Existing Conditions Report

South Arcata Multimodal Safety Improvement Plan (SAMSIP)

City of Arcata

March 07, 2025

→ The Power of Commitment

Project name	Arcata US 101 SR 255 Multi-Modal Accessibility and Safety Improvements Project						
Document title	Existing Conditions Report | South Arcata Multimodal Safety Improvement Plan (SAMSIP)						
Project number	12625945						
File name	12625945_Draft Existing Conditions_SAMSIP_ReportFormat.docx						
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S3	1	H. Murphy	T. Tregenza	TT			
S4	2			RS	R. Southern	RS	8/27/24
S3	3	H. Murphy	T. Tregenza	TT			
S4	4		R. Southern	RS	R. Southern	RS	3/0625

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1. Introduction

The City of Arcata received funding for the *South Arcata Multimodal Safety Improvements Plan* (SAMSIP) through the Caltrans Sustainable Communities Planning Grant. The project includes the US 101 interchange with State Route (SR) 255, also known as Samoa Boulevard, between the roundabout east of the interchange (at Union Street), to F Street west of the interchange. In Arcata, the US 101 and SR 255 interchange has created inequitable conditions that exacerbate disconnection between communities east and west of US 101.

The *South G and Samoa Beautification and Safety Improvements Plan* (SGSBSIP) is being developed concurrently alongside the SAMSIP. The SGSBSIP study area is immediately adjacent to the west of SAMSIP, including Samoa Boulevard (SR 255) from G Street to V Street, as well as South G Street, from Samoa Boulevard to the Humboldt Bay Trail entrance near the Arcata City Corporation Yard.

1.1 Plan Goal

The goal of the SAMSIP is to increase east-west connectivity in southern Arcata through safe, comfortable transportation facilities, specifically addressing barriers to non-motorized transportation. The Plan aims to address transportation inequities and improve access to key destination for all residents, specifically for those walking and bicycling.

1.2 Setting

Figure 1.1 illustrates the SAMSIP study area. US 101 connects the City of Arcata to coastal California cities and counties, including the City of Eureka, greater Humboldt County, adjacent Del Norte and Mendocino counties, and ultimately, along its entire length, the cities of Olympia (Washington) and Los Angeles, where it terminates into Interstate 5 to connect the US borders with Canada and Mexico.

SR 255 is owned and maintained by Caltrans. SR 255 connects the City of Arcata to the communities of Manila and Samoa, and to the City of Eureka along the west side of Arcata Bay, as well as the Sunnybrae community east of US 101. A portion of SR 255 is identified as Samoa Boulevard, which begins at Union Street in Arcata and terminates about 0.8 miles west of Jackson Ranch Road near the Mad River Slough Wildlife Area. East of Union Street, the corridor turns into Old Arcata Road. Samoa Boulevard connects downtown Arcata to south Arcata and communities west of US 101 through the interchange.

In its north-south alignment, US 101 divides the City, limiting access between downtown Arcata west of the highway and destinations east of US 101, such as Cal Poly Humboldt, student housing and apartments, and City and County communities like Sunny Brae and Bayside. While Cal Poly Humboldt is connected by other east-west facilities over US 101, the residential communities along Old Arcata Road east of US 101 are primarily connected through the SR 255 interchange, which lacks pedestrian and bicycle facilities. The SR 255 interchange design effectively precludes safe and comfortable active transportation use, as it is designed as a full cloverleaf interchange without intersection control and without bike lanes or sidewalks.

1.3 Land Use and Zoning

Figure 1.2 shows the existing zoning designations around the interchange. The following land use designations are present within and adjacent to the project study area. Descriptions of land use designations are referenced from the City of Arcata 2045 General Plan.

Agriculture Exclusive (A-E)

The land south of the interchange east of E Street is primarily designated as A-E, which is intended for agricultural land which includes lands soil fit for agriculture and/or wetlands that may be used for grazing.

Public Facilities (P-F)

A portion of land within the A-E designated land east of the interchange is categorized as P-F, including Public Parks Facilities (P). Facilities within the P-F designated land south of the interchange include the Arcata Little League Fields as well as the California Highway Patrol (CHP) office.

P-F comprises a large portion of land north of the interchange, which includes Arcata Community Park and Arcata Sports Complex. The land within the US 101 interchange is also designated as P-F.

Residential High Density (R-H)

Adjacent to the P-F designated land north of the interchange, R-H land is present on both sides of Union Street. The General Plan defines R-H as designated for multifamily housing near key destinations such as commercial land uses, employment, parks, schools, and other services. Commercial uses that directly serve residents are also allowed. Housing complexes in this area include Parkway Apartments, Camble Apartments, Village Apartments, and Bayview Senior Apartments.

Residential Medium Density (R-M)

R-M designated land is present on the northwest corner of the interchange and along South G Street in South Arcata. The General Plan defines R-M as including lower density apartment complexes, duplexes, townhouses, co-housing, and modular housing.

General Commercial (C-G)

C-G land is present along Samoa Boulevard west of E Street, and in a pocket south of Samoa Boulevard between E Street and F Street. C-G is identified by the General Plan as Commercial-Mixed Use (C-M) and includes high-density infill development. This land use is flexible and has no upper density limit.

Industrial Commercial (I-C)

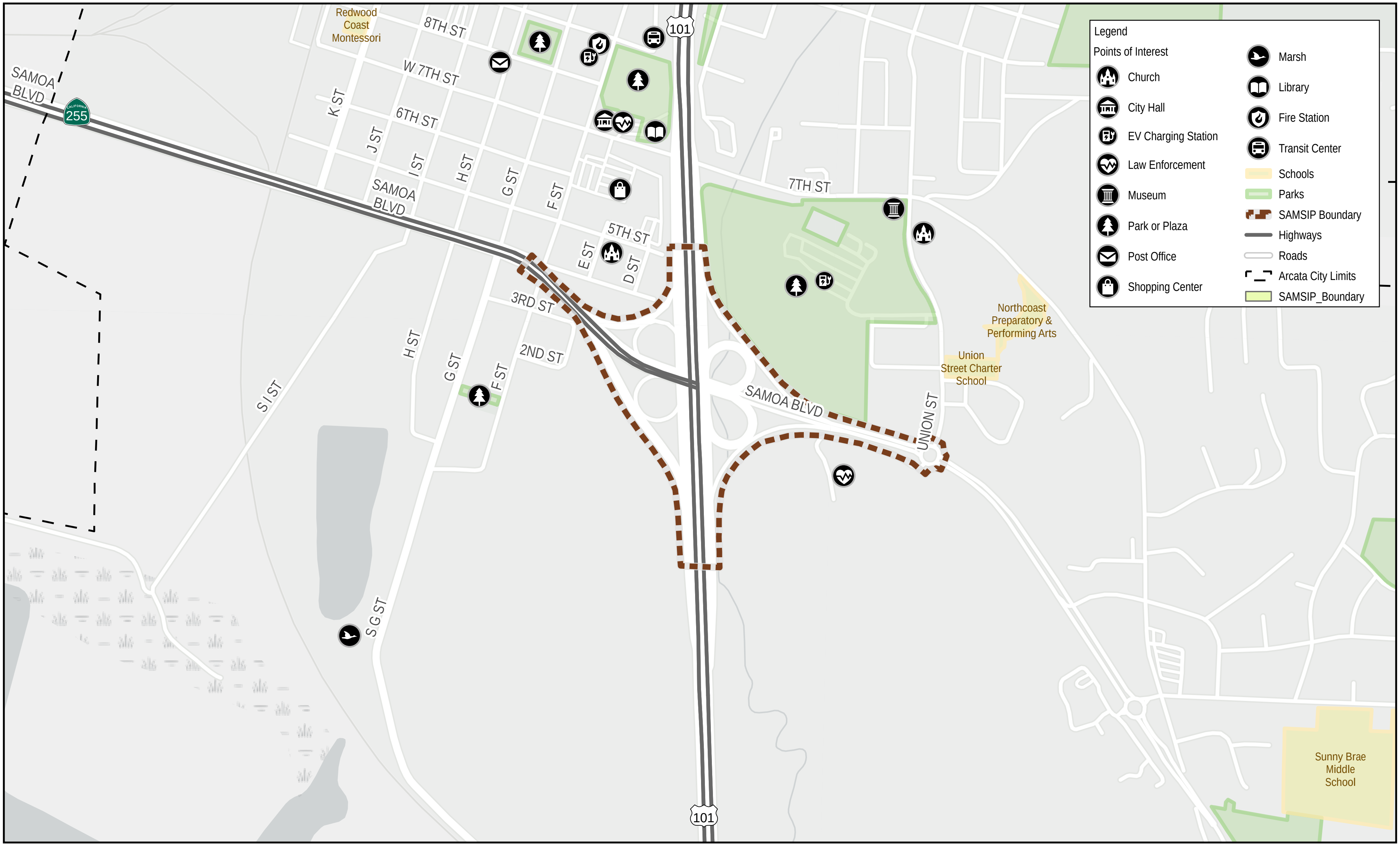
I-C land is present south of 3rd Street between F Street and A-E designated land. I-C is identified by the General Plan as Industrial Limited (I-L) – Acceptable uses include light manufacturing and limited commercial uses and limits uses that produce noise, odors, heavy truck traffic, or dust.

Natural Resource Protection (NRP)

NRP designated land is present east of Union Street on the north side of Old Arcata Road. Known as Natural Resource (NR) in the General Plan, this land includes where unique and/or sensitive natural resources are protected, or the managed production of resources is present.

Coastal Zone

The study area is located within the Coastal Zone boundary.



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SOUTH ARCATA MULTIMODAL SAFETY IMPROVEMENT PLAN

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City of Arcata
South Arcata Multimodal Safety Improvements Project
(SAMSIP)

Study Area Map

Project No. 12625945
Revision No. -
Date 3/07/2025

FIGURE 1.1

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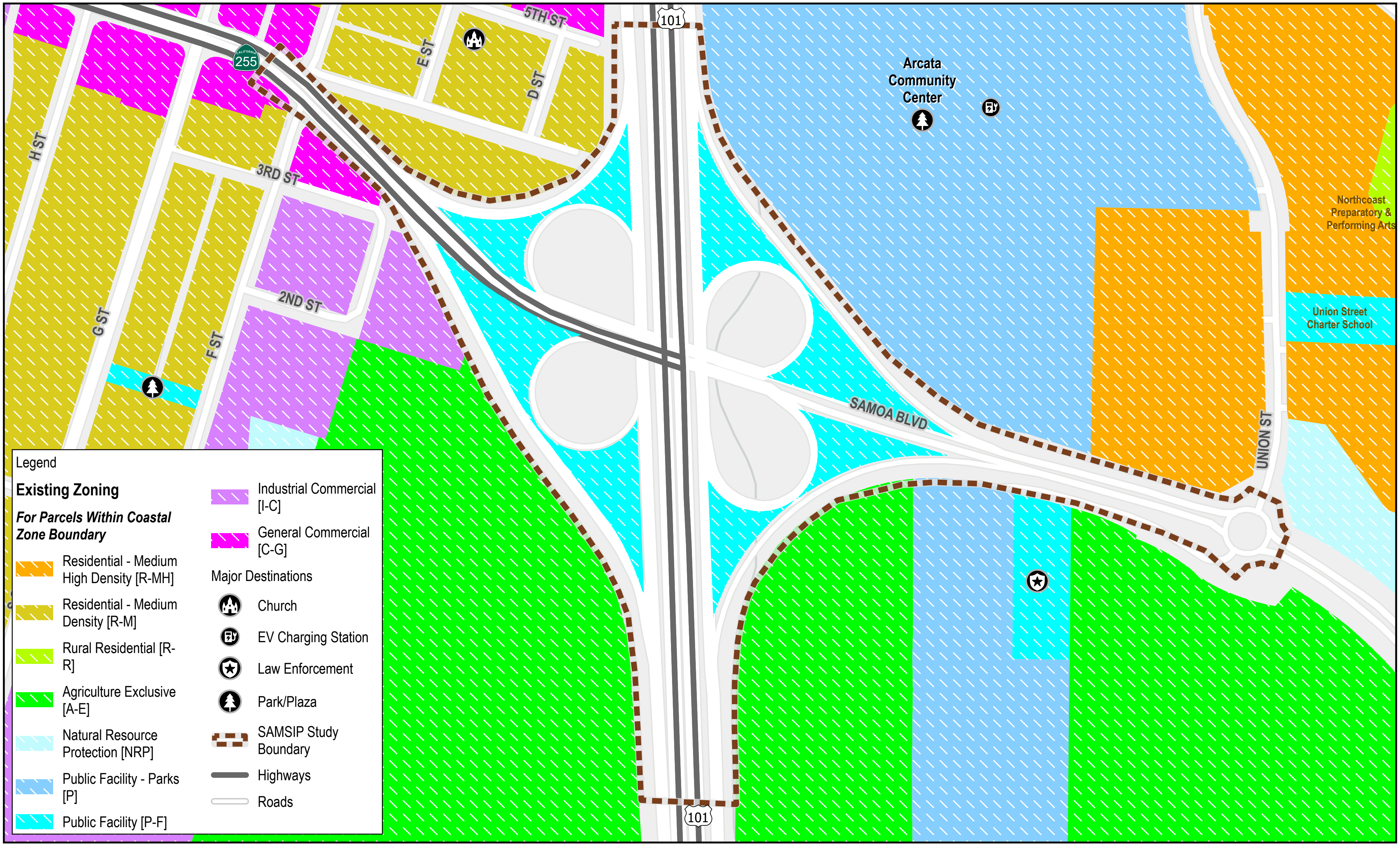
Print date: 07 Mar 2025 - 10:54

Data source: Light Gray Base: Esri Community Maps Contributors, California State Parks, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, USFWS. Created by: hmurphy



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SOUTH ARCATA MULTIMODAL SAFETY IMPROVEMENT PLAN

GHD

City of Arcata
South Arcata Multimodal Safety Improvements Project (SAMSIP)

Existing Zoning and Major Destinations

Project No. **12625945**
Revision No. **-**
Date **8/21/2024**

FIGURE 1.2

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Data source: Light Gray Base: Esri Community Maps Contributors, California State Parks, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, USFWS. Created by: rsouthern

2. Demographics

Data from the 2022 American Community Survey (ACS) 5-year estimates, as well as the City of Arcata General Plan was used to gather demographic information for Arcata's population.

2.1 Population

Arcata is home to approximately 18,536 residents comprised of 7,496 households. The average household size is 2.26 residents, similar to the average household size in Humboldt County. According to the City of Arcata's General Plan Growth Management Element, it is estimated that Arcata's population will increase by 1-1.4% annually, to 27,000 by 2045.

2.2 Age

Figure 2.1 illustrates the age distribution of the City of Arcata versus Humboldt County. The median age in Arcata is 27.2 years old, more than 12 years younger than the median age of 39.5 in Humbolt County. Cal Poly Humbolt is in Arcata and the large student population likely lowers the City's median age. Figure 2.2 shows the age distribution of the City of Arcata compared to the seven census block groups within and adjacent to the Plan's study area. The block groups exclude Cal Poly Humboldt, northern Arcata, and the Bayside Community. Age within the study area is more evenly distributed and does not have the same disproportionate population of residents aged 20 to 24 shown in the citywide data.

Figure 2.1 Age Distribution: City of Arcata and Humboldt County

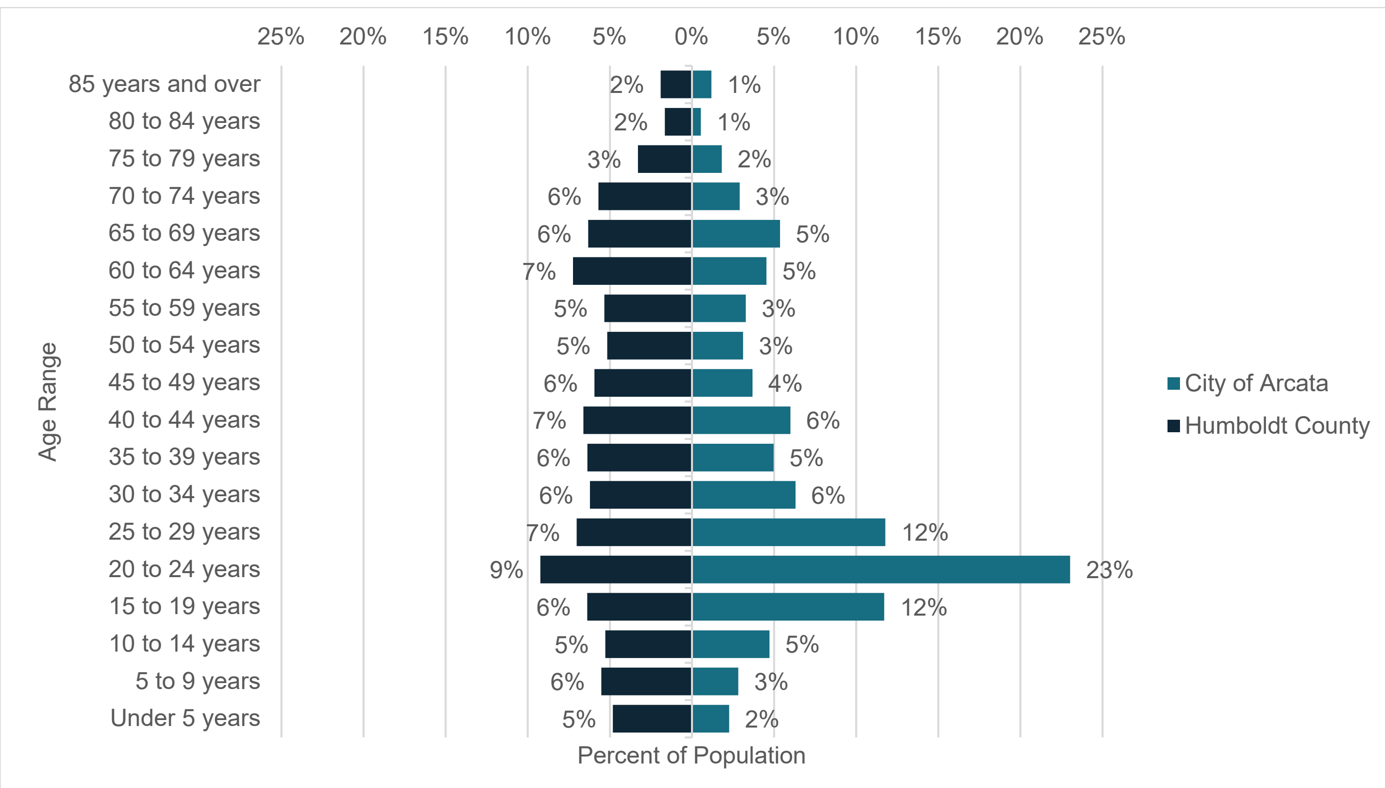
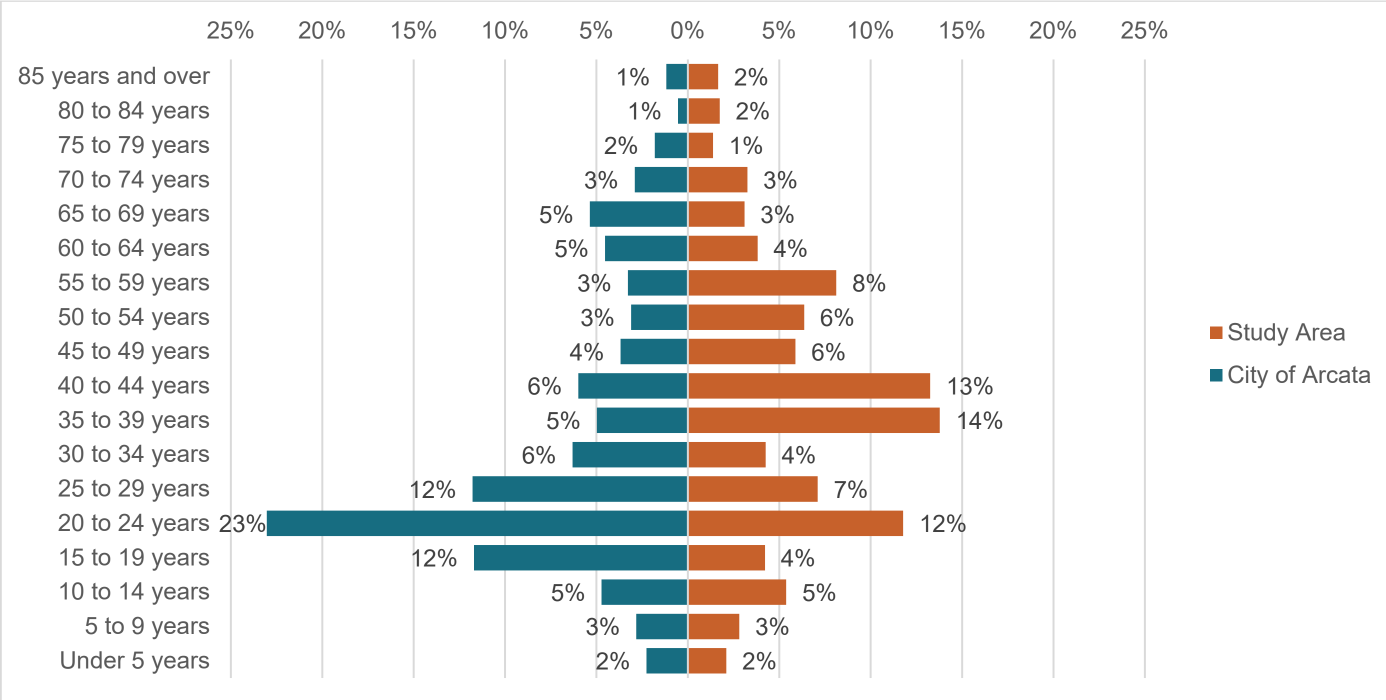


Figure 2.2 Age Distribution: Study Area and City of Arcata



2.3 Income

Figure 2.3 compares household income in the City of Arcata and Humboldt County. The median household income in the City of Arcata is $43,444, more than fourteen thousand dollars lower than the median household income of $57,881 in Humbolt County. Arcata's low median household may be attributed to City's student population, many of whom either do not work or work part time jobs with lower wages.

Figure 2.4 compares household income in the City of Arcata compared to the seven census block groups within and adjacent to the Plan's study area. Household income distribution near the study area is similar to that of the City, with fewer households within the $10,000-$24,999 range and more within the $50,000 - $99,000 range.

According to a US Census study conducted in 2014, people with the lowest income levels are most likely to walk and bicycle to work[1]. Providing adequate multimodal infrastructure improves mobility to low-income community members who may already rely on active transportation but do not have access to a safe, connected network.

Figure 2.3 Income: City of Arcata and Humboldt County

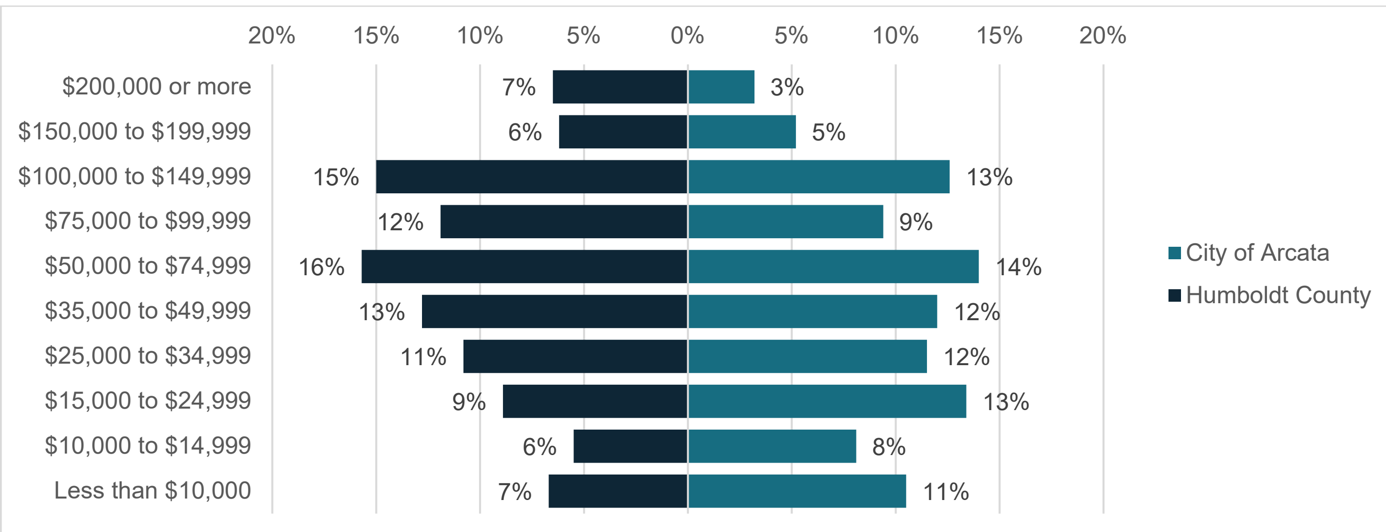
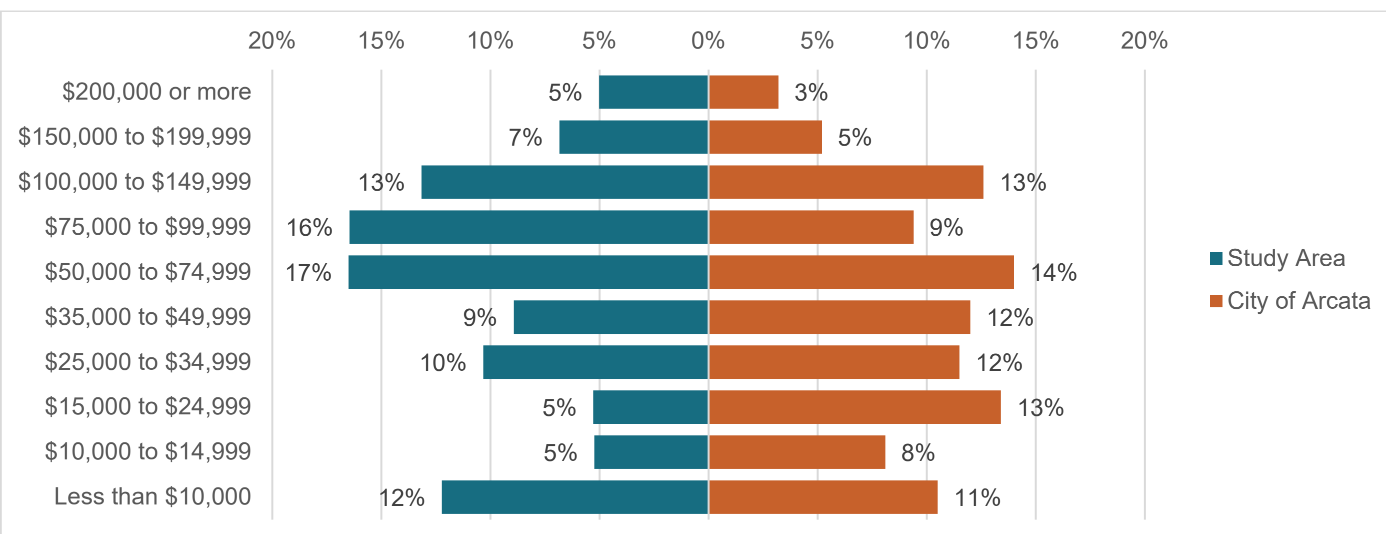


Figure 2.4 Income: Study Area and City of Arcata

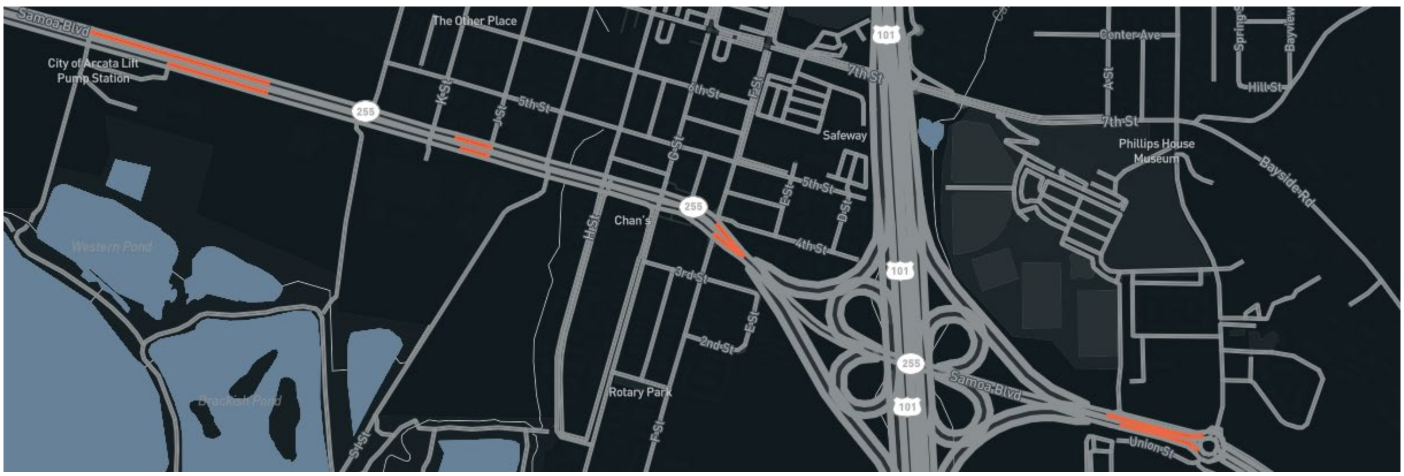


[1] **Modes Less Traveled—Bicycling and Walking to Work in the United States: 2008–2012**

3. Transportation Patterns

Travel patterns along Samoa Boulevard and throughout the City of Arcata were assessed using both 2022 American Community Survey (ACS) 5-year estimates and the most up to date Replica Data from Fall 2023 weekday data. Replica uses Location Based Services (LBS) in addition to census data and traffic count information to determine origin-destination data. Replica generates its data using modeling tools that use a composite data source. This method generates an approximation of real-world travel characteristics that can be useful in assessing travel patterns, mode choice, and trip purposes. However, the validation of trip count estimates from Replica against real-world traffic counts can be average to poor, especially in rural areas with sparse data points. Estimations include trips that are tracked from start to finish regardless of jurisdictional boundaries and can be differentiated by trip purpose, travel mode or vehicle type, and trip distance among other metrics. The Replica data analyzed represents travel on a typical Thursday (Replica provides weekday travel patterns on a typical Thursday, or weekend patterns on a typical Sunday) and was captured from selected roadway segments along Samoa Boulevard, shown in Figure 3.1.

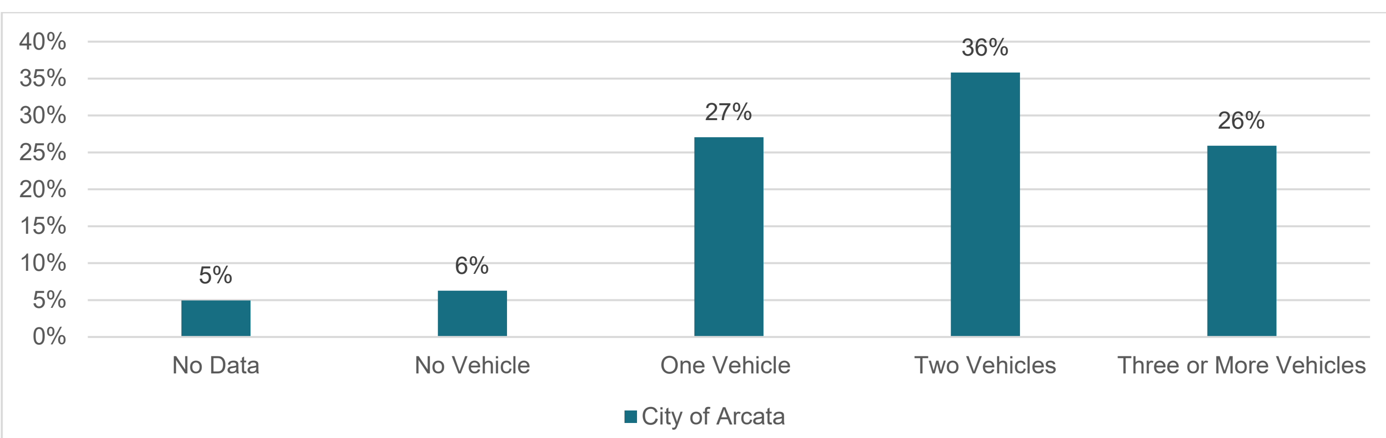
Figure 3.1 Selected Replica Segments



3.1 Vehicle Availability

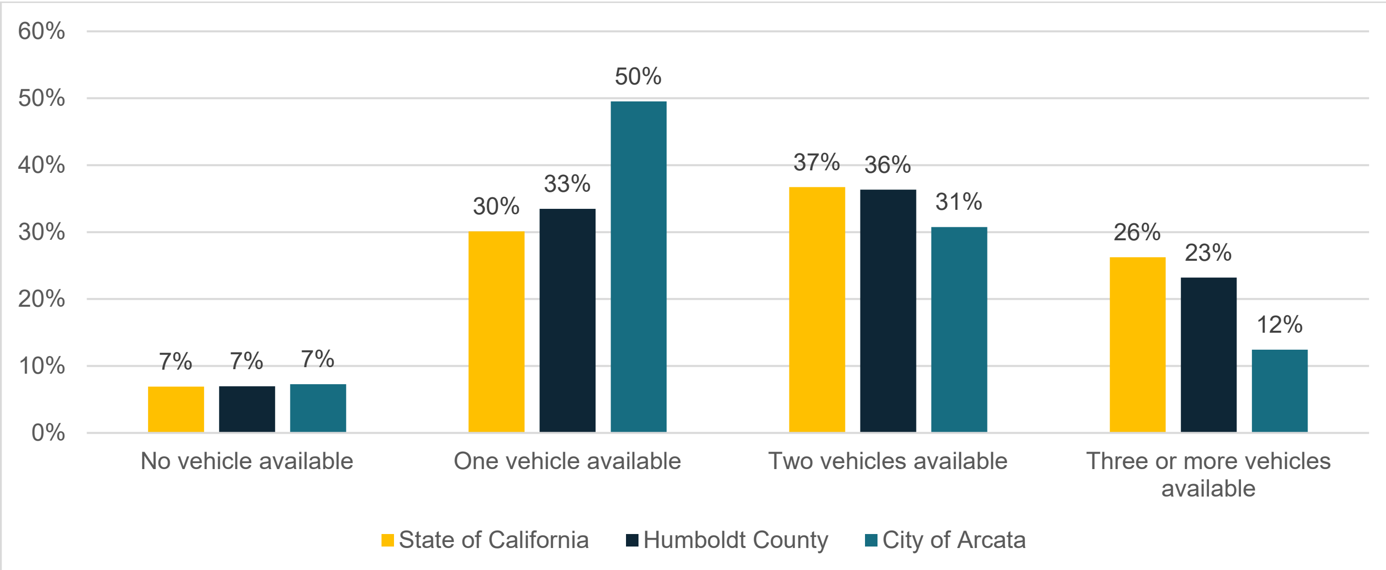
Vehicle availability measures how many private automobiles a person has access to. According to Replica, City of Arcata residents are most likely to have access to two vehicles, as shown in Figure 3.2.

Figure 3.2 Replica Vehicle Availability for City of Arcata Residents



According to ACS 2022 5-Year, households in the City of Arcata typically have access to fewer vehicles than in Humboldt County or the State of California, as shown in Figure 3.3. Households with fewer available vehicles are more likely to rely only alternative modes of transportation such as walking, bicycling or taking transit.

Figure 3.3 ACS Vehicle Availability



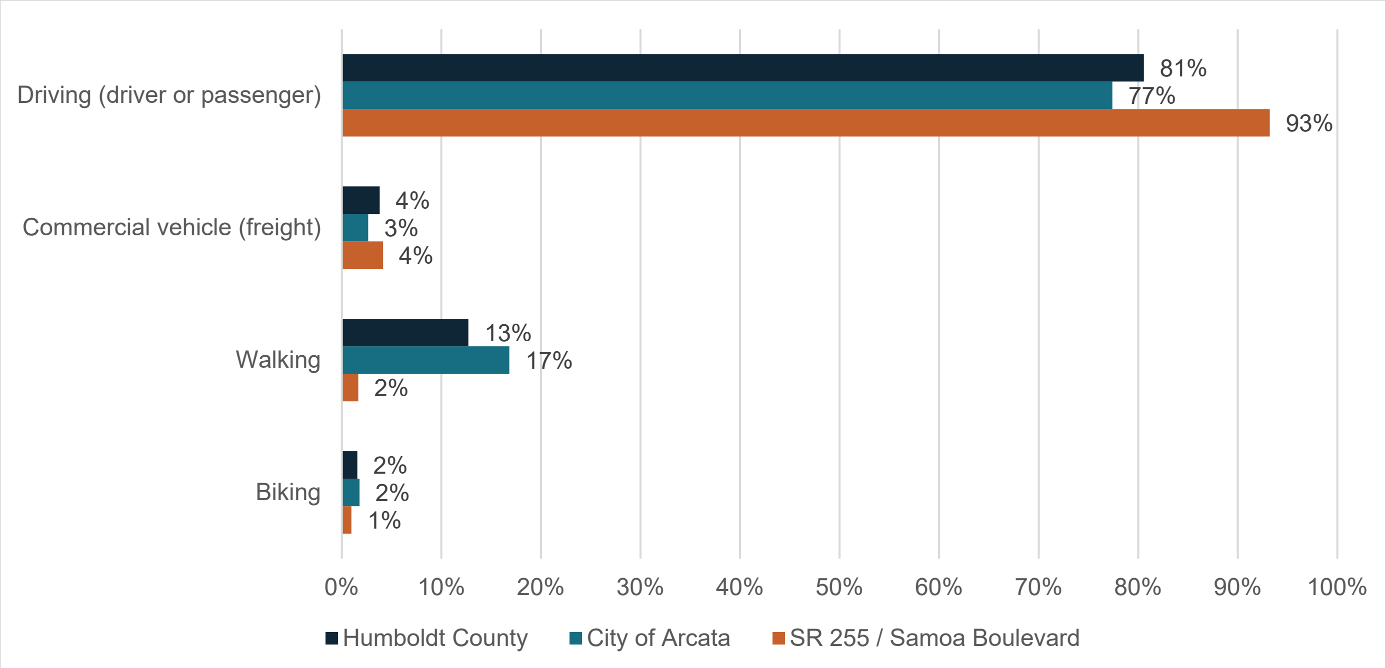
Based on Replica, about 14% of people who only walked or biked in Arcata do not have access to a vehicle. Low-income residents are also more likely to not have access to a vehicle and rely on walking, bicycling, or use public transportation [2]. The lack of adequate active transportation infrastructure and public transportation disproportionately impacts people without access to vehicles.

3.2 Mode Share

According to Replica 77% of trips taken in the City of Arcata were taken by car, compared to 81% in Humboldt County and 83% in the State of California. A higher portion of trips in Arcata were taken by pedestrians (17%) than in Humboldt County (13%) and in California (11%), but bicycle mode share remains similar for all three places. Replica did not report any public transportation trips along Samoa Boulevard, in the City of Arcata or Humboldt County.

[2] **Low-Income Americans Walk and Bike to Work the Most — Streetsblog USA**

Figure 3.4 Mode Share



Replica trip data represents chained trips, meaning any distance a pedestrian walk is counted as a walking trip, even if their primary commute mode is bicycling, driving, or transit. For example, a person may drive to the store, but Replica will also count the distance they walk from the parking lot to the store as a walking trip. To test the reliability of Replica, the data was compared to ACS trip data, shown in Table 3.1. ACS commute data, drawn from the US census, provides journey to work data only, but can provide an alternate data source to compare with Replica. ACS does not include commercial vehicle information but provides the percentage of employees that work from home, which is not reported by Replica. As shown in Table 3.1, ACS trip data provides similar mode share information to Replica for the City of Arcata, although ACS reported that 3% of workers took public transportation to work.

Table 3.1 Mode Share Comparison

Mode	ACS	Replica
Driving (driver or passenger)	68%	77%
Commercial vehicle (freight)	N/A	3%
Walking	12%	17%
Biking	2%	2%
Public Transit	3%	0%
Taxicab/Other means	2%	0%
Worked from Home	13%	N/A

3.2.1 Mode Share Over Time

ACS data provides information about how means of transportation to work has changed over time in Humbolt County and the City of Arcata between 2012 and 2022. Driving rates have remained similar in both areas. People who commute by public transportation in Arcata has increased by 1% and the share of those who walk to work has decreased by almost 3%. The share of people bicycling in Arcata has decreased drastically, from 10.6% in 2012 to 1.8% in 2022. In Arcata and Humbolt County, working from home as roughly doubled.

Table 3.2 Mode Share Over Time

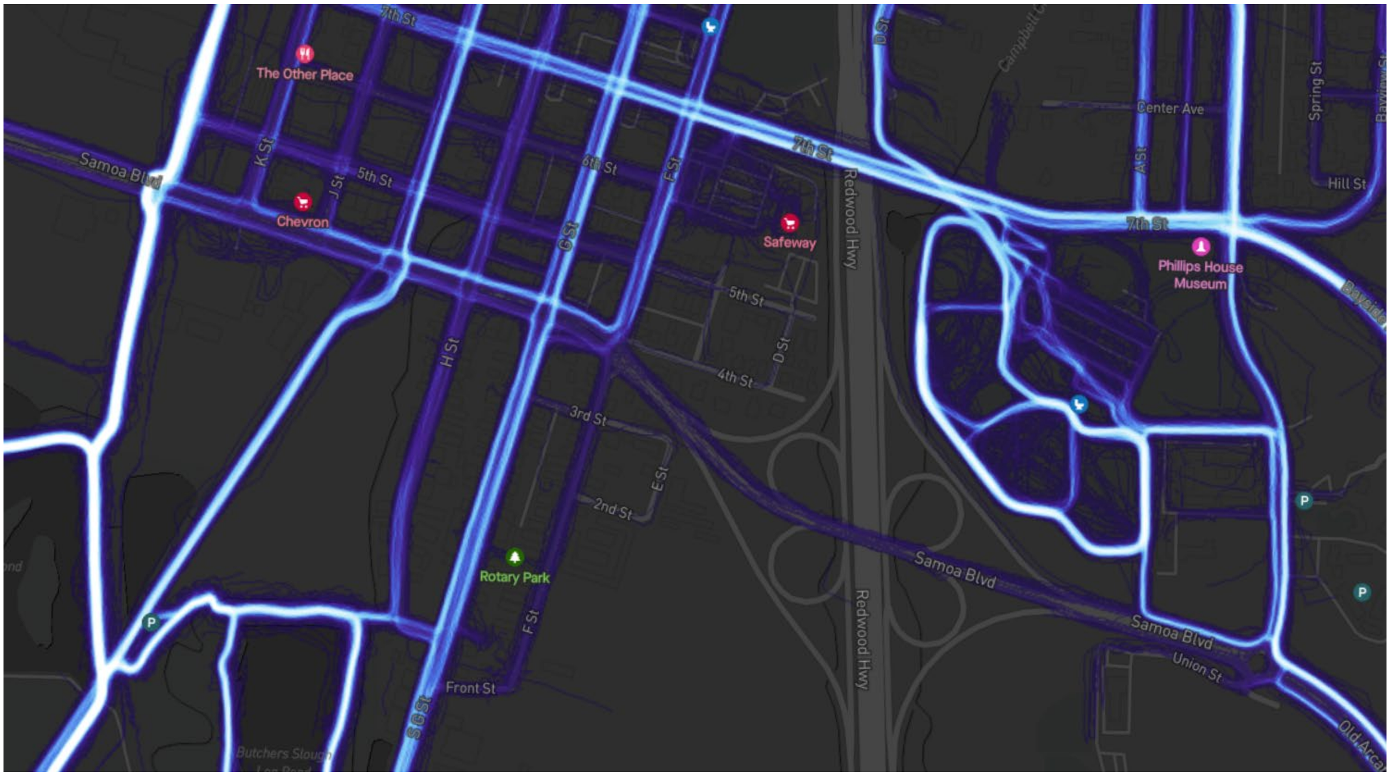
Mode	Humboldt County		City of Arcata	
	2012	2022	2012	2022
Car, truck, or van (drove alone and carpooled)	82.8%	80.3%	66.9%	68.2%
Public Transportation	1.2%	1.2%	1.5%	2.5%
Walked	5.8%	5.3%	15%	12.2%
Bicycled	2.4%	0.8%	10.6%	1.9%
Taxicab, motorcycle, or other means	1.3%	1.4%	0.3%	1.8%
Worked at home	6.5%	10.9%	5.7%	13.4%

3.2.2 Pedestrian and Bicycle Trips

Figure 3.4 and Figure 3.5 illustrate trip density for pedestrian and bicycle trips, respectively, using Strava data. Routes highlighted in white have a higher usage than routes in dark blue. Strava is a mobile service used to track physical activity. The data presented may disproportionately represent recreation trips and more affluent trip takers as Strava users must own a smart phone, elect to track their physical activity, and make time for recreation activities. However, Strava data can provide some insight into which corridors experience frequent pedestrian and bicycle traffic.

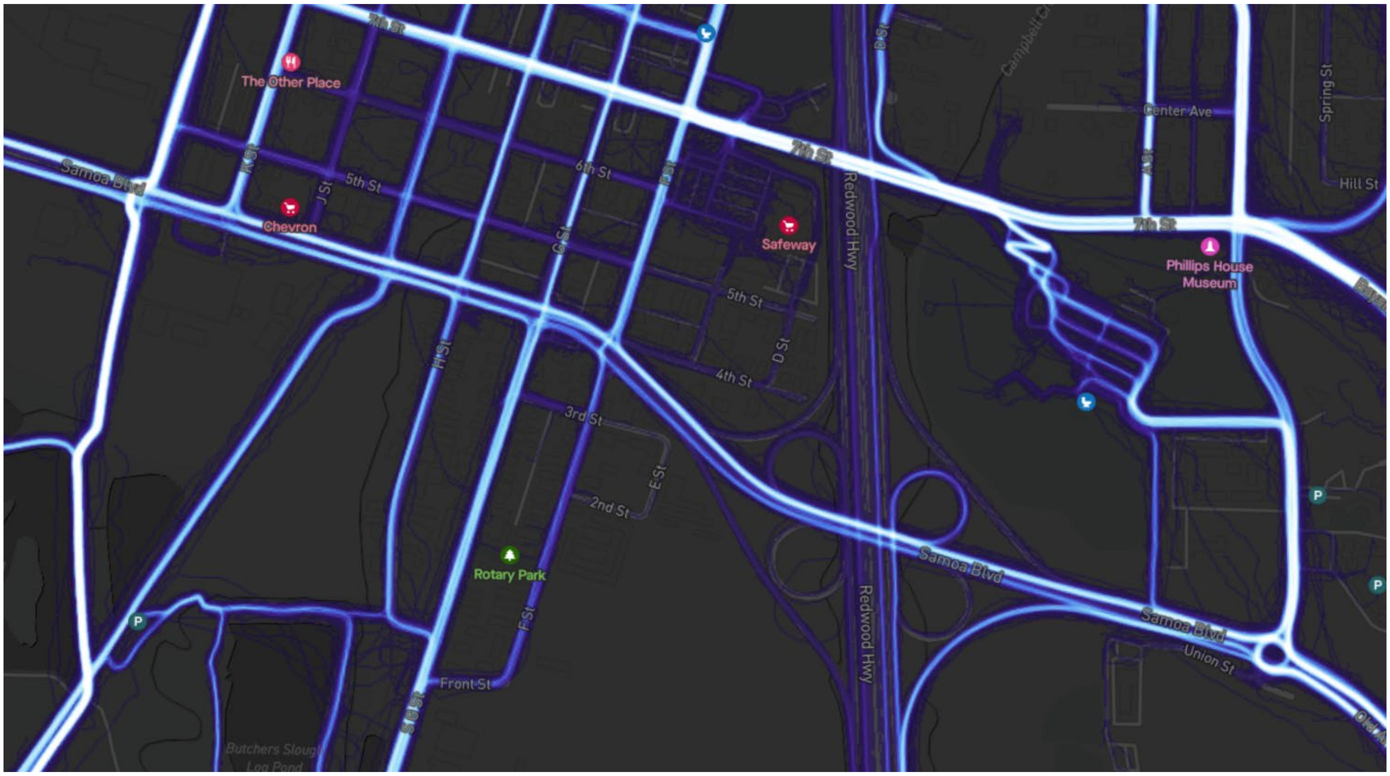
Pedestrian trip density is highest along the Humboldt Bay Trail and around the Arcata sports complex, which are recreation facilities. I Street is also highlighted, which connects to the northern end of the Arcata to Eureka Bike Trail. Routes like 7th Street, G Street / South G Street, and Union Street, which connect to Cal Poly Humboldt and the south Arcata Community are also highlighted. These routes may be used for recreation or for commuting to key destinations. A low level of pedestrian activity was reported along Samoa Boulevard through the interchange.

Figure 3.5 Strava Pedestrian Trips



Like the pedestrian trips, high bicycle trip density is present along the Humboldt Bay Trail, Union Street, 7th Street, and G Street. However, more bicycle trips were reported along Samoa Boulevard through the entire length of the study area. Trips were also reported throughout the interchange, most frequently on the north bound off ramp, as well as along US 101.

Figure 3.6 Strava Bicycle Trips



3.2.3 Trip Length

According to Replica, half of trips along Samoa Boulevard were between eight and 16 miles (51%) and approximately 15%-20% of trips using the interchange are local to Arcata, or less than four miles. Figure 3.7 illustrates average trip length by transportation mode in Arcata and along Samoa Boulevard specifically. Of all city-wide trips, those made along Samoa Boulevard tend to be longer than average. Because SR 255 is a regional connector, users may be traveling longer along the corridor to or from other regional destinations outside of the City of Arcata.

Specifically, pedestrian and bicycle trips along the corridor are typically more than twice the length compared with other trips in Arcata. Recreators may be using Samoa Boulevard to reach recreational facilities such as the Humboldt Bay Bike Trail, Arcata to Eureka Bike Trail, and the Arcata Marsh and Wildlife Sanctuary which are farther from the downtown core, potentially explaining longer trip lengths.

Figure 3.7 *Trip Distance per Mode*

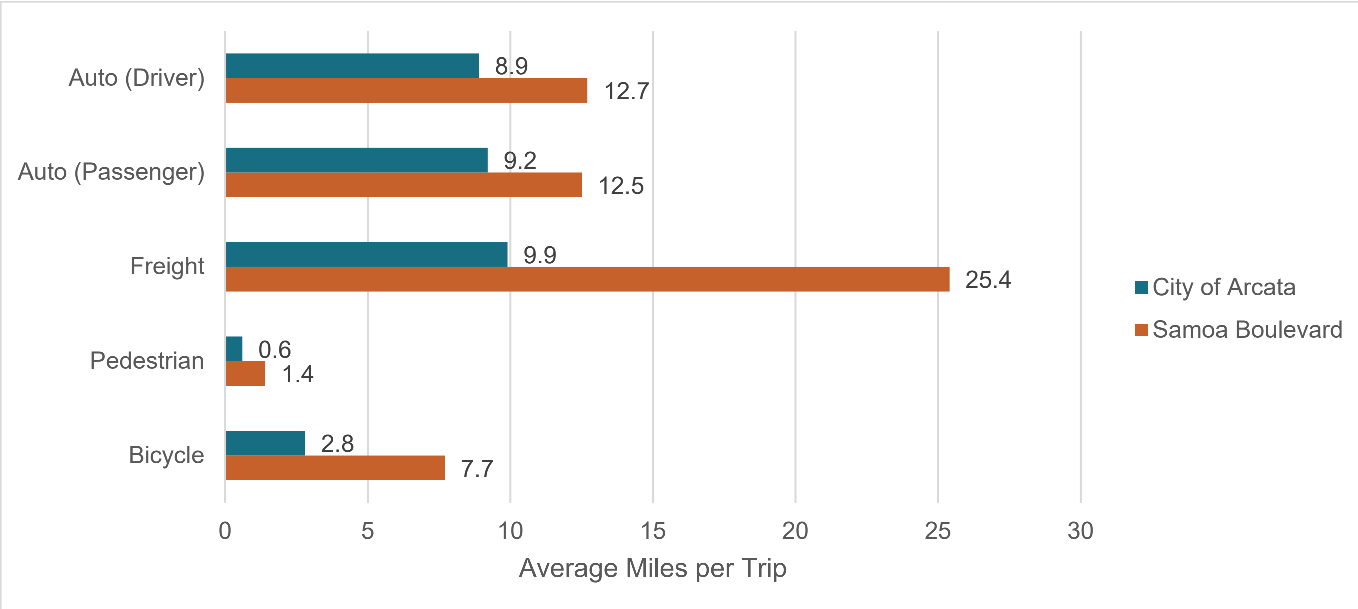
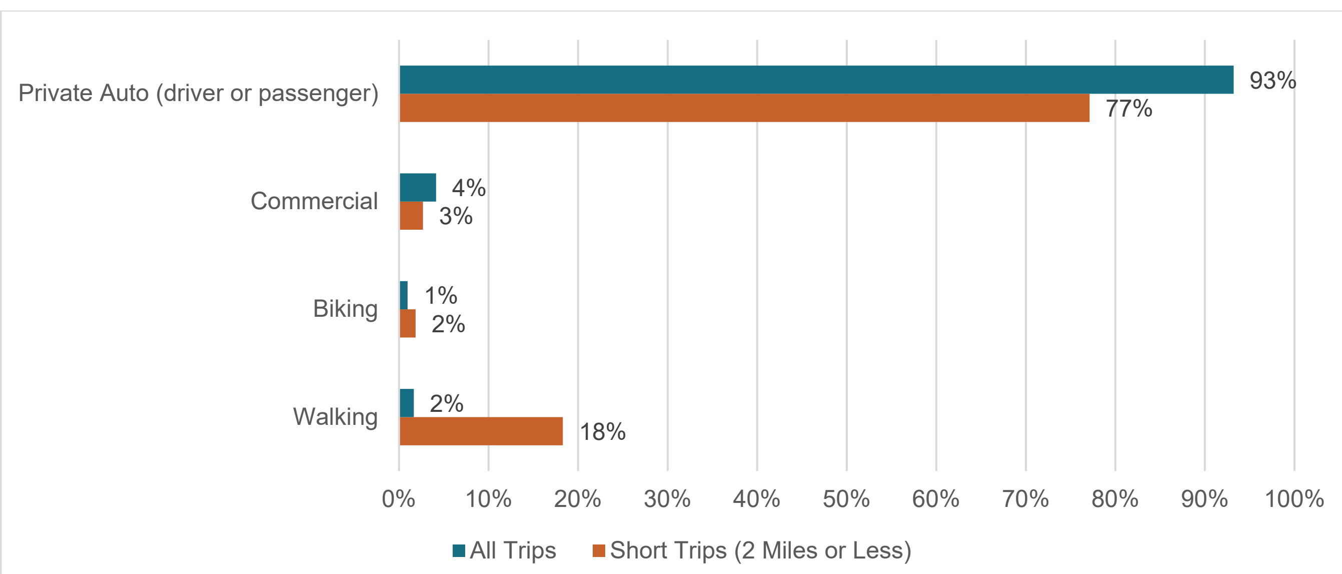


Figure 3.8 presents mode share along Samoa Boulevard for short trips (two miles or less). According to Replica, 6% of trips made along Samoa Boulevard were two miles or under, of which 18% were taken by pedestrians and 2% were taken by bicyclists. Short trips present an opportunity for mode shift. People are typically willing to walk up to a half mile or bike up to two miles to their destinations[3] and are therefore more likely to switch to active modes of transportation for shorter trips. Providing safe, connected active transportation facilities along Samoa Boulevard and across the interchange may incentivize short trip takers to consider walking or bicycling to their destinations rather than driving.

Figure 3.8 *Short Trip Mode Share*

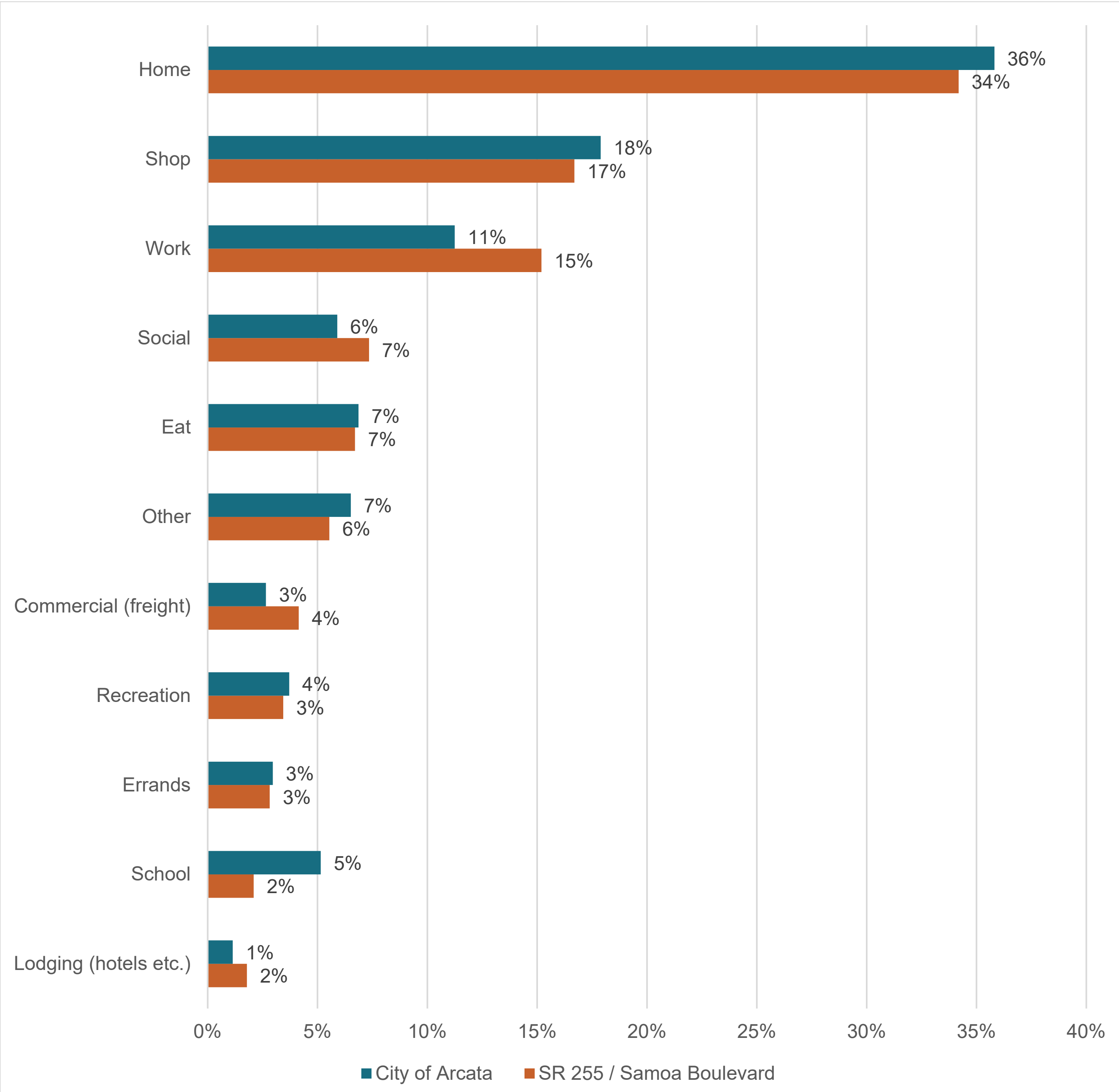


[3] Federal Highway Administration. (2017). 2017 National Household Travel Survey, U.S. Department of Transportation, Washington, DC.

3.3 Trip Purpose

According to Replica, the purpose of trips taken along Samoa Boulevard was similar to trips throughout Arcata, as shown in Figure 3.9. Other than trips to and from home, shopping trips were most common both in the City of Arcata and along Samoa Boulevard. Fifteen percent of trips taken along Samoa Boulevard were work trips, compared to 11% of trips taken throughout the City, meaning Samoa Boulevard is likely a popular route to work. On the other hand, trips for recreation, school, errands, and lodging are typically uncommon along Samoa Boulevard.

Figure 3.9 Trip Purpose



4. Existing Circulation

The Samoa Boulevard US 101 interchange is a full cloverleaf interchange with collector and distributer roads. The interchange provides access between Samoa Boulevard and US 101, serving to connect local traffic to the regional transportation system. The interchange is designed for motor vehicles only and there are no pedestrian or bicycle facilities between F Street and Union Street, with direct on/off ramps for all directions of travel serviced by free-flowing merge and diverge lanes. The speed limit is 35 mph on Samoa Boulevard through the interchange, and there are two through lanes in each direction. Between the loop ramps, there is a relatively short weaving section which limits capacity, yet the interchange design is typical of freeway-to-freeway connections and provides far more vehicular capacity than required to meet current travel demand. Both US 101 and Samoa Boulevard are designated truck routes - US 101 serves interstate transportation and travels 255 provides truck access between Arcata, the Samoa peninsula, and the city of Eureka.

US 101 Interchange Aerial View

East of the interchange at Union Street and Samoa Boulevard, there is a single-lane roundabout that provides access to nearby Cal Poly Humboldt facilities and student housing.

Figure 4.1 shows the average daily traffic (ADT) volume along SR 255 west of the US 101 interchange, provided by Caltrans, between February 2022 and September 2022. Figure 4.2 shows the average AM and PM peak hour volumes for eastbound and westbound SR 255 during the same timeframe. As shown, the average daily volumes for each month are relatively consistent throughout the majority of the year for the 8-month period, with a slight dip in July and a slight increase in September. These fluctuations are also present during the average monthly peak hour data and are likely correlated to school traffic patterns.

Caltrans provided one week of daily and peak hour data for the ramps, between August 23, 2022, to August 29, 2022. The volumes were averaged for the weekdays to obtain existing year traffic volumes. Weekday traffic data on SR 255 west of the interchange was averaged for the same week to be consistent with the ramp counts provided. Figure 4.3 illustrates the ADT and peak hour volumes by location.

Figure 4.1 SR 255 Average Daily Volume (Weekday Only)

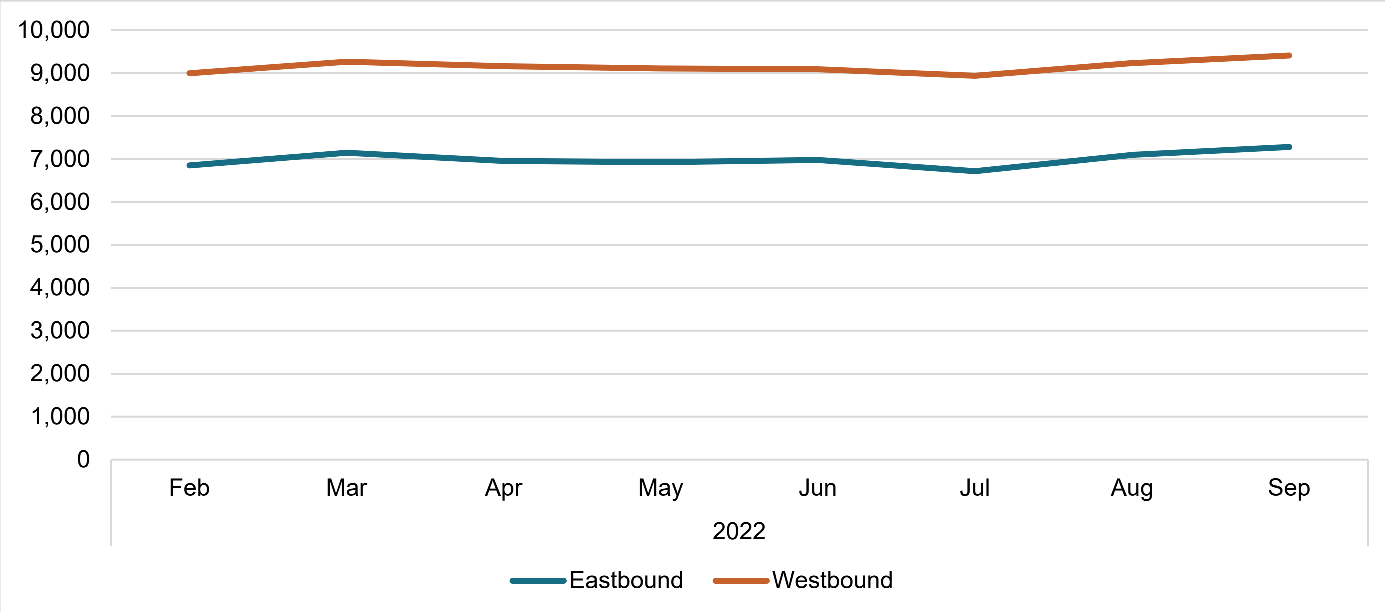
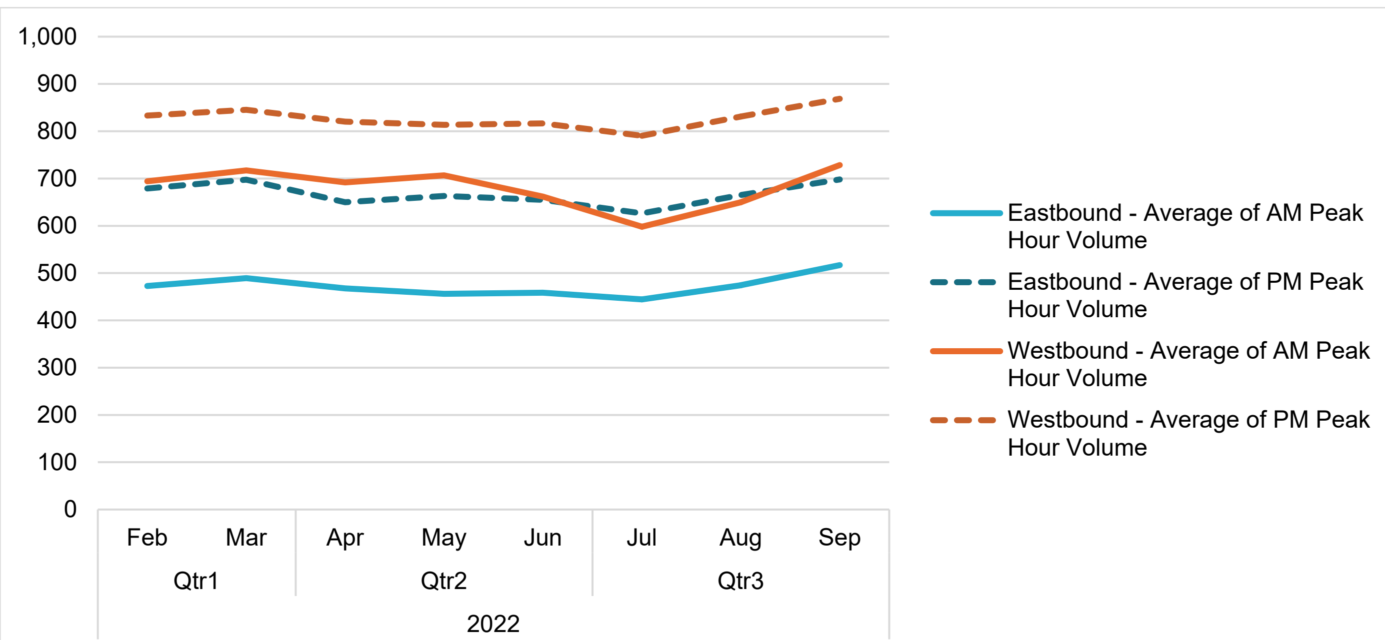
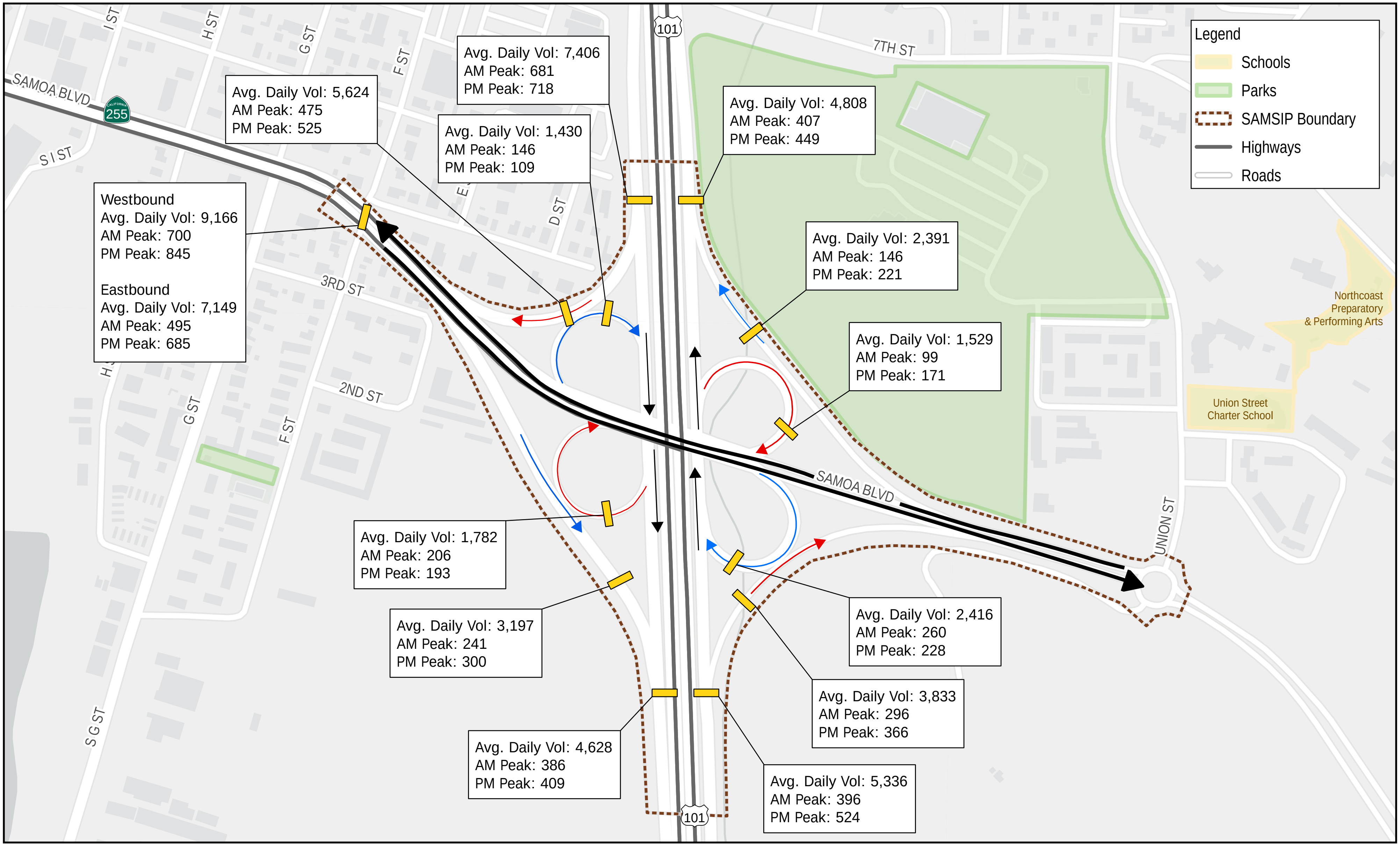


Figure 4.2 Daily Peak Hour Volumes (Weekday Only)





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Map Projection: Lambert Conformal Conic
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SOUTH ARCATA MULTIMODAL SAFETY IMPROVEMENT PLAN

GHD

City of Arcata
South Arcata Multimodal Safety Improvements Project
(SAMSIP)

Traffic Volumes

Project No. 12625945
Revision No. -
Date 3/04/2025

FIGURE 4.3

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5. Pedestrian and Bicycle Facilities

5.1 Pedestrian Facilities

Figure 5.1 illustrates the existing pedestrian network along the US 101 and SR 255 interchange. The pedestrian network is largely disconnected between F Street and Union Street across the interchange. West of F Street, sidewalks are present along Samoa Boulevard and South G Street. Four hundred feet east of Union Street, there is a paved, shared-use pathway connecting Samoa Boulevard to the Arcata Community Park. At the entrance of the path, there is a curb with wayfinding signage, as well as a sign indicating the end of the path. Beginning 150 feet east of the Arcata Community Park pathway, separated paths begin along either side of Samoa Boulevard and extend about 650 yards east to Sunnybrae along Old Arcata Road. The pathway is undefined for 150 feet along Samoa Boulevard, disconnecting the Arcata Community Park pathway from the rest of the pathway network. At the Union Street roundabout, high visibility crosswalks, pedestrian median islands, and crossing signs are present.

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RCAA, 2024. Pathway leading to Arcata Community Park (right) and wayfinding signage (left).

RCAA, 2024 – Unprotected pathway along Samoa Boulevard from Union Street to the Arcata Community Park Trail (left). Google Maps, 2023 – Car shown parked in unprotected pathway (right).

The lack of pedestrian facilities across the US 101 interchange creates a barrier between communities east and west of the highway. Although the Arcata Community Park path connects pedestrians to Samoa Boulevard over US 101 via 7th Street and F Street, almost doubling the trip length for pedestrians and bicyclists. Replica indicates that pedestrians walk along the interchange for convenience. The conflict risk and potential collision severity for these pedestrians is increased due to high vehicle speeds, conflict points, and lack of pedestrian facilities.

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US Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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City of Arcata
South Arcata Multimodal Safety Improvements Project
(SAMSIP)

Existing
Pedestrian Network

Project No. 12625945
Revision No. -
Date 2/19/2025

FIGURE 5.1

N:\US\Azure\EastUS\12625945\GIS\Maps\Deliverables\12625945_ExCon_2024_07_02\12625945_ExCon.aprx - 12625945_104_SAMSIP_Interchange_Ex_Ped
Print date: 19 Feb 2025 - 18:46

Data source: Light Gray Base: Esri Community Maps Contributors, California State Parks, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, USFWS. Created by: hmurphy

5.2 Bicycle Facilities

Figure 5.2 illustrates the existing bikeway network along the US 101 interchange. West of G Street, Class II bike lanes are present along Samoa Boulevard, and along both G Street and South G Street. East of G Street, there are no bicycle facilities across the US 101 interchange until Union Street, where there are Class II bicycle paths on both sides of the road that extend further to Jacoby Creek Road. Shared-use, paved pathways begin on Samoa Boulevard 200 feet west of Union Street and parallel the Class II along Old Arcata Road until Buttermilk Lane. Four hundred feet west of Union Street, there is a paved path that connects Samoa Boulevard to Arcata community park, but this path is disconnected from the rest of the bicycle network. As shown in Section 3.2: Mode Share, bicyclists are riding along Samoa Boulevard through the interchange, even without existing bicycle facilities.

According to the HCAOG Humboldt Bay Area Bike Map, US 101 is officially designated as the Pacific Coast Bike Route but lacks any formal bicycle facilities besides paved shoulders.

The Caltrans Design Information Bulletin (DIB) 94 outlines complete streets planning guideline for the State Highway. Figure 5.3 from the DIB 94 describes which bicycle facilities are appropriate based on average daily traffic volumes (ADT) and posted speed limit. Samoa Boulevard has a posted speed limit of 35 mph and average daily traffic volume of 15,913 cars a day. According to DIB 94, the only appropriate facilities for roadway conditions comparable to Samoa Boulevard are Class I or Class IV bicycle facilities that separate bicyclists from vehicle traffic.

RCAA, 2024. Bike lanes not present east of F Street (left) and across the US 101 Interchange (right).

RCAA, 2024. Faded pedestrian crossing on east leg of Union Street roundabout.

Paper Size ANSI A

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US Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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SOUTH ARCATA MULTIMODAL SAFETY IMPROVEMENT PLAN

GHD

City of Arcata
South Arcata Multimodal Safety Improvements Project (SAMSIP)

Existing Bikeway Network

Project No. 12625945
Revision No. -
Date 10/18/2024

FIGURE 5.2

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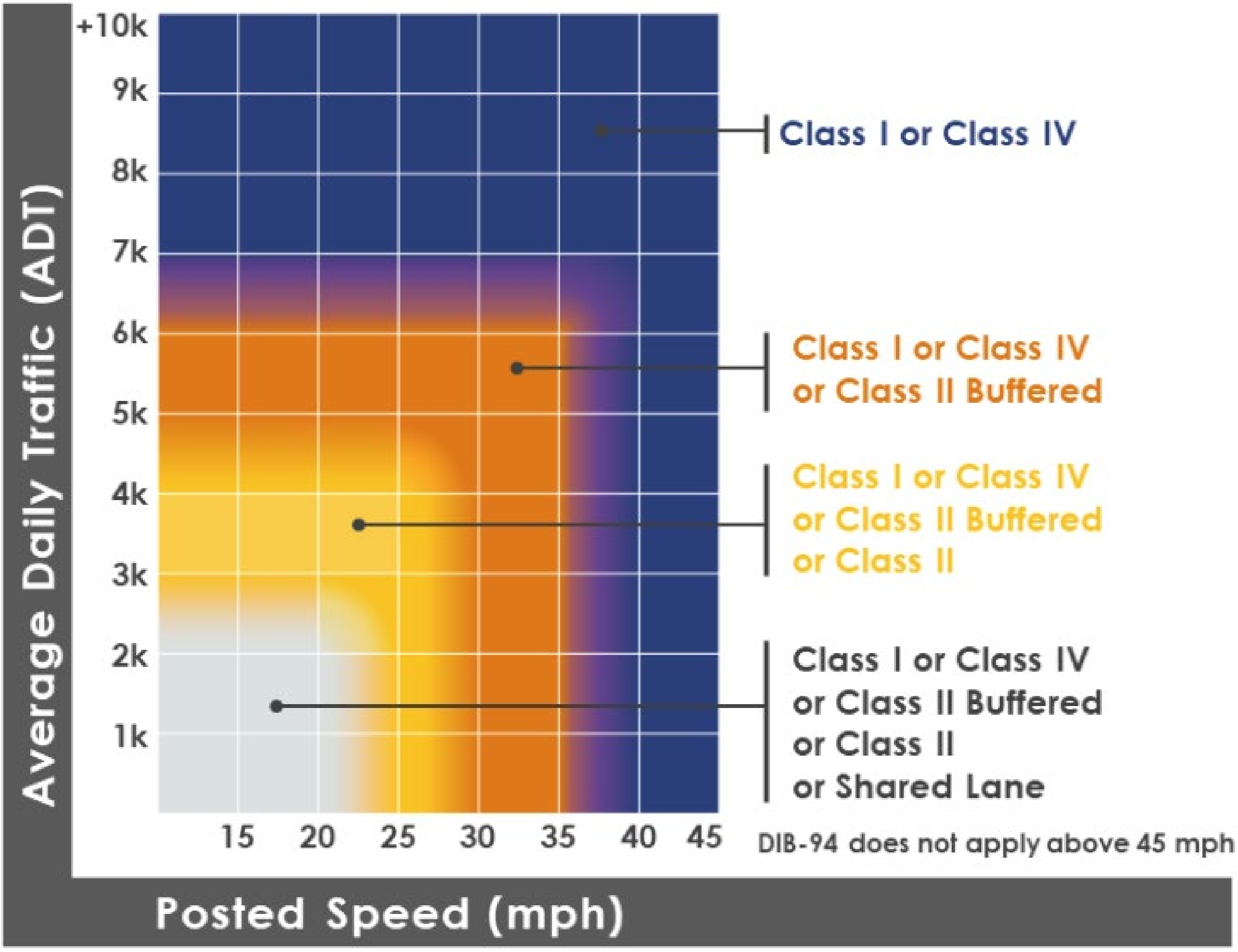
Print date: 18 Oct 2024 - 15:28

Data source: Light Gray Base: Esri Community Maps Contributors, California State Parks, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, USFWS. Created by: hmurphy

Figure 5.3 DIB 94: Recommended Bicycle Facilities by Traffic Volumes and Posted Speed.



6. Bicycle Level of Traffic Stress (LTS)

Bicycle LTS is a suitability rating system of the safety, comfort, and convenience of active transportation facilities from the perspective of the user. Moreover, the methodology allows planning practitioners to assess gaps in connectivity that may discourage active users from traversing roadways. Bicycle LTS analyzed as part of this Plan assigns a score from 1 to 4 for roadway segments, intersection crossings, and intersection approaches within the Arcata Community, using the methods described in the Oregon Department of Transportation (ODOT) “Analysis Procedures Manual Version 2, Chapter 14, Multimodal Analysis,” (October 2020). The methodology presented there is based on the paper, Low Stress Bicycling and Network Connectivity, Report 11-19, published by the Mineta Transportation Institute (MTI) (May 2012). The LTS methodology as reported by ODOT’s latest Multimodal Analysis Procedure Manual includes updates to the methodology that was originally published by MTI. The updated methodology includes analysis criteria for new bicycle facility types that have become more popularly used since the original report was published and considers additional infrastructure types not analyzed under the MTI methodological approach. The methodology scores roadway facilities into one of four classifications or ratings for measuring the effects of traffic-based stress on bicycle riders, with 1 being the lowest stress or most comfortable, and 4 being the highest stress or least comfortable. The stress level of a given roadway segment, intersection crossing, or intersection approach is based on a variety of infrastructure characteristics, including, but not limited to:

- Number of vehicle lanes
- Posted speed limit
- Roadway functional classification
- Type of bikeway, if applicable
- Separation between bicycle facility and vehicles
- Presence of parking alongside on-street bike lanes
- Width of bike lanes and parking aisles
- Intersection control (stop signs, traffic signals, roundabouts)
- Presence of turn lanes

An overall LTS score is then determined for the segment, combining the segment, intersection approach and crossing scores. The overall score is governed by the worst-case principle, meaning that the highest stress score associated with the analyzed criteria will determine the LTS score of the overall segment, with LTS 1 being the lowest stress and LTS 4 being the highest stress. The specific criteria and details of the methodology used to determine the LTS scores are provided in **Appendix A**.

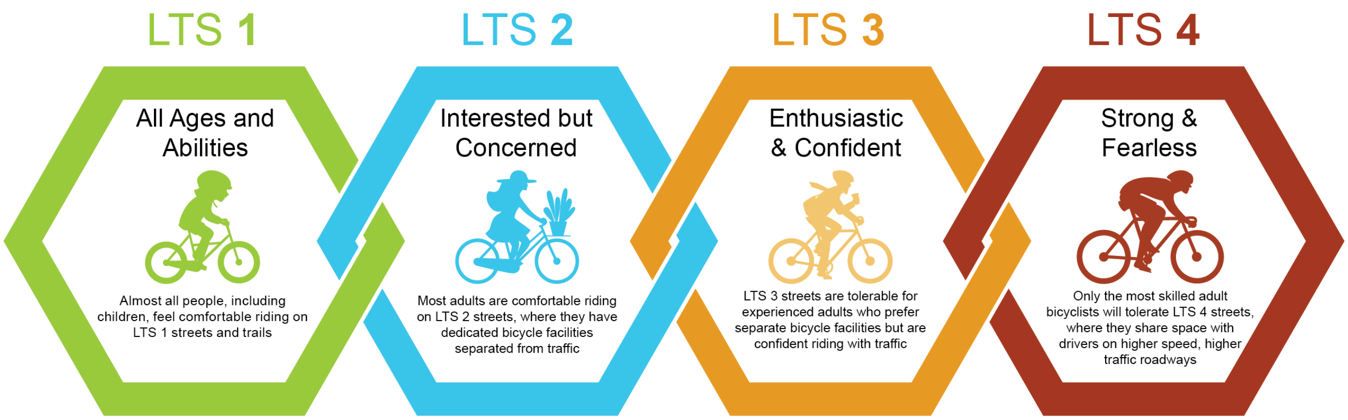
6.1 Types of Bicyclists

Most people fall into one of four categories of bicyclists, based on skill level and confidence:

- **Strong and Fearless** bicyclists are skilled and experienced and are comfortable riding on most roadways whether a designated bicycle facility is provided. They likely account for one to three percent of the population.
- **Enthusiastic and Confident** bicyclists are very comfortable riding in most situations but would prefer streets with designated bicycle facilities. They likely account for five to ten percent of the population.
- **Interested but Concerned** bicyclists are comfortable riding on shared use paths or in bicycle lanes on lower speed streets and would like to bicycle more if better separation was provided. They likely account for about half of the population.
- **All Ages and Abilities** include children, new riders, and people uncomfortable riding on the most comfortable facilities. It also includes people currently uninterested in bicycling or those who are physically unable to bicycle. They likely account for about a third of the population.

Fig illustrates how the types of cyclists align with the LTS categories.

Figure 6.1 Types of Cyclists and LTS



6.2 What Does LTS Consider?

Segment LTS is the level of stress a bicyclist experiences while riding along the roadway. Segment LTS considers bicycle facility type, bike lane width (if applicable), posted speed limit, whether the bike lane is adjacent to a parking lane, and if the bike lane experiences frequent blockage i.e. cars parking in the bike lane, trashcans blocking the bikeway, and more.

Segment LTS does not consider stress levels experienced when bicyclists cross or approach intersections. Crossing LTS measures the level of stress a bicyclist experiences while crossing an intersection.

Crossing LTS considers posted speed limit, roadway functional class/daily traffic volume, and how many lanes the bicyclist must cross to reach the other side of the road. Intersection Approach LTS measures the level of stress a bicyclist experiences when crossing the street to access a left turn pocket. Approach LTS considers posted speed limit and how many lanes a bicyclist must cross to reach a left turn pocket from a bike lane on the right side of the road.

Intersection Approach LTS measures the level of stress a bicyclist experiences when either approaching an intersection that has a right turn lane or where cyclists need to navigate a left turn. Approach LTS for right turns considers the bike lane and right turn alignment and turn lane length. Approach LTS for left turns considers the posted speed limit and how many lanes a bicyclist must cross to make a left turn from the bike lane on the right side of the road.

6.3 US 101 Interchange

Figure 6.2 illustrates segment LTS through the U-101 interchange from F Street to Union Street and crossing LTS at F Street and Union Street. Because the interchange does not feature any intersection itself, intersection approaches were not analyzed. Figure 6.2 also displays LTS scores along South G Street and along Samoa Boulevard west of F Street. A comprehensive discussion about LTS along these segments can be found in the South G Street and Samoa Boulevard Existing Conditions Chapter.

6.3.1 Segment LTS

Most of the interchange is rated an LTS 4. The posted speed limit throughout the interchange is 35 per hour and there are no bicycle facilities, creating an extremely stressful environment for bicyclists. The roadway segment between F Street and the west most interchange on-ramp is categorized as an LTS 3. The posted speed limit is 35 mph and there are two travel lanes in each direction.

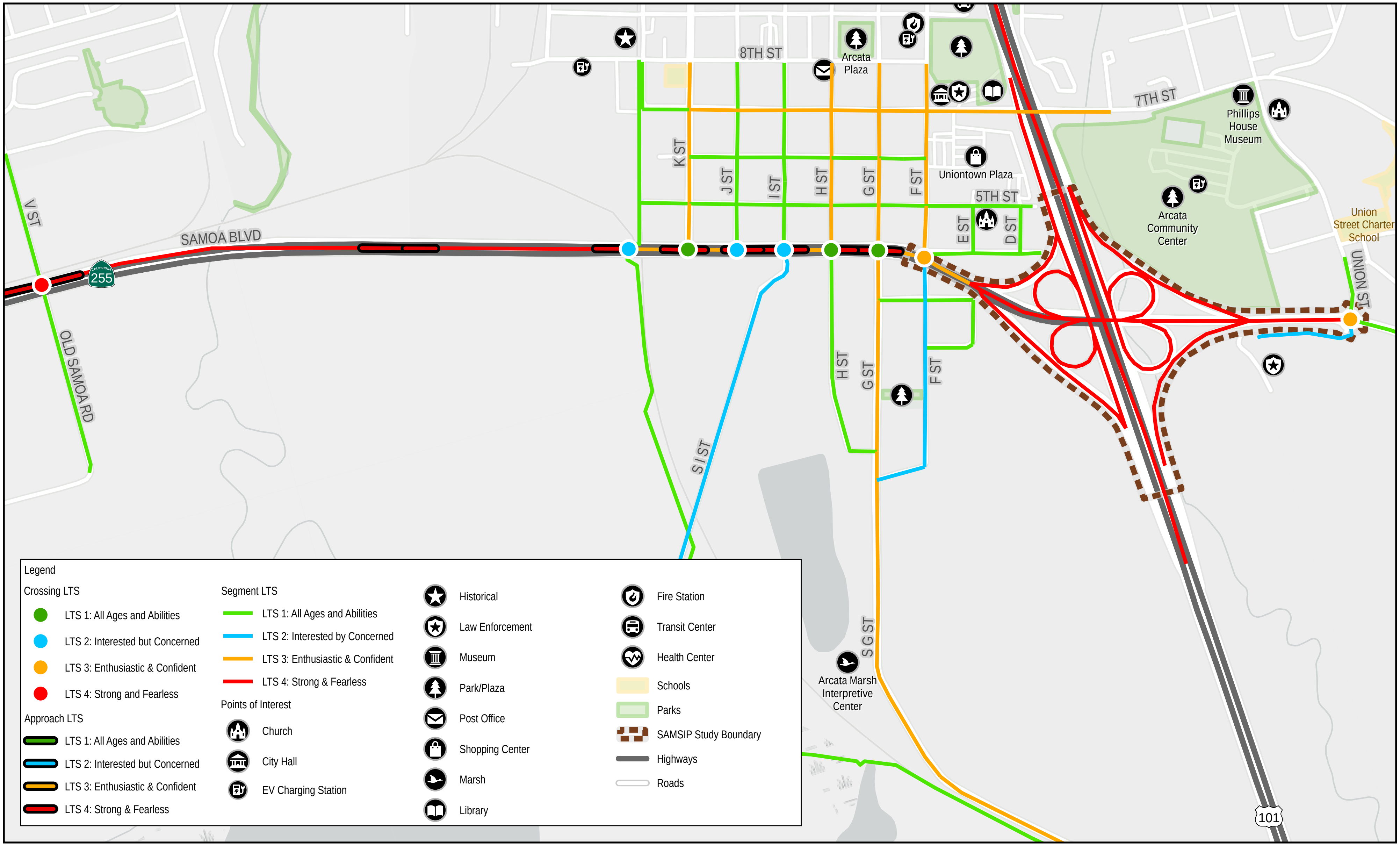
6.3.2 Crossing LTS

F Street

The F Street and Samoa Boulevard crossing is an LTS 1. The posted speed limit of Samoa Boulevard at this intersection is 35 mph. There is a median island in the middle of Samoa Boulevard, and bicyclists crossing Samoa Boulevard must cross two lanes of traffic in each direction.

Union Street

The Union Street roundabout is categorized as an LTS 3. The west leg of the roundabout is missing a crosswalk, and the existing crossings are inadequate. Additionally, the north leg of the roundabout is tangential, meaning the approach centerline does not go through the roundabout center, creating a larger turn radius. Vehicles traveling southbound can make right turns at higher speeds, increasing collision risk for bicyclists sharing the roundabout.



Paper Size ANSI A

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US Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

City of Arcata
South Arcata Multimodal Safety Improvements Project
(SAMSIP)

Project No. 12625945
Revision No. -
Date 2/07/2025

Existing Bicycle
Level of Traffic Stress (LTS)

FIGURE 6.2

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Print date: 07 Feb 2025 - 12:38

Data source: Boundaries, Roads, POI: City of Arcata, 2024; Light Gray Base: Esri Community Maps Contributors, California State Parks, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, USFWS. Created by: hmurphy

7. Public Transportation

Humbolt Transit Authority runs two transit service providers that serve the City of Arcata and Mad River Transit System (A&MRTS) and, Redwood Transit System (RTS). Figure 7.1 illustrates existing transit service along Samoa Boulevard, Union Street and thruoghout the US 101 interchange.

7.1 Arcata and Mad River Transit System (A&MRTS)

A&MRTS is the primary service provider with the City of Arcata and runs four routes, two of which run along the interchange year-round, including the Red Route and the Orange Route Ridership information for each route between August 2023 and July 2024 is presented in Figure 7.1 and Figure 7.2

7.1.1 Red Route

The Red Route begins at the Arcata Transit Center and connects east to Sunny Brae, west to Bloomfield Elementary, and north along L K Wood Boulevard, connecting to student housing. The Red Route has one-hour headways and runs from 7 am to 7 pm on weekdays all year round.

Red Route ridership peaked in February 2024 and had higher ridership than the Orange Route during the study period, excluding August 2023. The Red Route consistently received more rides from Jack Pass holders than non-Jack Pass holders excluding June 2024 and July 2024 during summer break.

7.1.2 Orange Route

The Orange Route begins at the Arcata Transit center and connects along Samoa Boulevard east to the Sunny Brae community and west to V Street, to Cal Poly Humbolt, and north to the Korblex and Alliance neighborhoods. The Orange Route has one-hour headways and runs from 7pm to 10 pm on weekdays while the Cal Poly is in Session, and from 7 am to 7 pm on weekends when school is not in session.

The Orange Route received fewer riders than the Red Route except during August 2023 when ridership peaked. The Orange routed received slightly more rides from non-Jack Pass holders as the route serves downtown, Samoa Boulevard, and the Sunny Brae community.

Figure 7.1 ***A&MRTS Ridership (August 2023 – December 2023)***

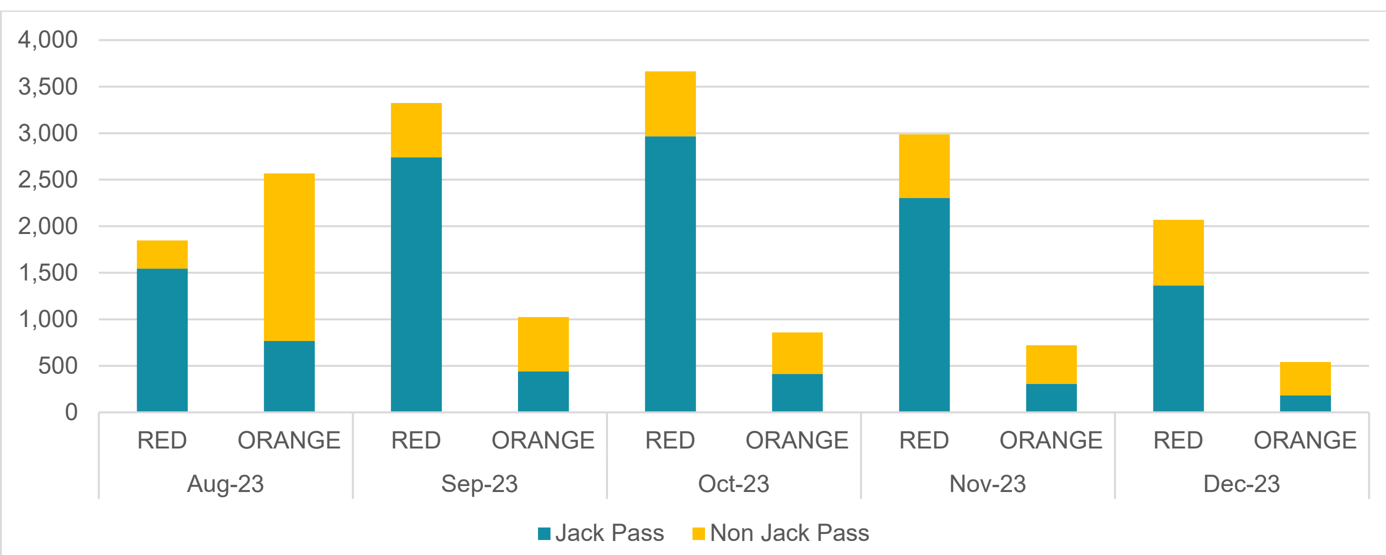
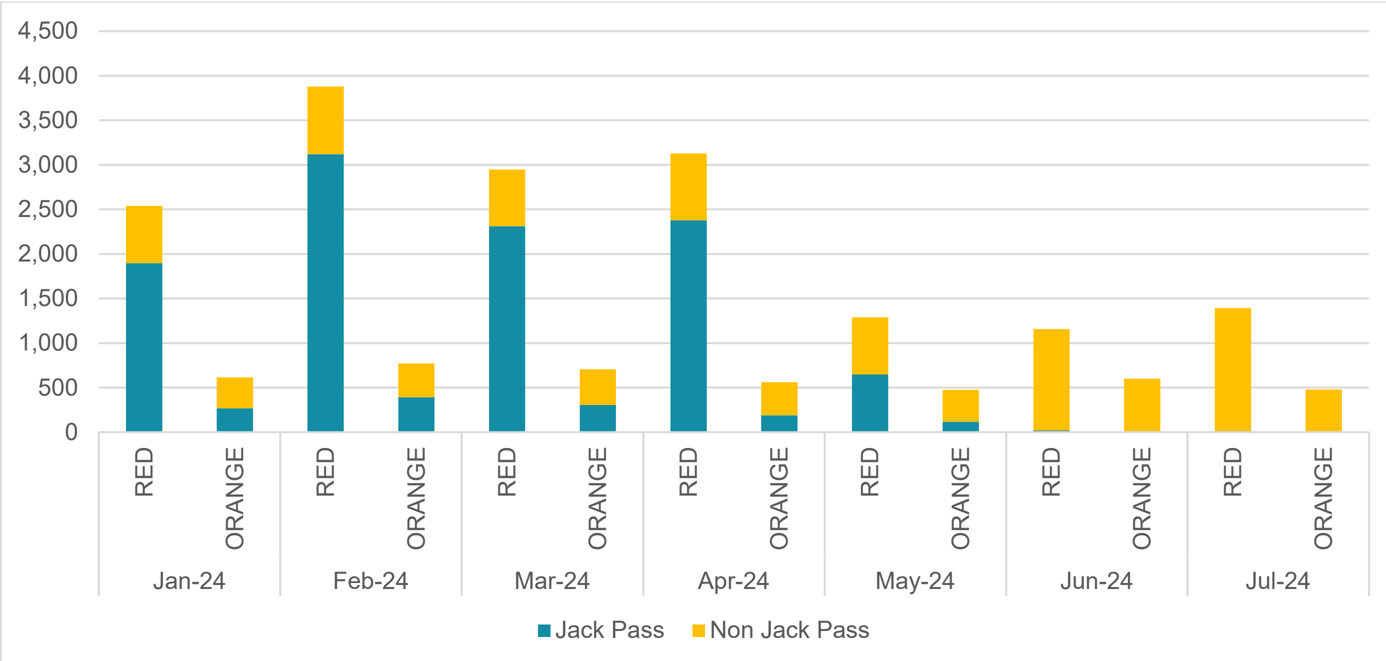
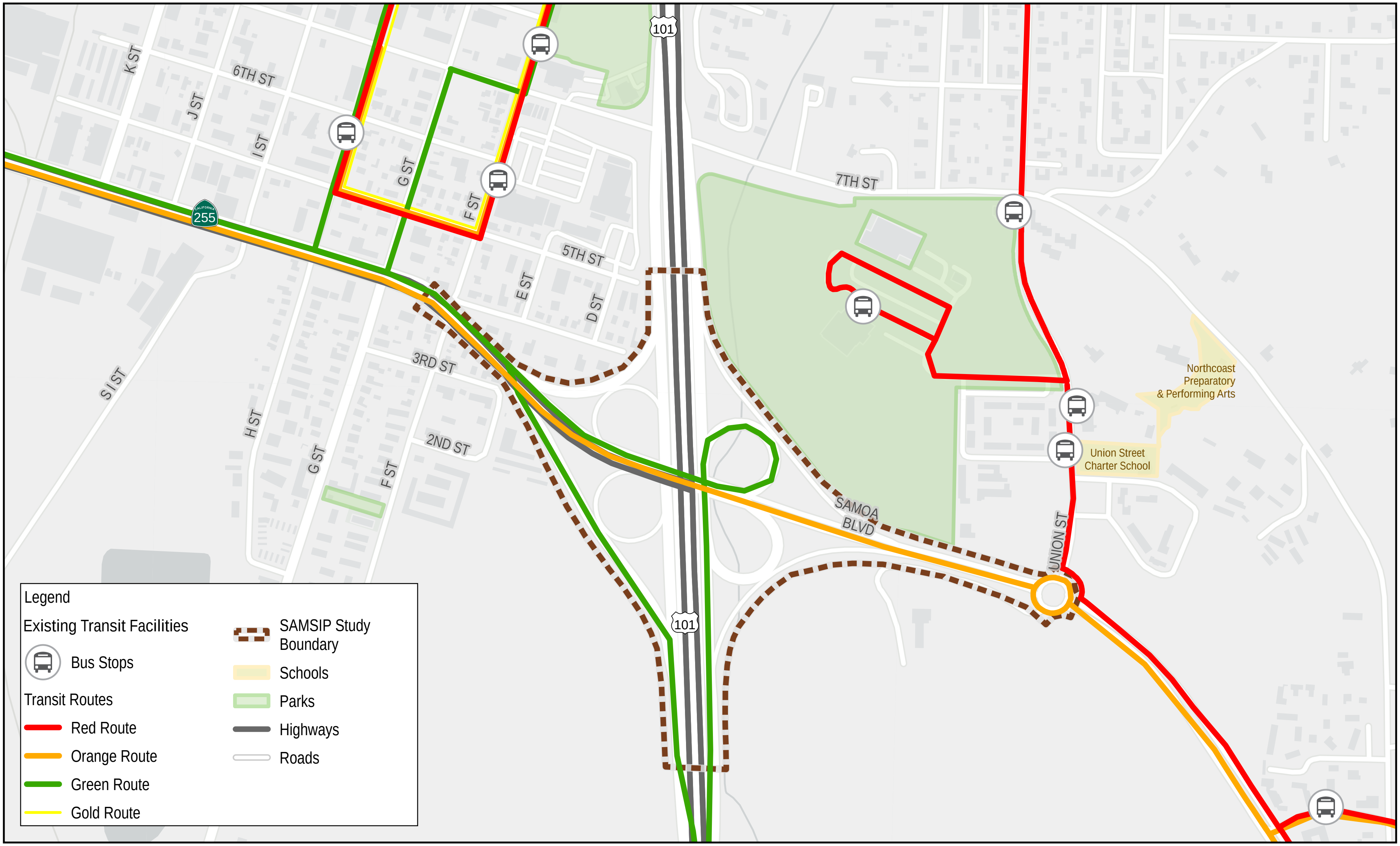


Figure 7.2 A&MRTS Ridership (January 2024 – July 2024)



7.2 Redwood Transit System (RTS)

RTS is a regional transit connection that runs one north-south route between the community of Scotia to the south and the Trinidad community to the north. Headways along the route vary. Buses run every thirty minutes at key downtown Arcata stops, including Cal Poly Humboldt, B Street and 14th Street, Arcata Transit Center, and H and 6th Street. Buses run along SR 255 from H Street and 6th Street to Lupin Drive and Peninsula Drive every three to four hours.



Paper Size ANSI A

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US Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
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City of Arcata
South Arcata Multimodal Safety Improvements Project
(SAMSIP)

Project No. 12625945
Revision No. -
Date 10/17/2024

Existing Transit Service

FIGURE 7.1

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Print date: 17 Oct 2024 - 08:56

Data source: Light Gray Base: Esri Community Maps Contributors, California State Parks, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, USFWS. Created by: hmurphy

8. Safety Analysis

Collision data from the most recent five-year period (January 1, 2019 – December 31, 2023) available from the Statewide Integrated Traffic Records System (SWITRS) and Transportation Injuring Mapping System (TIMS) were used to evaluated roadways safety along Samoa Boulevard, G Street, and the Samoa Boulevard US 101 interchange.

8.1 Collision Severity and Density

Fourteen collisions occurred at the Samoa Boulevard and US 101 Interchange during the five-year study period. As shown in Table 8.1 and Figure 8.1, most collisions (12) resulted in property damage only (PDO) while three resulted in a suspected minor injury or visible injury. No severe injuries or fatalities were reported.

Table 8.1 101 Interchange Collision Severity

Year	PDO	Suspected minor injury or visible injury	Total
2019	2	1	3
2020	2	1	3
2021	2	0	2
2022	5	0	5
2023	1	1	2
Total	12	3	15

Figure 8.1 US 101 Interchange Collision Severity by Year

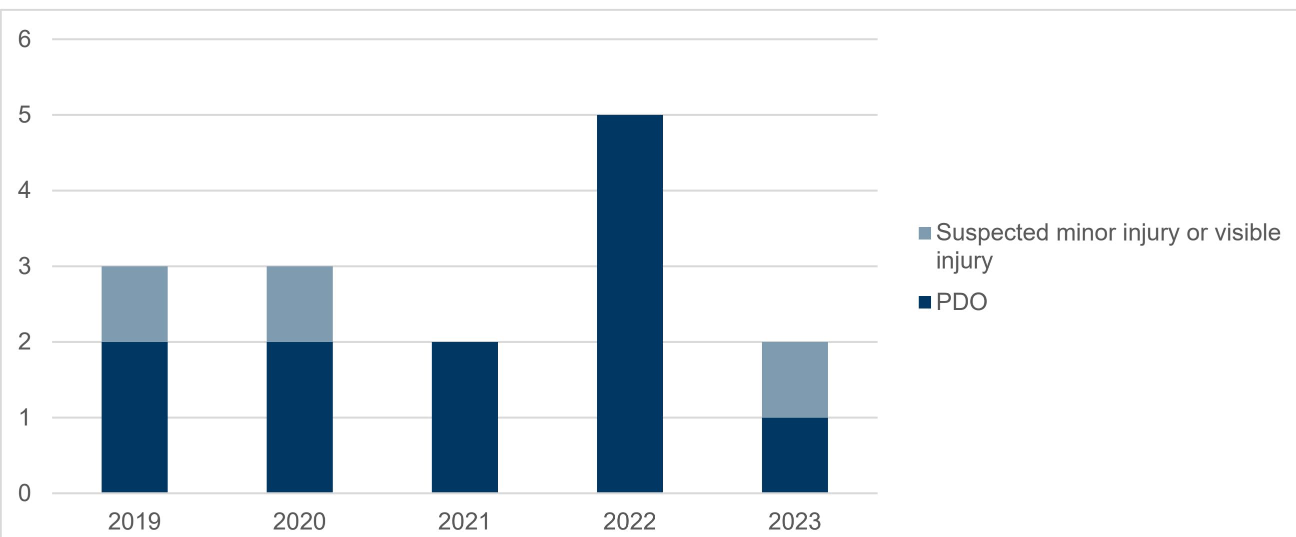

Figure 8.2 illustrates collision density throughout the interchange and highlights the most common collision locations throughout the area. Collision locations include F Street just east of the study area (20 collisions) on and off-ramps directly east of US 101 (five collisions), Samoa Boulevard and 3rd Street (three collisions), Samoa Boulevard and Union Street (three collisions), the south bound US 101 on-ramp (two collisions), and the east bound US 101 off-ramp (two collisions). Collisions were most frequently reported at the western end of the study area at F Street, as well as

just outside the boundary at G Street, suggesting an increased collision risk as drivers transition between a high-speed highway environment the urban street network, and vice versa.

Figure 8.3 presents collision severity and highlights pedestrian and bicycle collisions. The collisions that occurred within the Study area resulted in only PDO or minor injuries. Only one bicycle collision occurred within the study area at F Street, but other collisions involving non-motorized users occurred just west of the study area at G Street and H Street. The concentration of pedestrian and bicycle collisions at the west end of the study area again suggests collision risk at the edge of the urban street network as drivers enter and exit the highway.

The low number and severity of collisions on the interchange itself show the system as designed for vehicles moves vehicles efficiently until they interact with city streets, especially to the west. As the City seeks to encourage active transportation, however, the risk for potential severe collisions will increase as non-motorized users interact with vehicles moving at high speeds between the urban network and the interchange.

Paper Size ANSI A

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US Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
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SOUTH ARCATA MULTIMODAL SAFETY IMPROVEMENT PLAN

GHD

City of Arcata
South Arcata Multimodal Safety Improvements Project
(SAMSIP)

Project No. **12625945**
Revision No. **-**
Date **8/21/2024**

Collision Density

FIGURE 8.2

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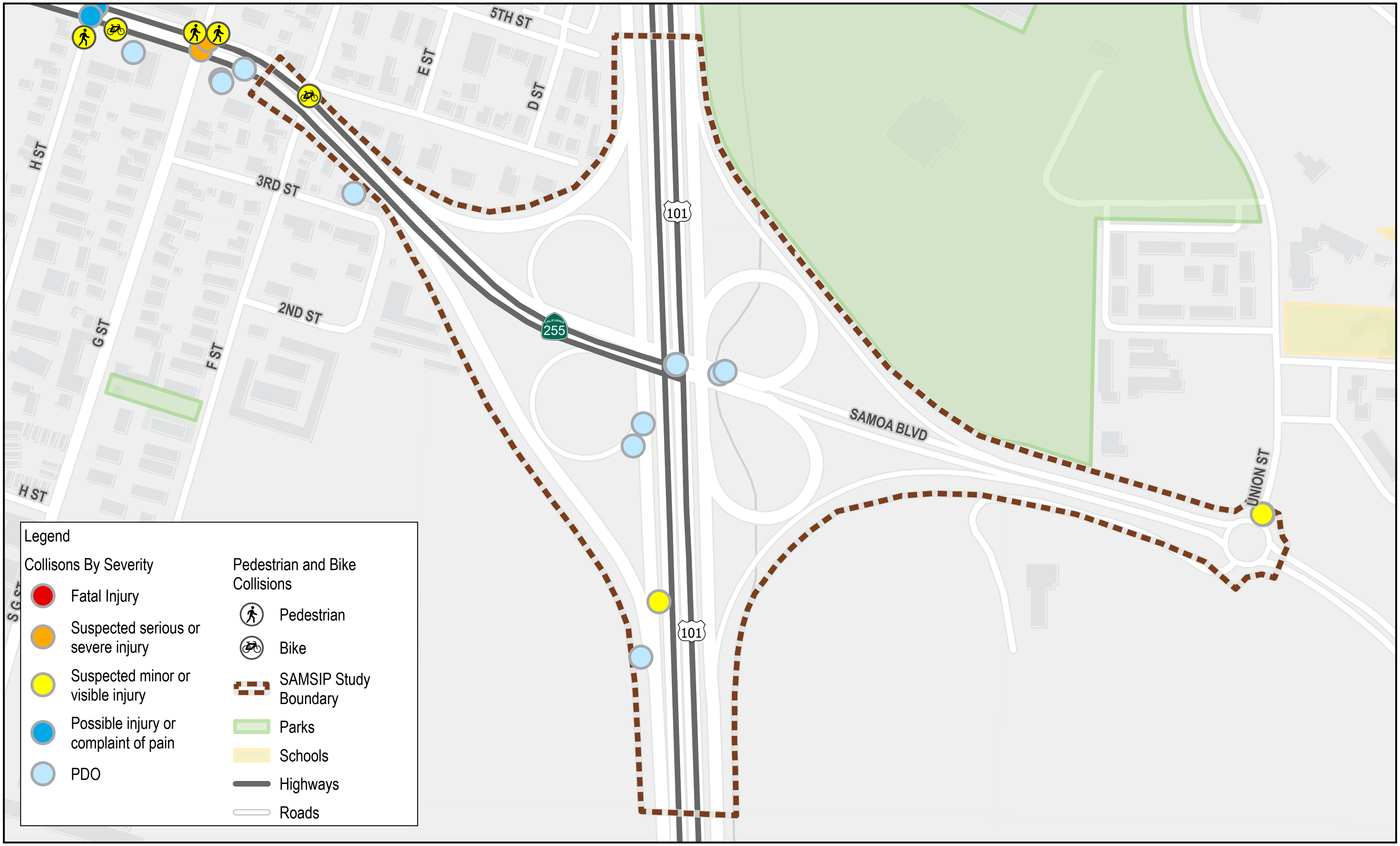
Print date: 21 Aug 2024 - 18:17

Data source: Light Gray Base: Esri Community Maps Contributors, California State Parks, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, USFWS. Created by: rsouthern



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SOUTH ARCATA MULTIMODAL SAFETY IMPROVEMENT PLAN

GHD

City of Arcata
South Arcata Multimodal Safety Improvements Project
(SAMSIP)

Project No. 12625945
Revision No. -
Date 8/27/2024

Collisions by Severity

FIGURE 8.3

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Print date: 27 Aug 2024 - 11:43

Data source: Light Gray Base: Esri Community Maps Contributors, California State Parks, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, USFWS. Created by: rsouthern

8.2 Collision Types

As shown in Table 8.2 and Figure 8.4, over half of the collisions that occurred at the US 101 interchange during the study period were hit object collisions (nine collisions). As shown in Table 8.3 , the reported hit object collisions resulted from a variety of violations, including driving under the influence of alcohol or drugs, improper turning, unsafe speeds, and driving on the wrong side of the road. Other collision types included broadside (two collisions), overturned vehicle (two collisions) and sideswipe collisions (one collision).

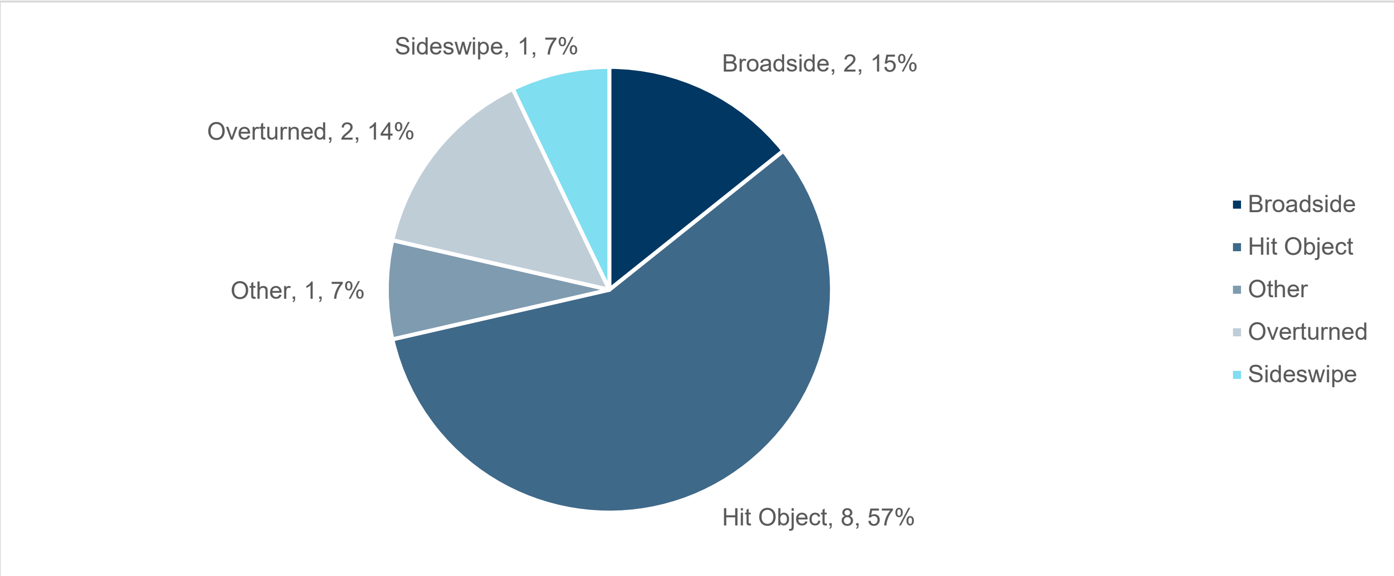
Table 8.2 US 101 Interchange Collision Type

	Year					
Collision Type	**2019**	**2020**	**2021**	**2022**	**2023**	**Total**
Broadside	1	0	1	0	0	2
Hit Object	2	1	1	4	1	9
Other	0	0	0	0	1	1
Overturned	0	2	0	0	0	2
Sideswipe	0	0	0	1	0	1
Total	3	3	2	5	2	15

Table 8.3 Primary Collision Factor

Collision Type	Driving or Bicycling Under the Influence of Alcohol or Drug	Improper Turning	Not Stated	Unsafe Speed	Wrong Side of Road	N/A	Grand Total
Broadside	0	1	1	0	0	0	2
Hit Object	3	3	0	2	1	0	9
Other	0	0	0	0	0	1	1
Overturned	2	0	0	0	0	0	2
Sideswipe	0	1	0	0	0	0	1
Total	5	5	1	2	1	1	15

Figure 8.4 US 101 Interchange Collision Type



8.3 Primary Collision Factors

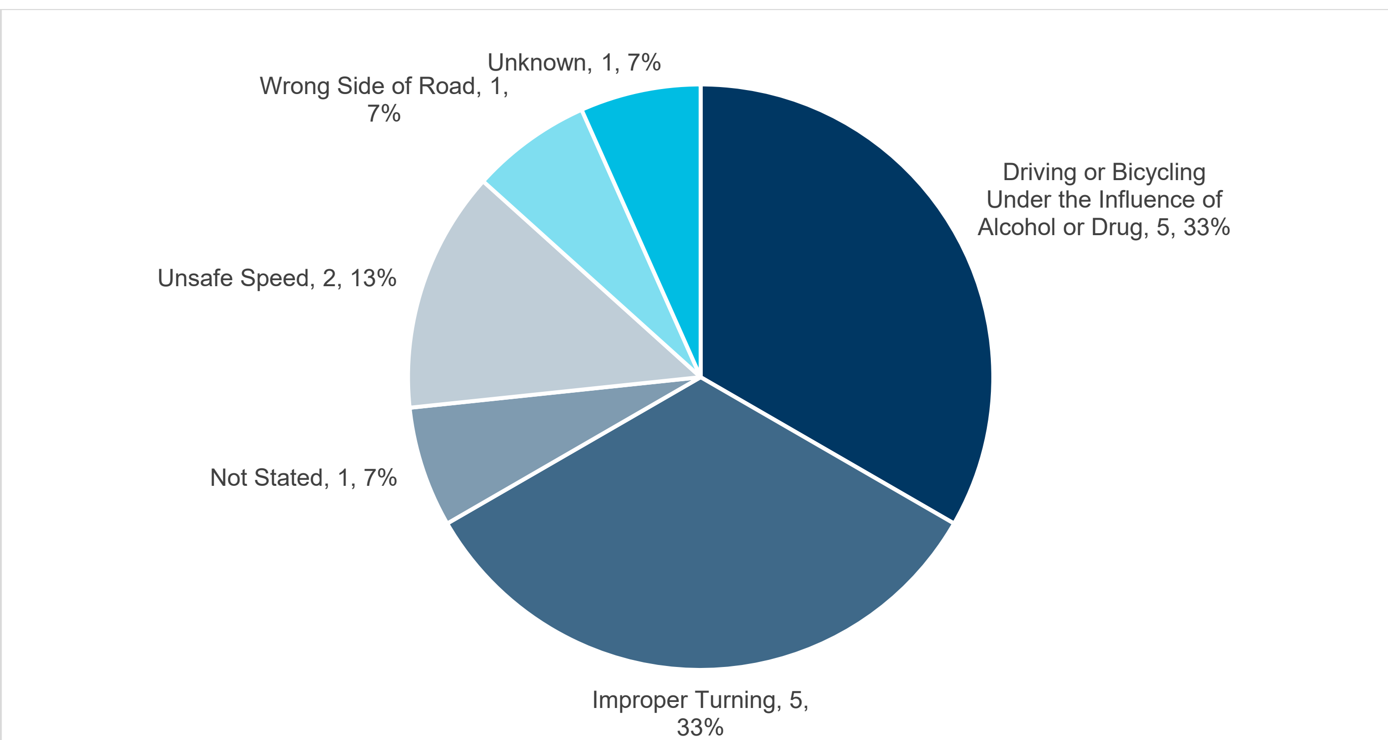
During the study period, the most common cause of collisions that occurred on the US 101 interchange was driver or bicycling under the influence of alcohol or drug(s) (five collisions). Other collision factors included improper turning (four collisions), unsafe speeds (two collisions), and traveling on the wrong side of the road (one collision).

Both unsafe speed collisions occurred at Union Street, resulting in one suspected minor visible injury and one PDO collision. Both collisions occurred when vehicle struck a fixed object, likely the center median of the roundabout, surrounding signage, or the approach medians. West of the roundabout, the approaching speed is 35 mph, and to the east, the posted speed is 25 mph. The roundabout is designed to slow approaching vehicles as they travel through the intersection to less than 20 mph. Vehicles traveling at unsafe speeds may result in minor collisions.

Table 8.4 US 101 Interchange Primary Collision Factors

Row Labels	2019	2020	2021	2022	2023	Total
Driving or Bicycling Under the Influence of Alcohol or Drug	0	3	1	1	0	5
Improper Turning	2	0	0	3	0	5
Not Stated	0	0	1	0	0	1
Unsafe Speed	1	0	0	1	0	2
Wrong Side of Road	0	0	0	0	1	1
N/A	0	0	0	0	1	1
Total	3	3	2	5	2	15

Figure 8.5 US 101 Interchange Primary Collision Factors



8.4 Crash Rates (TASAS)

In addition to the SWITRS data analyzed above, Caltrans provided crash data from the Traffic Accident Surveillance and Analysis System (TASAS) for SR 255 (Samoa Boulevard) on the US 101 overcrossing (between post miles 8.68 and 8.80). The TASAS data provided was based data between 2021 and 2024, which is a different timeframe than the collisions available from SWITRS. Table 8.5 presents the crash rates reported for the interchange overcrossing, excluding crashes along the ramps, and compared to the statewide average rate for similar facilities. Crash rates are reported in crashes per million vehicles. The table shows that the overcrossing had 3 crashes reported, no fatal or injury crashes, and the resulting crash rate is lower than the statewide average. In addition to these crashes reported below, the TASAS report showed three collisions occurred along ramps of the interchange.

Table 8.5 TASAS "Table B" Crash Rates (2021-2024)

Segment	Number of Crashes	Actual (per million vehicle)			Average (per million vehicle)		
		Fatal Crashes	Fatal + Injury Crashes	Total	Fatal Crashes	Fatal + Injury Crashes	Total
SR 255 PM 8.68 to 8.80	3	0.000	0.00	0.11	0.007	0.17	0.32

8.5 Pedestrian and Bicycle Collisions

8.5.1 Pedestrian and Bicycle Collisions

No pedestrian-involved collisions occurred at the US 101 interchange during the study period. There are no sidewalks or pathways across the interchange, meaning there is likely low pedestrian activity. However, high speeds and lack of pedestrian infrastructure increases the risk of fatal or severe injury collisions for pedestrians who do walk along the interchange.

Between 2019 and 2023, one bicycle-involved collision occurred within the study area. The bicyclist was traveling south across Samoa 17 feet west of F Street when they were struck by a vehicle traveling west, resulting in a bicyclist injury. The primary collision factor is unknown, but the bicyclist was deemed at fault. At this intersection, there are no bicycle lanes. The speed limit on this segment is 35 miles per hour, and bicyclists must contend with drivers along the roadway and with those turning onto F Street. The existing crosswalk at F street is accompanied by a median island and an RRFB. However, approaching the intersection, there are no traffic calming measures present to slow drivers transitioning from the highspeed interchange to the urban street network. To support the existing crossing safety countermeasure in place at the crosswalk, measures to slow driver speeds must be implemented. The lack of bicycle facilities, high speeds, and lack of traffic calming create a risky environment for bicyclists.

The lack of active transportation facilities along the interchange creates a hazardous environment for pedestrian and bicyclists. As the City works to increase non-motorize trips in Arcata and along Samoa Boulevard, failure to improve safety and implement adequate active transportation facilities along the interchange will result in an increased collision risk for these road users.

As shown in Figure 8.3, the western end of the study area experiences a higher concentration of pedestrian- and bicyclist-involved collisions. Existing infrastructure does little to slow drivers exiting the high-speed highway and entering the urban street network, increasing the risk of collisions with pedestrians and bicyclists traveling along or across Samoa Boulevard.

Appendices

Appendix A

Bicycle LTS Methodology

Technical Memorandum

August 27, 2024

To	Rosanna Southern
From	Paige Thornton
Subject	Bicycle Level of Traffic Stress Methodology

1. Introduction

Level of traffic stress (LTS) is a suitability rating system from the perspective of different subsets of the population, which measures the perceived comfort, safety and convenience associated with bicycling or walking in or adjacent to vehicle traffic. Studies have shown that 60 percent of the population will be deterred from bicycling or walking if an active transportation facility features high levels of traffic stress and they will only choose the routes with the highest levels of perceived safety.[1] The less stressful the experience, and the lower the LTS score, the more likely bicycling or walking is to appeal to a broader segment of the population.

A bicycle and pedestrian network will attract greater numbers of residents, employees and visitors of all ages and abilities if it is designed to reduce the level of stress associated with potential conflicts with motor vehicles and safely connect people to their destinations. Facilities that provide greater separation between vehicle traffic and people walking and bicycling, as well as minimize the potential for stressful conflicts between these road user groups, will result in the lowest levels of traffic stress and highest comfort using the facility.

The LTS analysis analyzes the traffic stress associated with bicycling. Bicycle LTS analysis employs the level of traffic stress methodology described in the Oregon Department of Transportation (ODOT) "Analysis Procedures Manual Version 2, Chapter 14, Multimodal Analysis," (August 2024). The methodology presented therein is based on the paper, *Low Stress Bicycling and Network Connectivity,* Report 11-19, published by the Mineta Transportation Institute (MTI) (May 2012). The LTS methodology as reported by ODOT's latest Multimodal Analysis Procedure Manual includes updates to the methodology that was originally published by MTI. The updated methodology includes analysis criteria for new bicycle facility types that have become more frequently implemented since the original report was published and considers additional infrastructure types not analyzed under the MTI methodological approach.

This memorandum describes the LTS methodology and analysis criteria in additional detail.

2. Methodology

The bicycle LTS methodology considers a variety of roadway infrastructure characteristics to determine the LTS score of a roadway or intersection, including:

– Level of separation from vehicular traffic
– Street width (number of lanes), daily traffic volumes and/or functional classification

[1] "Four Types of Transportation Cyclists in Portland," Geller, 2006

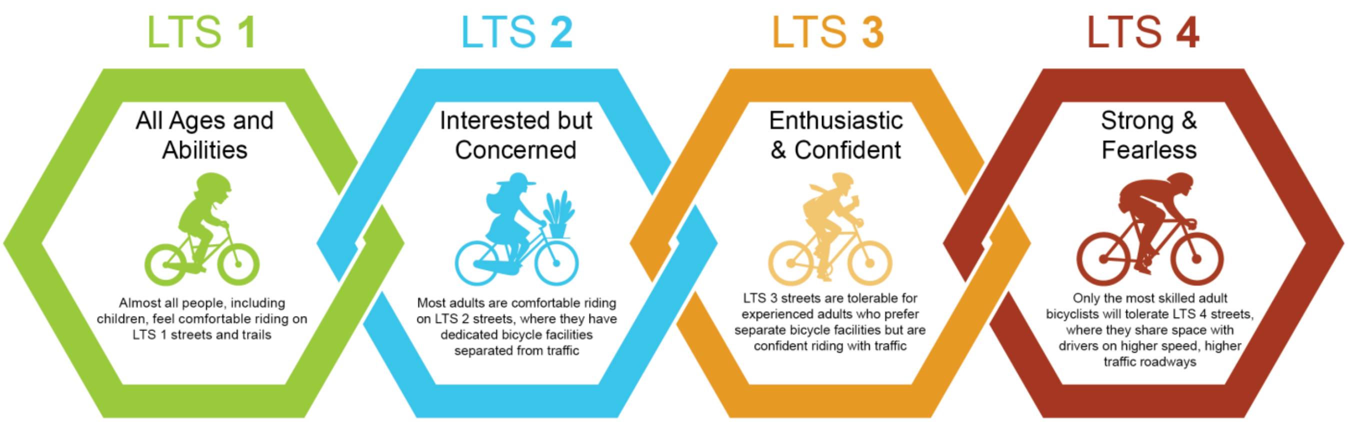
- Presence and width of bike lanes, parking lanes, medians and turn lanes
- Frequency of bike lane blockage
- Speed limit or prevailing speed of adjacent street or streets being travelled along or crossed
- Intersection control type

Level of traffic stress scores are governed by the worst-case principle, meaning that the highest stress score associated with analyzed criteria will determine the LTS score of the overall segment, with LTS 1 being the lowest stress and LTS 4 being the highest stress. The application of these criteria-specific bicycle LTS analysis is described below.

2.1 Bicycle Level of Traffic Stress

Figure 2.1 describes each LTS score by bicycle user type or category. 60 percent of the population falls within the interested but concerned LTS 1 or LTS 2 categories. Bicycle LTS analyzes roadway segments, intersection approaches and intersection crossings, and the worst score among the three analysis categories determines the overall LTS score of the overall segment.

Figure 2.1: Level of Traffic Stress by User Category



2.1.1 Segments

The criteria for analyzing Bicycle LTS is broken into three categories:

- Physically separated paths or lanes, such as Class I shared-use paths or Class IV cycle tracks
- Streets with standard bicycle lanes, such as Class II or Class II buffered bicycle lanes
- Streets without bicycle lanes, also referred to as mixed traffic

Physically separated paths or lanes are generally assigned LTS scores of one due to the greater separation from vehicular traffic, while the LTS scores associated with the other two categories vary based on a variety of factors.

The criteria for analyzing the segment LTS of streets with Class II bicycle lanes are presented in Table 2.1 and

Table 2.2, which are separated by segments that feature an adjacent parking lane, and those that do not. As shown, the segment BLTS score considers bicycle lane width, presence and parking lane width, speed and lanes per direction.

Table 2.1 BLTS Criteria for Segment with Bike Lane and Adjacent Parking Lane

Prevailing or Posted Speed	1 Lane per direction			≥2 lanes per direction	
	≥ 15' bike lane + parking	14' – 14.5' bike lane + parking	13' bike lane + parking or Frequent blockage[1]	≥ 15' bike lane + parking	≤ 14.5' bike lane + parking or Frequent blockage[1]
≤25 mph	BLTS 1	BLTS 2	BLTS 3	BLTS 2	BLTS 3
30 mph	BLTS 1	BLTS 2	BLTS 3	BLTS 2	BLTS 3
35 mph	BLTS 2	BLTS 3	BLTS 3	BLTS 3	BLTS 3
≥40 mph	BLTS 2	BLTS 4	BLTS 4	BLTS 3	BLTS 4

1 Typically occurs in urban areas (i.e., delivery trucks, parking maneuvers, stopped buses).

Table 2.2 BLTS Criteria for Segment with Bike Lane, no Adjacent Parking Lane

Prevailing or Posted Speed	1 Lane per direction				≥2 lanes per direction	
	≥ 7' bike lane (buffered bike lane)	5.5' – 7' bike lane	≤ 5.5' bike lane	Frequent bike lane blockage[1]	≥ 7' bike lane (buffered bike lane)	< 7' bike lane or frequent blockage[1]
≤30 mph	BLTS 1	BLTS 1	BLTS 2	BLTS 3	BLTS 1	BLTS 3
35 mph	BLTS 2	BLTS 3	BLTS 3	BLTS 3	BLTS 2	BLTS 3
≥40 mph	BLTS 3	BLTS 4	BLTS 4	BLTS 4	BLTS 3	BLTS 4

1 Typically occurs in urban areas (i.e., delivery trucks, parking maneuvers, stopped buses).

Table 2.3 and Table 2.4 presents the criteria for analyzing segments without bicycle lanes that require a bicyclist to ride with mixed traffic. If daily traffic volume is available, then that data should be considered in the analysis. If daily volume data is not available, functional classification should be analyzed in place of daily traffic volumes. As shown, lower speed roadways and higher speed roadways are analyzed differently, but both categories consider presence of a marked centerline, number of through lanes per direction, daily traffic volume or functional classification, and speed.

Table 2.3 BLTS Criteria for Segments in Mixed Traffic - 30 mph or less

Number of Lanes	ADT (Average Daily Traffic)	Functional Class	Posted or Prevailing Speed (mph)		
			≤20	25	30
Unmarked Centerline	≤750	Local	BLTS 1	BLTS 1	BLTS 2
	750 - ≤1,500	Local/Collector	BLTS 1	BLTS 1	BLTS 2
	1,500 - ≤3,000	Collector	BLTS 2	BLTS 2	BLTS 2
	>3,000	Arterial	BLTS 2	BLTS 3	BLTS 3
1 through lane per direction	≤750	Local	BLTS 1	BLTS 1	BLTS 2
	750 - ≤1,500	Local/Collector	BLTS 2	BLTS 2	BLTS 2
	1,500 - ≤3,000	Collector	BLTS 2	BLTS 3	BLTS 3
	>3,000	Arterial	BLTS 3	BLTS 3	BLTS 3
2 through lanes per direction	≤8,000	Arterial	BLTS 3	BLTS 3	BLTS 3
	>8,000	Arterial	BLTS 3	BLTS 3	BLTS 4
3+ through lanes per direction	Any ADT	Arterial	BLTS 3	BLTS 3	BLTS 4

Table 2.4 BLTS Criteria for Segments in Mixed Traffic - 35 mph or more

Number of Lanes	ADT (Average Daily Traffic)	Functional Class	Posted or Prevailing Speed (mph)		
			35	40	>45
Unmarked Centerline	≤750	Local	BLTS 2	BLTS 3	BLTS 3
	750 - ≤1,500	Local/Collector	BLTS 3	BLTS 3	BLTS 4
	1,500 - ≤3,000	Collector	BLTS 3	BLTS 4	BLTS 4
	>3,000	Arterial	BLTS 3	BLTS 4	BLTS 4
1 through lane per direction	≤750	Local	BLTS 2	BLTS 3	BLTS 3
	750 - ≤1,500	Local/Collector	BLTS 3	BLTS 3	BLTS 4
	1,500 - ≤3,000	Collector	BLTS 3	BLTS 4	BLTS 4
	>3,000	Arterial	BLTS 3	BLTS 4	BLTS 4
2 through lanes per direction	≤8,000	Arterial	BLTS 3	BLTS 4	BLTS 4
	>8,000	Arterial	BLTS 4	BLTS 4	BLTS 4
3+ through lanes per direction	Any ADT	Arterial	BLTS 4	BLTS 4	BLTS 4

2.1.2 Intersection Approaches

Right-Turns

The Bicycle LTS criteria for analyzing intersection approaches along the corridor considers locations with right-turn lanes at the intersection approach, as well as the configuration, lane length, alignment, vehicle turning speed or curb radius at the intersection corner. Only locations with a dedicated right-turn lane are analyzed herein. If there are approach locations without dedicated right-turn lanes known to be high stress based on local data that are not identified as such using this approach, those locations should be adjusted to reflect actual conditions.

Figure 2.2 presents the types of right-turn lane configurations analyzed to assess the BLTS of intersection approaches where bike lanes are present. Approaches with right-turn lanes where no bike lanes are present are considered high stress unless the right-turn lane is less than 100 feet including the lane taper or is rarely used. Additional high stress scenarios include approaches with turn lanes longer then 300 feet, and locations with dual turn lanes. The criteria for analyzing intersection approach BLTS at locations with right-turn lanes with bike lanes is shown in Table 2.5.

Figure 2.2 Right Turn Lane Configuration Types[2]

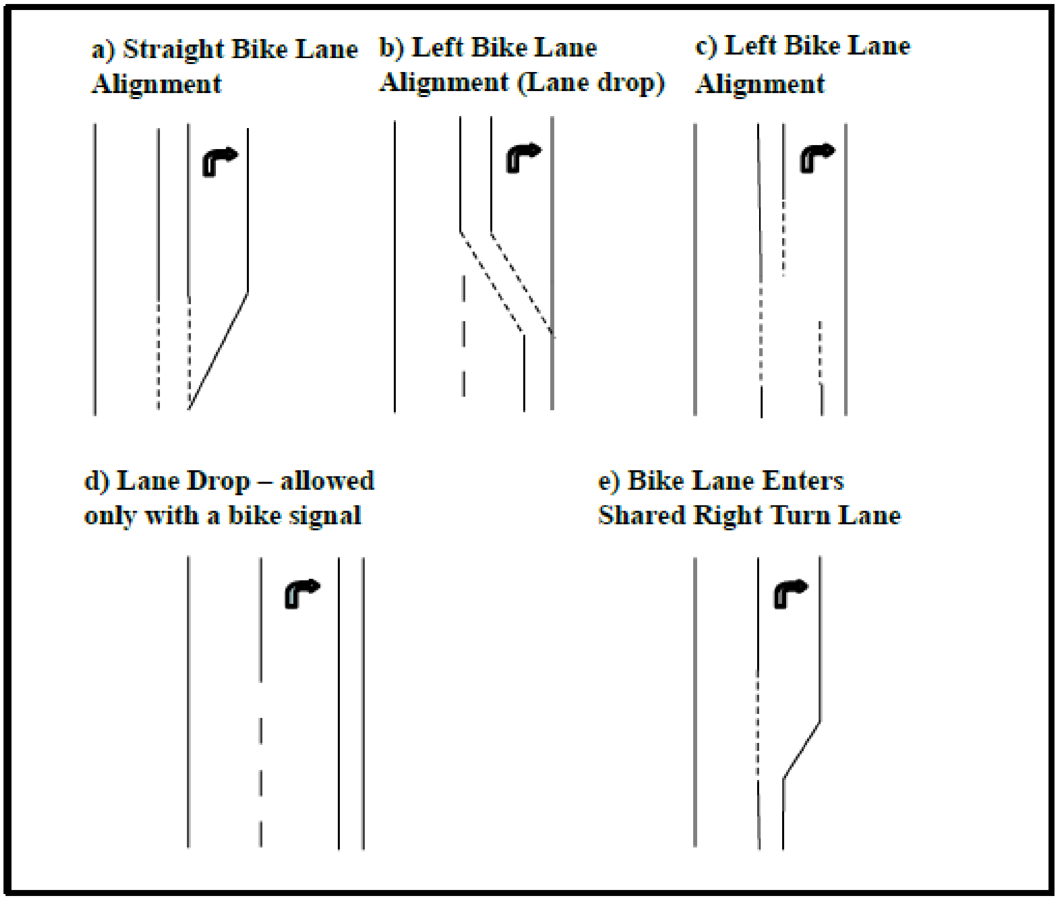


Table 2.5 BLTS Criteria for Intersection Approaches with Right-Turn Lanes[1]

Right-turn Lane Configuration	Right-turn Lane Length (ft)[2]	Bike Lane Approach Alignment	Vehicle Turning Speed (mph)[3]	BLTS
a)	≤ 150	Straight	≤ 15	BLTS 2
a)	> 150 to 500' maximum	Straight	≤ 20	BLTS 3
b) or c)	< 150	Shift to Left	≤ 15	BLTS 3
d)	N/A	N/A	N/A	BLTS 1
e)	≤ 75	Straight	≤ 15	BLTS 2
e)	>75' to 150' maximum	Straight	≤ 15	BLTS 3

1 Assign BLTS 4 for any lengths, speeds, or configurations (e.g. dual right turns or Figure 2.2dchui if bike signal is not present) not shown in the table.
2 For the purposes of this methodology, the right turn lane length include the length of the taper.
3 This is vehicle speed at the corner, not the speed crossing the bike lane. Corner radius can also be used as a proxy for turning speeds.

Left-Turns

The original LTS methodology published by MTI did not consider the effect of left-turns on an intersection approach. However, the ODOT methodology suggests an approach for considering left-turn lanes in locations

[2] Oregon Department of Transportation (ODOT), "Analysis Procedures Manual Version 2, Chapter 14, Multimodal Analysis," (October 2020).

where a route requires a left-turn and typically uses the vehicle lane rather than a two-stage movement for facilitating the left-turn.

Table 2.6 presents the criteria for analyzing the left turns. For locations where bicyclists use a lower-stress two-stage movement such as with a bike box or left-turn queue box markings at a low-speed signalized intersection, then the left-turn approach LTS is scored as LTS 1 and the crossing LTS score will determine the stress of the movement. High-speed intersections should include additional treatments to provide the lowest-stress bicycling experience.

Table 2.6 BLTS Criteria for Intersection Approaches with Left Turn Lanes [1]

Prevailing Speed or Speed Limit (mph)	No Lane Crossed [2]	1 Lane Crossed	2 + Lanes Crossed
≤ 25	BLTS 2	BLTS 3	BLTS 4
30	BLTS 3	BLTS 4	BLTS 4
≥ 35	BLTS 4	BLTS 4	BLTS 4

1 Use BLTS 4 for any shared/exclusive dual left turn lane configuration.
2 For shared through-left lanes or where mixed traffic conditions occur (no bike lanes present)

2.2 Intersection Crossings

Signalized Intersections

The Bicycle LTS criteria for analyzing intersection crossings considers only unsignalized intersections, because signalized intersections usually do not create a barrier as the signal generally provides adequate protections. BLTS 1 is assumed for the crossing movements at signalized intersections unless the location is known to create a barrier for the user. All signalized intersections analyzed herein were assigned a BLTS score of 1 due to no available data to suggest otherwise. If there are locations known to feature issues causing a barrier, the LTS score of the locations should be adjusted to reflect this information. Barriers could result from difficulty in triggering signal detection, or an intersection may not have the proper markings, ramps, and/or push-button accommodations for bicyclists. In locations such as these, the bicyclist is often forced to use the crosswalk like a pedestrian and should be assigned BLTS 2. Engineering judgement should be used for assigning stress levels higher than BLTS 1 at signalized intersections.

Unsignalized Intersections

Table 2.7 and

Table 2.8 present the BLTS criteria for analyzing unsignalized crossing locations, which considers the total number of through lanes, daily traffic volume or functional classification and speed. Locations with a median refuge can lower traffic stress by providing space for bicyclists if they are unable to cross before oncoming traffic is approaching. Thus, they are analyzed differently, as shown in Table 2.7 and Table 2.8.

Table 2.7 BLTS Criteria for Unsignalized Intersection Crossing without a Median Refuge[1]

Prevailing Speed or Speed Limit (mph)	Total Through/Turn Lanes Crossed (Both Directions)2					
	≤ 3 Lanes			4 -5 Lanes		≥ 6 Lanes
	Functional Class/ADT (daily traffic volume)					
	Local	Collector	Arterial	Arterial		Arterial
	≤ 1,200	1,200 - ≤3,000	>3,000	≤ 8,000	>8,000	Any ADT
≤ 25	BLTS 1	BLTS 1	BLTS 2	BLTS 3	BLTS 4	BLTS 4
30		BLTS 1	BLTS 3	BLTS 3	BLTS 4	BLTS 4
35		BLTS 2	BLTS 3	BLTS 4	BLTS 4	BLTS 4
≥ 40		BLTS 3	BLTS 4	BLTS 4	BLTS 4	BLTS 4

1 For street being crossed

Table 2.8 BLTS Criteria for Unsignalized Intersection Crossing with a Median Refuge[1]

Prevailing Speed or Speed Limit (mph)	Maximum Through/Turn Lanes Crossed per Direction			
	1 Lane	2 Lanes	3 Lanes	4+ Lanes
≤ 25	BLTS 1 [2]	BLTS 2 [2]	BLTS 2	BLTS 3
30	BLTS 1 [2]	BLTS 2 [2]	BLTS 3	BLTS 3
35	BLTS 2	BLTS 3	BLTS 4	BLTS 4
≥ 40	BLTS 3	BLTS 4	BLTS 4	BLTS 4

1 For street being crossed.
2 Refuge should be at least 10 feet to accommodate a wide range of bicyclists (i.e., bicycle with a trailer) for BLTS 1, otherwise BLTS=2 for refuges 6 to <10 feet.

Roundabouts

Calculation of the traffic stress at roundabouts will determine if bicyclists are expected to use a shared sidewalk that surrounds it or if they will ride in the vehicular lanes under mixed traffic conditions. For a sidewalk to serve as a potential bicycling path, all the following criteria must be met. If both routes are possible, evaluate both options and use the lower stress option as the controlling BLTS.

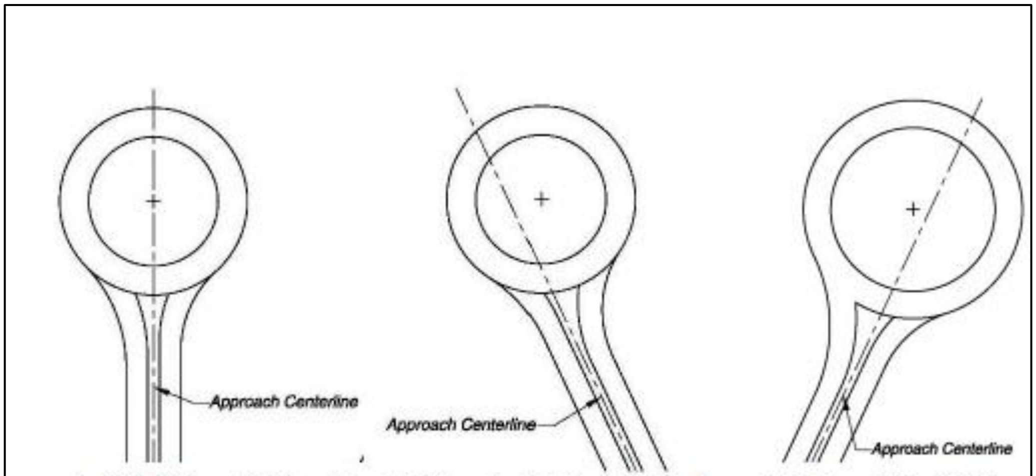
- Minimum six-foot clear width (allows slow-speed passing assuming no obstructions that would prevent a cyclist from riding close to the edge of the walkway).
- Offset from edge of circulating roadway to path crossing should be no more than 30' to minimize out-of-direction travel.
- Path geometry should have no turns greater than 90 degrees and allow a cyclist to see (without looking behind them) if it is safe to cross within 10' from the crossing (allows for minimum 5 mph travel speed).
- Separate bike ramps need to be provided to transition riders between the sidewalk and street (or bike lane) on entry and exit legs in a reasonably direct manner and provide a safe re-entry. If a single ramp is intended to provide both bicycle and pedestrian traffic, then it needs to be wider than the standard (8-10') pedestrian curb ramp.

A separate 8-foot or larger path or sidewalk surrounding a roundabout will be normally BLTS 1 for the segments between the leg crossings. Narrower 6' sidewalks are BLTS 2 as it is more difficult to overtake pedestrians or bicyclists traveling in the same direction or allow opposing traffic to pass.

Each of the roundabout leg crossings will need to be evaluated as that will be the source of traffic stress for bicyclists using the sidewalk crossing as shown in Figure 2.3. All the individual leg crossing BLTS's are compared, and the highest one will be used to represent the roundabout BLTS.

Leg crossings will generally control over the mixed traffic condition except in cases where tangential legs are used, or higher volumes are present. Tangential legs occur when the approach centerline does not go through the roundabout center. These have little deflection in the vehicle path and results in much higher speeds through the pedestrian crossing. Most roundabouts should have non-tangential approaches. The highest BLTS from Table 2.9 or Table 2.10 will be used in this case.

Figure 2.3 Roundabout Approach Geometry



gure from NCHRP Report 672, Roundabouts: An Informational Guide, 2nd Edition, Transportation Research Board, 2010.

Table 2.9 Roundabout Leg Crossing BLTS (for shared path or sidewalk)

Entry/Exit Type	Non-Tangential	Tangential
Single Entry Lane	BLTS 1	BLTS 2
Single Exit Lane	BLTS 1	BLTS 3
Dual Entry Lanes	BLTS 1	BLST 3
Dual Exit Lanes	BLTS 3	BLST 4
An exit/entry lane is tangential if a driver does not have to turn to the right when entering or exiting (deflection). This is a non-standard design.		

If there is no adequate alterative path or sidewalk to use, then the bicyclist will need to use the vehicle lane under mixed traffic conditions through the roundabout. The BLTS is computed for these cases in Table 2.10. Dual-lane roundabouts will always be BLTS 4 as these always have at least one multilane exit which sets up a potentially hazardous conflict between circulating bicyclists and exiting traffic from the inside lane. Partial two-lane roundabouts are considered to have two circulating lanes for the purposes of this methodology as stress level is controlled by the worst condition. Right-turn bypass lanes outside of the roundabout should be considered as mixed traffic conditions. Right-turn bypass lanes within the roundabout would be considered as right turn lanes as previously described.

Table 2.10 Roundabout Circulating BLTS (for mixed traffic)

Number of circulating lanes	Total Entry Leg Daily Volume	BLTS
1	≤ 4,000	BLTS 1
1	4,000 - ≤ 6,000	BLTS 2
1	> 6,000	BLST 3
2+ (partial or full)	Any	BLTS 4