				

Figure 2-32. Park-and-Ride Lot Locations Along SR 87





## 2.4 All Modes Travel Time & Speed Comparison

In May 2017, VTA staff conducted vehicle travel runs along SR 87 for GP lanes and HOV lanes and compared travel times for various modes using the travel times recorded during these runs, average LRT travel times obtained from Swiftly, and an average bicycle travel speed of 10 mph (Table 2-14).

For the travel time comparisons shown in the table, the SR 87 corridor was divided into two sections: SR 85/SR 87 interchange to I-280 (Children’s Museum LRT station) and I-280 to the SR 87/US 101 interchange. This was done to account for the disparity in LRT travel speeds between these two sections, i.e., south of the intersection with I-280, LRTs run in the SR 87 median and are separated from the mainline, and north of I-280, LRTs run on city streets at grade, making frequent stops and traversing intersections.

As shown in the table, in the morning northbound direction, a significant amount of travel time can be saved by riding light rail compared with driving in the GP lane. In the evening southbound direction, light rail travel time is comparable to solo driving. However, factors that include inconsistency of weekday traffic and significant slow-downs caused by accidents add to the level of uncertainty in travel time for vehicles. Light rail and bicycles can be considered more consistent and, therefore, more reliable travel modes because they are less affected by day-to-day fluctuating conditions.

Table 2-14. Travel Time and Speed Comparison for Single and Carpool Vehicles, LRT and Bicycle Modes

Segment	Distance (mi)	Available Transit Modes	Bicycle Routes	Average Peak Hour Travel Time (min)				Average Peak Hour Speed (mph)					
				NB		SB		NB		SB			
				AM	PM	AM	PM	AM	PM	AM	PM		
85/87 Interchange to I-280	5.2	LRT 900, 901	Narvaez Ave to the trail along SR 87 to Guadalupe Trail (5.8 mi)	AM	PM	AM	PM	AM	PM	AM	PM		
				17:56	6:22	3:47	10:54	29.5	56.7	55.9	42.9		
		Express buses: 168, 182 (partial route on SR 87)	Vehicle (GP)	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
				13:25	Same as GP	3:56	8:21	38.8	Same as GP	65.5	50.5		
				11:12	11:12	11:18	11:10	36.7	37.1	35.9	35.4		
Buses: 64, 66, 68, 82 (partial route along SR 87)	Vehicle (HOV)	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM		
		33:00:00	33:00:00	33:00:00	33:00:00	10	10	10	10				
I-280 to 87/101 Interchange	3.8	LRT 900, 901 (along First St.)	Guadalupe River Trail (4.2 mi)	AM	PM	AM	PM	AM	PM	AM	PM		
				11:43	3:57	4:38	9:24	27.5	62.9	55.2	28.2		
		Bicycle	Vehicle (HOV)	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
				6:09	Same as GP	4:31	5:56	40.7	Same as GP	63.5	49.3		
				19:54	20:54	22:00	22:54	15.8	15.3	14.6	13.9		
Bicycle	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM			
				23:00	23:00	23:00	23:00	10	10	10	10		