



Binational San Luis Transportation Study



Final Report

San Luis Río Colorado, Sonora

United States
Mexico

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ADOT

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and

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1.0 INTRODUCTION

PURPOSE OF THE STUDY

The Binational San Luis Transportation Study is a joint effort by the City of San Luis, Ciudad de San Luis Río Colorado and the Arizona Department of Transportation (ADOT). The primary purpose of this study is to prepare a long-range multi-modal transportation plan that will address the most critical current and future transportation issues for the cities of San Luis, Arizona and San Luis Río Colorado, Sonora, Mexico. The study is funded by the Federal Highway Administration's (FHWA) Coordinated Border Infrastructure (CBI) Program and administered through ADOT's Office of International Affairs. The final report consists of two reports, one for each of the two cities. This report will focus on San Luis Río Colorado, Sonora.

Located 20 miles from the City of Yuma in southern Arizona, the Binational study area encompasses 28.8 square miles and includes portions of the incorporated limits of San Luis in Arizona, U.S. and San Luis Río Colorado in Sonora, Mexico. In the City of San Luis the study area is bounded by County 22nd Street/County 23rd Street to the north, Avenue E to the east, and Merrill Avenue to the west while in the City of San Luis Río Colorado the study area is bounded by Avenida Nuevo León to the south, Libramiento to the east, and Calzada Monterrey to the west. Regional access to the study area in Mexico is provided by Mexico 2, Sonora 40 and Sonora 3. A major federal highway, Mexico 2 transverses through the northern city limits to connect the cities of Mexicali in the west and Sonoyota in the east. Sonora 40, a north-south state highway, connects the San Luis Río Colorado I Land Port of Entry (LPOE) to the communities in the southern portion of Sonora such as Estacion Coahuila or Rito. Also a state highway, Sonora 3 connects the San Luis Río Colorado II LPOE to coastal communities in the south such as Golfo de Santa Clara and Puerto Penasco. Figure 1.1 displays the Binational study area boundary, which represents the limits of the transportation plan. Also, shown is the influence area which extends beyond the study area but has some impact on the study area transportation system by either daily use of the facilities or by proximity to the study area.

As part of the Long Range Transportation Plan identified in the *City of San Luis Small Area Transportation Study (SATS)*, it was recommended that a Binational Study be conducted to address the future travel exchange between the two cities and the recreational traffic using the San Luis I LPOE.

STUDY OBJECTIVES

The principal focus of this study is to develop a Transportation Plan for the City of San Luis Río Colorado that would be used in conjunction with the updated City of San Luis Transportation Plan to address the safety and mobility issues specific to the ever-growing border region. With increasing population and economic interdependency of the two Cities, the resurgence of the maquiladora industry, and the opening of San Luis II LPOE, an integrated transportation plan that will specifically address the future demands for all forms of transportation is needed.



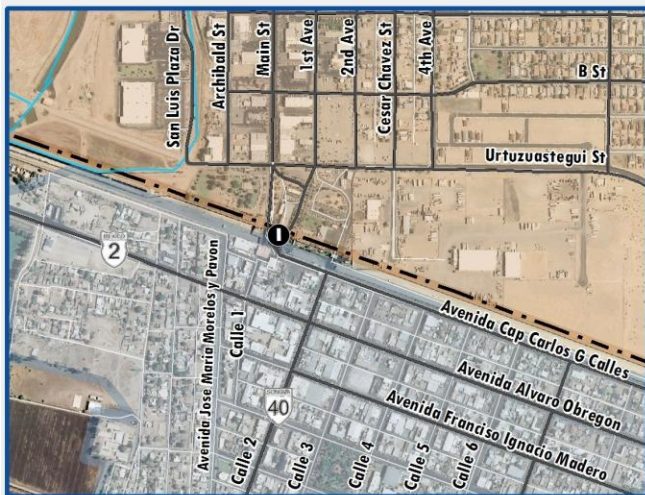
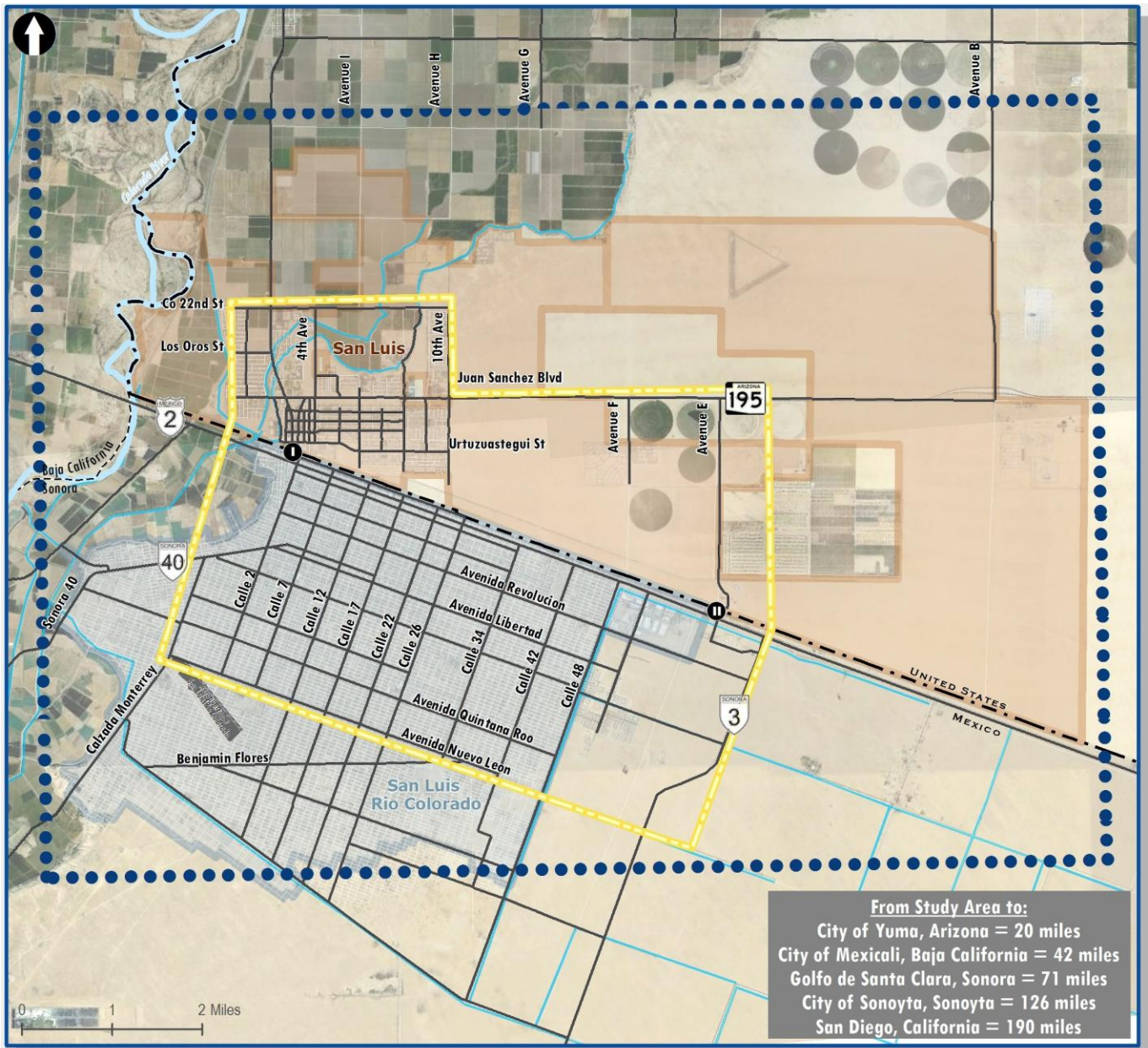


FIGURE 1.1: STUDY AND INFLUENCE AREA

- Study Area
- Influence Area
- Study Roadway
- Land Port of Entry
- Canal
- International Boundary
- San Luis
- San Luis Rio Colorado

Source: ALRIS, SLRC, ADEQ, INEGI, USGS, Google

With guidance from the *San Luis Río Colorado 2040, Programa de Desarrollo Urbano de Centro de Población de La Ciudad de San Luis Río Colorado, Sonora* and interviews with members of the Technical Advisory Committee (TAC) from San Luis Río Colorado the following objectives for the study were identified:

- Address pedestrian and bicycle needs.
- Enhance connectivity between modes - vehicles, transit, and pedestrians.
- Evaluate staging areas for vehicular transportation and transit service.
- Enhance the mobility and connectivity of the transportation system at an international, regional, and local level.
- Communicate with TAC, and stakeholders.

STUDY PROCESS

The study was guided by a TAC that included representatives from:

- Ciudad de San Luis Río Colorado
- City of San Luis, AZ
- ADOT - Office of International Affairs
- ADOT - Yuma District
- ADOT - Communication and Community Partnerships (CCP)
- ADOT - Enforcement and Compliance
- Federal Highway Administration (FHWA)
- Secretaría de Infraestructura y Desarrollo Urbano (SIDUR)
- Secretaría de Comunicaciones y Transportes (SCT)
- Yuma Metropolitan Planning Organization (YMPO)
- Greater Yuma Economic Development Corporation (GYEDC)
- General Services Administration (GSA)
- U.S. Customs and Border Protection (CBP)
- Greater Yuma Port Authority (GYPA)
- Yuma County Intergovernmental Public Transportation Authority (YCIPTA)

The role of the TAC was to provide technical guidance, support, advice, suggestions, and recommendations, and to perform document reviews throughout the study process. Figure 1.2 illustrates the process utilized to complete this study.



FIGURE 1.2: STUDY PROCESS



2.0 EXISTING AND FUTURE CONDITIONS

EXISTING LAND USE AND SOCIOECONOMIC CONDITIONS

This section summarizes current land use, socioeconomic conditions, characteristics of the physical and natural environments, environmental justice population review (Title VI), and cultural resources inventory for the study area.

Land Ownership Status

As shown in Figure 2.1, the portion of the study area located in Mexico accounts for 43.2 percent of the total incorporated boundary of the City of San Luis Río Colorado, while the remaining is located in the unincorporated area of the Municipality of San Luis Río Colorado.

Socioeconomic Conditions

Creating an inventory of the study area's socioeconomic characteristics and understanding this data is a critical element for any transportation planning study. Socioeconomic data is one of the primary inputs to the travel demand modeling process that is used to forecast traffic demand in the study area.

Population and Housing Unit Growth Trends

According to Consejo Nacional de Población (CONAPO) statistics, in 2010 the City of San Luis Río Colorado had a population of approximately 158,089 residents with more than half (65%) residing in the study area. Since 2000 the population in the study area has steadily increased. However, the population increased at a slightly higher rate (2.78% per year) from 2005 to 2010 than the previous five years (1.92% per year). In addition, the growth rate observed in the study area from 2005 to 2010 is slightly higher than both the Municipality and State for the same period. In 2010, the population in the study area was 102,699, a 14 percent increase from 2005 while the housing units increased 17 percent from 23,448 to 27,549 during the same period. The average household size in 2010 for the study area was 3.73 which is similar to the Municipality and State estimates. Using the same trend observed from 2005 to 2010, the population and housing units in the study area were estimated to be 111,264 and 29,846 by 2013. Table 2.1 lists the population and housing growth trends from 2000 to 2013.

SOCIOECONOMIC CONDITIONS

- Land Area: 28.8 square miles
- Population (Year 2013): 111,264
- Occupied Housing Units (Year 2013): 29,846
- Average Household Size: 3.73

Source: INEGI 2010 Census of Population & Housing and 2010 CONAPO



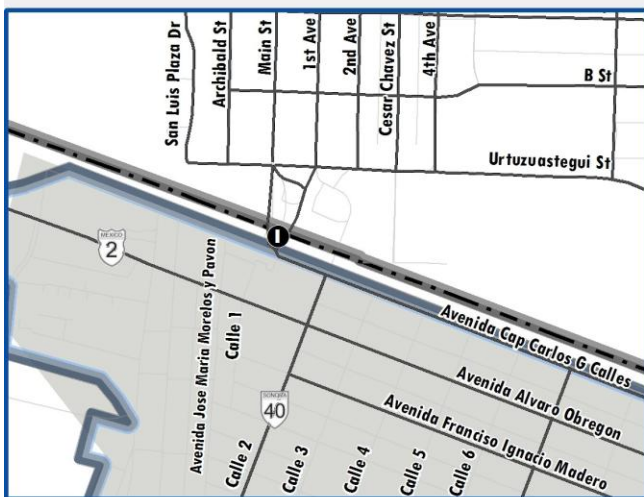
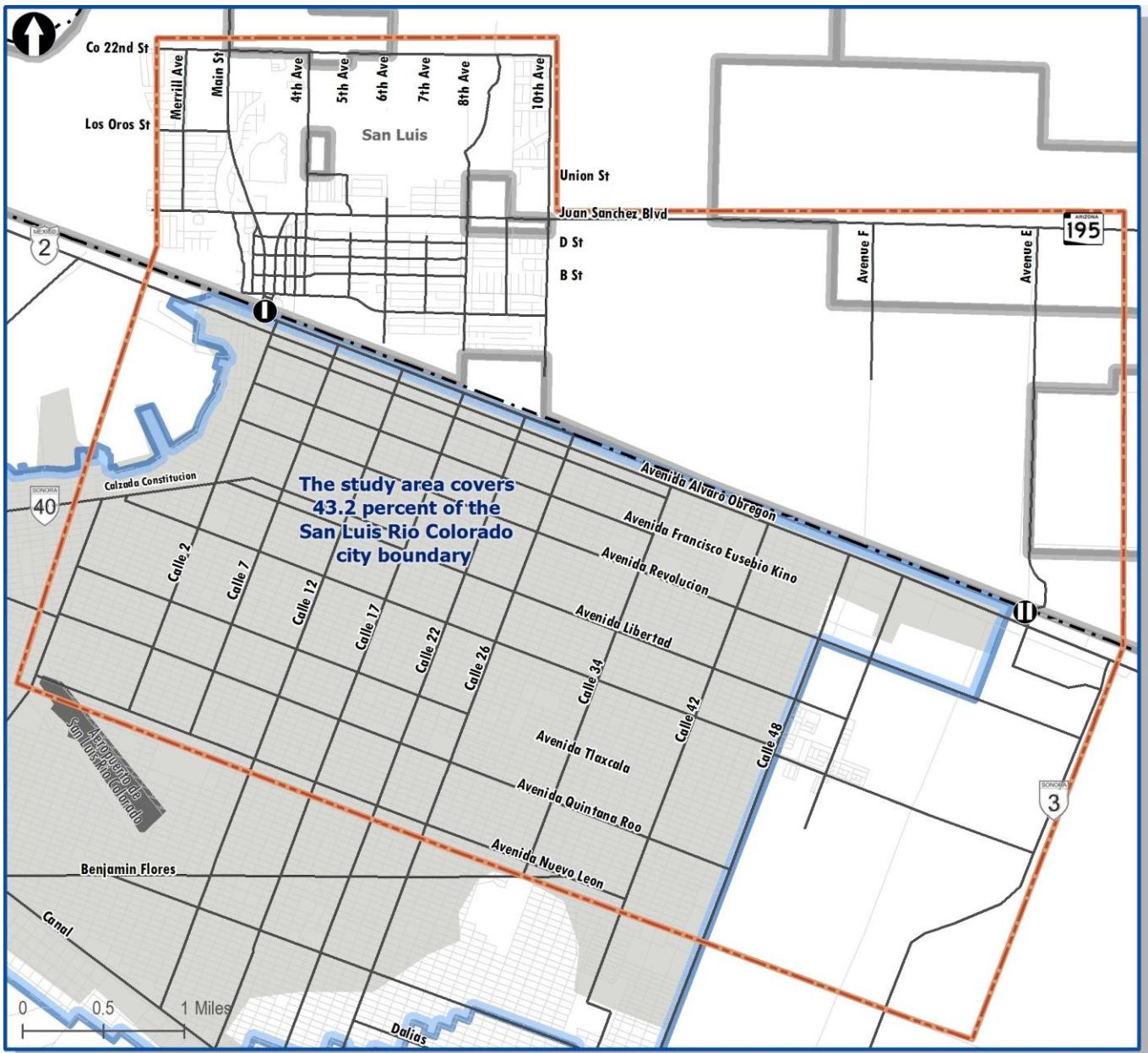


FIGURE 2.1: LAND OWNERSHIP

- Urban Area
- Land Port of Entry
- Study Roadway
- International Boundary
- San Luis
- San Luis Rio Colorado
- Study Area

Source: ALRIS, SLRC, ADEF, INEGI, USGS



TABLE 2.1: POPULATION AND HOUSING UNIT GROWTH TRENDS

	Study Area		Municipality San Luis Río Colorado		State of Sonora	
	Total Population	Total Private Housing Units Occupied	Total Population	Total Private Housing Units Occupied	Total Population	Total Private Housing Units Occupied
2000	82,272	20,343	145,006	35,315	2,216,969	529,937
2005	90,166	23,448	157,076	40,706	2,394,861	614,595
2010	102,699	27,549	178,380	47,824	2,662,480	712,108
2013	111,264	29,846	192,896	51,716	2,840,995	759,854
Population Growth Rate						
'00 -'05	1.92%	3.05%	1.66%	3.05%	1.60%	3.20%
'05 -'10	2.78%	3.50%	2.71%	3.50%	2.23%	3.17%
'10 -'13	2.78%	2.78%	2.71%	2.71%	2.23%	2.23%

Source: INEGI 2010 Census of Population and Housing, 2010 CONAPO Socio-demographic indicators of the 384 cities

Figure 2.2 displays the 2013 study area population; the higher population densities occur in the central and eastern portion of the study area located in San Luis Río Colorado.

Employment Overview

Agricultural and manufacturing are the primary drivers of the economy for the study area. However, many of the residents travel to Yuma or other surrounding communities for employment especially during the winter months which is the peak of the harvesting season. It should be noted that detailed employment data for study area as well as for the City of San Luis Río Colorado was unavailable.

Figure 2.3 presents a visual depiction of the major activity centers located in the study area. The square footage of the major attractors in the study area totaled 37,059,896 square feet or 1.3 square miles which is roughly 4.6 percent of the total study area land coverage. Covering the largest square footage, are educational facilities which are located throughout the study area. Although Commercial Corridors (mixed commercial and services) are located throughout the study area, many are clustered along the major corridors such as Mexico 2, Sonora 40, Avenida Libertad, and Calle 26. As the figure illustrates there is a higher density of shopping centers, commercial corridors, and health facilities in the northwest corner of the city. It was observed that within a one-mile radius of Avenida Alvaro Obregon and Calle 2 intersection, which is just south of the San Luis Río Colorado ILPOE:

- 62 percent of the total square footage of Health Care Facilities is located in the area.
- 37 percent of the total square footage of Shopping Centers is located in the area.
- 35 percent of the total square footage of Commercial Corridors is located in the area.

Within a two-mile radius:

- 98 percent of the total square footage of Health Care Facilities is located in the area.
- 63 percent of the total square footage of Commercial Corridors is located in the area.
- 52 percent of the total square footage of Shopping Centers is located in the area.



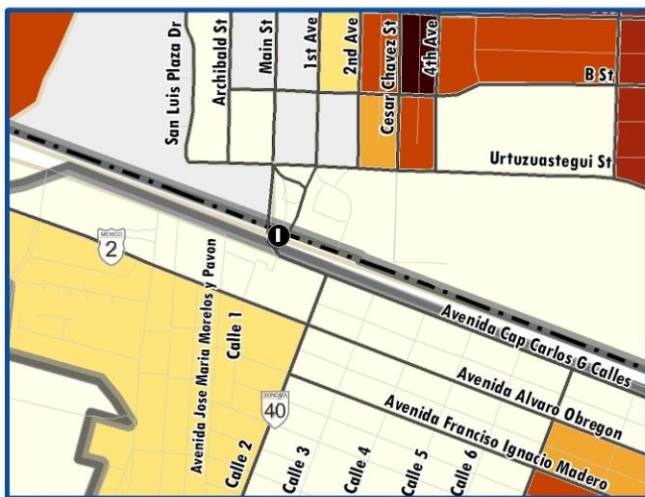
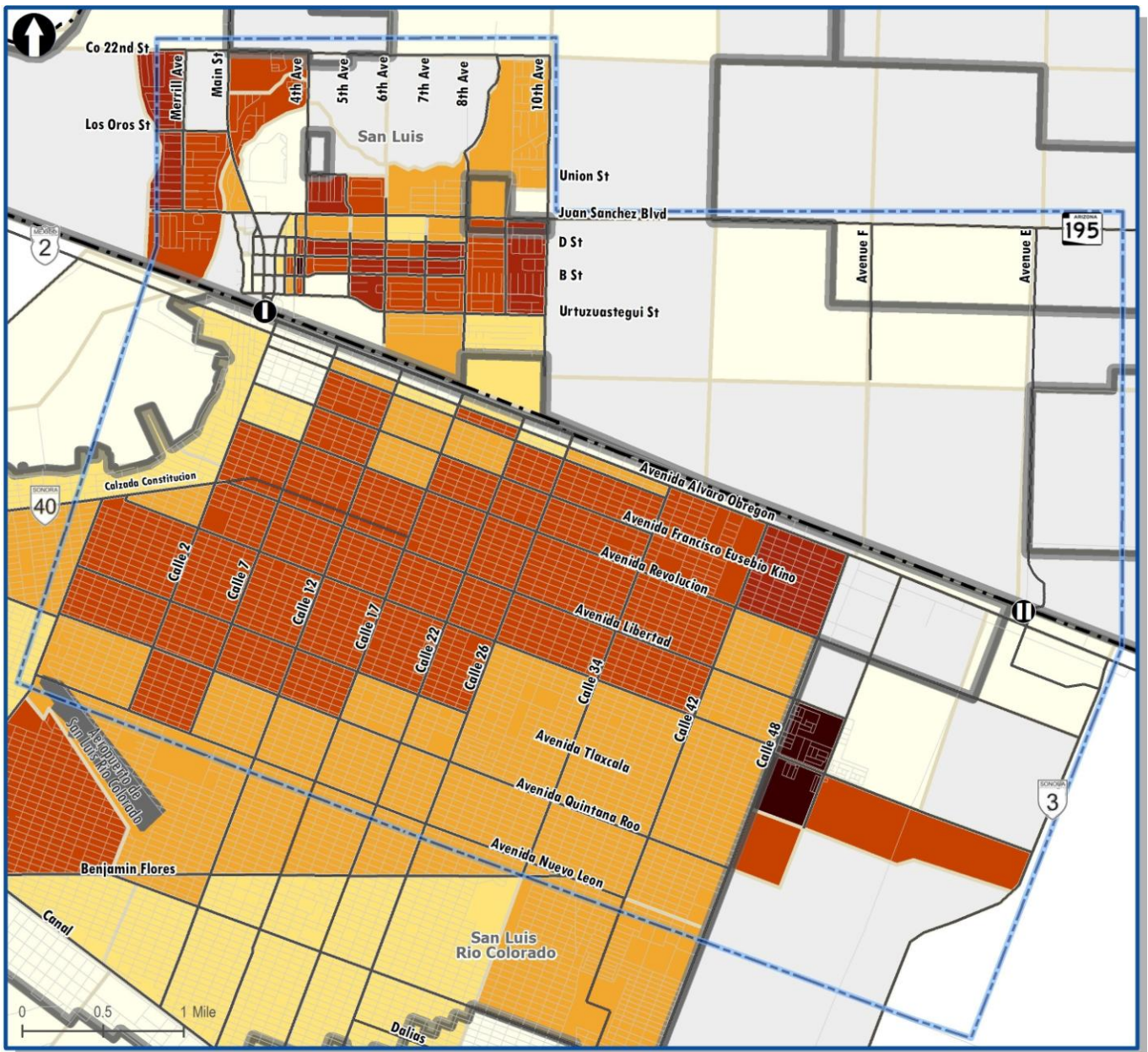


FIGURE 2.2: YEAR 2013 POPULATION DENSITY

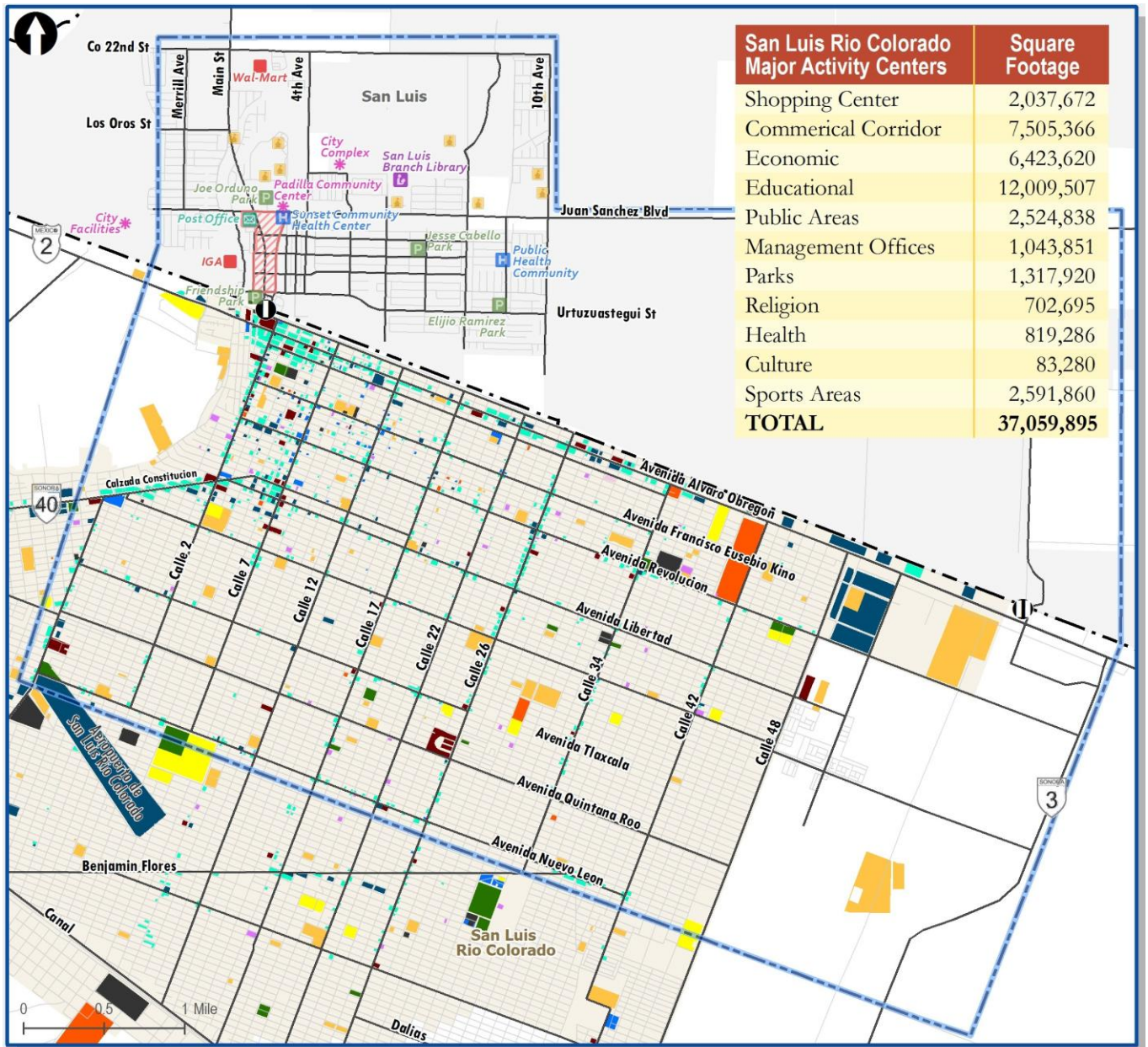
Population per Square Mile



- Land Port of Entry
- Study Roadway
- - - International Boundary
- Cities
- Study Area

Source: U.S. Census 2010, ADOT, ALRIS, SLRC, ADEQ, INEGI, USGS, SL, Arizona Dept. of Administration Office of Employment and Population Statistics





San Luis Rio Colorado Major Activity Centers	Square Footage
Shopping Center	2,037,672
Commerical Corridor	7,505,366
Economic	6,423,620
Educational	12,009,507
Public Areas	2,524,838
Management Offices	1,043,851
Parks	1,317,920
Religion	702,695
Health	819,286
Culture	83,280
Sports Areas	2,591,860
TOTAL	37,059,895

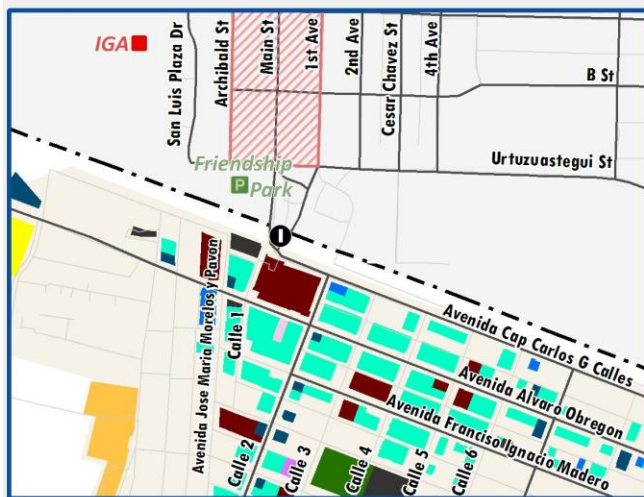


FIGURE 2.3: MAJOR ACTIVITY CENTERS



Source: ALRIS, SLRC, ADEQ, USGS, InfoUSA

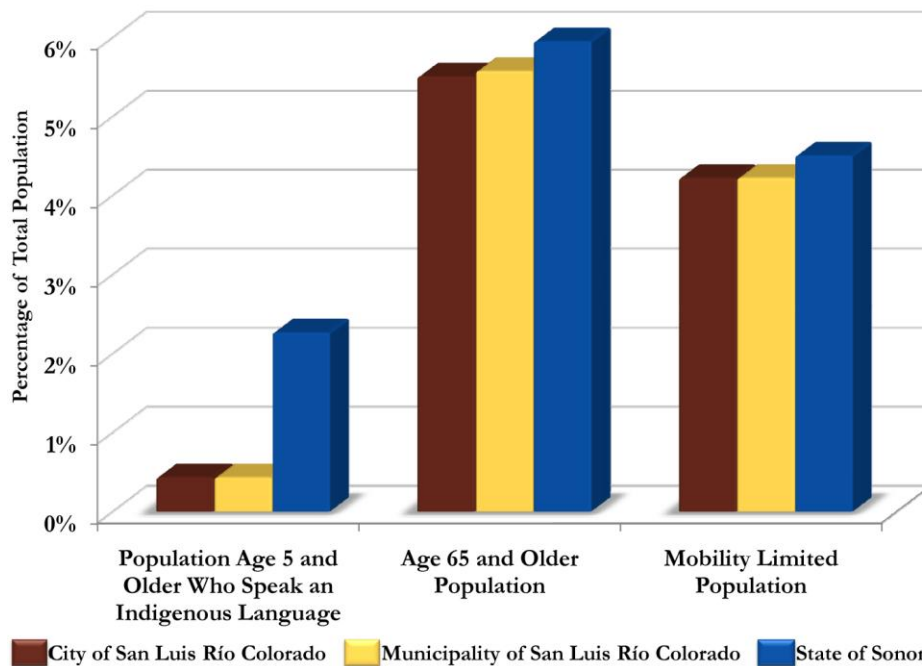


Environmental Justice Review (Title VI)

Although this report of the Binational San Luis Transportation Study covers the portion of the study area located in Mexico, the environmental justice principles and procedures are followed to assure that transportation improvements do not adversely impact different socioeconomic groups. To assure that these policies are adhered to, a variety of possible alternatives should be developed and considered in order to make sure all groups are fairly represented in the amount and type of transportation services provided.

Protected populations considered in this analysis include indigenous, elderly, low-income, and disabled populations. As the locality of these protected populations within the study area are unknown, statistics at the city level are presented and were reviewed. Figure 2.4 shows a graphical comparison of these protected populations while Table 2.2 summarizes the percentage of the protected populations within the City of San Luis Río Colorado, Municipality of San Luis Río Colorado, and State of Sonora. Instituto Nacional de Estadística Y Geografía (INEGI) data bank was unavailable for selected protected populations and did not include local statistics therefore other data sources were used. The Statistical Yearbook of Sonora 2011 data was used to identify the mobility limited and poverty population for the municipality and state while CONAPO City Estimates included elderly data for the City of San Luis Río Colorado. From the CANAPO data, it was observed that 87 percent of the elderly population in the Municipality was located in the City. Since 88.6 percent of the Municipality population resides in the City, as previously discussed, the same percentage was applied to the mobility limited population and the population that speak an indigenous language for the City of San Luis Río Colorado.

FIGURE 2.4: PROTECTED POPULATION GROUPS COMPARISON



Source: INEGI Data Bank, 2010 CONAPO Socio-demographic indicators of the 384 cities, Statistical Yearbook of Sonora 2011, and ⁺City of SLRC calculation reflects the 88.6 percent of the Municipality population is located within city limits of San Luis Río Colorado.



TABLE 2.2: PROTECTED POPULATION PERCENTAGES

	City of San Luis Río Colorado		Municipality of San Luis Río Colorado		State of Sonora	
	Total Pop	% of Total Population	Total Pop	% of Total Population	Total Pop	% of Total Population
Total Population (Year 2010)	158,089		178,380		2,662,480	
Population, Age 5 and Older, Who Speak an Indigenous Language	681 ⁺	0.4	768	0.4	60,310	2.3
Age 65 and Older Population	8,702	5.5	9,942	5.6	158,431	6.0
Mobility Limited	6,672 ⁺	4.2	7,528	4.2	119,866	4.5
Equity Poverty in 2005		-		41.1		40.4

Source: INEGI Data Bank, 2010 CONAPO Socio-demographic indicators of the 384 cities, Statistical Yearbook of Sonora 2011, and⁺ City of SLRC calculation reflects the 88.6 percent of the Municipality population is located within city limits of San Luis Río Colorado.

Indigenous Population: Indigenous population consists of individuals, age 5 and older, who can speak an indigenous language; Mayo or Yaqui mainly in the state of Sonora. In 2010, less than 1 percent of the City and Municipality populations spoke an indigenous language which is less than the State's estimate of 2.3 percent.

Population Age 65 and Over: Elderly population, or persons who are over the age of 65 constitute 5.5 percent of the City population in 2010, which is comparable to the Municipality (5.6%) and State (6.0%) estimates.

Mobility Limited Population: Mobility-limited population is comprised of individuals who have a physical or mental disability that prohibits them from operating an automobile and may require access to some form of public transportation. In 2010, the percentage of mobility-limited population in the City was 4.2 percent, which is similar to the Municipality (4.2%) and State (4.5%) estimates.

Poverty Population: Poverty population or equity poverty, as established by the National Council for Evaluation of Social Development Policy (CONEVAL) refers to individuals who are unable to purchase food and daily expenditures that include clothing, housing, transportation, education, and health care even when the total household income is used exclusively for the purchase of these goods. Similar to the state's estimate, 41.1 percent of the municipality population in 2005 were not able to make the necessary expenditures for daily living. This data was only available at municipality and state level.



Environmental Overview

Inventory of the physical, natural, and cultural environment is an important component of the planning process. When environmental conditions and historic and cultural concerns are reviewed in the early stages of the planning process, transportation solutions can be developed to lessen the negative impacts on the environment and cultural treasures.

Natural Environment

Figure 2.5 presents the natural environmental overview of the study area.

Vegetation: One vegetation type, microphyll desert scrub, has been identified within the study area.

Water Features: In addition to the canal west of the San Luis Río Colorado I LPOE, three additional canals transverse the eastern portion of the study area.

Wildlife: The Arizona Wildlife Linkages Workgroup (AWLW) is a collaborative effort between ADOT and nine public and nonprofit organizations to identify large blocks of protected habitat, potential wildlife movement corridors, and factors that may disrupt these linkage zones. The AWLW developed the Arizona Wildlife Linkages Assessment, which identified wildlife habitat blocks and linkage zones that allow land managers and transportation planners to integrate wildlife needs into developments and land use plans. Wildlife habitat blocks are defined as large, contiguous areas of natural woodland with little or no human disturbance and are essential for maintaining a diverse and healthy population of wildlife. Wildlife linkage zones are areas of wildlife movement between habitat blocks. The study area east of Calle 22 is located in the linkage zone.

Environmental Concerns

Sandstorm: With arid desert like conditions, sandstorms not only impact the air quality but also limit visibility on roadways posing a hazard to motorists and pedestrians alike. In addition they could potentially damage infrastructure such as street lights and signs, and obstruct the roadways with fallen trees.



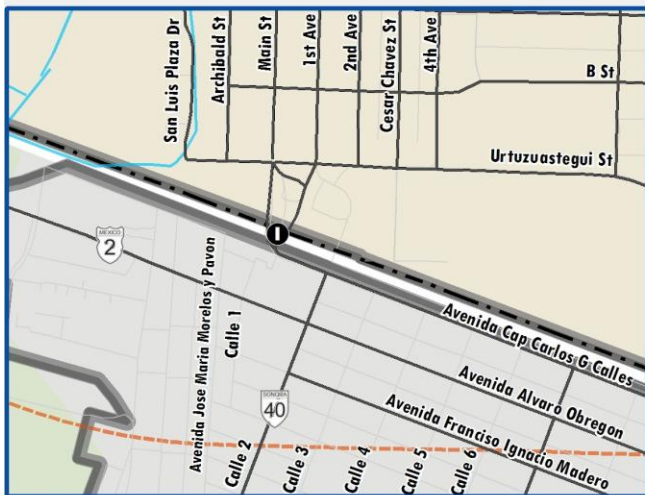
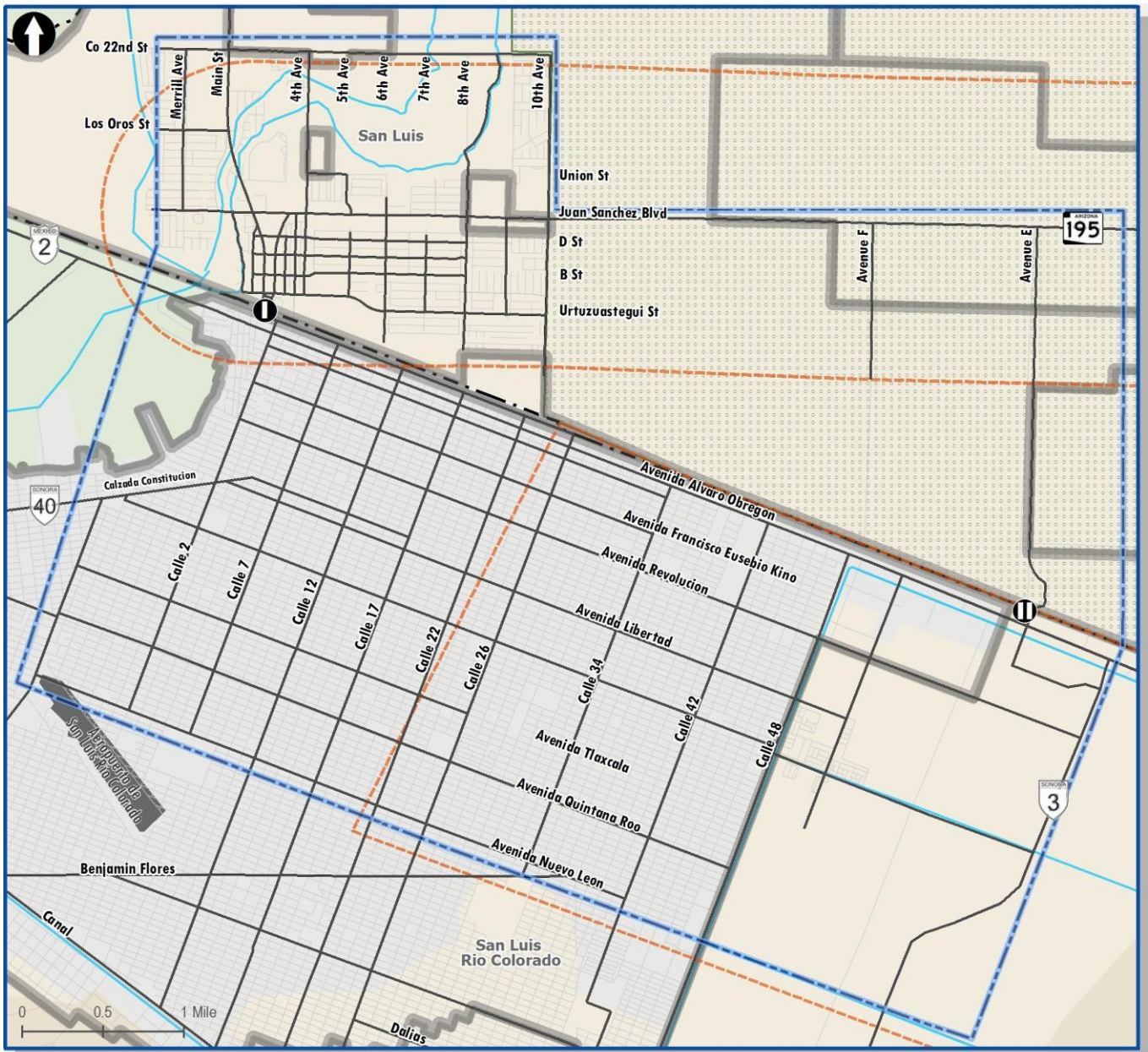


FIGURE 2.5: NATURAL ENVIRONMENT

- Wildlife Habitat Block
- Wildlife Linkage Zone
- Irrigated Agriculture
- Urban Area
- Sonoran Desertscrub
- Sandy Desert Vegetation
- Land Port of Entry
- Study Roadway
- Canal
- International Boundary
- Cities
- Study Area

Source: ADOT, ALRIS, SLRC, ADEQ, INEGI, USGS

EXISTING TRANSPORTATION CONDITIONS

This section inventories major elements of the existing transportation system and documents the status/condition of each element. Major elements inventoried include bridges, pavement condition, crashes, traffic conditions, roadway performance, and other modes of transportation in the study area.

Roadway System

Major Roadways

The study area is comprised of a network of arterials, collectors, and local roadways. The following is a summary of characteristics of the major roadways that transverse the study area:

- | | | | | | | | | | | | | | |
|--|---|----------------------|------------------------|------------|--------------------|-----------|------------|----------------------|-----------|------------|---------------------------|------------|--|
| <i>Mexico 2/
Avenida
Álvaro
Obregón</i> | <ul style="list-style-type: none"> ■ Federally owned east-west highway that provides interstate travel across Baja California, Sonora and Chihuahua. Also, serves as the regional connection to Mexicali in the west and Sonoyta in the east. ■ Four-lanes (two-lanes each direction) for majority of its length with the exception between Calle 6 and Calle 37 where the road was widened to include a center turn lane. ■ Speeds range from 22 mph (35 kph) to 31 mph (50 kph). ■ With eleven traffic signals, it is the most signalized roadway in the study area. | | | | | | | | | | | | |
| <i>Sonora 40/
Calle 2/
Calzada
Constitución:</i> | <ul style="list-style-type: none"> ■ North-south principal arterial that provides a regional connection from the U.S./Mexico border at San Luis Río Colorado I LPOE to the southern Sonoran communities. Through the study area, the route follows Calle 2 and Calzada Constitución. ■ Transitions from a two-lane (one-lane each direction) roadway at the border to a four-lane (two lane in each direction) roadway at Avenida Benito Juárez García. ■ Speed is 25 mph (35 kph) for entire length in study area. ■ Eight traffic signals located along the route, seven on Calle 2 and one on Calzada Constitución | | | | | | | | | | | | |
| <i>Sonora 3/
Libramiento</i> | <ul style="list-style-type: none"> ■ North-south principal arterial that provides a regional connection from the U.S./Mexico border at San Luis Río Colorado II LPOE to the southern Sonoran communities. ■ Transitions from a four-lane (two-lane each direction) roadway at Mexico 2/Avenida Álvaro Obregón to a two-lane (two lane in each direction) roadway just south of the commercial vehicle port of entry. ■ Speeds range from 22 mph (35 kph) to 31 mph (50 kph) ■ No signalized traffic control | | | | | | | | | | | | |
| <i>Other Major
Roadways:</i> | <table border="0" style="width: 100%;"> <tr> <td>■ Avenida Revolución</td> <td>■ Calzada Constitución</td> <td>■ Calle 26</td> </tr> <tr> <td>■ Avenida Libertad</td> <td>■ Calle 2</td> <td>■ Calle 34</td> </tr> <tr> <td>■ Avenida Nuevo León</td> <td>■ Calle 7</td> <td>■ Calle 48</td> </tr> <tr> <td>■ Avenida Benjamín Flores</td> <td>■ Calle 17</td> <td></td> </tr> </table> | ■ Avenida Revolución | ■ Calzada Constitución | ■ Calle 26 | ■ Avenida Libertad | ■ Calle 2 | ■ Calle 34 | ■ Avenida Nuevo León | ■ Calle 7 | ■ Calle 48 | ■ Avenida Benjamín Flores | ■ Calle 17 | |
| ■ Avenida Revolución | ■ Calzada Constitución | ■ Calle 26 | | | | | | | | | | | |
| ■ Avenida Libertad | ■ Calle 2 | ■ Calle 34 | | | | | | | | | | | |
| ■ Avenida Nuevo León | ■ Calle 7 | ■ Calle 48 | | | | | | | | | | | |
| ■ Avenida Benjamín Flores | ■ Calle 17 | | | | | | | | | | | | |



Roadway Functional Classification

Functional Classification is the grouping of streets and highways by the character of service they intend to provide. Defining a street's functional classification, serves as a basis for establishing speed limits, design standards, and access controls. Functional classifications for the study area are presented in Figure 2.6.

Number of Lanes and Posted Speed Limits

A visual review was conducted to inventory the number of lanes and posted speed limits for major roadways in the study area. In addition, traffic control type (signals, roundabouts, stop signs, etc.) at major intersections was also inventoried. Figure 2.7 displays the number of lanes for each roadway, Figure 2.8 displays posted speed limits, and Figure 2.9 identifies traffic signal locations. The following are key observations noted during the review:

- Number of Lanes:*
- Mexico 2/Avenida Álvaro Obregón: western study limits to Calle 6 (four-lanes)
 - Mexico 2/Avenida Álvaro Obregón: Calle 6 to Calle 37 (four-lanes plus center turn lane)
 - Mexico 2/Avenida Álvaro Obregón: Calle 37 to eastern study limits (four-lanes)
 - Avenida Franciso Eusebio Kino: Calle 2 to Calle 8 (four-lanes)
 - Avenida Franciso Eusebio Kino: Calle 26 to Calle 34 (two-lanes plus center turn lane)
 - Avenida Revolución: Calle 40 to east of Dr. Samuel Ocaña García (four-lanes)
 - Avenida Libertad: Calzada Constitución to Calle 26 (four-lanes)
 - Avenida Tlaxcala: Calle 7 to Calle 17 (two-lanes plus center turn lane)
 - Avenida Nuevo León: Calzada Monterrey to Calle 42 (two-lanes plus center turn lane)
 - Calzada Monterrey: Calzada Constitución to Avenida Nuevo León: (four-lanes)
 - Calle 2: Avenida Benito Juárez García to Avenida Tamaulipas (four-lanes)
 - Calle 2: Avenida Tamaulipas to Avenida Tlaxcala (four-lanes plus center turn lane)
 - Calle 7: Captain Carlos G. Calles y/o Avenida Internacional to Avenida Nuevo León (four-lanes)
 - Calle 12: Captain Carlos G. Calles y/o Avenida Internacional to Avenida Tlaxcala (four-lanes)
 - Calle 17: Captain Carlos G. Calles y/o Avenida Internacional to Avenida Zacatecas (four-lanes)
 - Calle 22: Mexico 2/Avenida Álvaro Obregón to Avenida Tamaulipas(four-lanes plus center turn lane)
 - Calle 22: Avenida Tamaulipas to Avenida Durango (four-lanes)
 - Calle 26: Captain Carlos G. Calles y/o Avenida Internacional to Avenida Francisco Ignacio Madero (four-lanes)
 - Calle 26: Avenida Francisco Ignacio Madero to Avenida Tlaxcala (four-lanes plus center turn lane)
 - Calle 26: Avenida Tlaxcala to southern study limits(four-lanes)
 - Calle 32: Avenida Revolución to Avenida Sinaloa "B" (two-lanes plus center turn lane)
 - Sonora 3/Libramiento: Mexico 2/Avenida Álvaro Obregón to south of commercial port of entry (four-lanes)
 - Calzada Constitución: Avenida Libertad to western study limit (four-lanes)
 - All other study roadway are two-lane (one-lane in each direction) roadway facilities



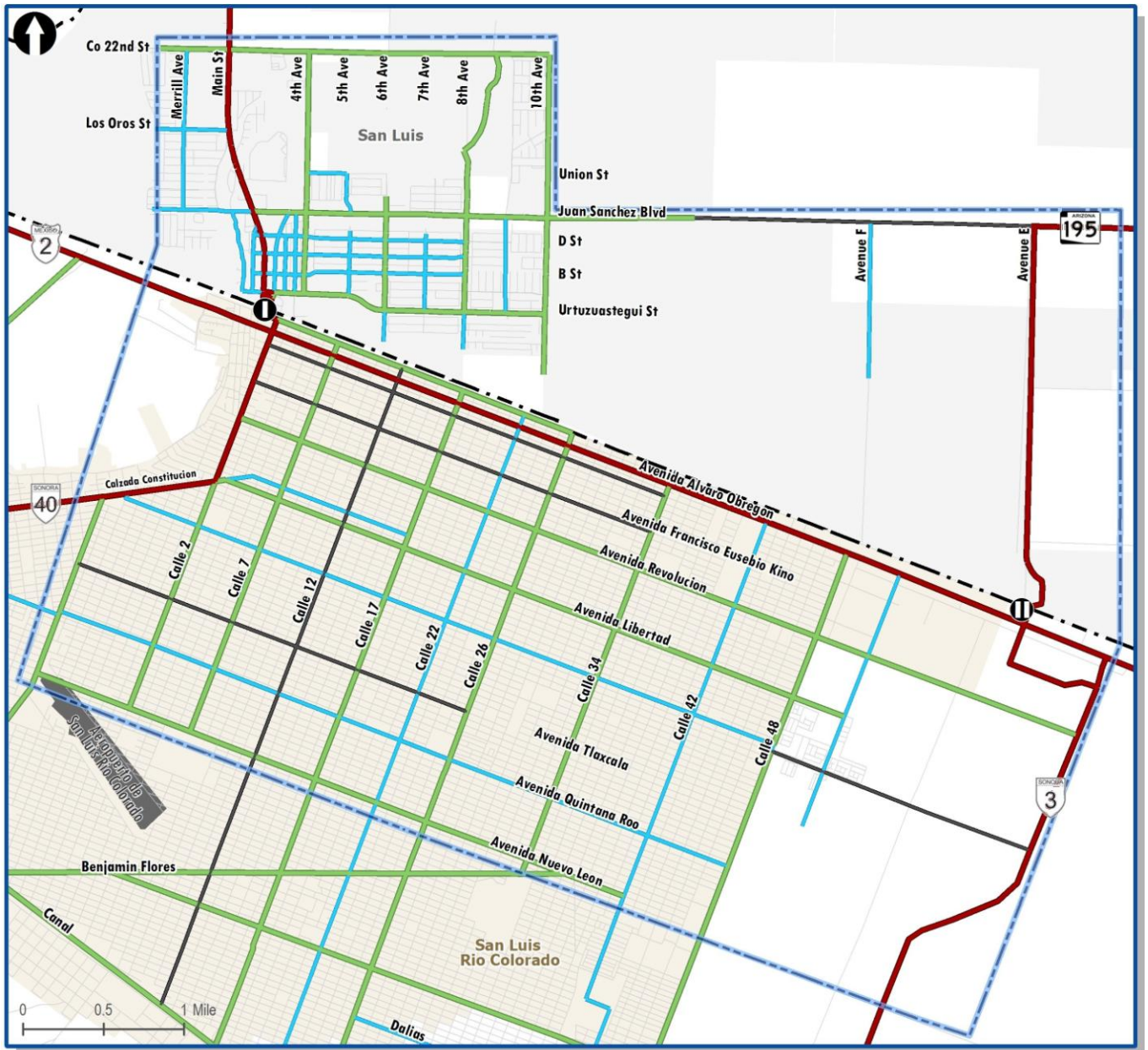


FIGURE 2.6: FUNCTIONAL CLASSIFICATION

- Principal Arterial
- Minor Arterial
- Collector
- Minor Collector
- Land Port of Entry
- - - International Boundary
- San Luis
- San Luis Rio Colorado
- Study Area

Source: ADOT, ALRIS, SLRC, ADEQ, INEGI, USGS, SL, YMPO



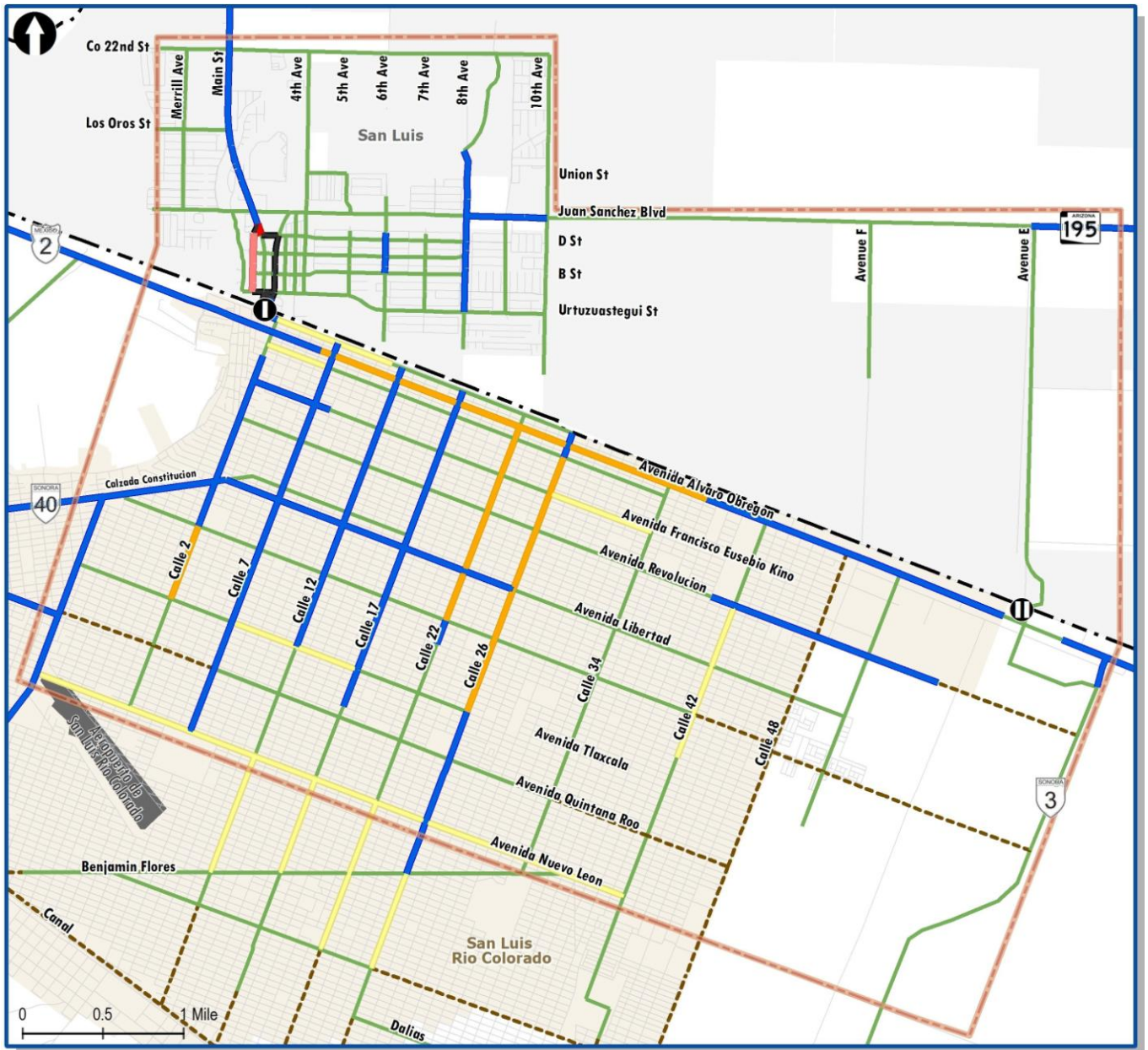


FIGURE 2.7: NUMBER OF LANES

- 4 Lanes with Center Turn Lane Paved
- 4 Lanes Paved
- 3 Lanes Paved
- 3 Lanes Paved (one-way)
- 2 Lanes with Center Turn Lane Paved
- 2 Lanes Paved
- 2 Lanes Paved (one-way)
- - - 2 Lanes Unpaved
- Land Port of Entry
- - - International Boundary
- San Luis
- San Luis Rio Colorado
- Study Area

Source: ALRIS, SLRC, ADEQ, INEGI, USGS, SL, YMPO



- Speed Limits:*
- Mexico 2/Avenida Álvaro Obregón ranges from 22 mph (35 kph) to 31 mph (50 kph)
 - Captain Carlos G. Calles y/o Avenida Internacional ranges from 22 mph (35 kph) to 31 mph (50 kph)
 - Majority of streets in the study area are 22 mph (35 kph) or less

- Traffic Signals:*
- | | |
|---|---|
| <ul style="list-style-type: none"> ■ Mexico 2/Avenida Álvaro Obregón and Calle 1 ■ Mexico 2/Avenida Álvaro Obregón and Calle 2 ■ Mexico 2/Avenida Álvaro Obregón and Calle 4 ■ Mexico 2/Avenida Álvaro Obregón and Calle 6 ■ Mexico 2/Avenida Álvaro Obregón and Calle 7 ■ Mexico 2/Avenida Álvaro Obregón and Calle 12 ■ Mexico 2/Avenida Álvaro Obregón and Calle 17 ■ Mexico 2/Avenida Álvaro Obregón and Calle 22 ■ Mexico 2/Avenida Álvaro Obregón and Calle 26 ■ Mexico 2/Avenida Álvaro Obregón and Calle 34 ■ Mexico 2/Avenida Álvaro Obregón and Calle 42 ■ Avenida Franciso Ignacio Madero and Calle 2 ■ Avenida Franciso Ignacio Madero and Calle 3 ■ Avenida Benito Juárez García and Calle 2 ■ Avenida Miguel Hidalgo y Costilla and Calle 2 ■ Avenida Franciso Eusebio Kino and Calle 6 ■ Avenida Franciso Eusebio Kino and Calle 7 ■ Avenida Franciso Eusebio Kino and Calle 12 ■ Avenida Franciso Eusebio Kino and Calle 26 ■ Avenida Revolución and Calle 2 ■ Avenida Revolución and Calle 7 ■ Avenida Revolución and Calle 12 ■ Avenida Revolución and Calle 17 ■ Avenida Revolución and Calle 22 ■ Avenida Revolución and Calle 26 ■ Avenida Revolución and Calle 34 ■ Avenida Libertad and Calle 7 ■ Avenida Libertad and Calle 12 ■ Avenida Libertad and Calle 17 ■ Avenida Libertad and Calle 22 ■ Avenida Libertad and Calle 26 ■ Avenida Libertad and Calle 34 ■ Avenida Tlaxcala and Calzada Monterrey ■ Avenida Tlaxcala and Calle 7 ■ Avenida Tlaxcala and Calle 12 | <ul style="list-style-type: none"> ■ Avenida Tlaxcala and Calle 17 ■ Avenida Tlaxcala and Calle 22 ■ Avenida Tlaxcala and Calle 26 ■ Calzada Aviación and Calzada Monterrey ■ Avenue Nuevo León and Calzada Monterrey ■ Avenue Nuevo León and Calle 9 ■ Avenue Nuevo León and Calle 12 ■ Avenue Nuevo León and Calle 17 ■ Avenue Nuevo León and Calle 22 ■ Avenue Nuevo León and Calle 26 ■ Calzada Constitución and Calle 2 ■ Calzada Constitución and Calzada Monterrey |
|---|---|



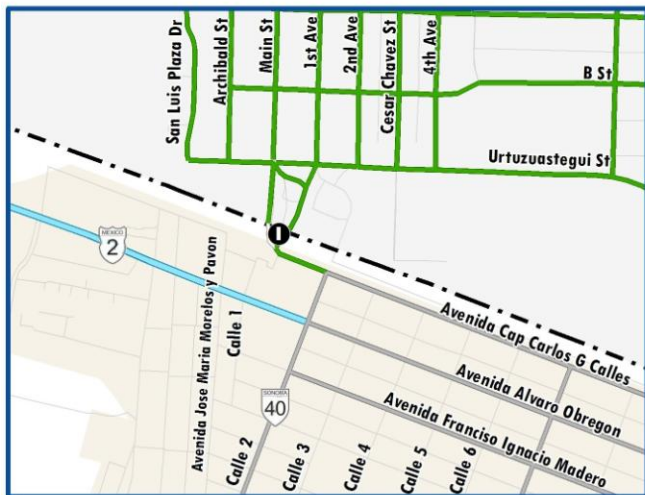
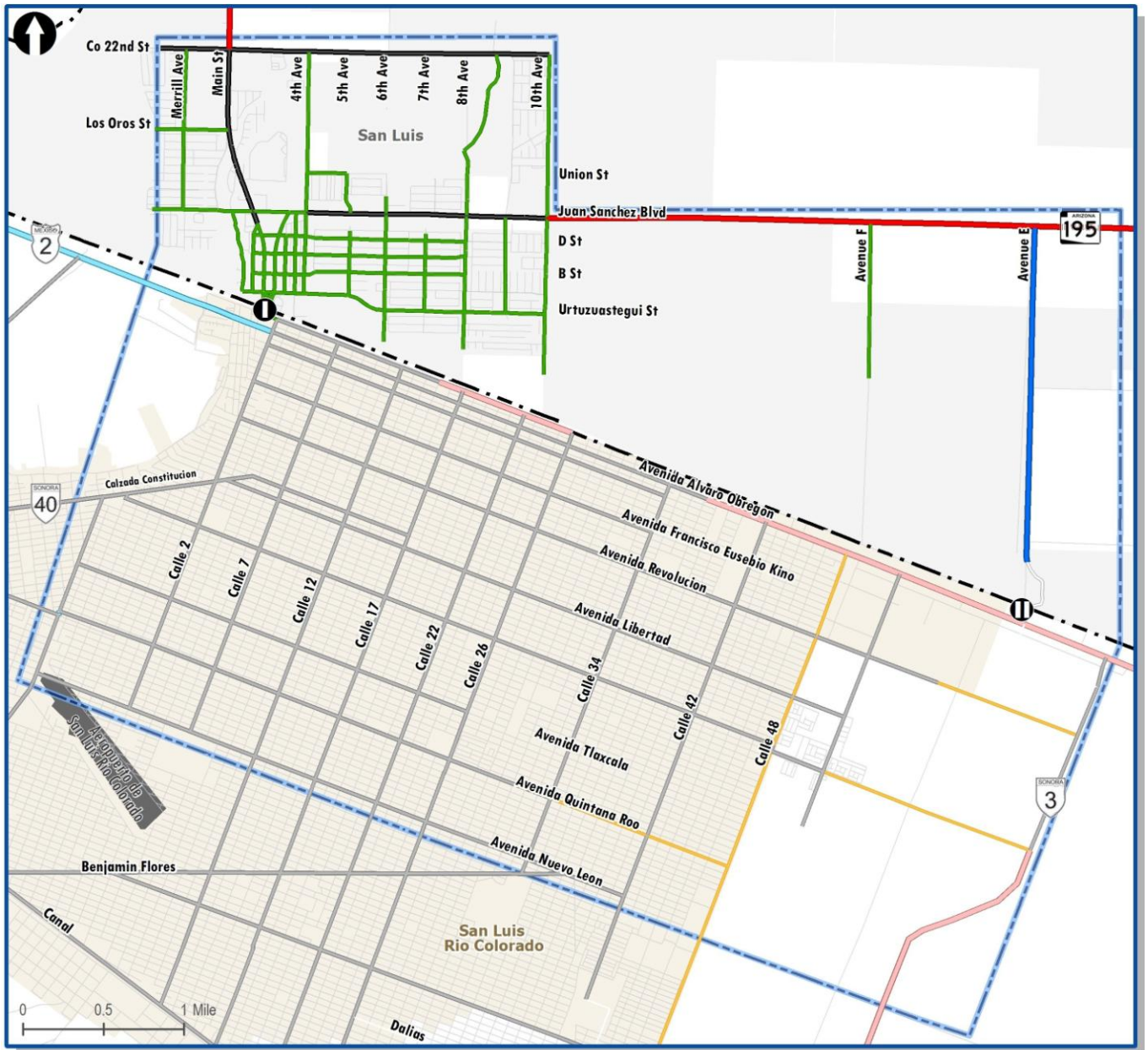


FIGURE 2.8: SPEED LIMITS

San Luis		San Luis Rio Colorado		Legend
—	50 - 55 MPH	—	50 KPH	
—	40 - 45 MPH	—	40 - 45 KPH	- - - International Boundary
—	30 - 35 MPH	—	30 - 35 KPH	○ San Luis
—	20 - 25 MPH	—	20 - 25 KPH	○ San Luis Rio Colorado
—	15 MPH	—	15 KPH	□ Study Area
—	0 MPH	—	0 KPH	

Source: ALRIS, SLRC, ADEQ, INEGI, USGS, SL, YMPO



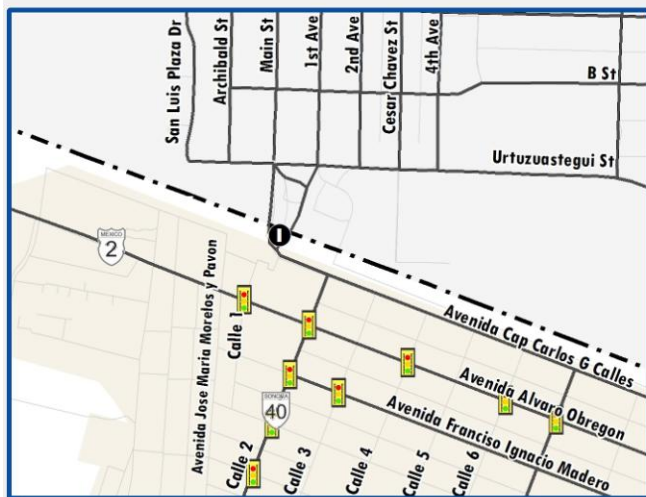
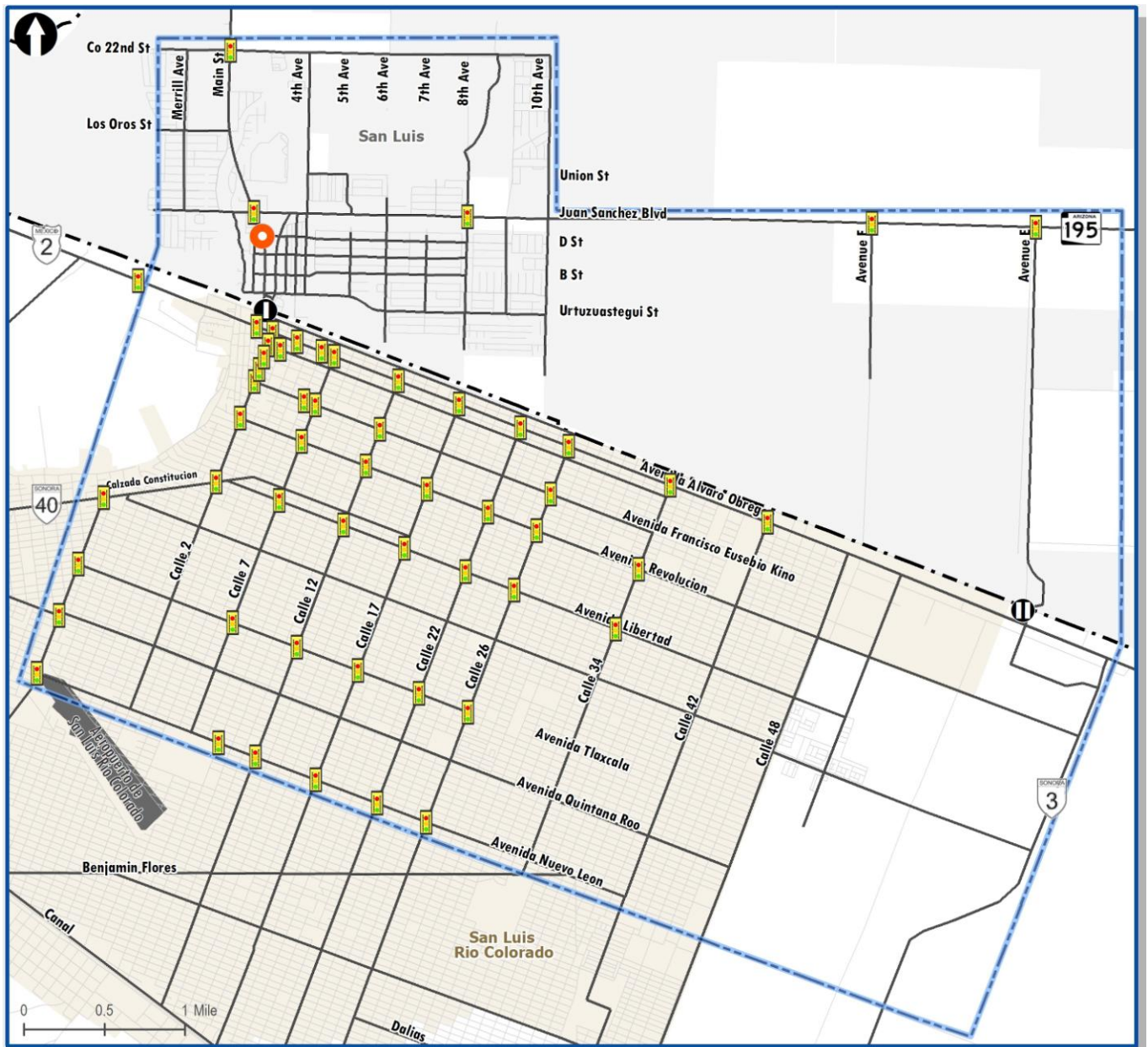










FIGURE 2.9: TRAFFIC CONTROL

-  Roundabout
-  Traffic Signal
-  Land Port of Entry
-  Study Roadway
-  International Boundary
-  San Luis
-  San Luis Rio Colorado
-  Study Area

Source: ALRIS, SLRC, ADEQ, INEGI, USGS



Pavement Condition

Of the total 77.8 miles of study area roadway, 7.9 miles are unpaved. A majority of the unpaved roads are located in the eastern portion of the study area, but Calle 48, which extends from Avenida Álvaro Obregón to the southern study limits, is unpaved for its entire length. Data for pavement conditions for the study area and City were not available while visual inspection of pavement was limited to Google Street View 2009.

Bridge Condition

According to the *San Luis Río Colorado 2040, Programa de Desarrollo Urbano de Centro de Población de La Ciudad de San Luis Río Colorado, Sonora*, most of the bridges in the study area are located along Calle 48 canal near the eastern city limits. Major crossings include Avenida Revolución and Avenida Libertad, while minor crossings include Avenida Tamaulipas and Nuevo León. Bridge conditions in the study area as well as for the City of San Luis Río Colorado were not available.

Crash Data Analysis

A crash analysis was conducted to identify trends, patterns, predominant crash reasons, and high crash rate intersections and corridors. The purpose of the crash analysis is to identify safety hazard locations that need to be addressed to improve area safety. Historical crash data from INEGI data bank was available, however the data is limited and aggregated at municipal and state levels. Data for crashes occurring between 2004 and 2009 was obtained from INEGI data bank for the Municipality of San Luis Río Colorado. As previously mentioned, a majority of the Municipality population resides in the City of San Luis Río Colorado and crash trends may reflect traffic conditions in the City. As shown in Figure 2.10, the total number of crashes peaked in 2007, and has since steadily declined. As illustrated in Figure 2.11, a total of 8,631 crashes occurred during the five year time period; collision with another vehicle accounted for 65 percent of the crashes while another 22 percent of the crashes were collisions with a fixed object.

With help from the City staff, high crash and conflict intersections in the study area were identified and are displayed in Figure 2.12. While a majority of the intersections in the northern portion of the city boundary experience conflict, high crash intersections are located throughout the study area.

FIGURE 2.10: MUNICIPALITY HISTORICAL CRASH TRENDS

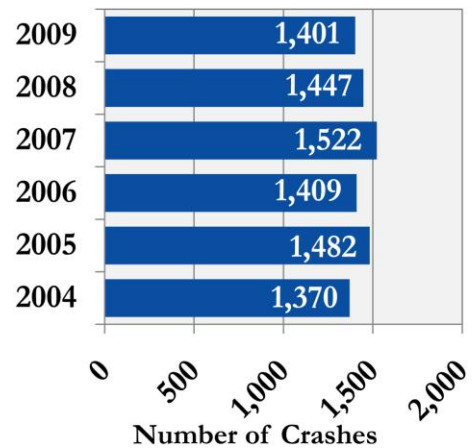
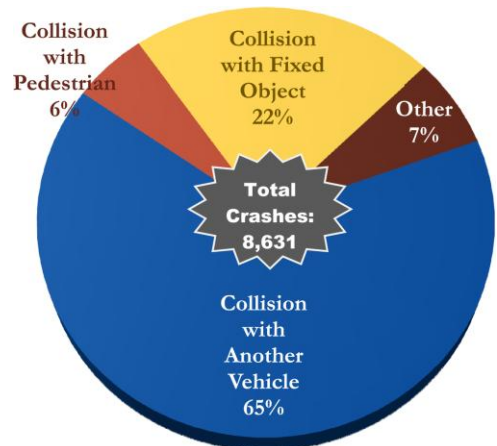


FIGURE 2.11: MUNICIPALITY HISTORICAL COLLISION TYPE



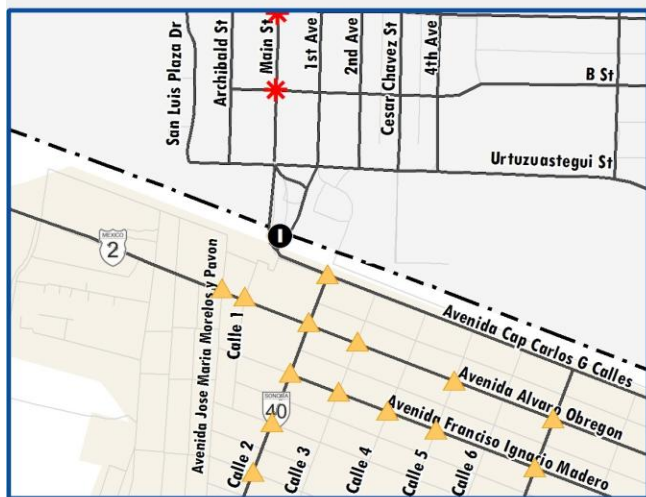
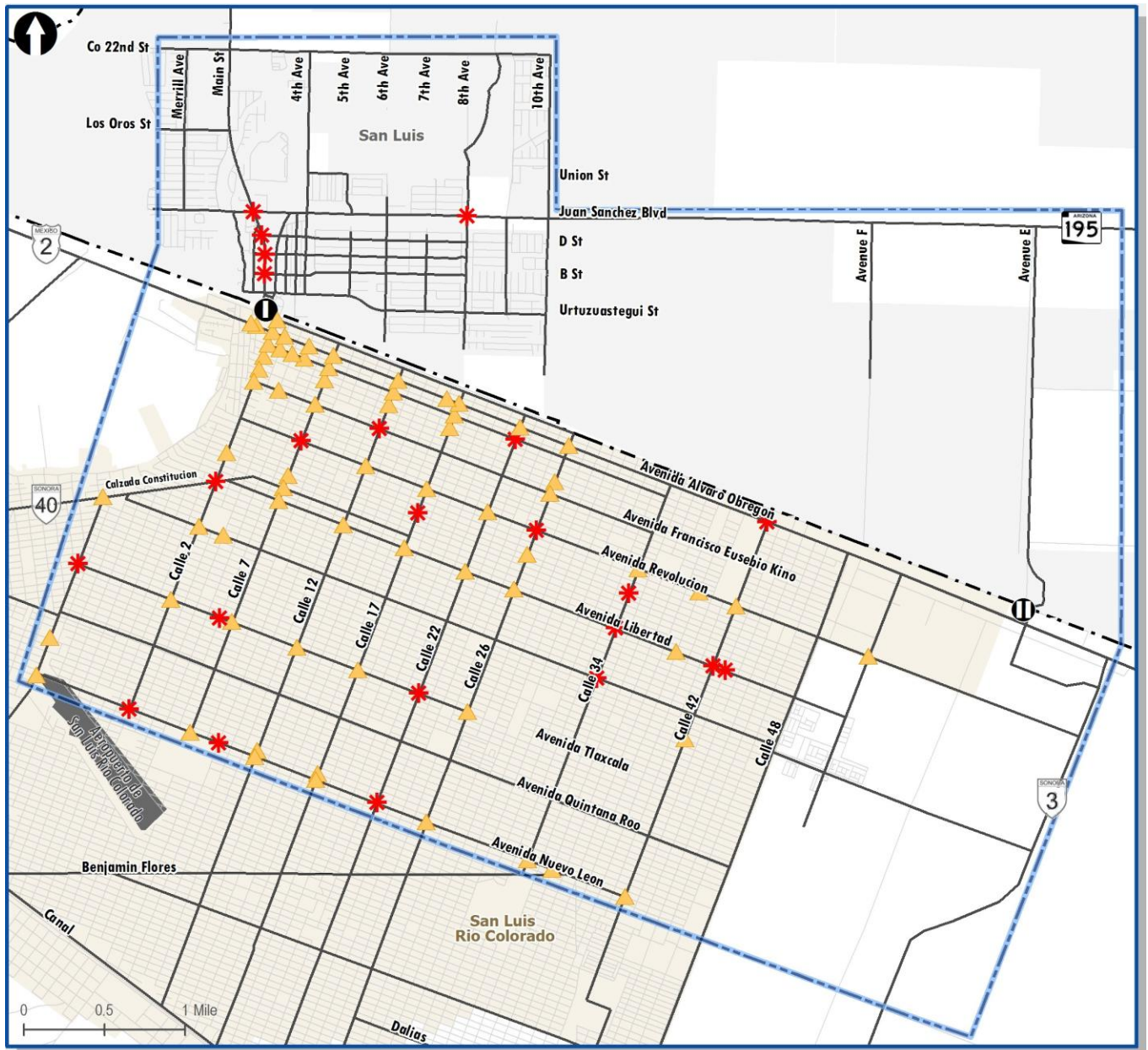


FIGURE 2.12: HIGH CRASH LOCATIONS

- * High Crash Location
- ▲ Conflict Location
- Land Port of Entry
- Study Roadway
- International Boundary
- San Luis
- San Luis Rio Colorado
- Study Area

Source: U.S. Census 2010, ADOT, ALRIS, SLRC, ADEQ, INEGI, USGS, SL, Accident Location Identification Surveillance System Database (January 2006 - December 2012)



A total of 19 intersections were identified as high crash intersections, 10 were signalized intersection and 9 were unsignalized:

Signalized Intersection

- Avenida Álvaro Obregón and Calle 42
- Avenida Franciso Eusebio Kino and Calle 12
- Avenida Revolución and Calle 7
- Avenida Revolución and Calle 26
- Calzada Constitución and Calle 2
- Avenida Libertad and Calle 34
- Avenida Tlaxcala and Calzada Monterrey
- Avenida Tlaxcala and Calle 22
- Avenida Nuevo León and Calle 9
- Avenida Nuevo León and Calle 22

Predominant violations included lack of caution when driving, failing to yield ROW to left turning vehicle, followed too closely, and running red lights.

Unsignalized Intersection

- Avenida Franciso Ignacio Madero and Calle 22
- Avenida 16 de Septiembre and Calle 17
- Avenida 16 de Septiembre and Calle 34
- Avenida Libertad and Calle 42
- Avenida Libertad and Calle 43
- Avenida Tamaulipas and Calle 9
- Avenida Tamaulipas and Calle 34
- Avenida Tlaxcala and Calle 6
- Avenida Nuevo León and Calle 2

Predominant violations included lack of caution when driving, failing to yield ROW, and disregard for stop sign.



Traffic Conditions

Employment is an essential element of the socioeconomic data which is one of the primary inputs to the travel demand modeling process that is used to replicate the traffic demand and conditions in the study area for the base year. With little to no employment data available, a travel demand model for San Luis Río Colorado was not developed for the base year 2013.

Level of Congestion

Traffic congestion levels of major roadways within the study area were estimated using existing traffic count data. The degree of traffic congestion is commonly expressed in terms of Level of Service (LOS). LOS is a measurement of traffic congestion conditions defined by the Transportation Research Board's (TRB) Highway Capacity Manual (HCM). For a planning level analysis, the roadway LOS is determined based on the ratio of traffic volume on the road to the capacity of the road. Capacity of the road is a function of the number of lanes, functional classification, speed, and roadway geometrics and provides thresholds for the maximum number of cars allowed to travel on a lane for the peak or daily conditions. Each level of service is given a letter grade based on its level of congestion, ranging from "A" through "F", with LOS A representing free flowing traffic conditions where vehicles experience minimal delays, and LOS F represents failure conditions where vehicles experience long delays.

Road segment LOS is characterized by the HCM as follows:

LOS A: Best, free flow operations (on uninterrupted flow facilities) and very low delay (on interrupted flow facilities). Freedom to select desired speeds and to maneuver within traffic is extremely high.

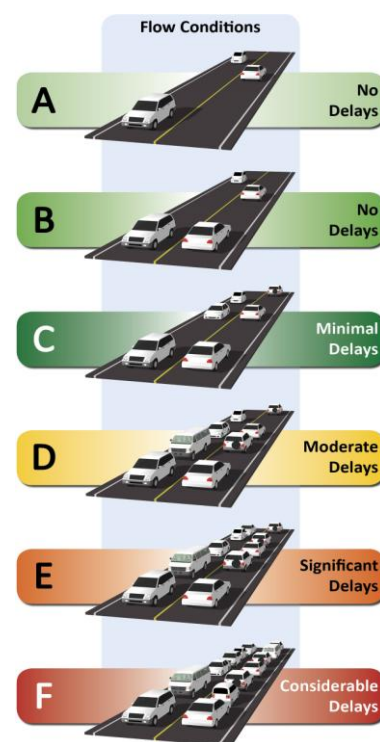
LOS B: Flow is stable, but presence of other users is noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within traffic.

LOS C: Flow is stable, but the operation of users is becoming affected by the presence of other users. Maneuvering within traffic requires substantial vigilance on the part of the user.

LOS D: High density but stable flow. Speed and freedom to maneuver are severely restricted. The driver is experiencing a generally poor level of comfort and convenience.

LOS E: Flow is at or near capacity. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within traffic is extremely difficult. Comfort and convenience levels are extremely poor.

LOS F: Worse, facility has failed, or a breakdown has occurred.



In general for rural areas, LOS A and B represent no or minimal congestion, LOS C represents moderate congestion, and LOS D, E, and F represent significant and considerable congestion.

With the help of City staff, roadways that experience daily levels of moderate to high congestion in the study area were identified. The six levels of service (LOS A - F) were combined into three congestion levels: Low (LOS A and B), Moderate (LOS C and D), and High (LOS E and F). Figure 2.13 displays the base year 2013 level of congestion for the study roadways. Currently, all roads located within the study area operate at low levels of congestion (LOS A and B), except for the following:

Moderate Congestion (LOS C and D)

- Avenida Álvaro Obregón: Calle 2 to Calle 7
- Avenida Francisco Igancio Madero: Calle 2 to Calle 7
- Avenida Francisco Eusebio Kino: Calle 2 to Calle 7
- Calle 2: Avenida Captain Carlos G. Calles y/o Avenida Internacional to Calzada Constitucion
- Calzada Constitucion: Calle 2 to western study limits

It should be noted that high congestion levels were observed during the morning and evening peak hours on the roads that lead to and from the San Luis I LPOE.

High Congestion (LOS E and F)

- Avenida Captain Carlos G. Calles y/o Avenida Internacional: San Luis I LPOE to Calle 6
- Calle 1: San Luis I LPOE to Avenida Benito Juarez Garcia



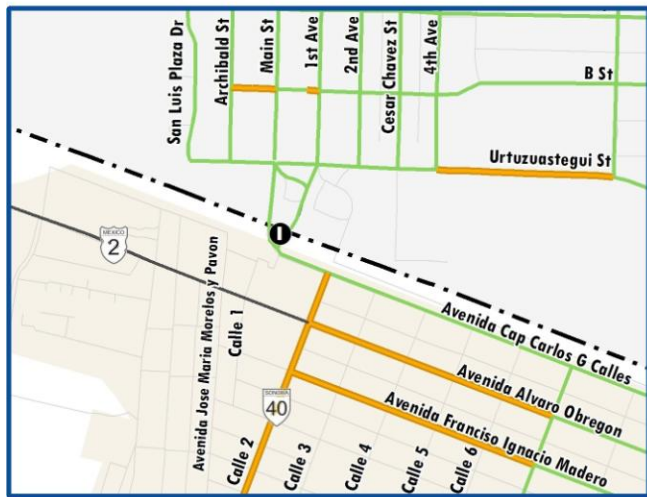
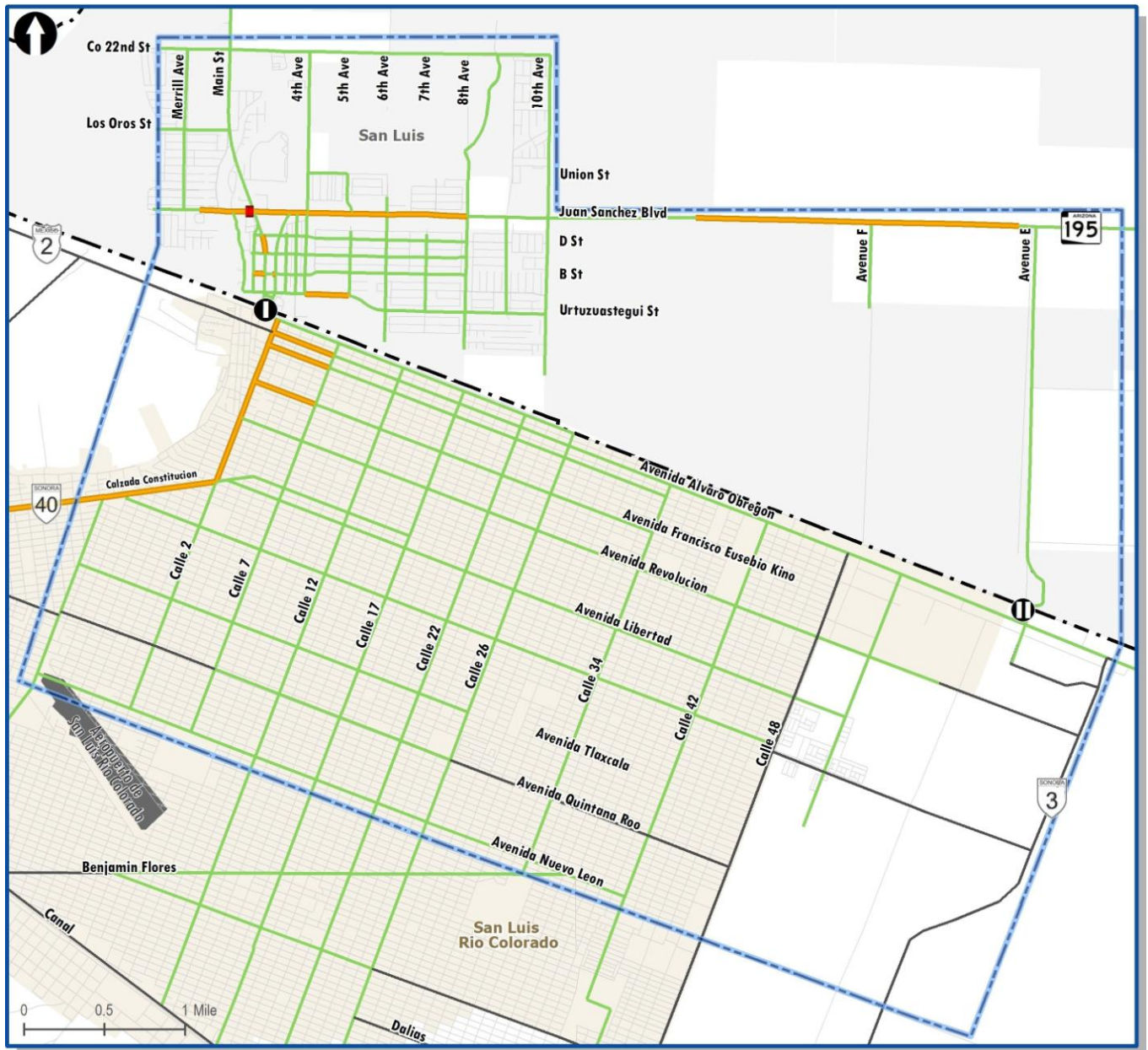
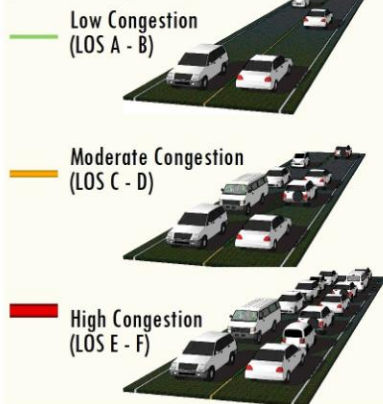


FIGURE 2.13: YEAR 2013 LEVEL OF CONGESTION

Level of Congestion



- Land Port of Entry
- - - International Boundary
- San Luis
- San Luis Rio Colorado
- Study Area

Source: ADOT, ALRIS, SLRC, ADEQ, INEGI, USGS, SL, YMPO



Other Modes of Transportation

Alternative modes of transportation are an important aspect of the multimodal transportation network as they provide mobility for those not able to operate or without access to a vehicle.

Pedestrian and Bicycle Facilities

The large number of pedestrians and bicyclists that crosses at San Luis Río Colorado I LPOE travels for a variety of reasons including: medical reasons, personal trips like visiting family, and return trips home after work and/or shopping. Figure 2.14 displays the pedestrian and bicycle facilities in the study area. Key observations include:

- Sidewalks are located throughout the study area along the study roadways, although as the roads extend further away (south and east) from the core activity area sidewalks lack connectivity.
- The study area roadways that are paved include shared bike lanes, however Calle 48 and portions of Avenida Tamaulipas and Avenida Quintana Roo have unpaved bike lanes.

Transit Service

Figure 2.15 displays the different bus routes that serve the study area. Transit services are provided throughout the study area, two bus stops located in the northwest corner of city are the initial starting points for the different routes that provide service to the different parts of the city. The 1st bus stop, near Avenida Francisco Ignacio Madero and Calle 2, services the following routes:

- Cinco de Mayo - Bosque
- Seguro Social
- Hidalgo - Calle 26
- Félix Contreras - Calle 30
- Kino - Tlaxcala
- Madero - Forest

The 2nd bus stop, near Avenida Francisco Ignacio Madero and Calle 3, services the following routes:

- Colima - Tamaulipas
- Tamaulipas - México
- 16 de Septiembre - Zaragoza
- Jalisco - Libertad

In addition, there are three bus carriers that provide international services and all are located in the core activity center.

- Terminal Transportes del Pacifico
- Central de Transportes ABC
- Terminal de Transportes Suburbanos



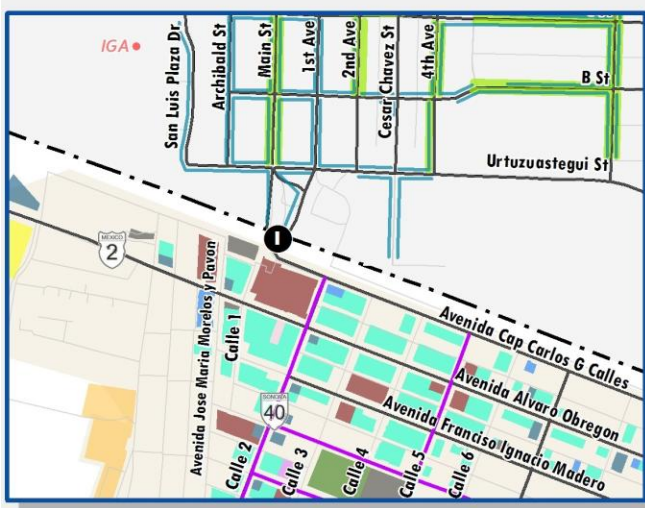
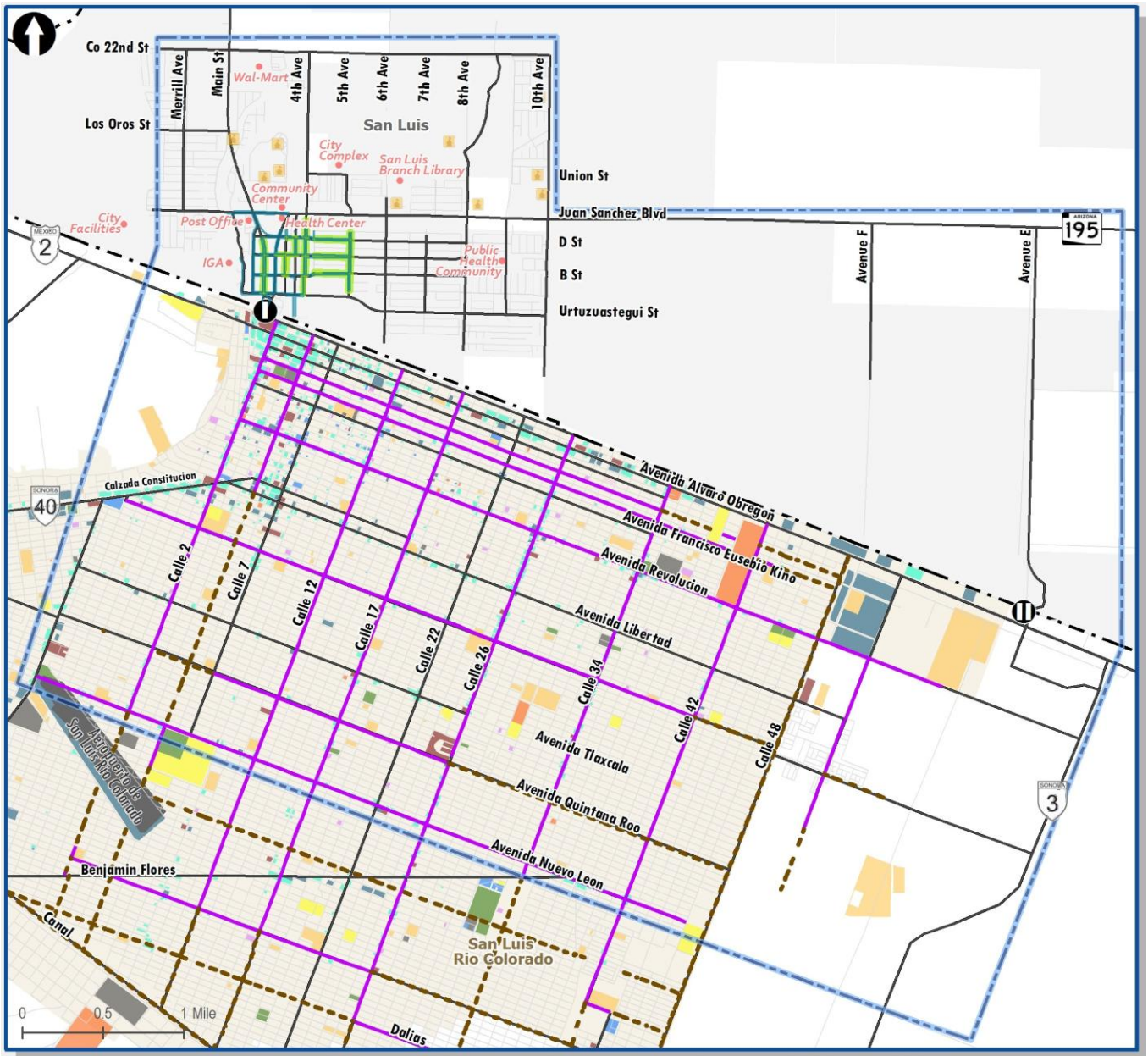


FIGURE 2.14: SIDEWALK AND BICYCLE FACILITIES

<ul style="list-style-type: none"> ● Major Activity Center in San Luis ■ Schools in San Luis — Sidewalk — On-Street Parking — Current Bike Lane (Paved) — Current Bike Lane (Unpaved) 	<ul style="list-style-type: none"> ■ Major Activity Centers in San Luis Rio Colorado ■ Shopping Center ■ Commerical Corridor ■ Economics ■ Educational ■ Public Areas ■ Management Offices ■ Parks ■ Religion ■ Health ■ Culture ■ Sports Areas 	<ul style="list-style-type: none"> ● Land Port of Entry — Study Roadway ○ San Luis ○ San Luis Rio Colorado □ Study Area
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Source: ADO, ALRIS, SLRC, ADED, INEGI, USGS, SL, TMO

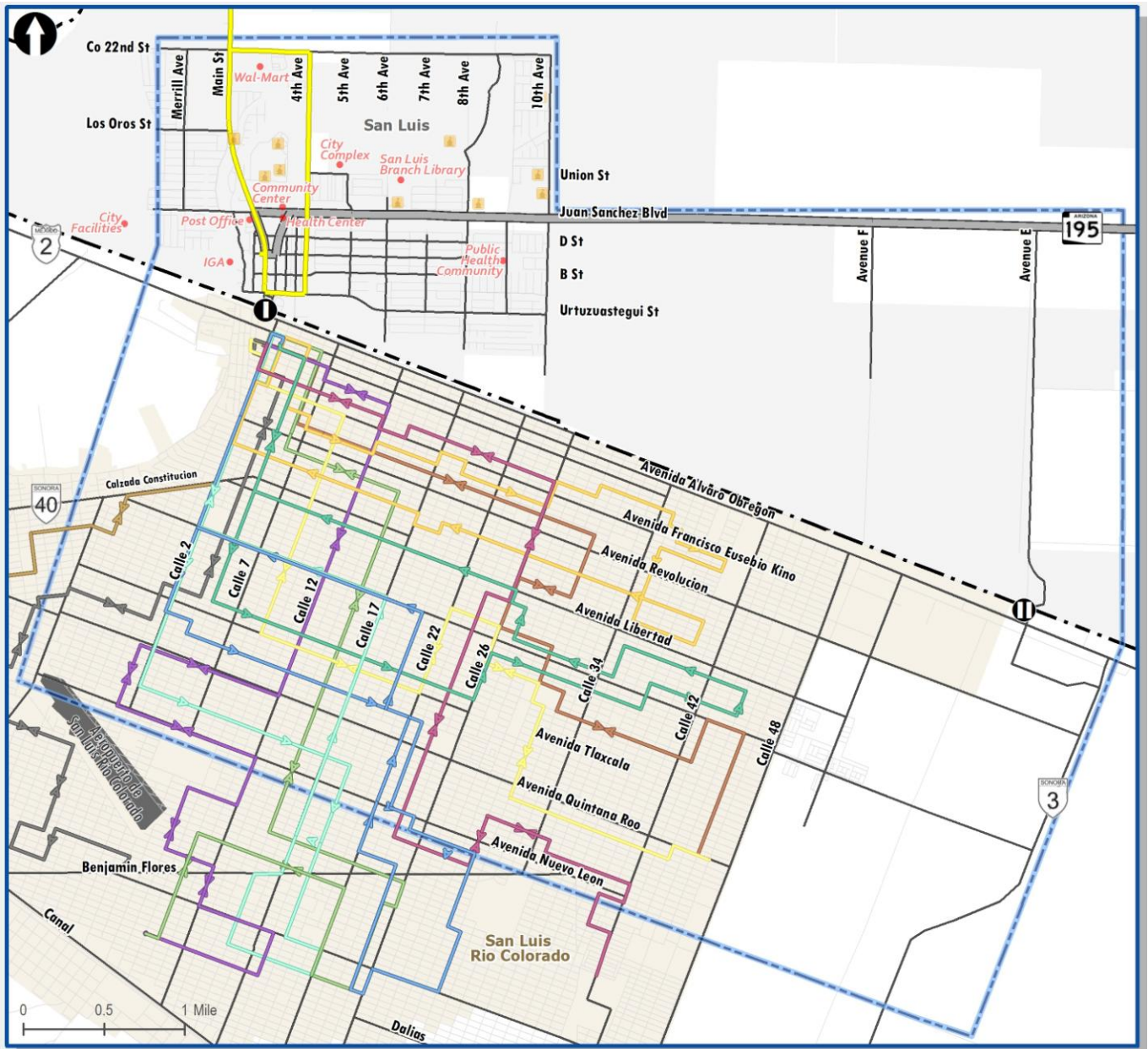
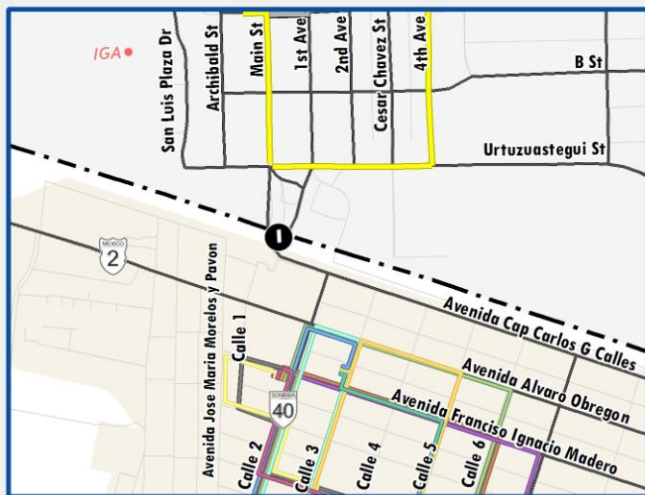


FIGURE 2.15: TRANSIT FACILITIES



- Major Activity Center in San Luis
- Schools in San Luis
- YCAT Yellow Route 95
- YCAT Silver Route 9
- San Luis Rio Colorado Transit Routes
- Land Port of Entry
- Study Roadway
- San Luis
- San Luis Rio Colorado
- Study Area

Source: ADOT, ALRIS, SLRC, ADEQ, INEGI, USGS, SL, YMPD



FUTURE SOCIOECONOMIC CONDITIONS

Forecasting future socioeconomic conditions allows us to anticipate changes in future travel demand and travel patterns and to envision potential solutions. Development of rational projections for population, housing units, and employment is vital to the process of forecasting realistic future travel demand.

Population, Housing Unit, and Employment Forecasts

Since the study area is located within the city limits of San Luis Río Colorado, projections developed for a moderate growth scenario in the *San Luis Río Colorado 2040, Programa de Desarrollo Urbano de Centro de Población de La Ciudad de San Luis Río Colorado, Sonora* were used for the horizon years 2020, 2030, and 2040. In the base year 2013 approximately 64 percent of the city population was located in the study area. Using the same trend, the study area population is estimated to be 127,093 by 2020, 162,690 by 2030, and 198,318 by 2040.

The forecast for housing units is assumed to retain the base year population to occupied housing unit ratio for future horizon years resulting in an estimated 34,092 units by 2018, 43,641 units by 2030, and 53,198 by 2040 in the study area. Table 6.1 shows a tabular summary of the base year and projected population along with the number of housing units in the study area. Future employment data for the study area as well as for San Luis Río Colorado was not available.

TABLE 2.3: PROJECTED POPULATION AND HOUSING UNITS

		2013	2020	2030	2040
Study Area	Population	111,264	127,093	162,690	198,318
	Occupied Housing Unit	29,846	34,092	43,641	53,198
	<i>Average Household Size</i>	<i>3.73</i>	<i>3.73</i>	<i>3.73</i>	<i>3.73</i>
City of San Luis Río Colorado	Population	171,274	195,639	250,435	305,279
	Occupied Housing Unit	45,944	52,480	67,179	81,890
	<i>Average Household Size</i>	<i>3.73</i>	<i>3.73</i>	<i>3.73</i>	<i>3.73</i>
Municipality of San Luis Río Colorado	Population	192,896	214,138	268,813	327,279
	Occupied Housing Unit	51,716	57,411	72,069	87,852
	<i>Average Household Size</i>	<i>3.73</i>	<i>3.73</i>	<i>3.73</i>	<i>3.73</i>

FUTURE TRANSPORTATION CONDITIONS

With little to no employment data or information available for each of the future horizon years, a future travel demand model for the San Luis Río Colorado area could not be developed.



3.0 TRANSPORTATION NEEDS

Based on an inventory and analysis of existing conditions, transportation deficiencies and issues were identified. These issues and deficiencies form the basis for the next phase of the study, which is the development of a transportation plan.

TRANSPORTATION ISSUES SUMMARY

Figure 3.1 displays the current major transportation issues in the study area. Study area issues have been grouped into five categories and the key issues in each category are listed below.

Safety issues:

- High number of intersection related crashes
- Majority of the intersection conflict occur in the core activity area in the northern portion of the city boundary near the international border
- Signage visibility

Mobility issues:

- Congestion in the core activity area, specifically along Avenida Captain Carlos G. Calles y/o Avenida Internacional during the morning peak periods and Calle 1 during the evening peak periods
- Lack of signal timing and coordination, especially in the core activity area
- Lack of pavement striping
- Unpaved roads in the eastern portion of the study area
- Access management issues in the core activity area as well as in the remaining portions of the study area

Pedestrian, and bicycle issues:

- Limited sidewalk connectivity especially outside of the core activity area
- Pedestrian congestion in the core activity area during the morning and evening peak periods
- Unpaved bicycle lanes
- Limited bicycle facilities such as bike stations or bike racks

Environmental issue

- More than half of the study area is located in the wildlife habitat block



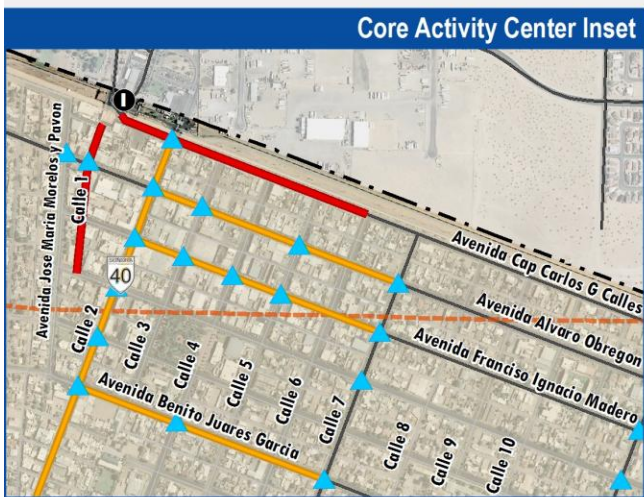
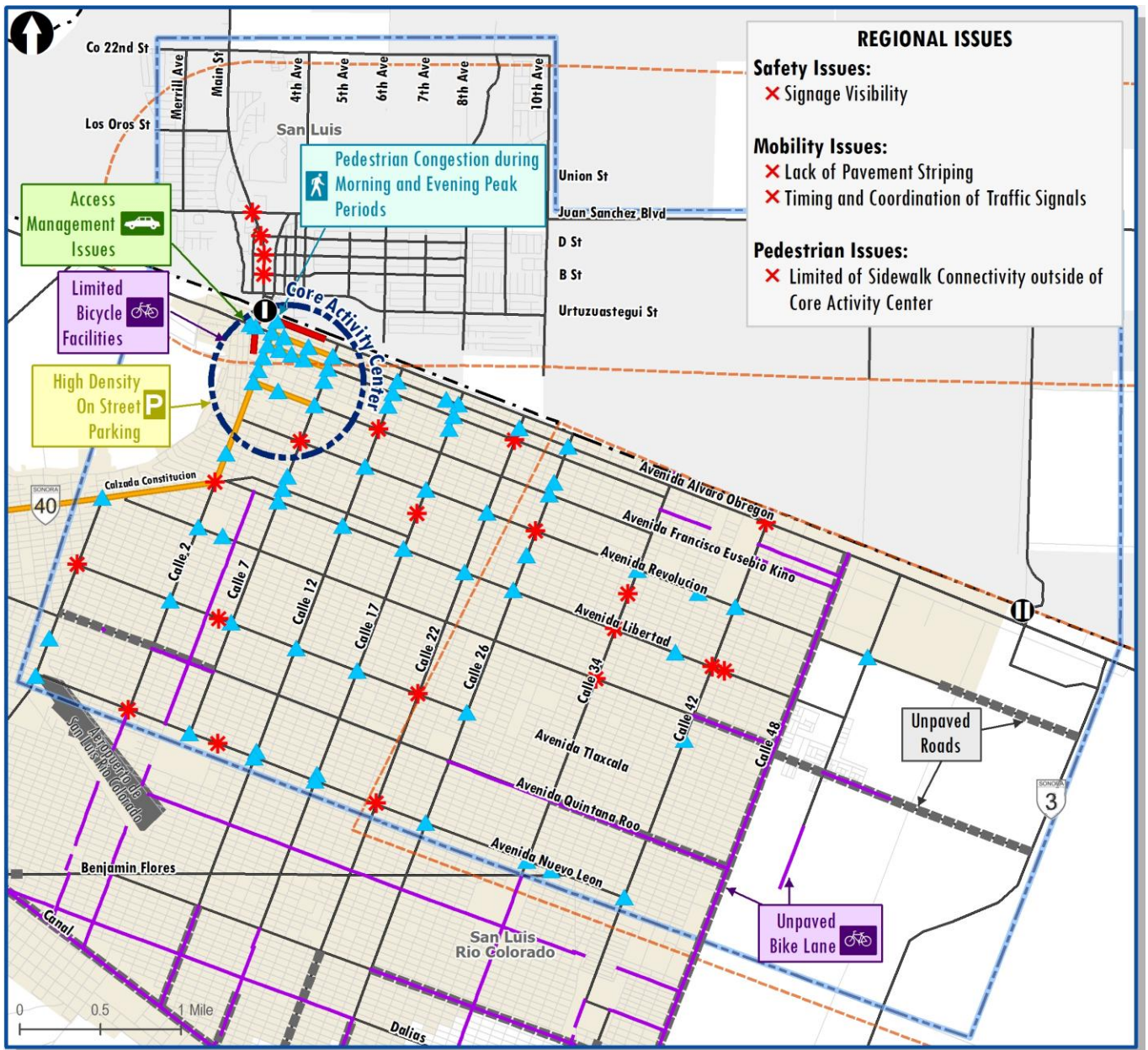


FIGURE 3.1: TRANSPORTATION ISSUES

- ✗ High Crash Location
- ▲ Conflict Location
- Unpaved Bike Lane
- Unpaved Road
- Moderate Congestion
- High Congestion during AM and PM Peak Periods
- - - Potential Linkage Zone
- ⊞ Core Activity Center
- Land Port of Entry
- Study Roadway
- - - International Boundary
- San Luis
- San Luis Rio Colorado
- ⊞ Study Area

Source: ADOT, ALRIS, SLRC, INEGI, USGS



With its close proximity to the border and to a major federal highway (Mexico 2), shopping centers, commercial retail, and health care facilities as well as some educational facilities, the Core Activity Area experiences intense vehicular and pedestrian traffic on a daily basis. A visual review, using Google Street View 2009, of the Core Activity Area helped identify additional issues and deficiencies pertinent to the area.

Roadway Issues

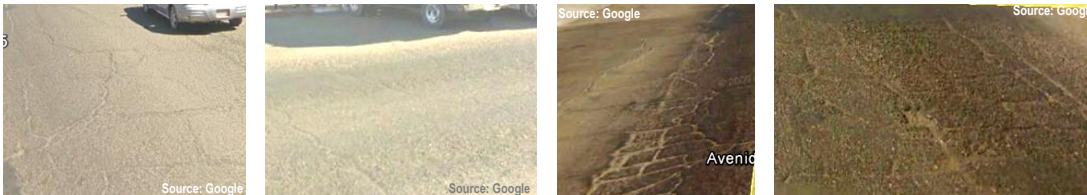
■ **Faded roadway signage**



■ **Inconsistent signage sizes**



■ **Poor pavement surface**



■ **Lack of pavement striping**



■ **High density parking**



■ **Faded or no striped parking spaces**



Intersections

■ Traffic control visibility and location



■ Inconsistent signal type



■ Faded or no striping for turn lanes



■ No exclusive left or right turn lane



■ Faded or no stop bar



■ Obstructed view of on-coming traffic



■ Parked cars at intersections



■ Faded or no pedestrian crosswalk



■ Unsafe Pedestrian Crossing



STATUS UPDATE OF PROJECTS IDENTIFIED IN THE PREVIOUS PLAN

The *San Luis Río Colorado 2040, Programa de Desarrollo Urbano de Centro de Población de La Ciudad de San Luis Río Colorado, Sonora* identified a variety of infrastructure and program improvements for three time frames: short-, mid-, and long-term. The improvements pertinent to the study area are displayed in Table 3.1. A visual review, using Google Street View, help identify the status of several recommended improvements which are denoted in bold.

TABLE 3.1: SAN LUIS RÍO COLORADO 2040 MULTIMODAL TRANSPORTATION IMPROVEMENTS

Proposed Action	Term			Sector		
	Short	Mid	Long	Public	State	Federal
Structural Axes						
Extend Avenida Revolución alignment east of Calle 42 <i>(Status: road is paved to west of Miguel de la Madrid)</i>	■	■		■		
Extend Avenida Libertad alignment east of Calle 42 <i>(Status: road is paved to Calle Doctor Samuel Ocaña)</i>		■		■		
Extend Avenida Tamaulipas alignment east of Calle 42		■		■		
Extend Avenida Jalisco alignment east of Calle 42			■	■		
Extend Avenida Quintana Roo alignment east of Calle 42			■	■		
Extend Avenida Nuevo León alignment east of Calle 42 <i>(Status: road is paved to Calle 47)</i>		■	■	■		
Extend Calle A alignment south of Avenida Quintana Roo			■	■		
Extend Calle B alignment south of Avenida Revolución			■	■		
Extend Calle C-Bypass to Mexico 2/Sonoyta-Mexico 2, the road to Mexicali	■	■		■		
Extend Calle D alignment to intersection of border and Avenida Quintana Roo		■		■		
Extend Calle E alignment south of Avenida Nuevo León		■		■		
Extend Calle F alignment south of Mexico 2 to Sonoyta			■	■		
Extend Calle G alignment south of Mexico 2 to Sonoyta		■		■		
Extend Calle H alignment south of Mexico 2 to Sonoyta		■	■	■		
Extend Calle I alignment south of Mexico 2 to Sonoyta			■	■		
Public Transportation						
Establishment of public transport terminals and rides	■	■		■	■	
Improve pavement condition of current routes	■			■	■	
Traffic Lights						
Implement a centralized system of traffic lights	■	■		■	■	
Incorporate a technical office of operation, programming, and maintenance of traffic light system	■			■	■	
Pedestrians						
Improve sidewalks in the city center	■			■		
Improve sidewalks near schools, churches, hospitals and high pedestrian activity areas	■	■		■		
Infrastructure for the mobility limited population	■	■	■	■		
Pedestrian crosswalks	■	■		■		
Pedestrian paths	■	■		■		



**TABLE 3.1: SAN LUIS RÍO COLORADO 2040 MULTIMODAL TRANSPORTATION IMPROVEMENTS
(Continued)**

Proposed Action	Term			Sector		
	Short	Mid	Long	Public	State	Federal
Bike Paths						
Establish bike network	■	■		■		
Generate a hierarchy and types of bike paths depending on corridor	■	■		■		
Pavement Maintenance						
Seal cracks in roadways	■			■		
Resurface primary roads	■	■		■		
Resurface roads in colonies		■		■		
Patch primary roads	■			■		
Patch roads in colonies	■			■		
Rehabilitation of existing pavements	■			■		
Regional Integration						
Extend Calle C-Bypass to Mexico 2/Sonoyta-Mexico 2, the road to Mexicali	■			■	■	
Communications and Transport						
Central bus	■	■		■		
Central cargo/supplies	■	■		■		■
Load intermodal station railway	■	■		■		■
Nodes foreign exchange and suburban transport	■	■		■		
Operation and Maintenance						
Update of roadway studies and paving prioritization strategies	■	■		■	■	
Bridges						
Expansion of toll bridge for crossing to Baja California	■			■		■
Calle 48 and Avenida Revolución intersection <i>(Status: bridge located on Avenida Revolución)</i>		■		■	■	
Calle 48 and Avenida Libertad intersection <i>(Status: bridge located on Avenida Libertad)</i>		■		■	■	
Calle 48 and Avenida Nuevo León intersection		■		■	■	
Calle 48 and Avenida Tamaulipas intersection		■		■	■	
Calle 48 and Avenida Quintana Roo intersection		■		■	■	
Strategic Plan for Paving						
Implement first phase		■		■		
Equipment						
Bus Terminal	■	■		■	■	■
Cargo Terminal	■	■		■	■	■
Railway Station	■	■				

4.0 MULTIMODAL TRANSPORTATION PLAN

This section presents the Multimodal Transportation Plan for the short-term phase. This transportation plan is the result of the deficiency analysis from Working Paper 1, and Chapters 2 - 3 of this report. It is a multimodal plan that includes roadway, transit, pedestrian, and bicycle improvements. Unless otherwise noted, the recommended projects are not yet funded.

SHORT-TERM RECOMMENDATIONS

In addition to the improvements identified in the previous plan the following short-term phase projects are recommended. Table 4.1 lists the transportation recommendations for this phase, as well as the project number*, location, and description.

TABLE 4.1: SHORT-TERM RECOMMENDATIONS

ID*	Project Location and Project Description
Roadway	
ST-1	Establish a Pavement Preservation Program Management of inventoried roadway in the City through scheduled maintenance, treatment type, or paving
ST-2	Establish a Sign Inventory and Management Program Management of traffic signs to maintain minimum levels of sign reflectivity
ST-3	Downtown Circulation Study Conduct study to address circulation issues and identify improvements that will enhance and promote safety and mobility, as well as improve access to local business in the downtown area
ST-4	Downtown Parking Lot Study Conduct to identify and evaluate potential locations in the downtown area for parking facilities
ST-5	Roundabout Study Conduct study to identify and evaluate potential roundabout or mini-roundabout locations
ST-6	Traffic Study Conduct comprehensive review and evaluation of traffic circulation and issues throughout the city
ST-7	Develop a Citywide Travel Demand Model Develop a travel demand model for the City of San Luis Río Colorado to capture the local traffic dynamics and forecast future traffic demand within the city. Integrate the model with ADOT's travel demand model
Pedestrian and Bicycle Facilities	
ST-8	Pedestrian Safety Study Conduct study to address pedestrian safety and mobility throughout the city, potential improvements could include pedestrian signal crossing locations and devices and/or pedestrian refuge islands
ST-9	Bicycle Study Conduct study to review and research bicycle users travel patterns
ST-10	Pedestrian and Bicycle Amenities Study Review and research pedestrian and bicycles amenities specific to the needs of San Luis Río Colorado
Transit	
ST-11	Transit Center Study Conduct to identify potential locations for a Transit Center that includes pedestrian and bicycle amenities such as shade or bike lockers. Future transit services should be coordinated with YCAT services in San Luis

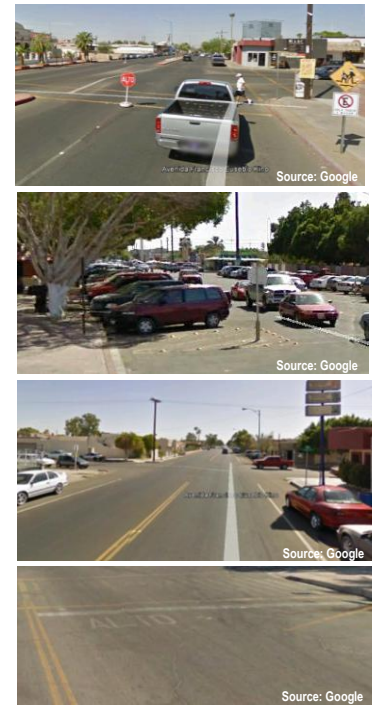
*The Project Identification Number (e.g. ST-1) does **NOT** represent the priority of the project; rather it is an identification number to track project progress in the future.



The following low cost improvements could be applied to the high conflict intersections in the Core Activity Area as well as to other high conflict or crash prone intersections in the study area.

Low cost intersection improvements include:

- Stripe/re-stripe median area for center line or center turn lane
- Stripe/re-stripe travel lanes at intersections
- Stripe/re-stripe exclusive left and/or right turn lanes
- Stripe/re-stripe/ relocate STOP bar
- Install/relocate/replace STOP sign
- Remove or relocate un-necessary signage at intersection approach
- Stripe/re-stripe pedestrian crosswalks
- Install advance warning - pavement striping and/or signage
- Restrict parking near intersections
- Trim roadside vegetation
- Review and update signal timing plans for signalized intersections



Additional improvement considerations:

- Potential mini-roundabout at two-lane intersections with raised central and splinter islands to maximize driver compliance for intersections where ROW is limited, approach speeds are 30 mph (50 km/h) or less, and the total entering daily traffic volumes is no more than 15,000 vehicles
- Curb extensions
- Stripe parking spaces - parallel or angled

SAN LUIS RÍO COLORADO I LPOE RECOMMENDATIONS

The recently completed, *Arizona-Sonora Border Master Plan (BMP)*, developed a coordinated binational implementation plan to improve traffic at the LPOEs along the Arizona - Sonora Border, as well as enhancing the surrounding multimodal transportation facilities. Listed below, by overall project ranking order, are the *BMP* LPOE specific projects for the San Luis Río Colorado area.

- Rank 1: San Luis Río Colorado I - Expansion and Modernization
- Rank 2: San Luis Río Colorado II - POV/Pedestrian Processing
- Rank 11: San Luis Río Colorado II - New Rail LPOE

FIGURE 4.1: MINI-ROUNDBOUT CONCEPTS



5.0 TRANSPORTATION PLAN IMPLEMENTATION

This section discusses available funding sources, roadway standards and policies, and implementation actions to help implement the Transportation Plan.

FUNDING SOURCES

The funding process in Mexico is centered on the federal government and the revenue generated from taxes or other sources that is not used directly by the federal agencies is disbursed to the states. The "Transportation Financing in Mexico: Realizing the Calderon Infrastructure Program" presentation at the 2008 Border to Border Transportation Conference highlights some key components of the different funding sources in Mexico.

Federal Revenue Sources

- Federal taxes include income, value added, excise tax, and import duties
- Fees from oil production approximately 40% of total revenue
- Most goes to general fund not directed to any one source
- Government revenue as a percentage of Gross Domestic Product (GDP) is around 19 percent
- Most transportation funding related to SCT requests

State and Municipal Infrastructure Financing

- State and local governments have little revenue raising power
- Credit agreements for states and municipalities must be in pesos and cannot be with any foreign government
- States like Aguascalientes, Tamaulipas, Durango, the state of Mexico and Oaxaca passed amendments to the regulatory framework in order to give legal certainty to Public-Private Partnerships (P3s)

Although Public-Private Partnerships (P3s) have typically been used in the construction and operation of toll roads in Mexico, potential P3 opportunities should be further evaluated for the San Luis Río Colorado region.

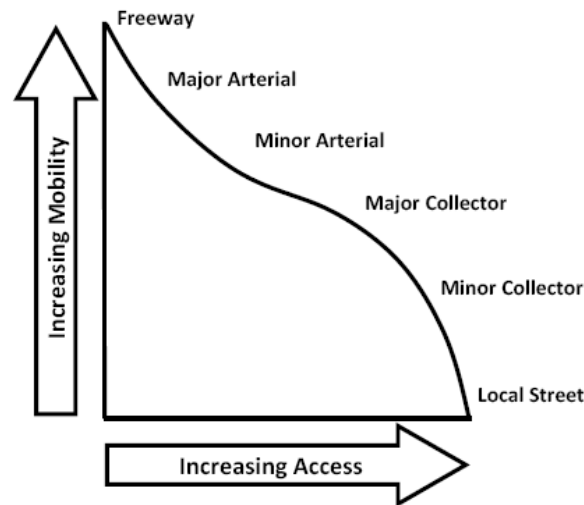
ACCESS MANAGEMENT

Access management enhances the flow of traffic on a corridor or roadway system by improving safety, capacity, and speed. Effective access management programs control the number of driveways and vehicular curb cuts, remove slower turning vehicles, and reduce the number of vehicular conflict points. It is important to implement these controls without overly restricting reasonable access to properties. Controlling access improves mobility and it is usually linked to the function of a particular roadway. Low volume, low speed facilities (such as local roads) serve to provide direct and



frequent access to properties. Roadways with higher speeds and higher traffic volumes serve to provide mobility and restrict direct access to adjacent land uses, such as freeways, which are completely access controlled. The amount of appropriate access is related to the level of mobility and specific function of a road as illustrated in Figure 5.1.

FIGURE 5.1: ACCESS VS MOBILITY



Benefits of Access Management

Improved traffic flow is one of the many benefits of applying access management techniques. Roadways utilizing access management techniques are likely to be safer and provide for better circulation while improving travel times. These techniques include increasing driveway spacing, utilizing turning lanes, grade-separating intersections, and installing medians. The frequency of intersections greatly influences the capacity and function of roadways. Roadways with more access points and intersections have more opportunities for conflicts, and significant friction to through-traffic, which contributes to congestion and crashes. Applying access management techniques can enhance the livability of a community. Access management has been shown to reduce crashes while also improving pedestrian/bicycle safety. The mobility benefits to a community include increases in roadway capacity and reductions in travel time. The potential economic benefits of access management include reserving the market area for businesses, improving customer safety and convenience, providing more efficient freight movement, and raising property values. Communities that have implemented access management have more area for landscaping, while preserving community/scenic character and promoting more efficient land and site design. Additionally, access management can reduce emissions and fuel consumption due to improved traffic progression, and can help avoid substandard access to lot splits caused by excessive driveways.

Access Management Guidelines

To develop a comprehensive access management program for San Luis Río Colorado requires development of access guidelines and careful regulation of land use development and

redevelopment. Guidelines are derived from creating a system based on functional classification that defines acceptable levels of access, which includes criteria for the access point spacing. This also includes defining appropriate geometric and roadway design. These may include features, such as medians, median openings, turn lanes, driveway design, and intersection channelization. These guidelines need to be supported through policy and regulations.

There are two primary guideline categories: limiting driveways and removing slower moving traffic. The elements of these guidelines are detailed below.

Limiting Driveway Spacing and Access

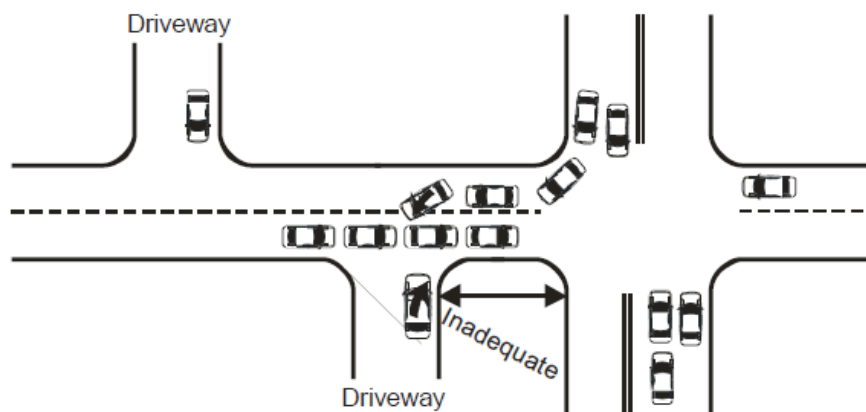
One of the key concepts in access management is control the number, location, and design of driveways to reduce conflicts and improve traffic flow. There are a number of specific elements that can be addressed to limit driveway impacts, including:

- Improve sight distance to increase safety and function of driveways.
- Implement a minimum distance between driveways to reduce conflict points and friction for through traffic. This is based on roadway function and typically can be defined follows:

	<u>In Feet</u>	<u>In Meters</u>
Major Arterials	300 - 500 feet	91 - 152 m
Minor Arterials	100 - 300 feet	31 - 91 m
Collectors	100 - 200 feet	31 - 61 m

- Regulate the maximum number of driveways for each lot.
- Establish corner clearance guidelines to keep driveways from being too close to intersections, as shown in Figure 5.2.
- Consolidate or require shared access to minimize the number of driveways and to reduce conflict points.
- Install continuous raised medians to limit driveway access to specific points

FIGURE 5.2: CORNER CLEARANCE



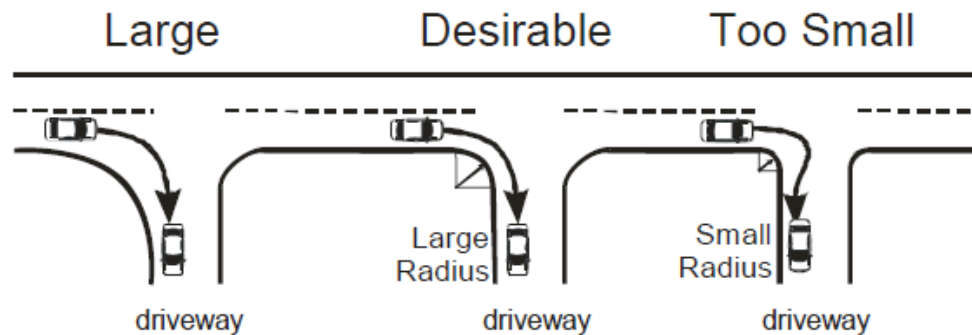
Source: Florida Department of Transportation 2008 Driveway Information Guide

Remove Slower-Moving Traffic

A second key concept in access management is to remove slower moving traffic from the main flow of traffic. Slower moving traffic include vehicles slowing down to turn. Improving the ability to turn quickly off the main road or providing a dedicated lane to facilitate that turn, keeps traffic flowing and improves safety. Techniques to manage turn movements include the following:

- Improve the geometrics of driveways or intersections with adequate turn radius, proper driveway widths, and safe driveway slopes. This allows traffic to leave and enter the traffic flow more efficiently. An example of proper turn radius is shown in Figure 5.3.
- Design commercial driveway entrances with adequate throat length to avoid vehicles backing up on the main roadway waiting to enter.
- Install right turn and left turn lanes to move turning traffic out of the main flow of traffic. Turn bay lengths will vary depending on roadway type and traffic volumes. Left turn lanes can be accommodated either in continuous left turn lanes or as left turn bays in median breaks.

FIGURE 5.3: TURN RADIUS



Source: Florida Department of Transportation 2008 Driveway Information Guide

Access Management Recommendations

The challenge of managing access is establishing a program of legal, administrative, and technical strategies with the appropriate balance between private property access rights and the need to control access to serve public need. Ideally, these strategies will be implemented through planning practices, rules, engineering standards, and procedures resulting in access decisions that successfully, fairly, and consistently determine access management for each unique situation. As a long-term undertaking, the City of San Luis Río Colorado should work towards:

- Developing a comprehensive access management standards guidebook. This guidebook should comprehensively categorize the roadway system by access management categories, provide specific guidelines for each category, and define the design criteria for each category.
- Implementing an access management ordinance that provides the specific guidance for access to land uses.