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MEMORANDUM

To: Nayan Amin and Ian Lin, TJKM

From: Sam Corbett and Aaron Fraint, Alta Planning + Design

Date: March 27, 2020

Re: Mountain View Pedestrian Quality of Service

Introduction

This memo describes the process for analyzing Pedestrian Quality of Service (PQOS) in the City of Mountain View. This includes the acquisition of source data, the methodology to classify PQOS, as well as a discussion of the results, which are also graphically displayed in the attached set of maps.

Background

The PQOS analysis assesses a variety of factors for all street segments (i.e. city blocks). This analysis was originally scoped to focus on street segments within a half-mile of public schools, high ridership bus stops, Caltrain stations, and VTA Light Rail stops. However, since the vast majority of the City of Mountain View is within a half mile of at least one of these amenities, the entire city was analyzed.

The PQOS combines four distinct factors to assess the quality of service for pedestrians:

- WalkScore (which incorporates factors like intersection density, block length, and proximity to a variety of nearby amenities)
- Gaps in the sidewalk network
- Speed of motor vehicle traffic
- Number of motor vehicle travel lanes

The result of this analysis is a numeric score between 1 and 5 assigned to each street segment, reflecting relative levels of service quality from the pedestrian point of view. A PQOS score of 1 indicates the best possible quality for pedestrians, while a QOS score of 5 indicates the worst possible quality for pedestrians.

Data Inputs

The line feature class named “Road_Centerlines” was the basis for this analysis, providing roadway geometries and attributes on posted speed limits. The “Street_Curbs” feature class was used to identify locations in the City of Mountain View where sidewalks exist. A manual review and interpolation of this layer was completed, tagging the “Road_Centerline” geometries with appropriate attributes wherever a sidewalk was missing on one or both sides of the street, as well as locations where existing sidewalks feature many gaps along the block length.

A feature class named "Pavement_Marking_Lines" was used to identify roadways with lane lines, and a manual process was employed to interpolate the number of through travel lanes for motor vehicles to the roadway geometries.

The final data input came from the WalkScore API, which provides users with a "Walk Score" between 0 and 100, with 100 being the best and 0 being the worst. This API requires that the user provide a Latitude/Longitude value to create the query, and every road segment in the City of Mountain View was queried using the centroid of the line segment as its representative point. The outputs from the API were saved as attributes within new columns tied to the roadway geometries.

Methodology

Initial QOS: WalkScore

WalkScore is an algorithm that accounts for walking distance to nearby amenities in addition to network-based considerations such as density of intersections and block length. Higher scores indicate the presence of pedestrian-friendly development: a multitude of nearby amenities, a high density of intersections, and short block lengths. Lower WalkScores indicate a lack of nearby amenities and/or sprawling roadway networks characterized by longer block lengths, fewer pedestrian connections and a lower density of intersections.

After querying the WalkScore API and assigning the values to the attribute table in GIS, the WalkScore values were subsequently reclassified into an initial QOS score as identified in the table at right.

WalkScore	Initial QOS
90 – 100	QOS 1
70 – 89	QOS 2
50 – 69	QOS 3
25 – 49	QOS 4
0 – 24	QOS 5

Built-Environment Adjustments

Using the "Street_Curbs" GIS dataset provided by the City of Mountain View, street segments that are missing sidewalks on one or both sides of the street were flagged and subsequently verified using Google Satellite Imagery and StreetView. The PQOS was increased by 1 for any street without sidewalks on both sides, indicating a worse quality of service for pedestrians.

Additionally, speed limit attribute data was utilized to further increase the QOS score, modeling the detrimental impact that high-speed traffic has on the quality of the pedestrian experience. This adjustment is shown in the table at right.

Posted Speed Limit	Impact on QOS
< 30 MPH	No impact on QOS
30 – 34 MPH	QOS + 1
>= 35 MPH	QOS + 2

The final adjustment made from built-environment attributes relates to roadway width: divided roads with more than 4 motor vehicle travel lanes caused the PQOS to increase by 1. Similarly, undivided roadways with more than 3 motor vehicle travel lanes also caused the PQOS to increase by 1.

Road Type	Lanes	Impact on QOS
Divided	> 4	QOS + 1
Undivided	> 3	QOS + 1
All others roads		No impact on QOS

Final QOS Calculation and Visualization

The final QOS value was calculated in the GIS attribute table using the following formula:

$$Final\ QOS = Initial\ QOS + sidewalk\ adjustment + speed\ adjustment + width\ adjustment$$

Any final QOS values greater than 5 were adjusted back to 5, and these results are visualized within the attached map set. A second map set was produced by overlaying pedestrian crashes to help understand the relationship between the Pedestrian QOS results and local pedestrian collisions.

PQOS Results

Maps

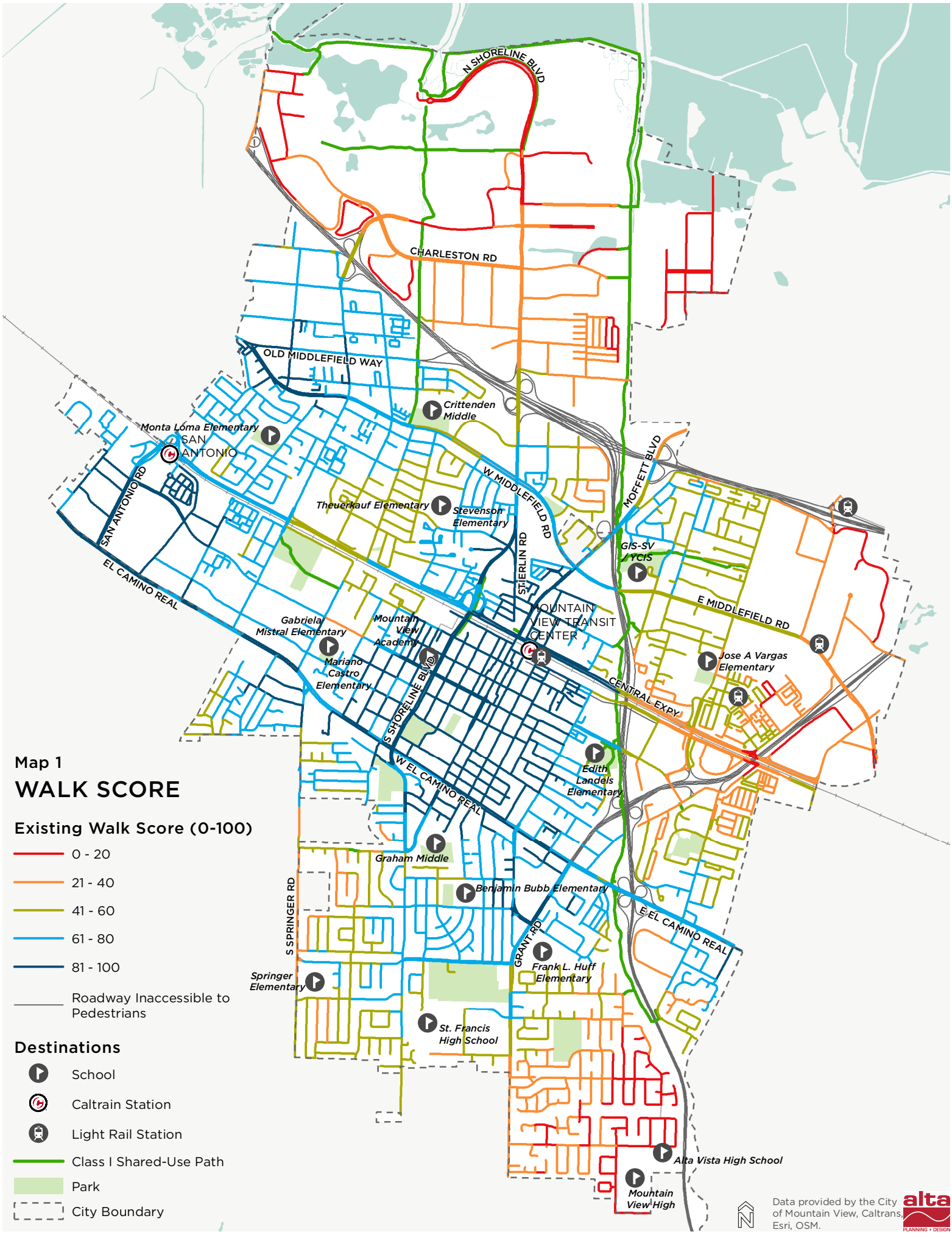
The PQOS results are shown in a variety of maps. The first map displays the raw WalkScore values, followed by the PQOS results at the citywide scale on Map 2 and a zoomed-in view of the downtown area in Map 3. Map 4 identifies the four quadrants of the city, and the subsequent maps provide a zoomed-in, detailed view of the PQOS results within each quadrant (Maps 6 – 9). The final set of maps overlays pedestrian crashes on the quadrant maps to help display the relationship between PQOS and the local crash history (Maps 10 – 13).

Discussion

The PQOS maps illustrate that downtown Mountain View has the best quality of service for pedestrians, due to the confluence of high intersection density, short block lengths, a multitude of nearby amenities, the presence of sidewalks, and reasonable speed limits.

There are a variety of places in the city where the PQOS demonstrates a lower-quality experience for pedestrians. Some of these places are corridor-oriented, including El Camino Real, Central Expressway, East Evelyn Avenue, East Middlefield Road, and portions of Moffett Boulevard. There are also some zones in the city where most streets received PQOS values of 4 and 5. This includes the North Bayshore neighborhood to the north of 101, the Whisman Station neighborhood (bounded by E Middlefield Rd, N Whisman Rd, Central Expy, and 237), as well as the Waverly Park neighborhood in the southern portion of the city.

There does not appear to be a strong relationship between poor PQOS and pedestrian collisions. In fact, most pedestrian collisions between 2014 and 2018 occurred downtown, likely due to the fact that downtown Mountain View has the highest demand for travel (across all modes). The patterns shown in these crashes likely speaks more to where there's relatively high demand for walking trips and higher rates of exposure, rather than an inherently unsafe condition on streets that received a high PQOS score.


N SHORELINE BLVD
CHARLESTON RD
OLD MIDDLEFIELD WAY
Crittenden Middle
Monta Loma Elementary
SAN ANTONIO
SAN ANTONIO RD
EL CAMINO REAL
W MIDDLEFIELD RD
Theuerkauf Elementary
Stevenson Elementary
STIERLIN RD
MOFFETT BLVD
GIS-SV / YCIS
E MIDDLEFIELD RD
MOUNTAIN VIEW TRANSIT CENTER
Gabriela Mistral Elementary
Mountain View Academy
Mariano Castro Elementary
S SHORELINE BLVD
CENTRAL EXPY
Jose A Vargas Elementary
Edith Landels Elementary
W EL CAMINO REAL
Graham Middle
Benjamin Bubb Elementary
E EL CAMINO REAL
S SPRINGER RD
GRANT RD
Springer Elementary
Frank L. Huff Elementary
St. Francis High School
Alta Vista High School
Mountain View High
Map 1
WALK SCORE
Existing Walk Score (0-100)
0 - 20
21 - 40
41 - 60
61 - 80
81 - 100
Roadway Inaccessible to Pedestrians
Destinations
School
Caltrain Station
Light Rail Station
Class I Shared-Use Path
Park
City Boundary
Data provided by the City of Mountain View, Caltrans, Esri, OSM.
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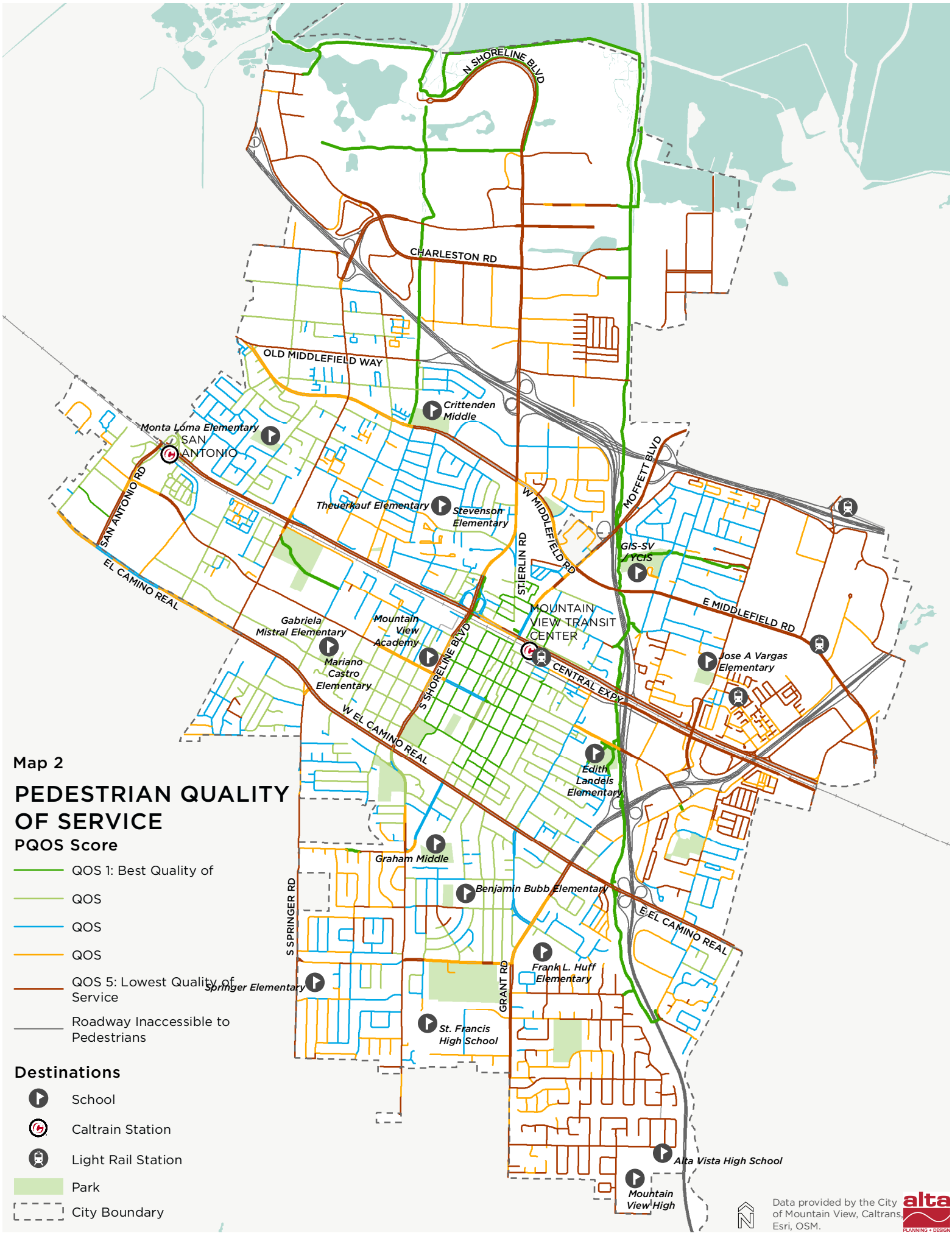
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Graham Middle
Benjamin Bubb Elementary
E EL CAMINO REAL
S SPRINGER RD
Springer Elementary
GRANT RD
Frank L. Huff Elementary
St. Francis High School
Alta Vista High School
Mountain View High
Map 2
PEDESTRIAN QUALITY OF SERVICE
PQOS Score
QOS 1: Best Quality of
QOS
QOS
QOS
QOS 5: Lowest Quality of Service
Roadway Inaccessible to Pedestrians
Destinations
School
Caltrain Station
Light Rail Station
Park
City Boundary
Data provided by the City of Mountain View, Caltrans, Esri, OSM.
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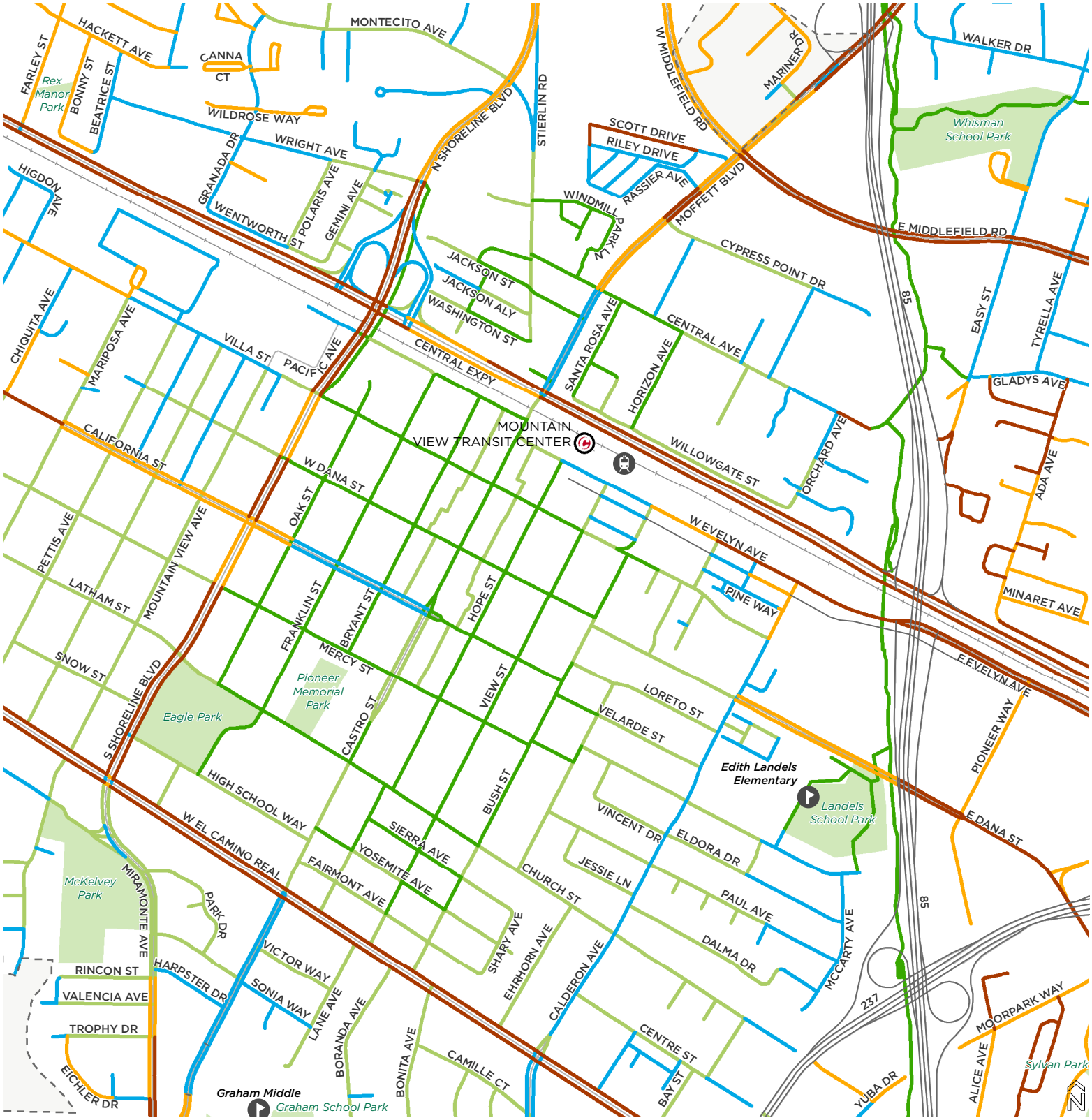


PEDESTRIAN QUALITY OF SERVICE

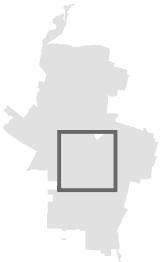
Map 3 DOWNTOWN

PQOS Score (Existing)

- QOS 1: Best Quality of Service
- QOS 2
- QOS 3
- QOS 4
- QOS 5: Lowest Quality of Service
- Roadway Inaccessible to Pedestrians

Destinations

- School
- Caltrain Station
- Light Rail Station
- Park
- City Boundary



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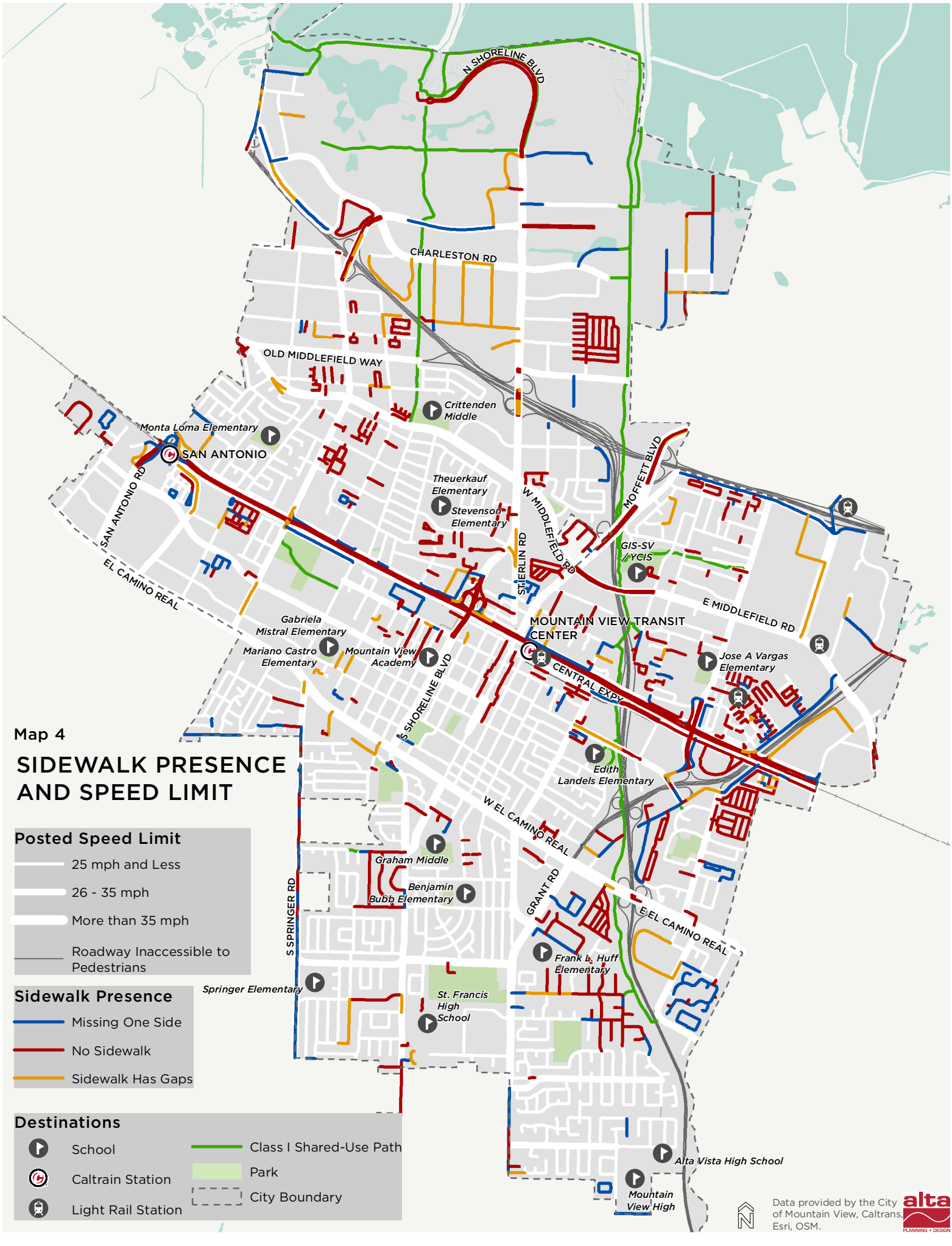

Map 4

SIDEWALK PRESENCE AND SPEED LIMIT

Posted Speed Limit

- 25 mph and Less
- 26 - 35 mph
- More than 35 mph
- Roadway Inaccessible to Pedestrians

Sidewalk Presence

- Missing One Side
- No Sidewalk
- Sidewalk Has Gaps

Destinations

- School
- Caltrain Station
- Light Rail Station
- Class I Shared-Use Path
- Park
- City Boundary

Data provided by the City of Mountain View, Caltrans, Esri, OSM.

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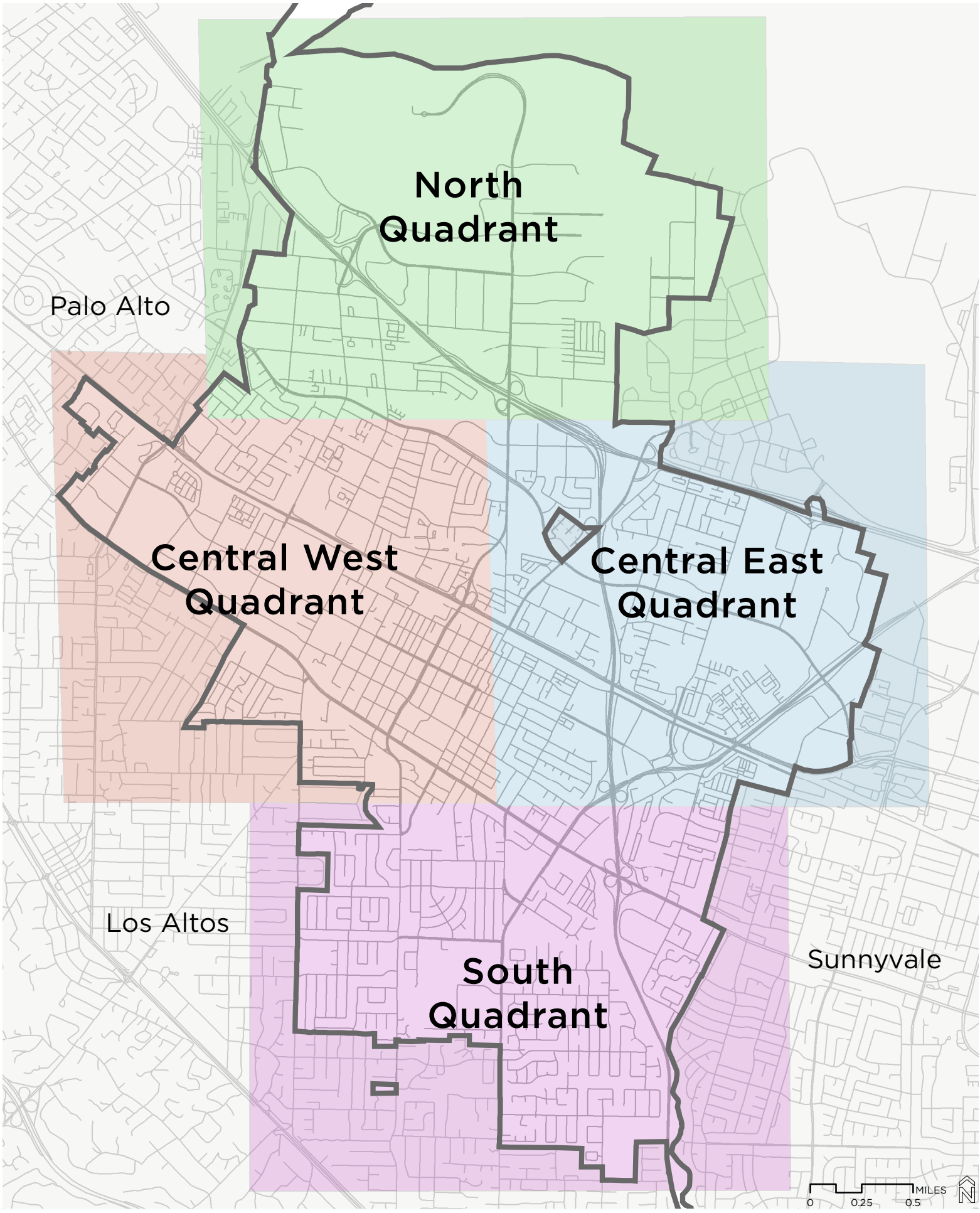

MOUNTAIN VIEW QUADRANTS

Map 5

City Boundary

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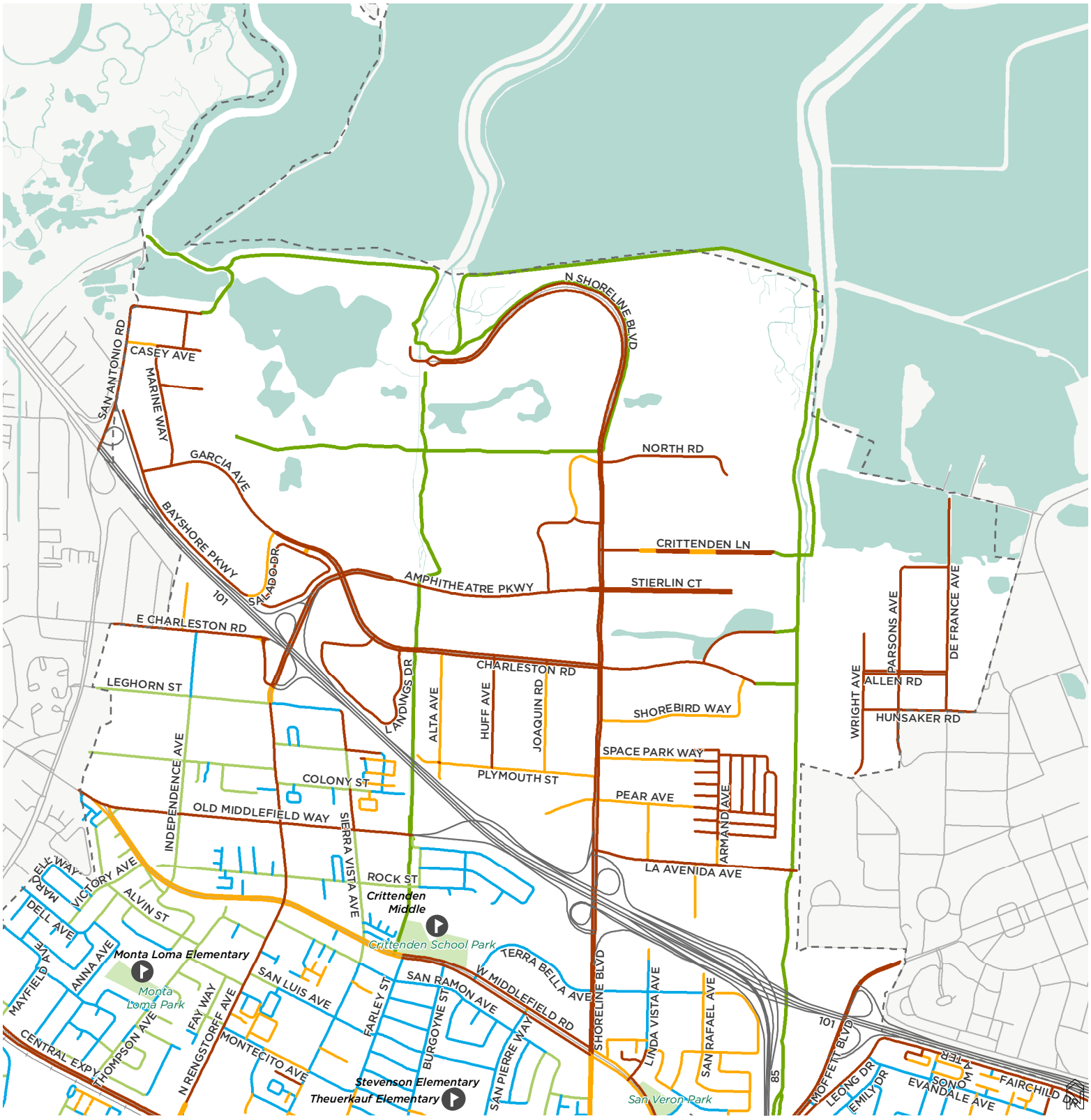


PEDESTRIAN QUALITY OF SERVICE

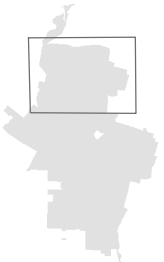
Map 6 NORTH QUADRANT

PQOS Score (Existing)

- QOS 1: Best Quality of Service
- QOS 2
- QOS 3
- QOS 4
- QOS 5: Lowest Quality of Service
- Roadway Inaccessible to Pedestrians

Destinations

- School
- Caltrain Station
- Light Rail Station
- Park
- City Boundary



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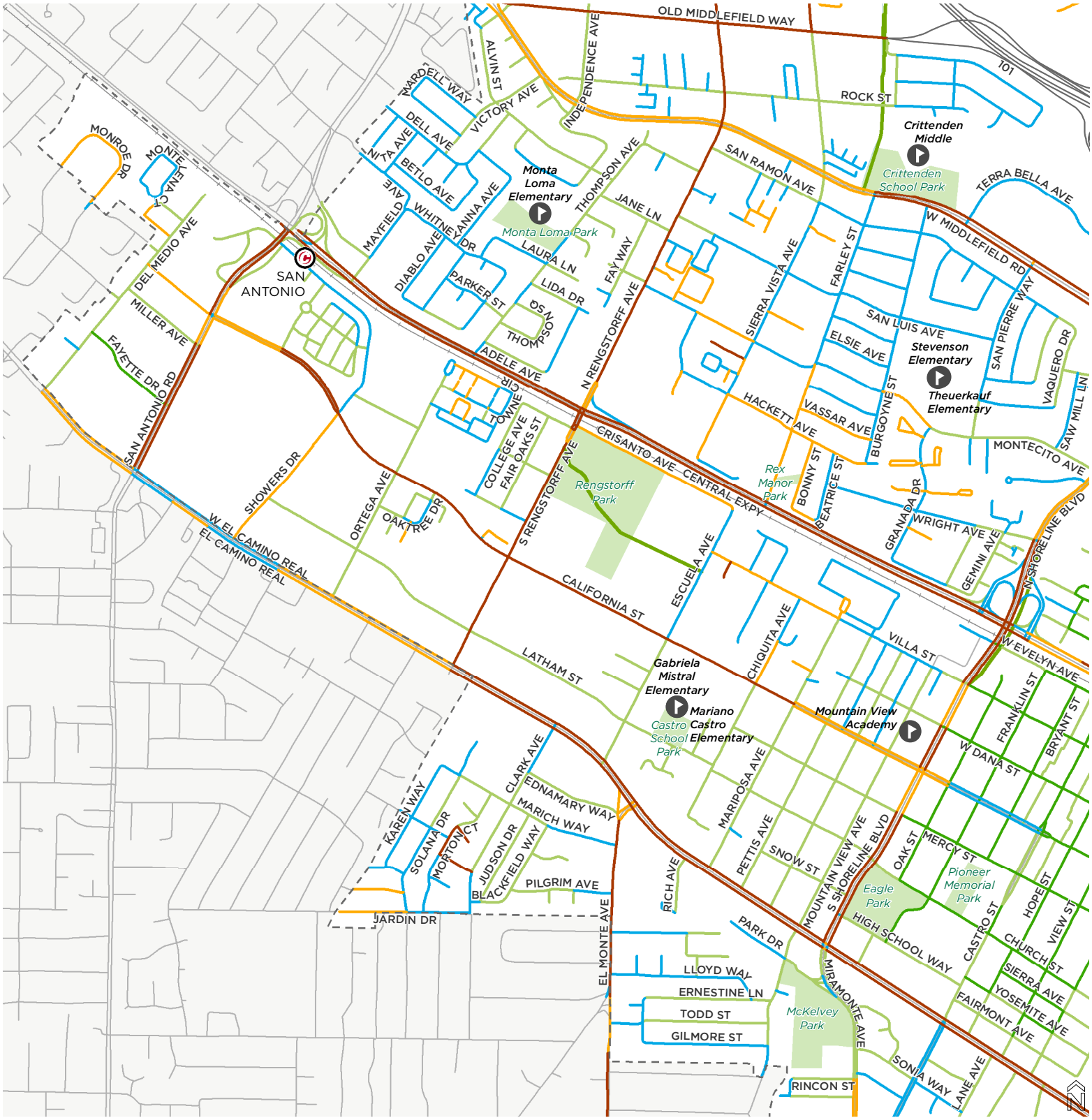


PEDESTRIAN QUALITY OF SERVICE

Map 7 CENTRAL WEST QUADRANT

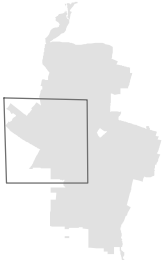
0 0.25 0.5 MILES

PQOS Score (Existing)

- QOS 1: Best Quality of Service
- QOS 2
- QOS 3
- QOS 4
- QOS 5: Lowest Quality of Service
- Roadway Inaccessible to Pedestrians

Destinations

- School
- Caltrain Station
- Light Rail Station
- Park
- City Boundary



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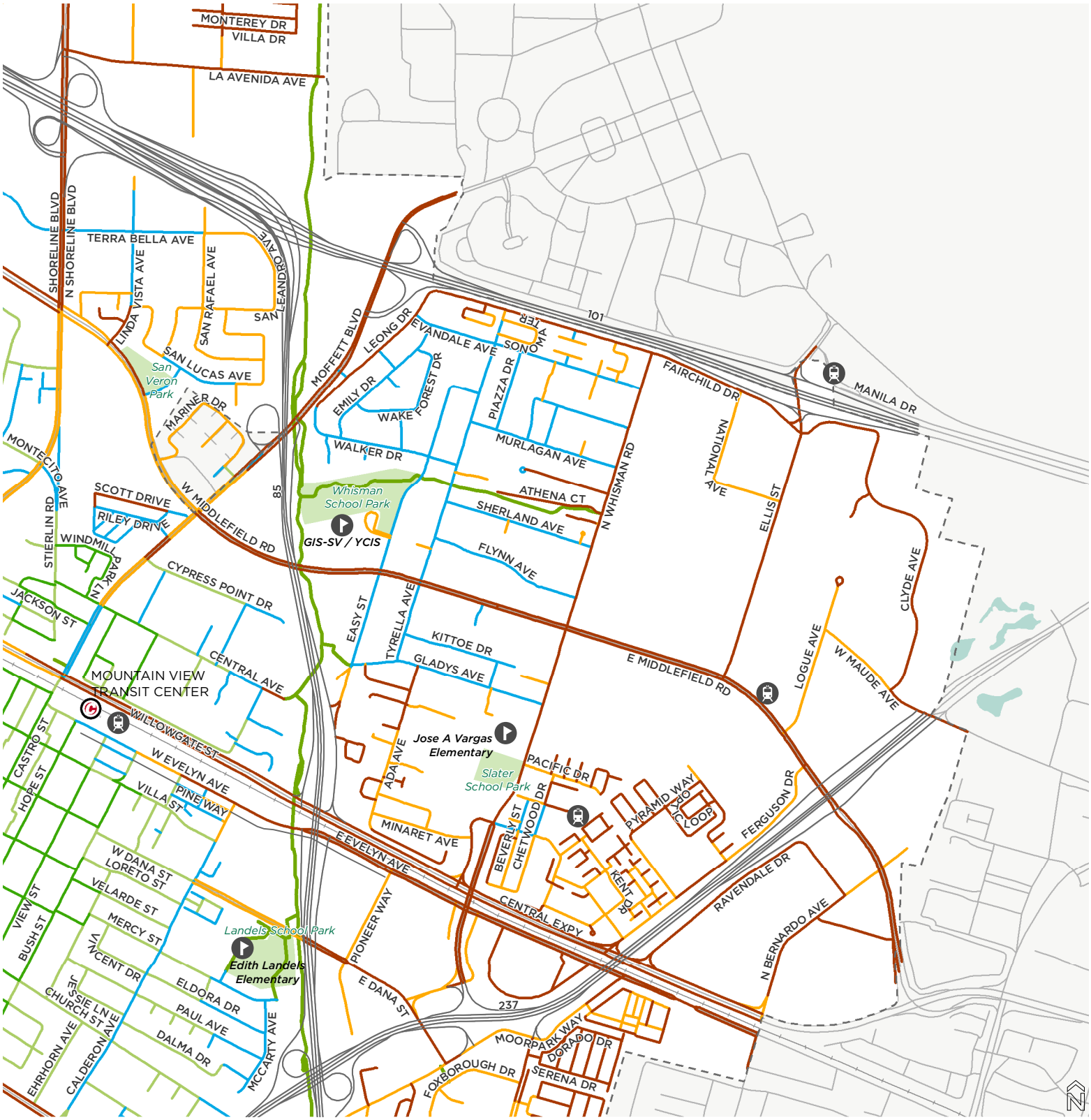


PEDESTRIAN QUALITY OF SERVICE

Map 8 CENTRAL EAST QUADRANT

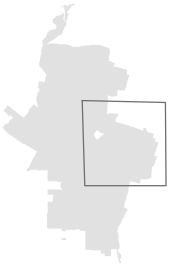
0 0.25 0.5 MILES

PQOS Score (Existing)

- QOS 1: Best Quality of Service
- QOS 2
- QOS 3
- QOS 4
- QOS 5: Lowest Quality of Service
- Roadway Inaccessible to Pedestrians

Destinations

- School
- Caltrain Station
- Light Rail Station
- Park
- City Boundary



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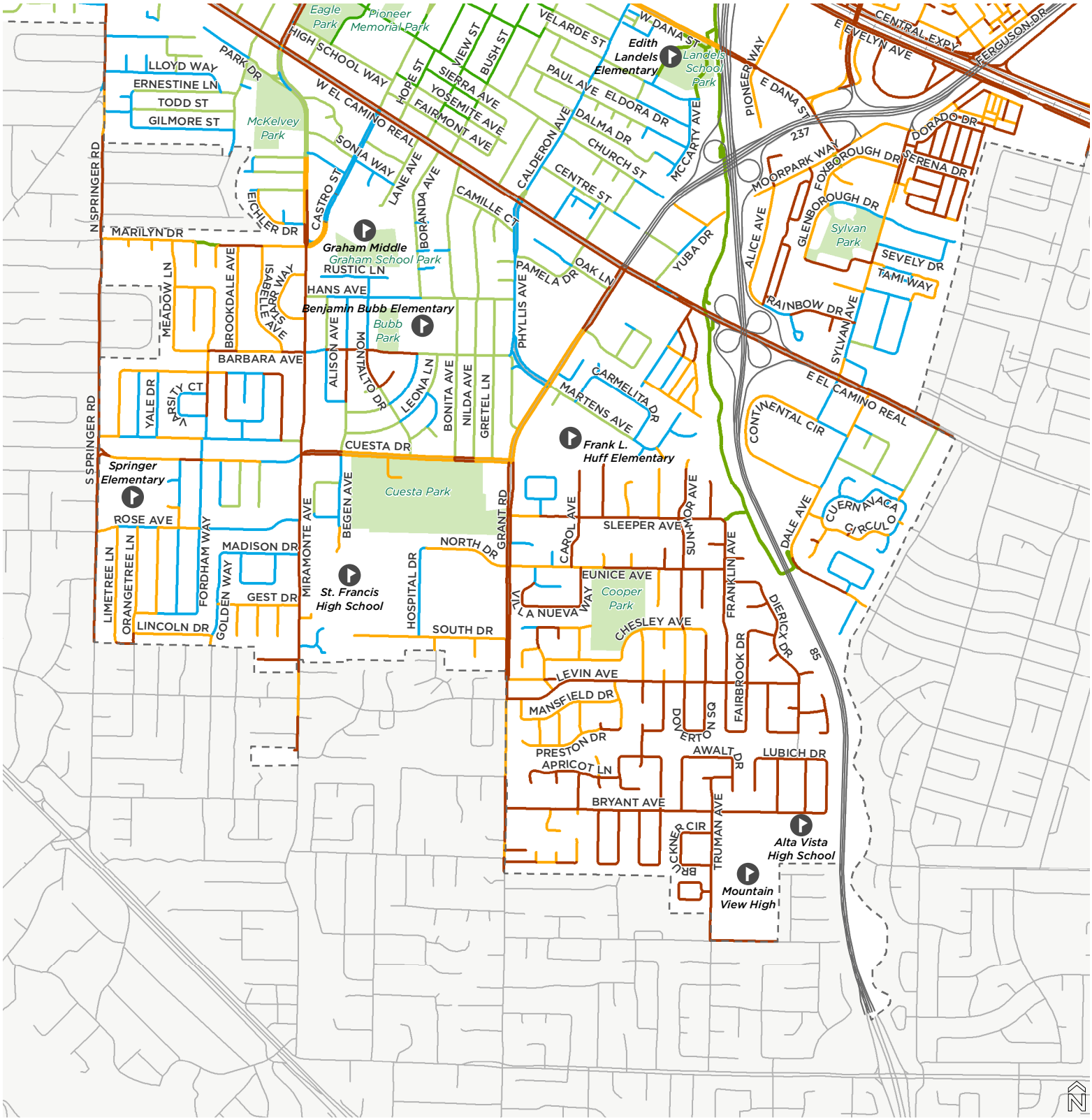


PEDESTRIAN QUALITY OF SERVICE

Map 9 SOUTH QUADRANT

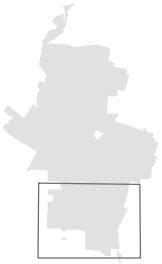
0 0.25 0.5 MILES

PQOS Score (Existing)

- QOS 1: Best Quality of Service
- QOS 2
- QOS 3
- QOS 4
- QOS 5: Lowest Quality of Service
- Roadway Inaccessible to Pedestrians

Destinations

- School
- Caltrain Station
- Light Rail Station
- Park
- City Boundary



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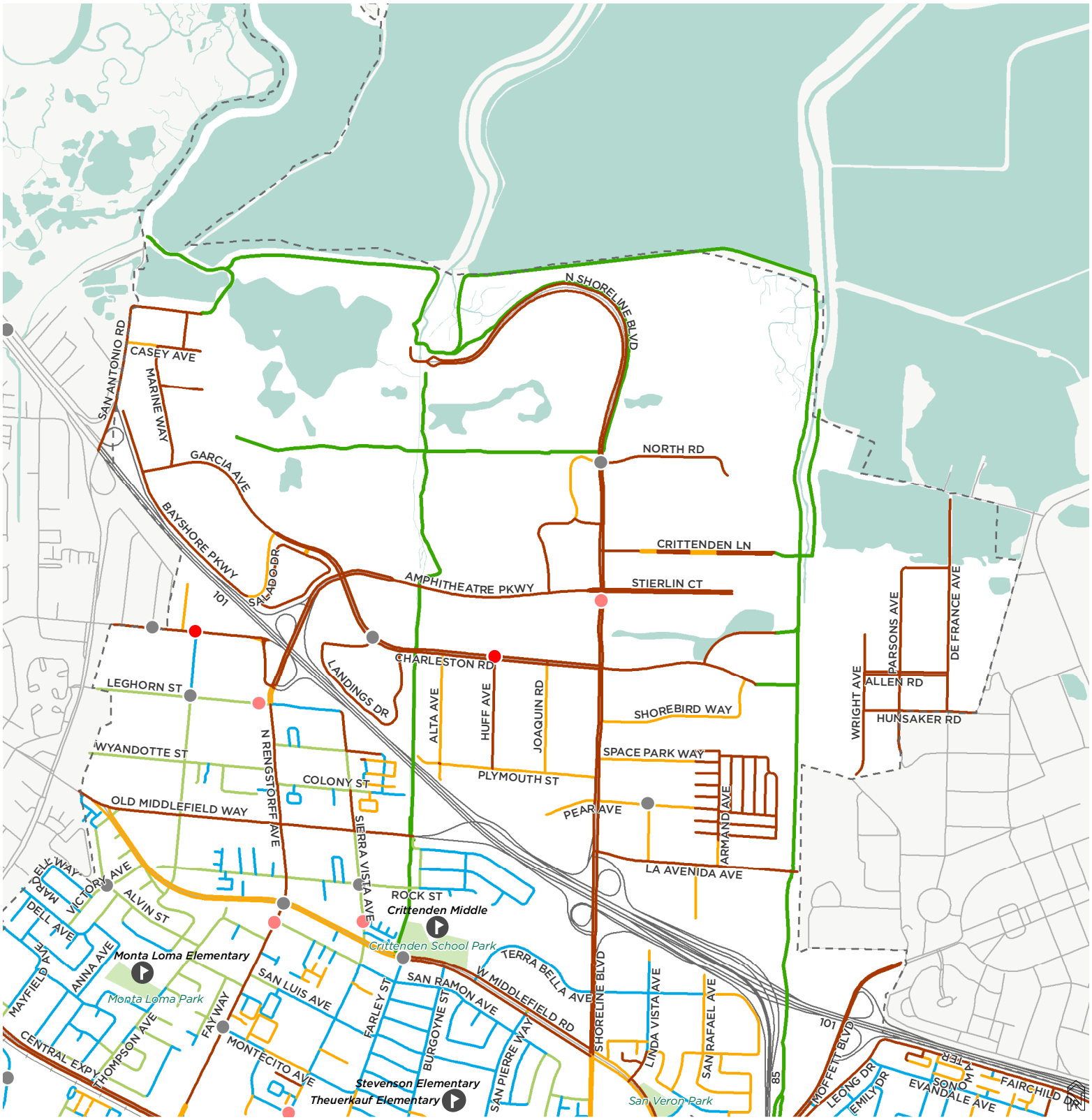


PEDESTRIAN QUALITY OF SERVICE

Map 10 NORTH QUADRANT

PQOS Score (Existing)

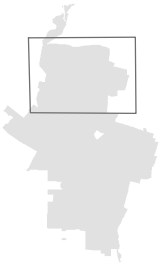
- QOS 1: Best Quality of Service
- QOS 2
- QOS 3
- QOS 4
- QOS 5: Lowest Quality of Service
- Roadway Inaccessible to Pedestrians

Pedestrian Collisions (2014 - 2018)

- Fatality
- Severe Injury
- Minor Injury

Destinations

- School
- Caltrain Station
- Light Rail Station
- Park
- City Boundary



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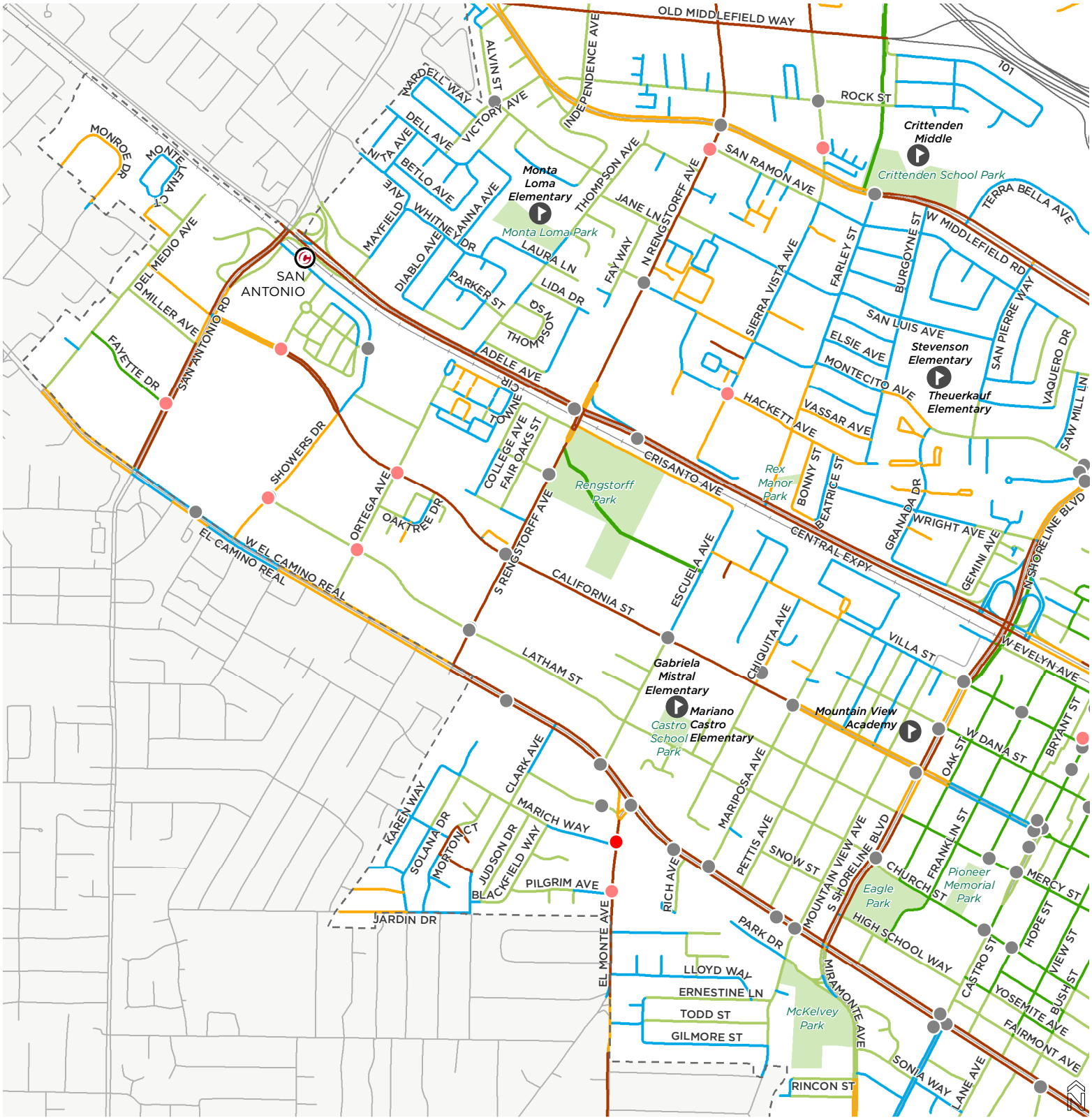


PEDESTRIAN QUALITY OF SERVICE

Map 11 CENTRAL WEST QUADRANT

PQOS Score (Existing)

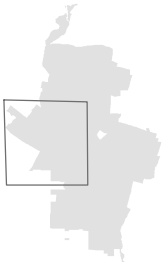
- QOS 1: Best Quality of Service
- QOS 2
- QOS 3
- QOS 4
- QOS 5: Lowest Quality of Service
- Roadway Inaccessible to Pedestrians

Pedestrian Collisions (2014 - 2018)

- Fatality
- Severe Injury
- Minor Injury

Destinations

- School
- Caltrain Station
- Light Rail Station
- Park
- City Boundary



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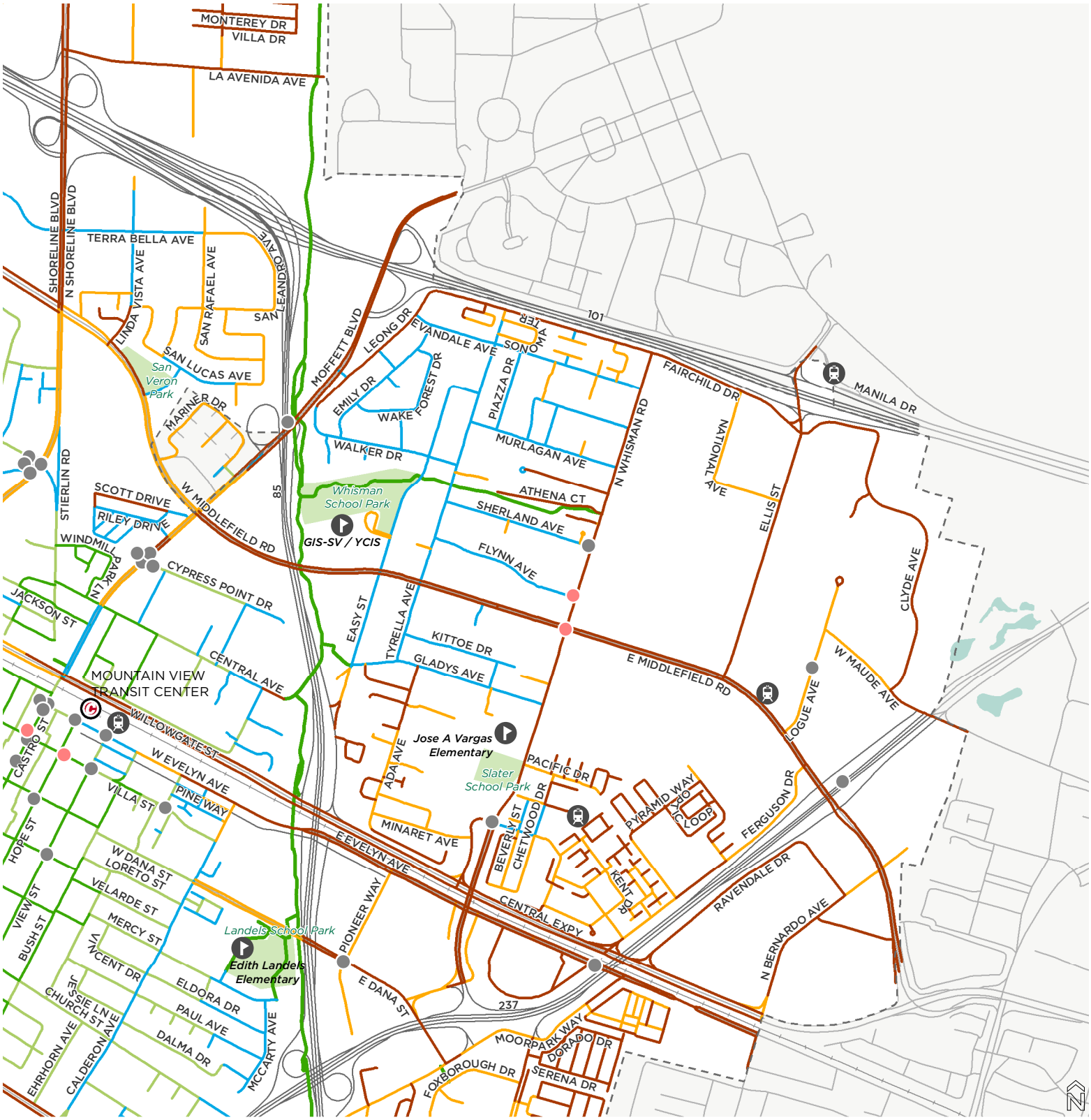

PEDESTRIAN QUALITY OF SERVICE

Map 12 CENTRAL EAST QUADRANT

0 0.25 0.5 MILES

PQOS Score (Existing)

- QOS 1: Best Quality of Service
- QOS 2
- QOS 3
- QOS 4
- QOS 5: Lowest Quality of Service
- Roadway Inaccessible to Pedestrians

Pedestrian Collisions (2014 - 2018)

- Fatality
- Severe Injury
- Minor Injury

Destinations

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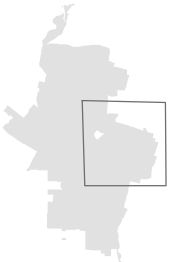
- Caltrain Station
- Light Rail Station
- Park
- City Boundary



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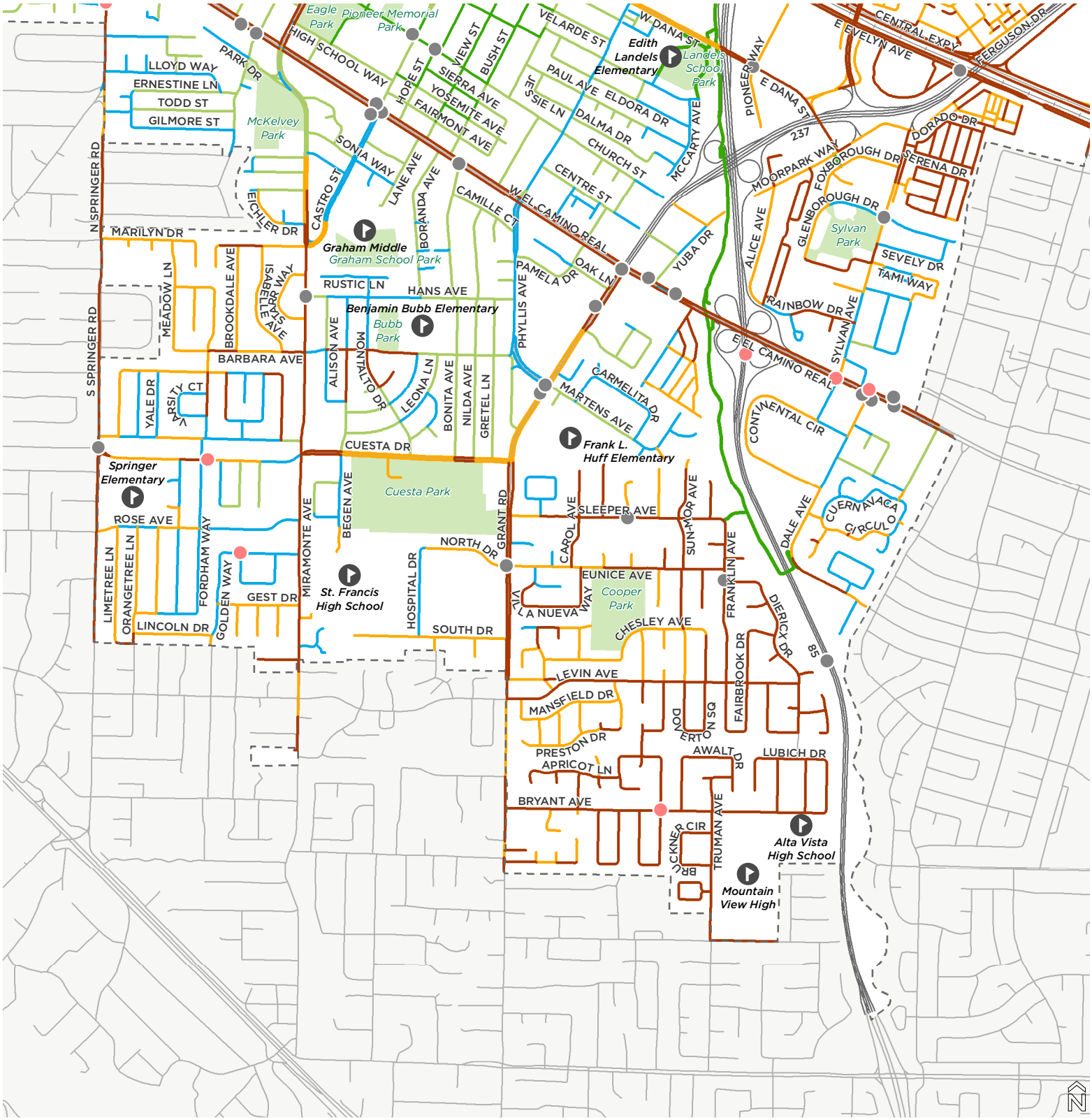

PEDESTRIAN QUALITY OF SERVICE

Map 13 SOUTH QUADRANT

MILES
0 0.25 0.5

PQOS Score (Existing)

- QOS 1: Best Quality of Service
- QOS 2
- QOS 3
- QOS 4
- QOS 5: Lowest Quality of Service
- Roadway Inaccessible to Pedestrians

Pedestrian Collisions (2014 - 2018)

- Fatality
- Severe Injury
- Minor Injury

Destinations

- School
- Caltrain Station
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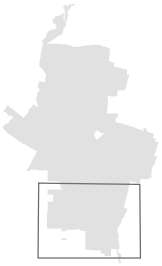
- Park
- City Boundary



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