Orange County Transportation Authority

Central Harbor Boulevard Transit Corridor Study

Purpose and Need Statement – Final

OCTA

FULLERTON

ANAHEIM

GARDEN GROVE

SANTA ANA

Purpose and Need Statement

Final

January 27, 2017

Task # 2.5

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TABLE OF CONTENTS

FIGURES

TABLES

ABBREVIATIONS / ACRONYMS

ARC.....Anaheim Rapid Connection
ART .....Anaheim Resort Transportation
ARTIC.....Anaheim Regional Transportation Intermodal Center
CSUF .....California State University, Fullerton
FCC .....Fullerton College Connector
FFS.....Free-Flow Speed
FTA .....Federal Transit Administration
FTC.....Fullerton Transportation Center
LOS .....Level of Service
mph .....miles per hour
OCCOG .....Orange County Council of Governments
OC CSI.....Orange County Complete Streets Initiative
OCP.....Orange County Projections
OCTA .....Orange County Transportation Authority
SARTC .....Santa Ana Regional Transportation Center
SCAG.....Southern California Association of Governments
V/C.....Vehicle Volume to Capacity

REFERENCES

Alternative Evaluation Methodology Report – March 2016
Katella Avenue Technical Addendum – January 2017
Mobility Problem Definition Report – April 2016
Prior Studies and Data Collection Report – April 2016
Study Corridor Definition Report – April 2016
Travel Demand Methodology Report – March 2016
Travel Market Assessment Report – March 2016

1. INTRODUCTION

1.1. STUDY OVERVIEW

Harbor Boulevard is Orange County's busiest north-south transit corridor. The entire corridor extends over 20 miles in length between the cities of La Habra and Costa Mesa, and intersects nearly 30 major east-west corridors. Its value as a north-south transit spine with connections to east-west arterials, including Katella Avenue, is evident on a daily basis. Average weekday boardings on buses from the Orange County Transportation Authority (OCTA) total more than 12,000 on this corridor. OCTA buses operating on the parallel Anaheim Boulevard/Lemon Street corridor collect an additional 9,000 average weekday boardings between the cities of Fullerton and Newport Beach. Additionally, OCTA buses operating along Katella Avenue between the cities of Long Beach and Orange average 4,000 boardings per weekday. The three routes combined account for a significant share of OCTA's total average daily boardings.

This transit corridor study focuses on an eight-mile segment of Harbor Boulevard from the Fullerton Transportation Center (FTC) in Downtown Fullerton, south through the cites of Anaheim and Garden Grove to Westminster Avenue, on the border of Garden Grove and the city of Santa Ana. This segment of the corridor accounts for approximately 60 percent of total route boardings. Additionally, this study also considers connections along a parallel five-mile segment of Lemon Street-La Palma Avenue-Anaheim Boulevard from Downtown Fullerton to Katella Avenue in Anaheim. An additional 2.2-mile segment of Katella Avenue, from Harbor Boulevard to the Anaheim Regional Transportation Intermodal Center (ARTIC) in Anaheim's Platinum Triangle district has also been identified for consideration in this study. The study area is shown on Figure 1.1.

Each corridor includes a connection to future fixed-guideway improvements and regional rail centers currently being studied or under development. These include:

- **The OC Streetcar Project:** A 4.2-mile streetcar system that will operate between the Santa Ana Regional Transportation Center (SARTC)—a hub for local and regional rail, bus, and airport taxi/shuttle service—and the intersection of Harbor Boulevard/ Westminster Avenue. The project is currently in design and is expected to begin operations in 2020.
- **ARTIC**: Opened in December 2014, the station provides rail, bus, taxi, and other services for commuters and travelers throughout Orange County. The first phase of ARTIC serves Metrolink, Amtrak, and connections to other local and regional transit providers, including OCTA and Anaheim Resort Transportation (ART). Phase two will provide additional passenger facilities and support services to accommodate future potential California High-Speed Rail service.
- **FTC:** The Fullerton Transportation Center is the busiest train station in Orange County, providing connections to Amtrak, Metrolink, and local transit providers like OCTA. The station is featured in the *Fullerton College Connector Study* (2015), which the City of

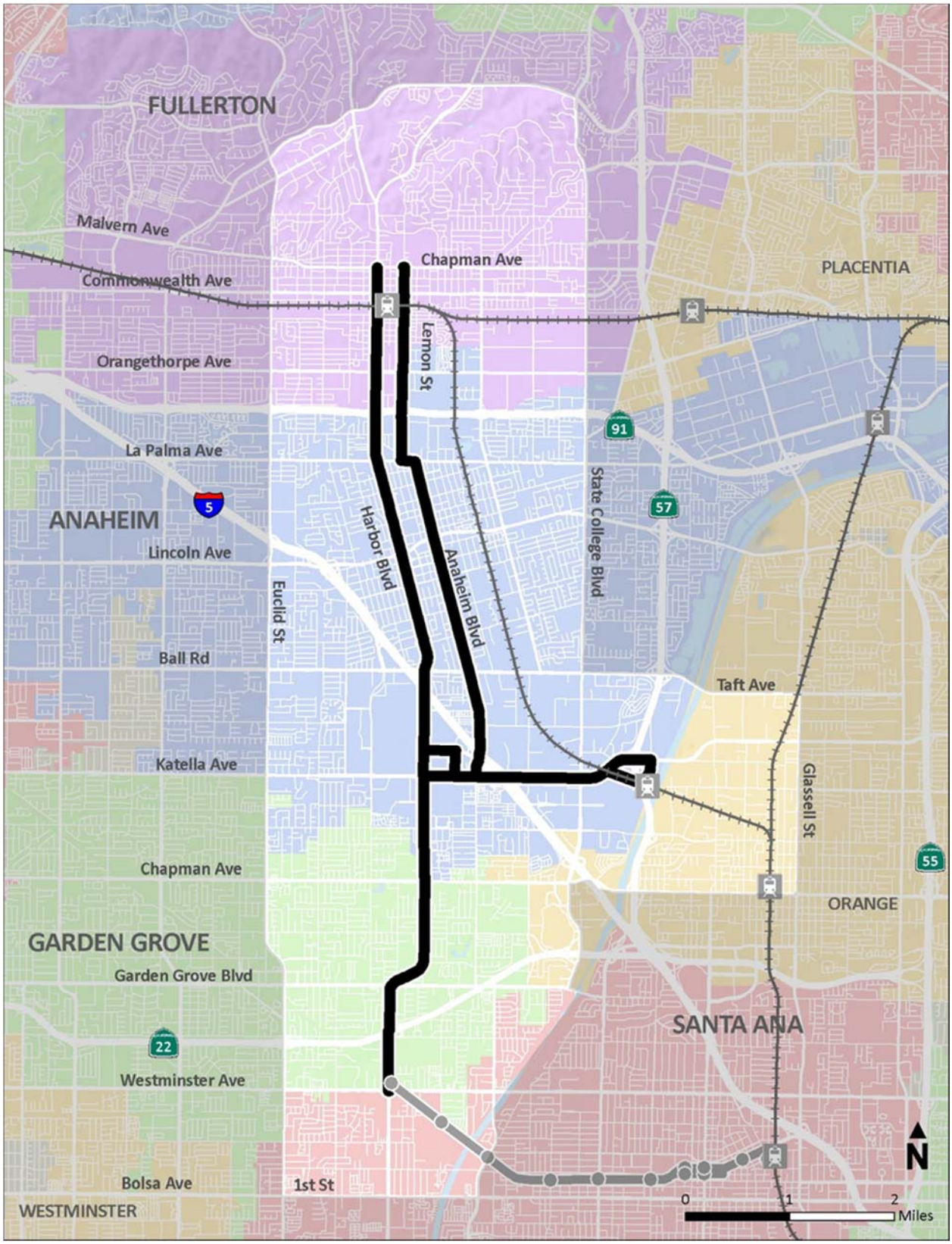
Fullerton developed to evaluate strategies for enhancing transit connections between local college campuses (Fullerton College and California State University, Fullerton) and the FTC.

OCTA, while working in close coordination with the cities of Anaheim, Fullerton, Garden Grove, and Santa Ana, has formed a project development team with staff representatives from each city. The objectives of the transit corridor team include:

1. To analyze and develop strategies for improving transit along these important corridors;
2. To establish goals, objectives and evaluation criteria for evaluating various transit improvements;
3. To develop up to 12 conceptual transit alternatives and evaluate each alternative against the evaluation criteria;
4. To prepare a final report with the results of the evaluation and possible recommendations about the next steps.

Subsequent phases of this study will describe and rank the 12 alternatives to determine which alternatives perform best. These alternatives can then be recommended for advancement into a subsequent study phase which would likely include detailed environmental analysis and additional public engagement.

Figure 1.1. Central Harbor Boulevard Transit Corridor Study Area



Source: STV, 2017

1.2. STUDY CORRIDOR TRANSIT THEMES

There are several important themes that have arisen from the study analysis which must be considered in the development of conceptual transit alternatives:

- **Important North-South Transit Spine:** Approximately 12 percent of OCTA's daily bus boardings occur along the two north-south corridors, helping riders connect to jobs, school, and other destinations and frequently to make transfers to east-west corridors.
- **High Frequency Service:** Harbor Boulevard provides the highest frequency bus service in the OCTA system, operating Route 43 and Bravo! Route 543, and providing a bus every 7.5 minutes during peak service hours at major bus stops.
- **Resorts, Tourism and Jobs:** The Harbor corridor is a jobs dense corridor with The Anaheim Resort® anchoring a regional jobs center and a national tourism destination. The Disneyland Resort® is the county's largest employer with an estimated 28,000 employees.
- **Residential and Employment Densities:** There study area averages more than twice as many jobs and residents than the rest of Orange County.
- **Future Planned Projects:** Each corridor city has plans to increase development and expand activity along the corridors. Frequent and convenient transit service is vital for these corridors to meet development demands and help offset higher traffic volumes and congestion.
- **Measure M1/M2:** Measure M is a half-cent sales tax first approved by county voters in 1990 (M1) and later renewed in 2006 (M2). The measure set aside nearly $1 billion for transit projects which focus on extending the influence of the regional rail stations.
- **Transit Rider Demographics and Needs:** Survey data indicates that home-to-work commute trips represent the greatest share of trips taken (78%), followed by other (10 percent) and School commutes (9 percent). The most desired improvements among existing riders are greater frequency of service and extended operating hours.
- **Current Trends and the Challenge of Growing Transit Ridership:** Retaining transit ridership is a key challenge for transit agencies. OCTA has experienced declining transit ridership in recent years and is focusing planning efforts around allocating service to the most productive corridors and evaluating ways to increase the competitiveness and quality of transit service across all routes.
- **OC Bus 360 & 2016 Bus Service Plan:** OCTA is planning on making frequency improvements to many of the east-west routes in the study area. These include Routes 26 (Commonwealth Avenue), 30 (Orangethorpe Avenue), 50 (Katella Avenue), and 54 (Chapman Avenue). The frequency improvements are expected to increase transit ridership in this area.
- **Connections to Regional Rail:** Enhanced connections to regional rail stations is another opportunity present in this study corridor. Enhanced service at each station has the potential to support future development in downtown Fullerton, the Anaheim Platinum Triangle development district, and downtown to Santa Ana. Establishing these connections requires enhancements to north-south, and east-west feeder service.

Each theme listed above provides important information about where the current travel demand is, how current transit services are operating, how commuter behavior is changing, what attributes of service are highly valued by existing riders, and where the residential and employment densities that will require more transit service going forward are located.

Given current and planned transit service in the corridor, the OCTA Central Harbor Boulevard Transit Corridor Study will develop options to leverage these investments and facilitate connections to the OC Streetcar, The Anaheim Resort, and ARTIC. This study will also consider alternative alignments and transit technologies along Harbor Boulevard, Lemon Street/Anaheim Boulevard, and Katella Avenue, and will include the necessary information so that corridor cities and OCTA may take the project further through additional public engagement, alternative selection, and environmental review (not part of this study). The study team will also incorporate input from staff representatives from corridor cities and internal OCTA stakeholders.

1.3. REPORT PURPOSE AND STRUCTURE

This report summarizes and synthesizes the data gathered throughout Phase 2 of this study (Purpose and Need), defines the key transportation mobility issues in the study area, and confirms the project's purpose and need. This report is thus organized into the following sections:

2. The Existing Transportation Network
3. Planned Transportation Facilities/Projects in the Study Area
4. Study Area Demographics and Land Use Patterns
5. Travel Market Assessment
6. Transit and Roadway Performance
7. Mobility Problems
8. Goals and Objectives

2. TRANSPORTATION NETWORK

This section describes the existing transportation network and services in the study area. More detailed information on this can be found in the *Study Corridor Definition Report* (April 2016).

2.1. FREEWAYS & ARTERIALS

The study area is served by four major freeways: the Santa Ana Freeway (Interstate 5), the Riverside Freeway (California State Route 91), the Garden Grove Freeway (California State Route 22), and the Orange Freeway (California State Route 57). Arterial roads are typically laid out in a grid pattern with major streets approximately one mile apart.

This convergence of four major freeways in an area with a high concentration of jobs and activity centers results in high volumes of traffic during peak commuting hours on Harbor Boulevard, Lemon Street/Anaheim Boulevard, Katella Avenue, and all other major arterials. This not only affects drivers but, as seen in the *Mobility Problem Definition Report* (April 2016), has adverse consequences on transit operations throughout certain hours of the day.

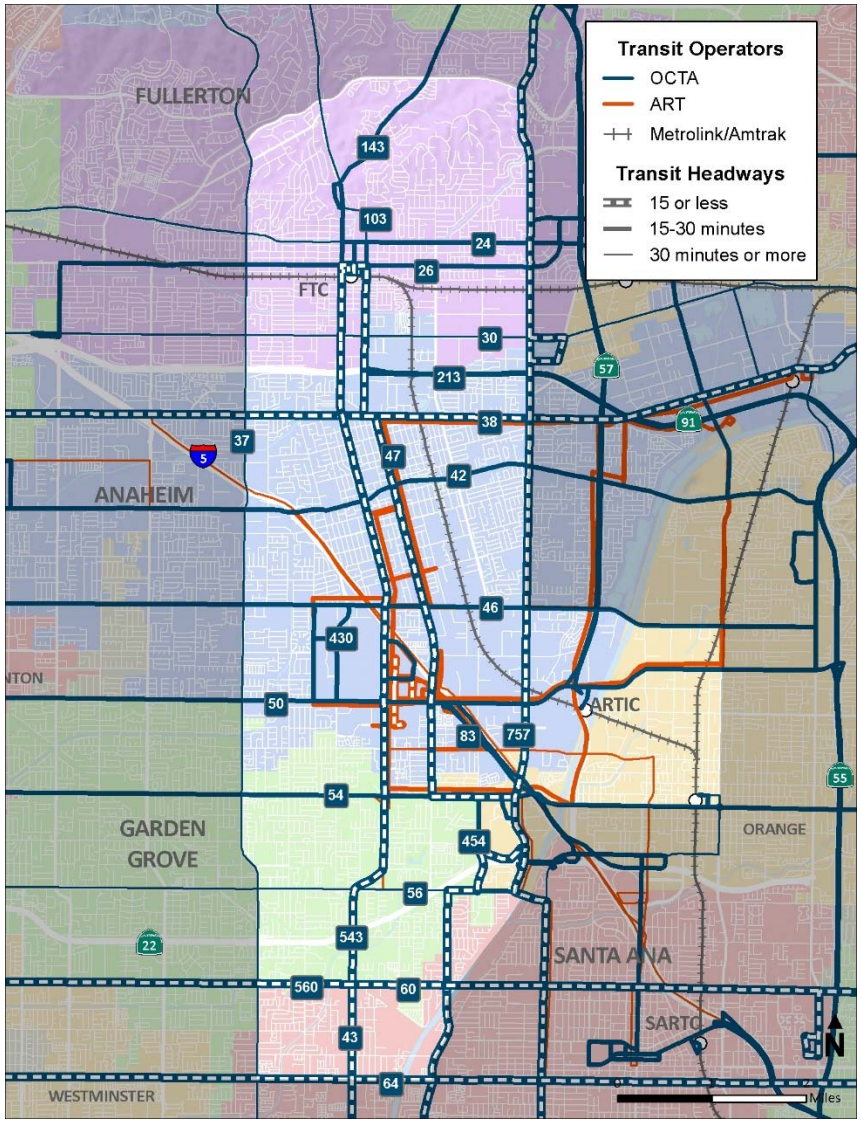
2.2. TRANSIT NETWORK

There are multiple operators providing a variety of transit options in the study area. They are described in the following section and shown in Figure 2.1 and Figure 2.2.

The following concepts help to describe the nature and quality of Transit in the study area.

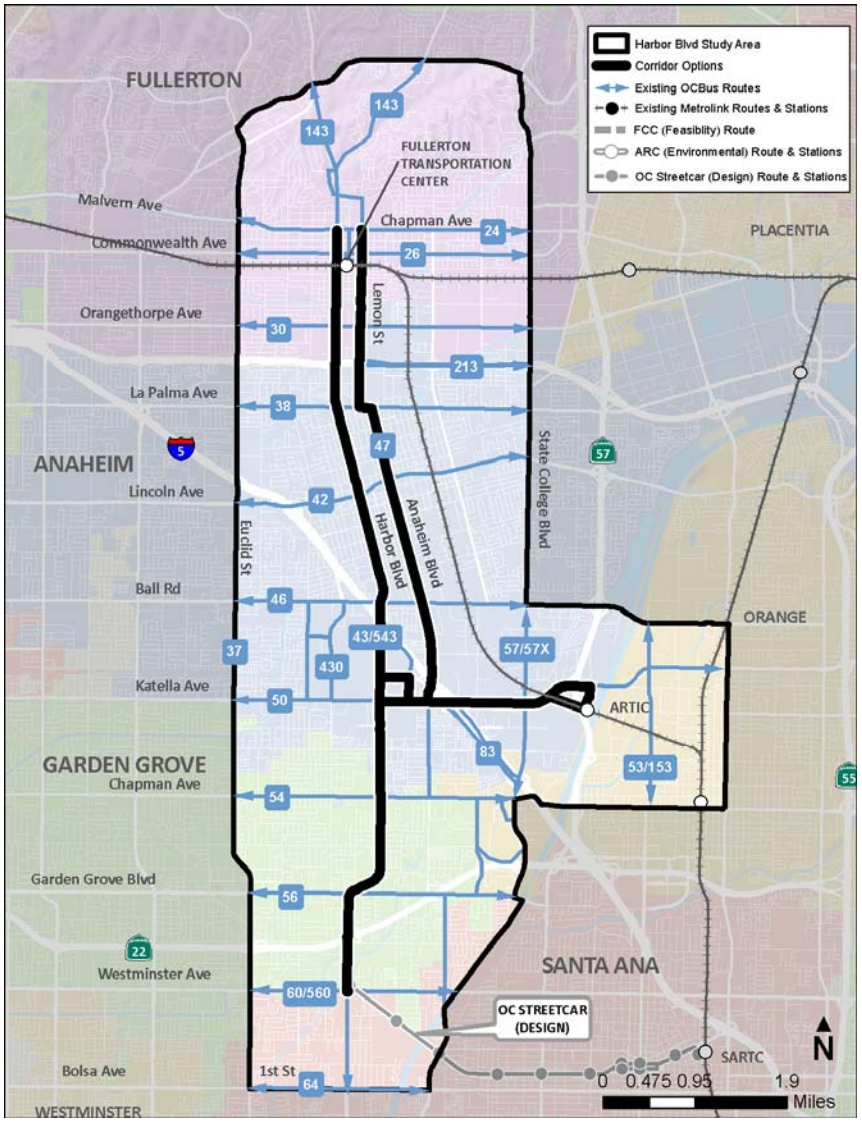
- **Service Coverage:** This relates to the destinations covered by the bus route and the number of stops along the corridor.
- **Frequency and Span of Service:** This refers to the time interval with which bus service is provided and the daily hours of operation for each route. Generally, transit service that is provided on an interval of every 15 minutes or less is considered "frequent" while wider time intervals are considered "infrequent."
- **Mixed Flow Traffic or Designated Transit Lanes:** All transit services in Orange County (except Amtrak and Metrolink commuter rail) operate in mixed flow traffic with other automobiles. Time schedules and on-time performance are at least partially dependent on traffic conditions.
- **Bus Stop/Shelter Amenities:** The provision and quality of bus stop amenities is currently determined by the local jurisdiction in which the stops are located. Along the Harbor corridor the provision of amenities is inconsistent and varies greatly from jurisdiction to jurisdiction.
- **Connectivity to the Network:** How do the services in the corridor connect to the overall transit network and to other modes.

Figure 2.1. Transit Lines through Study Area



Source: STV, 2017; OCTA, 2015

Figure 2.2. OCTA Routes through Study Area



Source: STV, 2017; OCTA, 2015

2.2.1. Orange County Transportation Authority

Harbor Boulevard

OCTA operates two bus routes on Harbor Boulevard: Route 43 (Local) and Bravo! 543 (Limited Stop). These two routes provide a high level of coverage and frequency when both routes are in service.[1] Table 2.1 below summarizes the characteristics of service provided. While Route 43 provides a high level of coverage with stops located an average of 0.25-miles apart, it has a lower frequency of every 20 minutes. Bravo! 543 runs more frequently (12 minutes during peak hours and 18 minutes during non-peak weekday service) and provides a faster travel time since its stops are spaced approximately 0.75-miles apart.

Table 2.1 Bus Service on the Harbor Boulevard Corridor

Route	Route Limits	Distance (miles)	Stop Spacing	Frequency (minutes)*	Hours of Operation	Run Time (minutes)
43 (SB)	North Court to Newport Blvd/19th St	18.0	0.25	20, 30, 60	3:50 am - 1:29 am	90
Bravo! 543 (SB)	FTC to MacArthur Blvd	13.0	0.75	12-20, 60	5:02 am - 7:50 pm	48
43 (NB)	19th St/Newport Blvd to North Court	18.0	0.25	20, 30, 60	4 am - 1:30 am	90
Bravo! 543 (NB)	MacArthur Blvd to FTC	13.0	0.75	12-20, 60	5:46 am - 8:00 pm	50

*Service frequency on Bravo! 543 is 12 minutes during peak hours while service frequency on Route 43 is 20 minutes during peak hours.

Anaheim Boulevard/Lemon Street

OCTA operates Route 47 (Local) between the FTC and the city of Newport Beach. This route travels north to south along Lemon Street and Anaheim Boulevard/Haster Street to Chapman Avenue. Past Chapman Avenue, Route 47 travels primarily along Fairview Street. Route 47 is 22 miles in length and has stop locations spaced about 0.3-miles apart. Stop spacing provides good coverage on this route but results in a long run time of 100 minutes. The frequency of service is 14 minutes during peak hours and up to 40 minutes during the non-peak. Service operates from 4 AM to 11:30 PM. Table 2.2 summarizes the characteristics of service provided.

[1] Bravo! 543 operates between approximately 5 AM and 8 PM on weekdays. Route 43 operates between approximately 4 AM and 1:30 AM on weekdays.

Table 2.2. Bus Service on the Lemon Street/Anaheim Boulevard Corridor

Route	Route Limits	Distance (Miles)	Stop Spacing	Frequency (Minutes)*	Hours of Operation	Run Time (mins.)
47 (SB)	FTC to Oceanfront/Palm St	22.0	0.3	14, 20-40	4:34 am - 11:27 pm	100
47 (NB)	Oceanfront/Palm St to FTC	22.0	0.3	20, 30-60	3:55 am- 11:37 pm	98

*Service frequency is 14 minutes during peak hours.

Katella Avenue

OCTA operates Route 50 (local) between the cities of Long Beach and Orange. This route primarily travels east to west along Katella Avenue, through the cities of Long Beach, Los Alamitos, Cypress, Stanton, Garden Grove, Anaheim (including ARTIC), and Orange. Route 50 is approximately 20 miles in length and has stop locations spaced at various intervals ranging from under 0.2 miles to approximately 0.35 miles. Stop spacing and skipped stops on this route result in a total run time of approximately 90 to 100 minutes. The frequency of service is 15 minutes during peak hours and up to 30-60 minutes during off-peak hours. Service operates from approximately 4 AM to 1:30 AM during weekdays. Table 2.3 summarizes the characteristics of service provided.

Table 2.3. Bus Service on the Katella Avenue Corridor

Route	Route Limits	Distance (Miles)	Stop Spacing	Frequency (Minutes)*	Hours of Operation	Run Time (mins.)
50 (WB)	The Village at Orange to 7th St/Channel Dr	20	0.2-0.35	15, 30, 60	4:34 am - 11:27 pm	90- 100
50 (EB)	7th St/Channel Dr to The Village at Orange	20	0.2-0.35	15, 30, 60	3:55 am- 11:37 pm	90-100

*Service frequency is 15 minutes during peak hours.

OCTA also operates a limited-stop shuttle on weekdays between ARTIC and Walnut Street/Calle de las Estrellas outside of the Disneyland Hotel on the western edge of the Disneyland Resort.

Other Corridors

There is an extensive network of other OCTA bus lines in the study area, including local, express, and station connector services. Table 2.4 lists the routes that run through the study area. As noted in the overview, Harbor Boulevard intersects more than two dozen major east-west corridors.

Table 2.4. OCTA Transit Lines through Study Area

Route Type	Routes
Local/Fixed Routes	24: Fullerton – Orange via Chapman Avenue 26: Buena Park – Huntington Beach via Commonwealth Avenue 30: Cerritos – Anaheim via Orangethorpe Avenue 37: La Habra – Fountain Valley via Euclid Street 38: Lakewood – Anaheim Hills via La Palma Avenue 42: Seal Beach – Orange via Lincoln Avenue 43: Fullerton – Costa Mesa via Harbor Boulevard 46: Los Alamitos – Orange via Ball Road 47: Fullerton – Newport Beach via Anaheim Boulevard 50: Long Beach – Orange via Katella Avenue 54: Garden Grove – Orange via Chapman Avenue 56: Garden Grove – Orange via Garden Grove Boulevard 57/57X: Brea – Newport Beach via Bristol Street 60: Long Beach – Tustin via Westminster Avenue 64: Huntington Beach – Tustin via 1st Street 83: Anaheim – Laguna Hills Express via Manchester Avenue 543: Fullerton – Santa Ana via Harbor Boulevard 560: Santa Ana – Long Beach via Westminster Ave
Community Routes	103: La Habra Express via Harbor Boulevard 143: La Habra – Brea Mall via Harbor Boulevard
Intracounty Express	213: Brea – Irvine via Brea Boulevard
Stationlink	430: Anaheim Resort – ARTIC via Katella Avenue 454: Garden Grove – Orange Transportation Center via Chapman Avenue
Intercounty Express	757: Diamond Bar – Santa Ana via SR-57

2.2.2. Anaheim Resort Transportation

Anaheim Resort Transportation provides transit services in the city of Anaheim, including The Anaheim Resort, the Platinum Triangle, and CtrCity Anaheim. ART also provides services to limited locations in other cities, including Garden Grove, Orange, Buena Park, Santa Ana, and Costa Mesa. There are 21 fixed route lines which originate from the Disneyland Resort Transportation Center. These routes travel to multiple destinations, retail districts, lodging establishments, and activity centers nearby. ART routes are described in Table 2.5.

Table 2.5. ART Routes Through Study Area

Route	Destination
Harbor Boulevard Lines 1-2	Garden Grove Entertainment District, via Harbor Boulevard
Grand Plaza Lines 3/4/5	Anaheim Convention Center via Harbor Boulevard
Hotel Circle Clementine Lines 6/7/8	Anaheim Hotel Circle via Harbor Boulevard, Katella Avenue, and Manchester Avenue
Katella Line 9	Harbor Boulevard and westbound on Katella Avenue to Walnut Street
Downtown Packing District Line 10	Downtown Anaheim Packing District via Harbor Boulevard, Anaheim Boulevard, and Ball Road
Ball Road Line 11	Harbor Boulevard and Ball Road to Walnut Street

Route	Destination
Manchester Ave Line 12	Harbor Boulevard, Katella Avenue, Haster Street, Orangewood Avenue, Manchester Way, and Disney Way
ARTIC Sports Complex Lines 14/15	Anaheim Convention Center, Angel Stadium of Anaheim, Honda Center, State College Boulevard, Outlets at Orange, and ARTIC
Orange Line 16	Garden Grove Entertainment District and The Outlets at Orange via Harbor Boulevard, Garden Grove Boulevard, The City Drive, and Chapman Avenue
Buena Park Line 18	Activity centers in Buena Park via Harbor Boulevard, Disney Way, Manchester Avenue, La Palma Avenue, and Beach Boulevard
Canyon Line 17/21	Anaheim Canyon Metrolink Station via Harbor Boulevard, Ball Road, SR-57, and La Palma Avenue
Santa Ana Line 19	Activity centers in Santa Ana via Harbor Boulevard, Orangewood Avenue, and Main Street
Toy Story Line 20	Toy Story Transportation Center via Harbor Boulevard
Costa Mesa/ South Coast Plaza Line 22	Costa Mesa South Coast Plaza, via Harbor Boulevard, Chapman Avenue, Anaheim Way, SR-55, and Bristol Street

2.2.3. Metrolink and Amtrak

Three multi-modal transportation hubs are located either in or near the study area: the Fullerton Transportation Center, the Anaheim Regional Transportation Intermodal Center, and the Santa Ana Regional Transportation Center. Metrolink commuter rail services and Amtrak regional/national rail services are accessed from each of these hubs. The FTC is located off Harbor Boulevard and provides a direct connection to/from the college campuses located in Fullerton and to/from the jobs-dense Harbor corridor. ARTIC is located south of Angel Stadium of Anaheim off Douglass Road. This study considers enhancements to connections between this station, which has been identified as a future potential California High Speed Rail station, and The Anaheim Resort, Angel Stadium of Anaheim, the Honda Center, and Anaheim's Platinum Triangle district. SARTC is located at East Santa Ana Boulevard and Penn Way in Santa Ana and provides access to downtown Santa Ana and the Santa Ana Civic Center. Metrolink and Amtrak lines are listed below in Table 2.6. When completed, the OC Streetcar project will connect SARTC to Harbor Boulevard.

Table 2.6. Commuter and Regional Rail Lines Through and Near Study Area

Route	Destination
Metrolink 91	Los Angeles to Riverside with stop at FTC
Metrolink Orange County Line	Los Angeles to Oceanside with stops at FTC, ARTIC, and SARTC
Metrolink Inland Empire Line	San Bernardino to Oceanside with stop at SARTC
Amtrak Southwest Chief	Los Angeles to Chicago with stop at FTC
Amtrak Pacific Surfliner	San Luis Obispo to Los Angeles to San Diego with stops at FTC, ARTIC, SARTC

2.2.4. Los Angeles County Metropolitan Transportation Authority

Additionally, the Los Angeles County Metropolitan Transportation Authority operates Local and Express Bus Route 460 between downtown Los Angeles and the Anaheim Resort via local streets through southeastern Los Angeles County/northwestern Orange County and the I-5 Freeway. Within the study area, Route 460 stops at the Disneyland Resort and at Manchester Avenue/Harbor Boulevard.

2.3. ACTIVE TRANSPORTATION

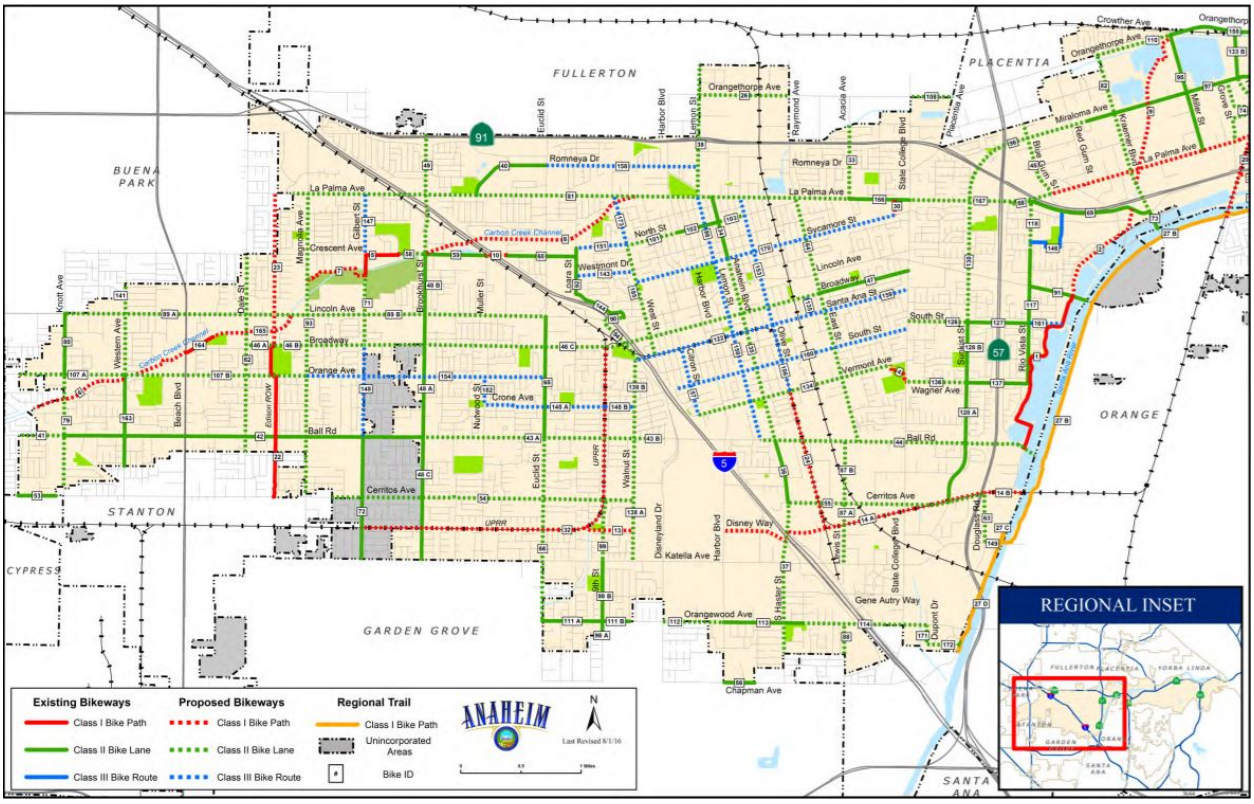
2.3.1. Bicycle Transportation

Bicycle facilities are currently limited within the study area and nearly non-existent along Harbor Boulevard. Most of the existing bike lanes and paths are located in Fullerton, along with a few east-west bike lanes through Garden Grove, and south of Westminster Avenue in Santa Ana. The sparse bikeway network and few connections to transit modes reflects the auto-centric nature of the corridor when originally developed. However, several cities are proposing extensive additions to fill the gaps in the existing bikeway network. Anaheim, for example, is proposing several Class II and III bikeways along east-west streets that connect CtrCity and the Colony Historic District. On the southern end of the study corridor, Garden Grove and Santa Ana are proposing several Class II and III facilities along Orangewood Avenue, Chapman Avenue, Lampson Avenue, and Westminster Avenue. These additions would create a strong regional network throughout the study area. Due to existing and projected traffic/transit volumes, however, this study does not currently recommend enhanced bicycle amenities along Harbor Boulevard. See *Study Corridor Definition Report* (April 2016) and the next section for more information on the region's proposed bikeway system.

Anaheim Bicycle Master Plan

Since the release of the *Study Corridor Definition Report* (April 2016), the city of Anaheim, as mentioned above, has released plans to improve bicycle infrastructure throughout the study area. In August 2016, the city of Anaheim released their Bicycle Master Plan to guide its implementation of citywide bicycle facilities. The Plan supersedes the 2004 Anaheim Bicycle Master Plan and is intended to improve bicycling safety, comfort, and accessibility. The Plan identifies a network of existing and proposed bicycle facilities that will improve multi-modal connectivity and increase bicycle mode share, especially for short trips through a system of on-street bike lanes and routes and off-street bike paths to connect residents, visitors, and workers to their destinations. The Plan has meets California State requirements for a Bicycle Transportation Plan and includes amendments to the Anaheim General Plan. The Plan does not propose to remove any vehicle travel lanes in favor of bicycle lanes, but does propose enhanced bicycle facilities (Class II and III) on Lemon Street, La Palma Avenue, Anaheim Boulevard/Haster Street, and Disney Way (a Class I Bike Path is proposed along Disney Way, between Harbor Boulevard and Haster Street). Enhancements to other intersecting east-west routes through the study area are also proposed along segments of Romneya Drive, North Street, Sycamore Street, Broadway, Santa Ana Street, South Street, Vermont Avenue, Ball Road, Cerritos Avenue, and Orangewood Drive. The existing and proposed bikeway network is shown in Figure 2.3 below.

Figure 2.3. Existing/Proposed Bikeway Network (Anaheim West)

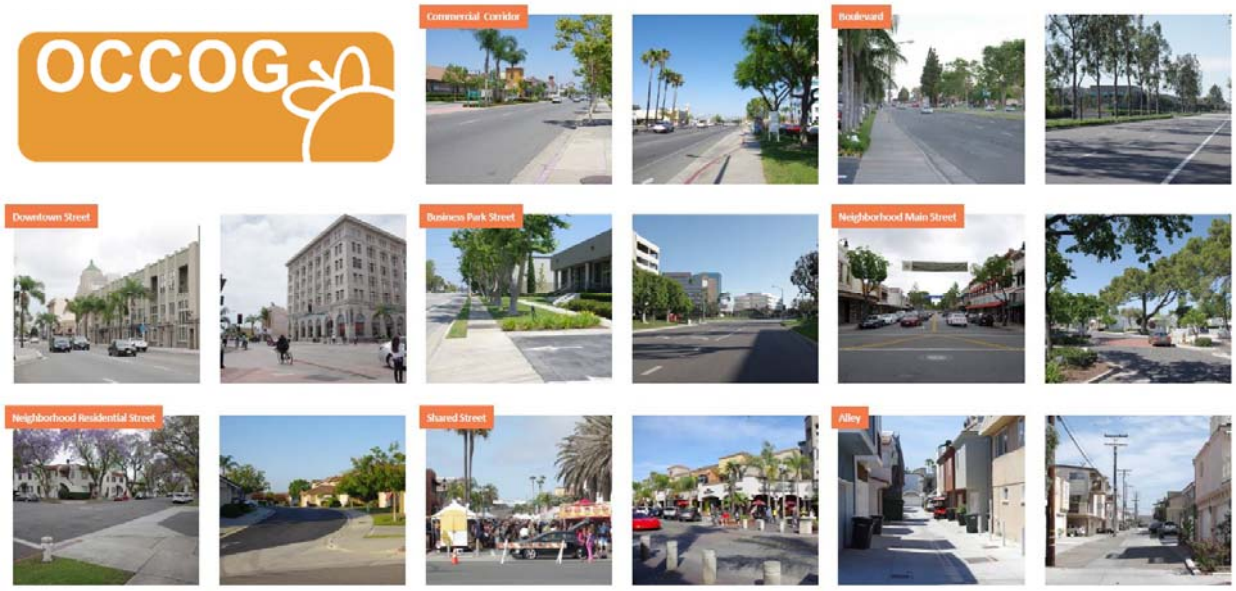


Source: City of Anaheim, 2016

2.3.2. Complete Streets

In April 2016, the Orange County Council of Governments (OCCOG) completed the draft Orange County Complete Streets Initiative Plan (OC CSI). The plan establishes criteria to create a transportation network that serves all users by enhancing mobility choices and offering a variety of improvements that improve safety, health, environmental, financial, and social issues. With respect to the study corridors, the OC CSI offers a variety of treatments to the different street typologies found within the study area. See the next page for examples.

Figure 2.4. Select Street Types Found in Orange County



Source: Orange County Council of Governments, 2016

Harbor Boulevard, for example, is a major arterial and serves as a commercial corridor first and foremost, but also as a neighborhood main street, neighborhood residential street, and a wide boulevard. The Lemon Street/Anaheim Boulevard corridor serves primarily as a downtown street, business park street, and commercial corridor/boulevard. Katella Avenue is a commercial corridor and boulevard.

3. PLANNED PROJECTS & STUDIES

This section introduces the major planned projects and studies in the area that seek to improve mobility in this region. More detailed information on these and other projects in the area can be found in the *Prior Studies & Data Collection Report* (April 2016).

3.1. OC STREETCAR (IN DESIGN)

The Santa Ana-Garden Grove Fixed Guideway Project (also known as the "OC Streetcar"), is a $289 million, Measure M2-initiated, streetcar project scheduled to begin operation in 2020. The approximately 4-mile route will travel from SARTC to a new multimodal hub in Garden Grove on the northeast corner of Harbor Boulevard and Westminster Avenue. The project's primary purpose is to provide "last mile" connections to Metrolink and Amtrak service at SARTC. The streetcar will travel along a combination of local streets and a dedicated right-of-way. The project is currently in the engineering and design phase and has achieved several milestones to date. The Revised Environmental Assessment/Final Environmental Impact Report was certified by Santa Ana in January 2015, and the Federal Transit Administration (FTA) approved a Finding of No Significant Impact in March 2015. In May 2015, the FTA approved the project for entry into project development.

3.2. FULLERTON COLLEGE CONNECTOR (FEASIBILITY STUDY)

The Fullerton College Connector Feasibility Study evaluated the opportunities, challenges, and costs associated with implementing an "urban circulator" system between Downtown Fullerton/FTC and numerous educational institutions (most notably Fullerton College and CSUF) located northeast of Downtown Fullerton. The study developed numerous alternatives for enhanced transit service primarily along Commonwealth Avenue and/or Chapman Avenue. Transit technologies considered in the study consisted of light rail, modern streetcars, heritage/historic streetcars, and rubber-tire or hybrid buses using a mixture of mixed-flow traffic and dedicated rights-of-way. Of the six alternatives studied, total capital costs for implementation range from $140-$173.8 million.

3.3. CENTRAL COUNTY CORRIDOR MAJOR INVESTMENT STUDY (PLANNING DOCUMENT)

The 2010 Central County Corridor Major Investment Study helped establish a long-term transportation vision by studying the need for strategic investments that address current and future mobility problems in central Orange County through 2035. The study resulted in a consensus on a multimodal strategy that includes improvements to arterials, freeways, bus, and rail transit. Proposed specific improvements range from arterial and intersection optimization/widening, additional high-occupancy vehicle lanes and interchanges to local freeways, enhanced connections to Metrolink/Amtrak passenger rail, investment in community-based shuttles (e.g., ART), the development of high-capacity fixed-guideways in Anaheim (ARC) and Santa Ana/Garden Grove (OC Streetcar), and substantial improvements to

local bus service in conjunction with the implementation of six Bus Rapid Transit routes (including Harbor Boulevard and Katella Avenue). The study also suggested an intersection improvement feasibility study for the intersection of Harbor Boulevard and Ball Road.

3.4. ANAHEIM RAPID CONNECTION

Anaheim's "ARC" project evaluated a fixed guideway connection along a 3.2-mile corridor between The Anaheim Resort and ARTIC. The project was intended to serve the major job and activity centers in The Anaheim Resort (i.e., the Anaheim Convention Center, the Disneyland Resort, and Anaheim GardenWalk) and provide a connection to the regional rail station. On October 24, 2016, the OCTA Board of Directors and the City of Anaheim agreed to discontinue planning efforts for the ARC, and instead evaluate transit connections between The Anaheim Resort and ARTIC as part of the Central Harbor Boulevard Transit Corridor Study.

Implications

The projects listed above indicate a willingness from local municipalities and OCTA to make significant investments in transportation improvements on or near Harbor Boulevard. With numerous projects being planned and developed in Downtown Fullerton, CtrCity (Downtown) Anaheim, The Anaheim Resort, Grove District-Anaheim Resort, and at the intersection of Harbor Boulevard and Westminster Avenue, enhanced transit options are essential to improving quality of life for residents, workers, and visitors.

In Santa Ana and Garden Grove, the OC Streetcar will enhance connections to SARTC, Downtown Santa Ana's Civic Center, and the proposed developments on Harbor Boulevard and Westminster Avenue. In Anaheim, the Central Harbor Boulevard Transit Corridor Study will examine methods to provide a direct connection between ARTIC and The Anaheim Resort. In Fullerton, the FCC seeks to enhance connections between CSUF and Downtown Fullerton.

4. DEMOGRAPHICS & LAND USE

4.1. LAND USE

Table 4.1. Land Uses within Study Area

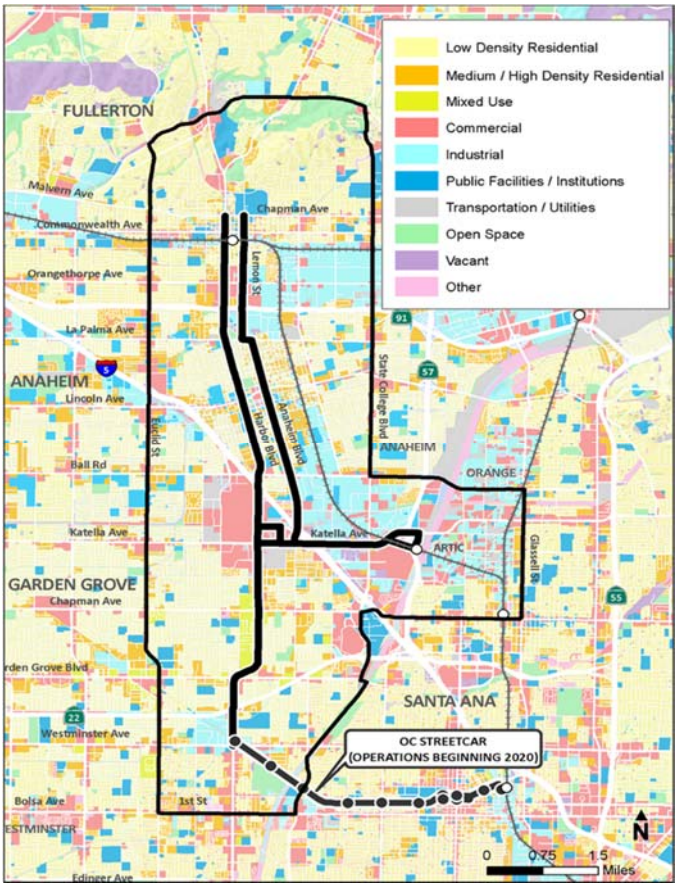
Region	Low-Density Residential	High-Density Residential	Commercial	Industrial	Public Facilities / Institutions	Transportation / Utilities	Mixed Use	Open Space / Recreation	Vacant[2]	Other
Study Area	36.4%	12.4%	19.1%	12.3%	8.2%	3.5%	0.4%	4.8%	1.1%	1.8%
Orange County	21.9%	5.9%	7.8%	4.1%	4.2%	2.9%	0.2%	10.1%	37.4%	5.5%

Source: STV, 2016; SCAG, 2008; City of Anaheim, 2015; City of Fullerton, 2015; City of Garden Grove, 2015

As seen in Table 4.1 above and Figure 4.1 to the right, approximately half of the land uses within the study area are residential, with approximately 36 percent low-density residential, and approximately 12 percent mid-to-high density residential. Commercial land uses comprise a large portion of the study area, at approximately 19 percent and are concentrated around The Anaheim Resort, downtown Fullerton, and along the Santa Ana River between the SR-22 freeway and Ball Road. Industrial uses make up approximately 12 percent of the study area, and are mostly located along freight and passenger rail lines.

Within the study area, there are large concentrations of commercial land uses around The Anaheim Resort and Platinum Triangle in Anaheim. Industrial land uses are dispersed near or off railway lines to the east of the Lemon/Anaheim corridor.

Figure 4.1. Land Uses within Study Area



Source: STV, 2016; SCAG, 2008; City of Anaheim, 2015; City of Fullerton, 2015; City of Garden Grove, 2015

[2] Vacant land categories include natural undeveloped areas of the county such as Cleveland National Forest.

4.2. Present Population and Employment

There are about 50 percent more residents than jobs within the study area. Residents are distributed fairly evenly across the area, with the exception of the area around The Anaheim Resort and the industrial and commercial centers east of the I-5 freeway between Chapman Avenue in the south and Ball Road in the north. This is in line with the heavier presence of industrial and commercial land along rail corridors in that area. Residential density in the study area is high at more than double the density of Orange County overall. Figure 4.5 through Figure 4.8 show jobs/job density, residents/residential density per sub-area (Figure 4.4).

Jobs within the study area are concentrated around Fullerton College and the rail-adjacent industrial areas east of the FTC, The Anaheim Resort, the Anaheim Convention Center, Anaheim's Platinum Triangle, the Outlets at Orange, the Grove District in Garden Grove, and downtown Santa Ana, which will also be served by the OC Streetcar beginning in 2020. Job density is significantly higher than that of Orange County at nearly three times as dense.

Table 4.2 below lists the population and employment densities for the study area and Orange County overall. Figure 4.2 and Figure 4.3 graphically represent the population and job distribution.

Table 4.2. Population and Employment Densities within Study Area (2015)

Region	Population Density (residents/sq. mile)	Employment Density (jobs/sq. mile)
Study Area	8,872	5,757
Orange County	3,945	2,032

Source: OCP, 2015

4.3. Future Population and Employment

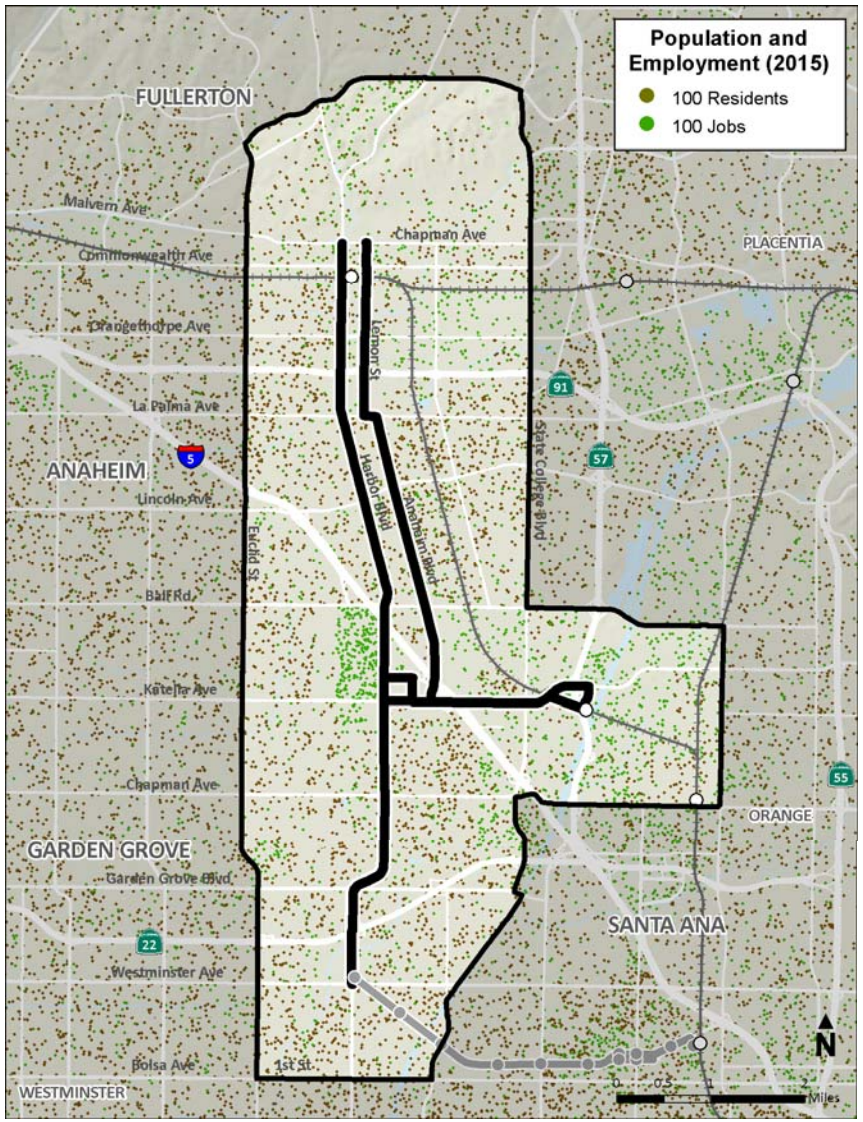
High rates of residential and employment growth are projected for the overall study area. Between 2015 and 2035, population is expected to increase by over 15 percent and employment by over 25 percent, with most of the growth concentrated in Anaheim and Fullerton. Compared to Orange County as a whole, the study area is projected to have higher rates of growth for both residents and jobs. Table 4.3 shows the projected population and employment change for the study area and the entire county from 2015 to 2035. See Figure 4.2 and Figure 4.3 for a side-by-side comparison of present and future spatial distribution of both jobs and population.

Table 4.3. Population and Employment Change within Study Area (2015 to 2035)

Region	Population Density (residents/sq. mile)	Employment Density (jobs/sq. Mile)	% Change in Population	% Change in Employment
Study Area	10,313	7,244	16	26
Orange County	4,297	2,430	9	15

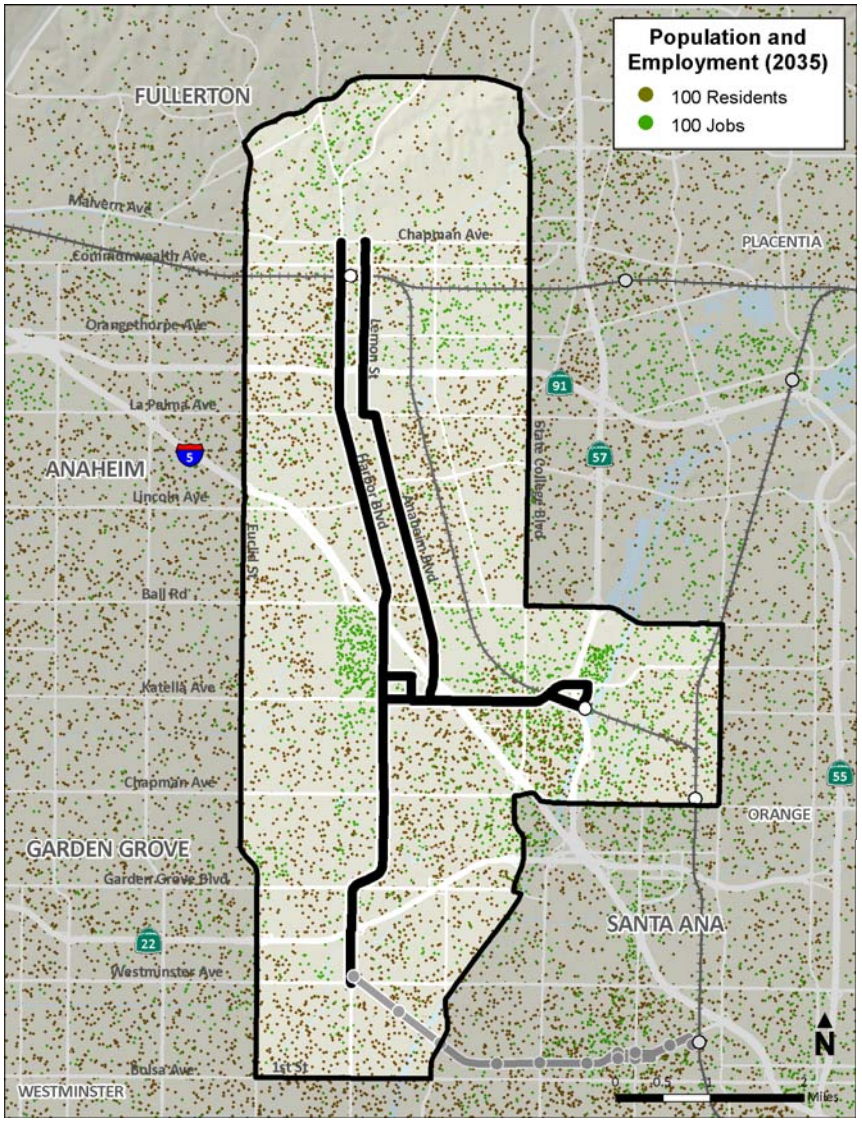
Source: STV, 2015; OCP, 2015

Figure 4.2. 2015 Population and Employment within Study Area



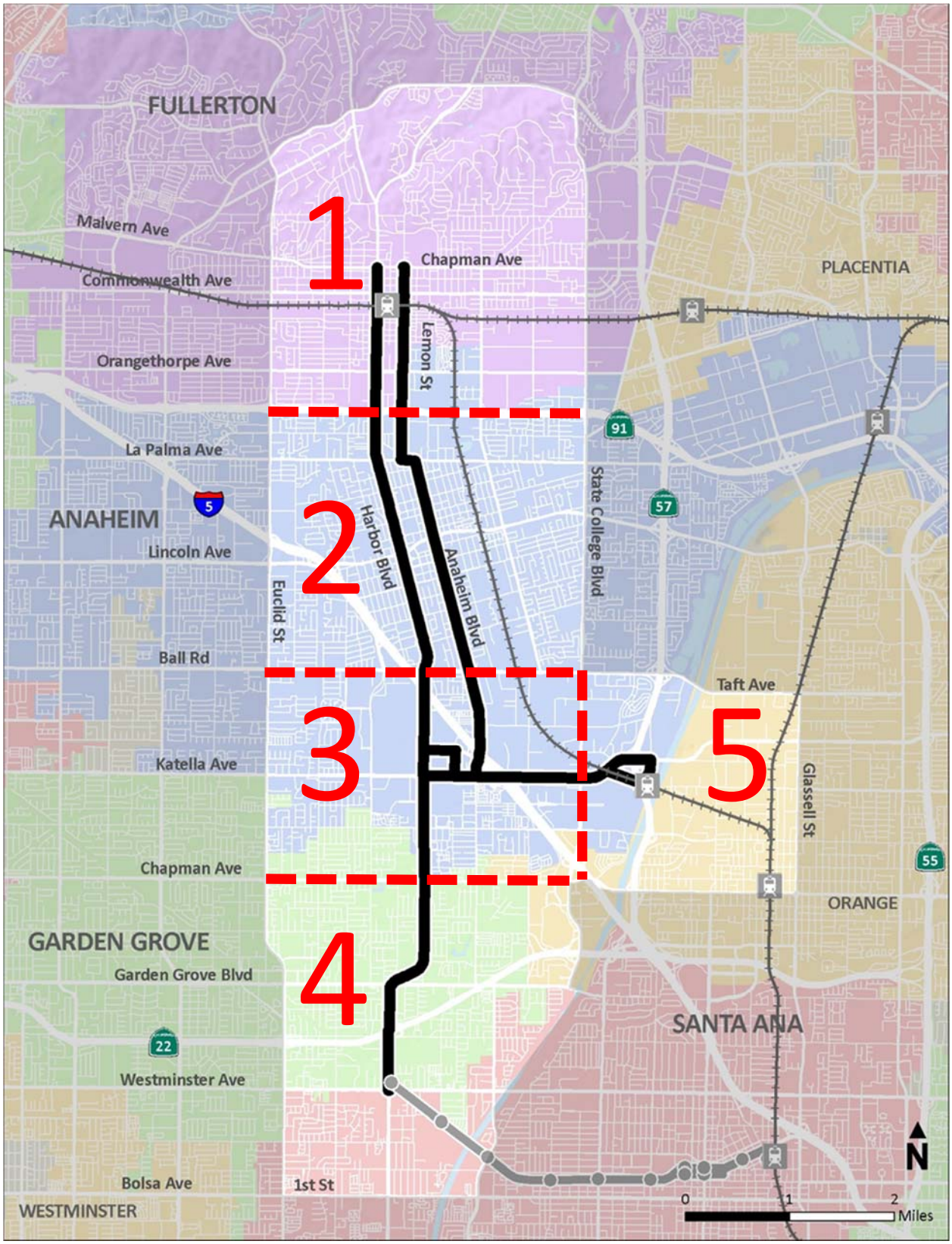
Source: STV, 2015; OCP, 2015

Figure 4.3. 2035 Population and Employment within Study Area



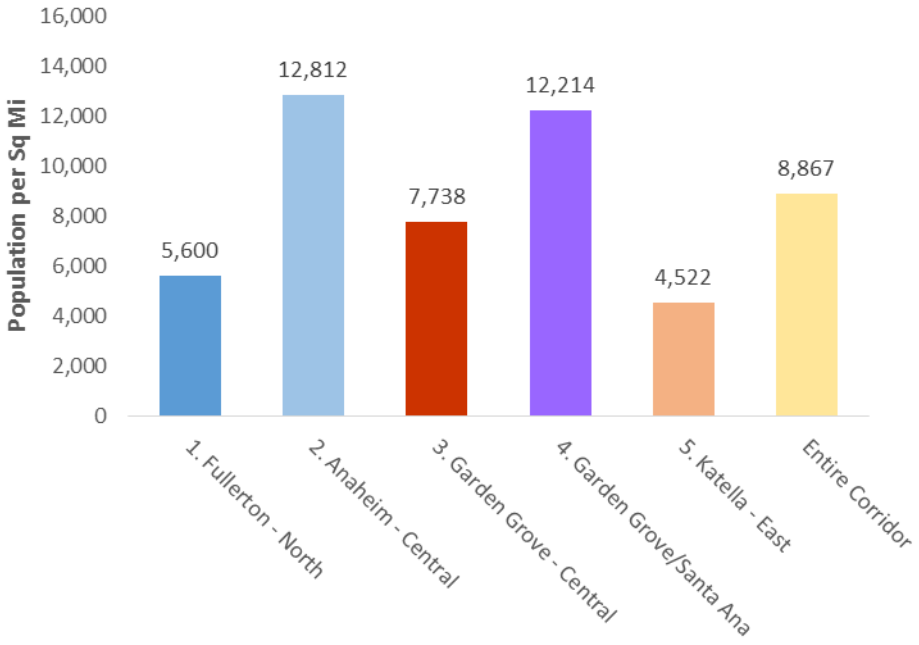
Source: STV, 2015; OCP, 2015

Figure 4.4. Project Sub-Areas



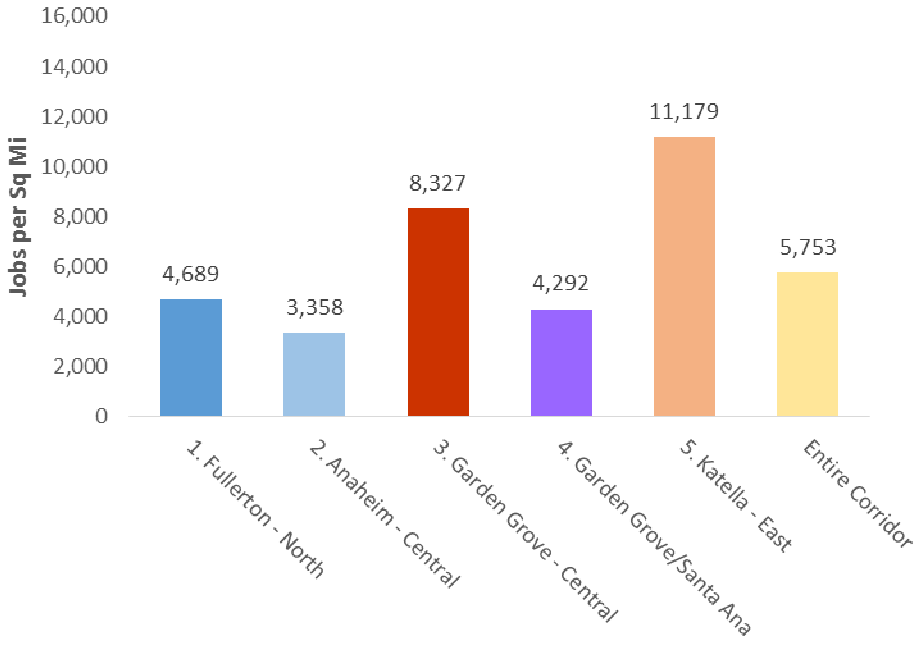
Source: STV, 2017

Figure 4.5. Population per Project Sub-Area per Square Mile[3]



Source: STV, 2016; U.S. Census Bureau, 2013

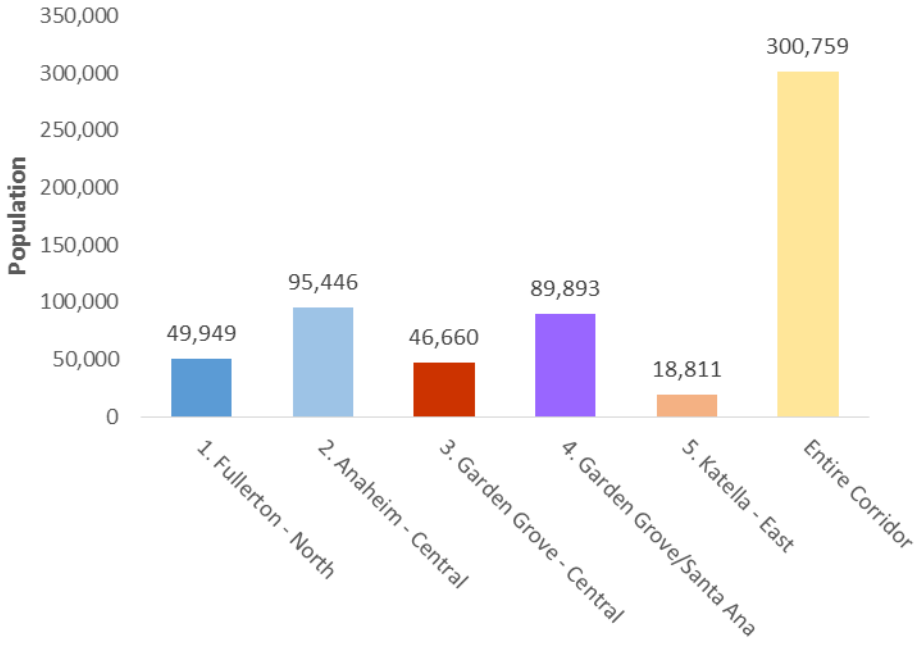
Figure 4.6. Jobs per Project Sub-Area per Square Mile



Source: STV, 2016; U.S. Census Bureau, 2013

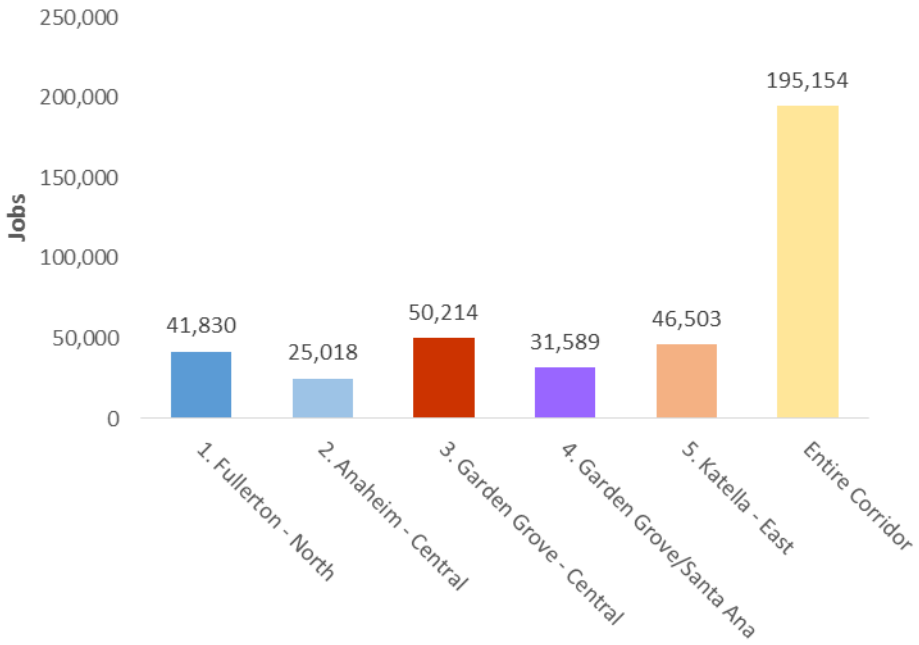
[3] Numbers in these charts may differ slightly from other parts of this report due to discrepancies between shape of study area boundaries and Traffic Analysis Zones and Census Tracts used for analysis.

Figure 4.7. Total Population per Project Sub-Area



Source: STV, 2016; U.S. Census Bureau, 2013

Figure 4.8. Total Jobs per Project Sub-Area



Source: STV, 2016; U.S. Census Bureau, 2013

4.4. STATION AREA DENSITIES AND TRANSIT RIDERSHIP

There is a strong positive relationship between residential and employment densities and transit ridership: the greater the densities in the station areas, the greater the potential for attracting transit riders. Transit professionals have attempted to articulate a precise range of densities within a 0.5-mile radius of transit stations at which investments in enhanced bus service, Bus Rapid Transit, Streetcar, Light Rail or Heavy Rail (subway) systems could expect higher returns on investment. However, since there are many other variables that affect transit ridership and these variables differ across every region, there is not one standard range of densities that has become accepted as the standard for determining the appropriate level of transit investment. Transit professionals have widely acknowledged the importance of both residential and employment densities within 0.5-mile radius (walking distance) of station areas, and a recent study of 58 transit systems in the U.S. found that employment densities within 0.25-mile radius of station areas provided the best predictor of ridership. A key objective of this study will be to ensure that proposed station/stop locations serve the densest residential and employment areas, as well as the key destinations and transfer points.

Additionally, projects applying for funding from the FTA's New Starts program are required to evaluate both the population density within 0.5-miles of proposed stations and the total employment within 0.5 miles of the proposed transit project. This is important to acknowledge since OCTA projects may compete through this process against other projects around the country.

4.5. TRANSIT RIDER DEMOGRAPHICS

OCTA has conducted a number of surveys in recent years to help provide more information about what types of trips are being taken, how the quality of service is perceived by riders, and to discern the reasons why former riders stopped riding transit. These surveys have provided valuable information about transit usage in Orange County.

The most extensive survey was the On Board Survey (2013) which collected nearly 100,000 on-board surveys over a two year period. The survey respondents reported the following:

- **Age (18-64)**: Eighty-seven percent **(87%)** of respondents fell within this age range.
- **Low income households**: Seventy percent **(70%)** estimated their household income as less than $30,000.
- **No Auto Available**: Forty-one percent **(41%)** reported being from a zero-car households and eighty-two percent **(82%)** reported that there was no auto available for their personal commute.
- **Walk to/from bus**: Ninety percent reported that they accessed their transit commute by walking **(90%)**, while 4.6 percent were brought by auto and 4.5 percent arrived by bike.

- **Home to Work Commute**: The predominate trip purpose reported was for work commute **(78%)**; the next most common responses were *Other* (10%) and *School/College* (9%).

The OCTA Bus Customer Survey (2014) asked respondents to rank their *Most Desired Improvements* and *Customer Service Needs*. The following improvements and needs were ranked the highest.

Top 5 Most Desired Improvements:

- Frequency of Service (58%)
- Overcrowding inside buses (27%)
- More weekend Service (24%)
- More evening service (23%)
- Security & safety at bus stops (23%)

Top 5 Customer Service Needs:

- Frequency of buses / Wait time at bus stops
- On-time performance of bus
- Cost of riding bus
- Info provided at bus stops
- Travel time of trip

In 2013, OCTA surveyed riders exclusively along the Harbor Boulevard corridors. The agency surveyed 1,000 passengers who were riding either Route 43 or Bravo! Route 543. Riders surveyed reported the great majority of trips (74%) as commute trips between home and work or between home and school. Over one-third of the trips required a transfer to complete the trip. Fifty-eight percent (58%) of riders surveyed reported household income below $30,000 and thirty-three percent (33%) indicated belonging to a zero-car household.

A couple of important implications can be made about Harbor Boulevard corridor ridership:

- **Core ridership** includes a large share of transit dependent riders who live and/or work within or near the study area; and who rely on bus service for all their daily travel needs, and often require transfers to reach their final destinations.

- Only a **small percentage of trips (7%) are made for recreation** despite the key activity centers located along the corridor. ART serves as a primary transit option for trips to/from The Anaheim Resort and serves many tourists and visitors traveling to other activity centers and destinations. Better access to information materials, and enhanced branding, fare media, and stop/shelter amenities could help make OCTA services more attractive to tourists visiting the corridor or connecting to/from ARTIC.

5. TRAVEL MARKET ASSESSMENT

5.1. EXISTING COMMUTE FLOW

Connections to Jobs

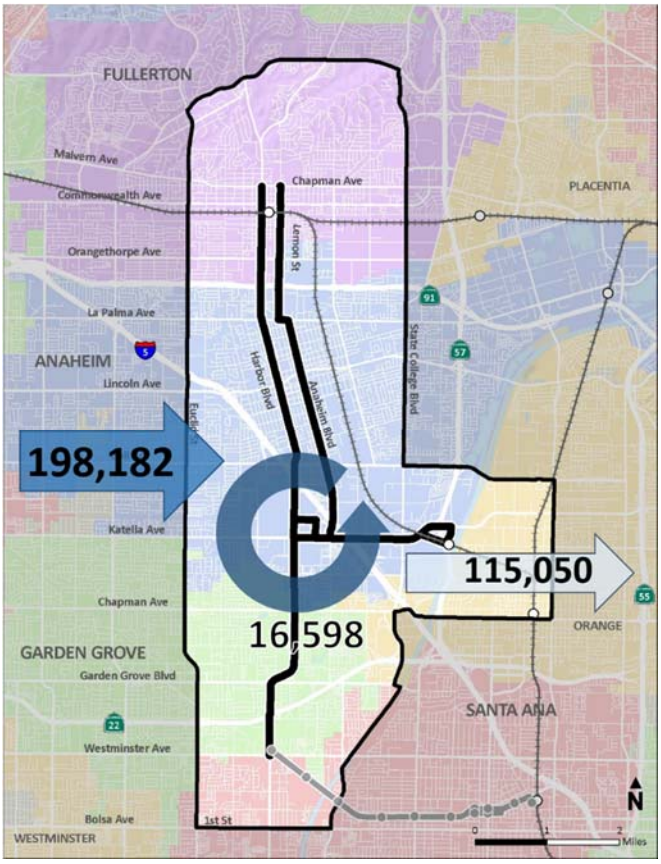


Figure 5.1. Study Area Commute Patterns
Source: LEHD, U.S. Census 2013: Kittelson & Associates, 2015

The study corridors are also some of the busiest and densest transit corridors in all of Orange County. Harbor Boulevard averages over 12,000 daily boardings, the Lemon Street/Anaheim Boulevard corridor averages an additional 9,000 daily boardings, while Katella Avenue averages over 4,000 daily boardings. The great majority of trips on these routes are commute-related: home-to-work and home-to-school trips. Thus, people who both reside and work/study within the study area are especially in a position to benefit from transit improvements along Harbor Boulevard, Lemon Street/Anaheim Boulevard, and Katella Avenue.

Study area commute patterns, as shown on Figure 5.1, suggest that the study area is skewed towards jobs as opposed to housing. In 2013, according to the U.S. Census Bureau's Longtitudinal Employment-Household Dynamics (LEHD) program, approximately 198,182 people commuted into the study area each day, while over 115,000 commuted to areas outside of the study area for work. About 16,598 both lived and worked in the study area.

Connections to Activity Centers

The study corridors provide connections to many local and regional activity centers and three major transportation hubs in Fullerton, Anaheim, and Santa Ana. Along Harbor Boulevard, for example, a significant number of transfers occur at the FTC, La Palma Avenue, Lincoln Avenue, Katella Avenue, and Westminster Avenue. La Palma Avenue and Lincoln Avenue in the northern half of the study area, in particular, along with Westminster Avenue in the southern edge,

Figure 5.2. Study Area Activity Centers
Source: STV, 2015

experience high volumes of transfers on the eastern edge of the study corridor at State College Boulevard (for La Palma and Lincoln Avenue) and Fairview Street at Westminster Avenue.

Therefore, improvements to the frequency and quality of transit service in the study corridor, as designated to take place under OCTA's Final 2016 Service Plan (approved February, 2016), would provide benefits to passengers transferring to/from east-west corridors. According to the Plan, frequencies along several key east-west routes would be elevated to 15 minutes or less, or similar Bravo! (12 minutes during peak hours). Frequencies along local routes 26 (Commonwealth Avenue), 50 (Katella Avenue), 54 (Chapman Avenue [South]) will be upgraded to 15 minutes during peak hours. OCTA's second Bravo! line (Route 560) travels along Westminster Avenue with a peak-hour frequency of 12 minutes. Changes outlined in the Plan went into effect in the summer and fall of 2016. For more information on changes to service, see OCTA's *Final 2016 Service Plan.*

Table 5.1 below compares travel time by mode from each transportation hub to a major activity center. Typically, transit commutes from a transit hub are two to four times longer than in a personal automobile. For these relatively short trips, cars have a clear advantage over the existing bus service. People coming from major activity centers outside of the area for work or recreation would likely find transit to be a less than convenient mode choice if time is the greatest concern.

Table 5.1. Comparison of Travel Time by Mode for Various Destinations, by City[4]

	Origin	Destination	Routes	Distance (miles)	Travel Time with Transit (minutes)	Travel Time with Auto (minutes)
Fullerton	FTC	Cal State Fullerton	Route 26	2.8	21	7
Fullerton	FTC	St. Jude Medical Center	Route 153	1.9	9	8
Anaheim	ARTIC	The Anaheim Resort	Route 14	3.9	30	13
Garden Grove	ARTIC	Downtown Garden Grove	Route 50 To Route 37	5.9	48	12
Santa Ana	SARTC	The Anaheim Resort	Route 19	7	40	15

Source: STV, 2016

5.2. TRAVEL MARKET CHARACTERISTICS

Commute Mode Share

The vast majority of workers in the area commute by driving alone along the corridor. Carpooling and bus transit appear to be the other major means of transportation to work (comprising less than twenty percent overall) while walking and working from home the only other modes above one percent. Commute mode choice percentages are shown by corridor city in Table 5.2 below.

Table 5.2. Means of Transportation to Work by Corridor Sub-Area[5]

Corridor Area	Drive Alone	Carpool	Transit	Bike	Walk	Other Means	Worked at Home
Fullerton	75.9%	12.1%	4.0%	1.2%	3.2%	0.4%	3.2%
Anaheim	70.1%	15.9%	6.5%	1.3%	2.5%	1.0%	2.7%
Garden Grove	73.8%	12.8%	7.0%	1.4%	2.4%	1.0%	1.6%
Santa Ana	75.6%	13.3%	5.1%	1.0%	2.2%	1.2%	1.7%
Total	73.0%	14.5%	5.4%	1.2%	2.5%	1.0%	2.4%
Orange County	78.0%	10.1%	2.8%	1.0%	2.0%	1.1%	5.0%

Source: Kittelson & Associates, 2015; US Census Bureau, ACS 5-Year Estimates, 2009-2013.

[4] Trips were calculated with Google Maps route planner using 10 AM departure times

[5] For residents living along the corridor, the most recent 5-year estimates from the American Community Survey (ACS) were used based on the 5-year period of 2009 to 2013. In order to help provide more local context for the travel market, the corridor has been broken down into four sub-segments. These sub-segments are:

- Fullerton-North: From Commonwealth Avenue to the City of Fullerton/City of Anaheim border;
- Anaheim-Central: From the City of Fullerton/City of Anaheim border to Katella Avenue;
- Garden Grove-Central: From Katella Avenue to Westminster Boulevard; and,
- Santa Ana-South: From Westminster Boulevard to 1st Street.

6. TRANSIT AND ROADWAY PERFORMANCE

This section examines existing and future traffic conditions, how they impact transit performance, and how future traffic conditions may affect transit performance.

6.1. EXISTING TRAFFIC CONDITIONS

A major constraint for transit service along the Harbor Boulevard and Lemon Street/Anaheim Boulevard study corridor is traffic congestion. Roadway congestion is often reported using level of service (LOS) which assigns a letter grade based on the amount of delay and comfort a driver is expected to experience.

Table 6.1. Level of Service Classifications

A	LOS A represents free-flow travel with an excellent level of comfort and convenience and the freedom to maneuver.
B	LOS B has stable operating conditions, but the presence of other road users causes a noticeable, though slight, reduction in comfort, convenience, and maneuvering freedom.
C	LOS C has stable operating conditions, but the operation of individual users is substantially affected by the interaction with others in the traffic stream.
D	LOS D represents high-density, but stable flow. Users experience severe restriction in speed and freedom to maneuver, with poor levels of comfort and convenience.
E	LOS E represents operating conditions at or near capacity. Speeds are reduced to a low but relatively uniform value. Freedom to maneuver is difficult with users experiencing frustration and poor comfort and convenience. Unstable operation is frequent, and minor disturbances in traffic flow can cause breakdown conditions.
F	LOS F is used to define forced or breakdown conditions. This condition exists wherever the volume of traffic exceeds the capacity of the roadway. Long queues can form behind these bottleneck points with queued traffic traveling in a stop-and-go fashion.

Source: Highway Capacity Manual, 2000

Table 6.1 above provides the criteria used to assign a LOS letter grade and describes the conditions a driver is likely to experience under these conditions. Table 6.3 on the following page shows peak hour traffic volumes, vehicle volume to capacity (V/C) ratios (i.e., number of vehicles on a roadway divided by the roadway's carrying capacity), and LOS for segments along the study corridors during peak morning travel hours.

According to the Highway Capacity Manual, "Free-Flow Speed" (FFS) on an urban street is the speed that a vehicle travels under low volume conditions when all the signals on the urban street are green for the entire trip. Thus, all delay at signalized intersections, even under low flow conditions, is excluded from the computation of urban street FFS. Table 6.3 shows LOS for northbound and southbound trips on both corridors during the morning rush hour. Northbound

LOS is shown on the half segments on the right and southbound LOS is shown on the half segments on the left.

None of the segments shown in Table 6.3 and Table 6.3, and in Figure 6.1 and Figure 6.2 operate at free-flowing condition which is to be expected in an urbanized area. There are numerous sections where "D" and "E" conditions are present, with V/C ratios close to 1.0, indicating the roadway is nearly at capacity. Additionally, southbound traffic during the morning hour is slower compared to northbound traffic, especially within Anaheim near The Anaheim Resort. The projected employment and population increases signifies that LOS on Harbor Boulevard, Lemon Street/Anaheim Boulevard, and Katella Avenue could continue to worsen in the future.

To mitigate this pressure without a substantial shift in travel modes, corridor cities would need to acquire additional private right-of-way to add additional capacity to streets. The high cost and impacts to adjacent land owners make this a difficult proposition in a highly urbanized area such as this. Existing demand and future growth thus require looking for ways to increase person throughput within existing constraints.

Table 6.2 Katella Avenue Study Corridor LOS (AM Peak)

	From	To	Class	Lanes	Volume	Capacity	V/C	LOS
Westbound								
Katella Avenue	West St	Harbor Blvd	2	3	761	2,670	0.29	C
	Harbor Blvd	Haster St[6]	2	3	838	2,670	0.31	C
	Haster St	State College Blvd	2	4	785	3,560	0.22	C
	State College Blvd	SR 57	2	3	1,178	2,670	0.44	C
	SR 57	Main St	2	3	920	2,670	0.34	C
Eastbound								
Katella Avenue	West St	Harbor Blvd	2	3	1,501	2,670	0.56	C
	Harbor Blvd	Haster St	2	3	1,509	2,670	0.57	C
	Haster St	State College Blvd	2	4	1,410	3,560	0.40	C
	State College Blvd	SR 57	2	3	1,234	2,670	0.46	C
	SR 57	Main St	2	3	1,300	2,670	0.49	C

Source: Kittelson & Associates, 2016

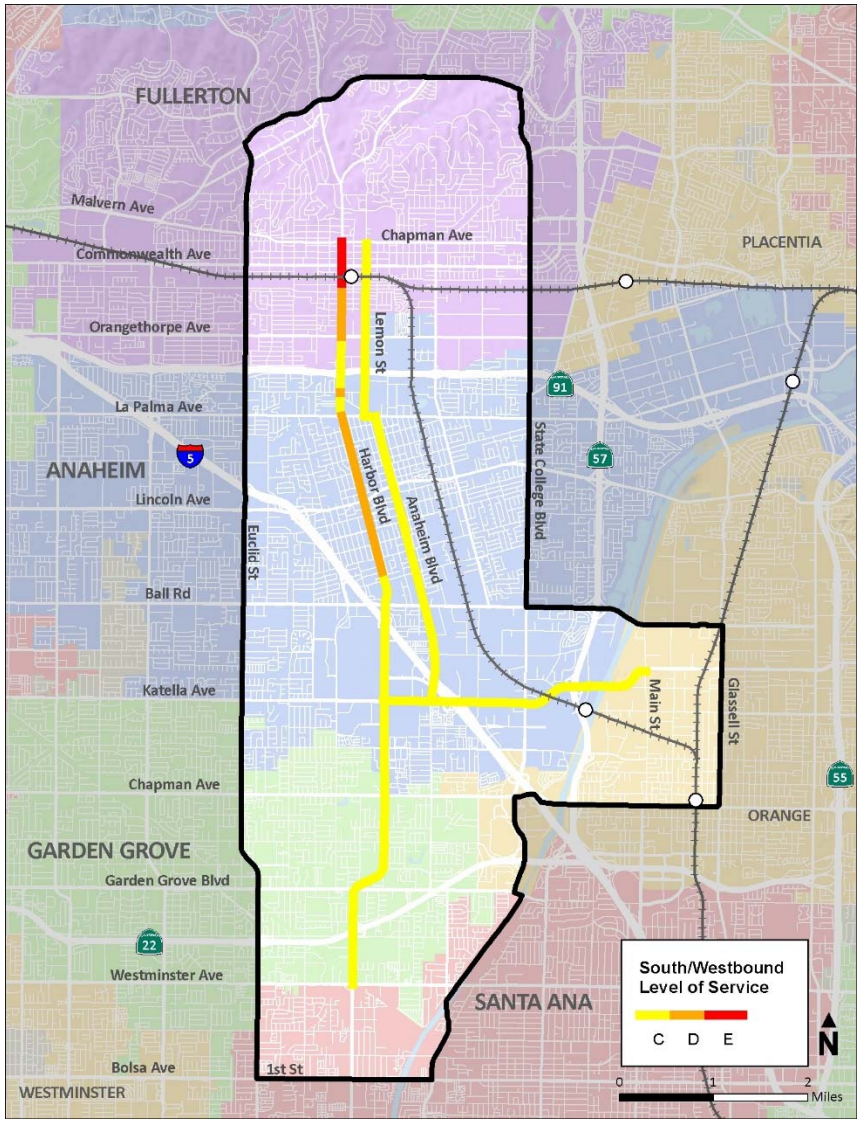
[6] North of Katella Avenue, Haster Street becomes Anaheim Boulevard.

Table 6.3. Harbor & Lemon/Anaheim Boulevard Study Corridors LOS (AM Peak Hours)

	From	To	Class	Lanes	Volume	Capacity	V/C	LOS
Southbound								
Harbor Boulevard	Chapman Avenue	Valencia Avenue	3	2	1,625	1,690	0.96	E
	Valencia Avenue	Orangethorpe Avenue	3	2	1,073	1,690	0.63	D
	Orangethorpe Avenue	Romneya Drive	2	3	1,522	2,670	0.57	C
	Romneya Drive	Victor Avenue	3	2	1,035	1,690	0.61	D
	Victor Avenue	La Palma Avenue	3	3	1,021	2,540	0.40	C
	La Palma Avenue	Sycamore Street	3	2	1,418	1,690	0.84	D
	Sycamore Street	Cypress Street	3	2	1,030	1,690	0.61	D
	Cypress Street	Vermont Avenue	3	2	1,329	1,690	0.79	D
	Vermont Avenue	Ball Road	3	3	1,202	2,540	0.47	C
	Ball Road	Manchester Avenue	2	4	1,861	3,560	0.52	C
	Manchester Avenue	Katella Avenue	2	3	1,046	2,670	0.39	C
	Katella Avenue	Orangewood Avenue	2	3	1,113	2,670	0.42	C
	Orangewood Avenue	Chapman Avenue	2	3	1,013	2,670	0.38	C
	Chapman Avenue	MacArthur Boulevard	2	3	1,056	2,670	0.40	C
Anaheim Boulevard / Lemon Street	Chapman Avenue	Orangethorpe Avenue	2	2	776	1,780	0.44	C
	Orangethorpe Avenue	SR 91	2	3	1,026	1,780	0.58	C
	SR 91 EB Ramps	La Palma Avenue	3	3	546	1,690	0.32	C
	Lemon Street	Anaheim Boulevard	2	2	1,036	1,780	0.58	C
	La Palma Avenue	Sycamore Street	3	2	649	1,690	0.38	C
	Sycamore Street	Broadway	3	2	733	1,690	0.43	C
	Broadway	Ball Rd	3	2	883	1,690	0.52	C
	Ball Rd	Cerritos Avenue	2	3	1,218	2,670	0.46	C
	Cerritos Avenue	Katella Avenue	2	3	615	2,670	0.23	C
Northbound								
Harbor Boulevard	MacArthur Boulevard	Chapman Avenue	2	3	1,194	2,670	0.45	C
	Chapman Avenue	Orangewood Avenue	2	3	1,090	2,670	0.41	C
	Orangewood Avenue	Katella Avenue	2	3	959	2,670	0.36	C
	Katella Avenue	Manchester Avenue	2	3	965	2,670	0.36	C
	Manchester Avenue	Ball Road	2	4	1,539	3,560	0.43	C
	Ball Road	Vermont Avenue	3	3	735	2,540	0.29	C
	Vermont Avenue	Cypress Street	3	2	754	1,690	0.45	C
	Cypress Street	Sycamore Street	3	2	601	1,690	0.36	C
	Sycamore Street	La Palma Avenue	3	2	846	1,690	0.50	C
	La Palma Avenue	Victor Avenue	3	3	1,475	2,540	0.58	C
	Victor Avenue	Romneya Drive	3	2	890	1,690	0.53	C
	Romneya Drive	Orangethorpe Avenue	2	3	954	2,670	0.36	C
	Orangethorpe Avenue	Valencia Avenue	3	2	1,566	1,690	0.93	D
	Valencia Avenue	Chapman Avenue	3	2	1,138	1,690	0.67	D
Anaheim Boulevard / Lemon Street	Katella Avenue	Cerritos Avenue	2	3	677	2,670	0.25	C
	Cerritos Avenue	Ball Rd	2	3	762	2,670	0.29	C
	Ball Rd	Broadway	3	2	488	1,690	0.29	C
	Broadway	Sycamore Street	3	2	537	1,690	0.32	C
	Sycamore Street	La Palma Avenue	3	2	574	1,690	0.34	C
	Anaheim Boulevard	Lemon Street	2	2	1,098	1,780	0.62	D
	La Palma Avenue	SR 91 EB Ramps	3	2	580	1,690	0.34	C
	SR 91	Orangethorpe Avenue	2	2	1,003	1,780	0.56	C
	Orangethorpe Avenue	Chapman Avenue	2	2	787	1780	0.44	C

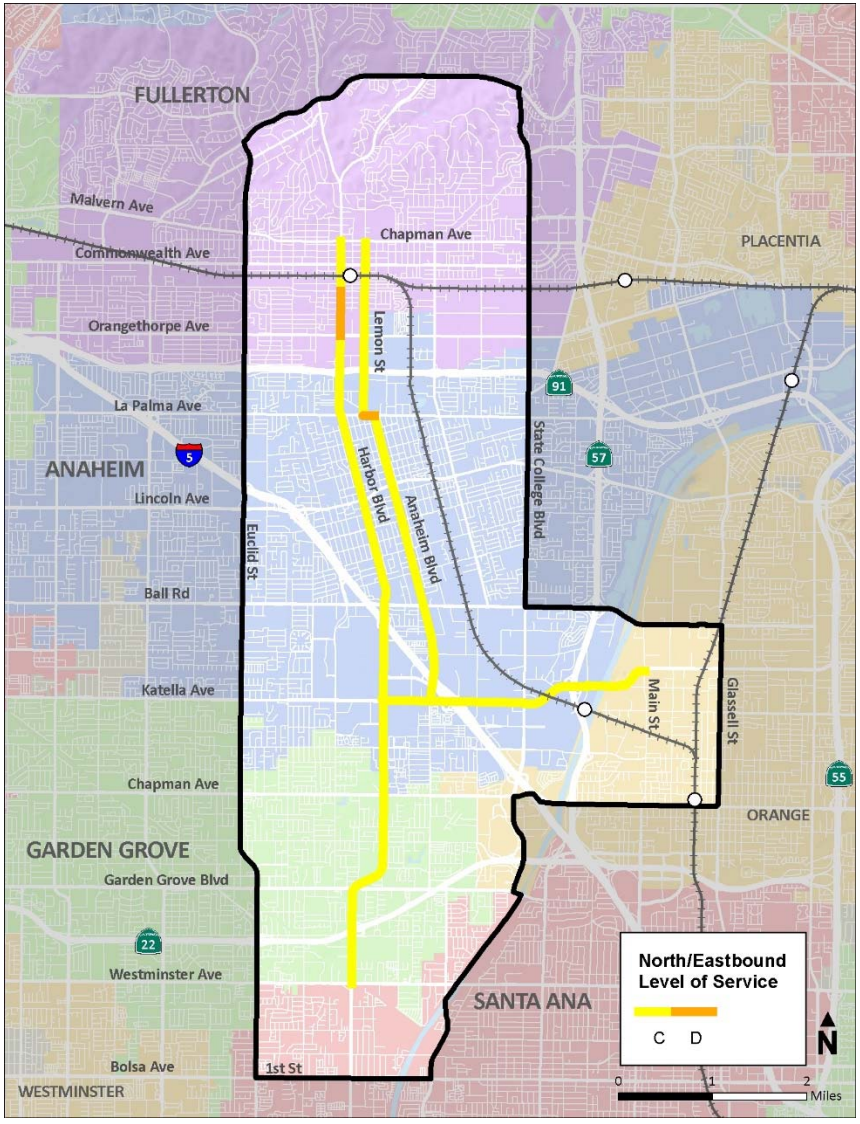
Source: Kittelson & Associates, 2016

Figure 6.1. South/Westbound Peak AM LOS



Source: STV, 2016; Kittelson & Associates, 2016

Figure 6.2. North/Eastbound Peak AM LOS



Source: STV, 2016; Kittelson & Associates, 2016

6.2. TRANSIT PERFORMANCE

Traffic delay on Harbor Boulevard and Lemon Avenue/Anaheim Boulevard not only affects drivers, but also negatively impacts transit operations. Despite the successes of OCTA's Bravo! Limited-stop service (detailed in OCTA's Bravo! Route 543 Survey Report from October 2014), there are indications that service is not performing optimally throughout the study corridor because of traffic conditions. A telling illustration of this is the lack of consistency in average bus travel speed throughout the approximately 8-mile Harbor Boulevard corridor and 5-mile Lemon Street-Anaheim Boulevard corridor. The following figures illustrate this and show what the problem areas for transit operations are during the morning and afternoon commute times.

Figure 6.3 and Table 6.4. Hourly Breakdown of Average OCTA Route 50 Speeds during AM Peak on the next page show average scheduled travel speeds for OCTA's Route 50 from 6 AM to 9 AM through the following sections of Katella Avenue (as determined by OCTA):

- Brookhurst Avenue to Katella Avenue
- Katella Avenue to ARTIC
- ARTIC to Glassell Street (city of Orange)

Figure 6.4 and Table 6.5 on the next page show average scheduled travel speeds for OCTA's Route 43 from 6 AM to 9 AM through the following sections of Harbor Boulevard (as determined by OCTA):

- Westminster Ave to Katella Ave
- Katella Ave to Lincoln Ave
- Lincoln Ave to Orangethorpe Ave to the FTC

Figure 6.5 and Table 6.6 on the next page show average scheduled travel speeds for OCTA's Bravo! 543 from 6 AM to 9 AM through the following sections of Harbor Boulevard (as determined by OCTA):

- FTC to Lincoln Avenue (Fullerton to Anaheim)
- Lincoln Avenue to Katella Avenue (Anaheim)
- Katella Avenue to Westminster Avenue (Anaheim to Santa Ana)

Finally, Figure 6.6. Average Route 47 Travel Speeds during AM Peak and Table 6.7 and on the following page show average scheduled travel speeds for OCTA's Local Route 47 from 6 AM to 9 AM through the following segments (also determined by OCTA):

- FTC to Orangethorpe Avenue (via Lemon Street in Fullerton)
- Orangethorpe Avenue to Lincoln Avenue
  (Lemon Street to La Palma Avenue to Anaheim Boulevard; Fullerton-Anaheim)
- Lincoln Avenue to Katella Avenue (via Anaheim Boulevard in Anaheim)

Travel Time: Key to Competitive Transit Service

Travel time is of critical importance to transit riders and also has important implications for the productivity and cost-effectiveness of transit service. A 25 percent improvement in travel time, for example, gets riders to their destinations and transfer points sooner, improves the attractiveness of the service, and has the added benefit of increasing the productivity of all the transit vehicles along the route, potentially resulting in a 25 percent reduction in operating cost. On the other hand, increasing travel times hurt the competitiveness of transit service and increase operating costs. For this reason, identifying and evaluating alternatives that produce real travel time reductions is a key objective of this study.

Areas to Evaluate for Travel Time Reductions:

This study will evaluate a number of strategies to identify those that have the potential to provide significant travel time reductions with limited impacts to other modes. Some of these strategies relate to service attributes employed by the transit agency and others relate to traffic coordination and/or transit priority attributes which would need to be coordinated with each jurisdiction in the study area. Strategies to be evaluated include the following:

- **Stop/Station Spacing**: One method for effectively reducing transit travel times is to increase the spacing between transit stops for more streamlined service. OCTA's Bravo! 543 every 0.75-miles on average and averages an operating speed closer to 17mph while the local service (Route 43) stops every 0.25 miles on average and averages an operating speed closer to 12 mph. Transit riders often demonstrate a willingness to walk further distances for faster, more frequent service.

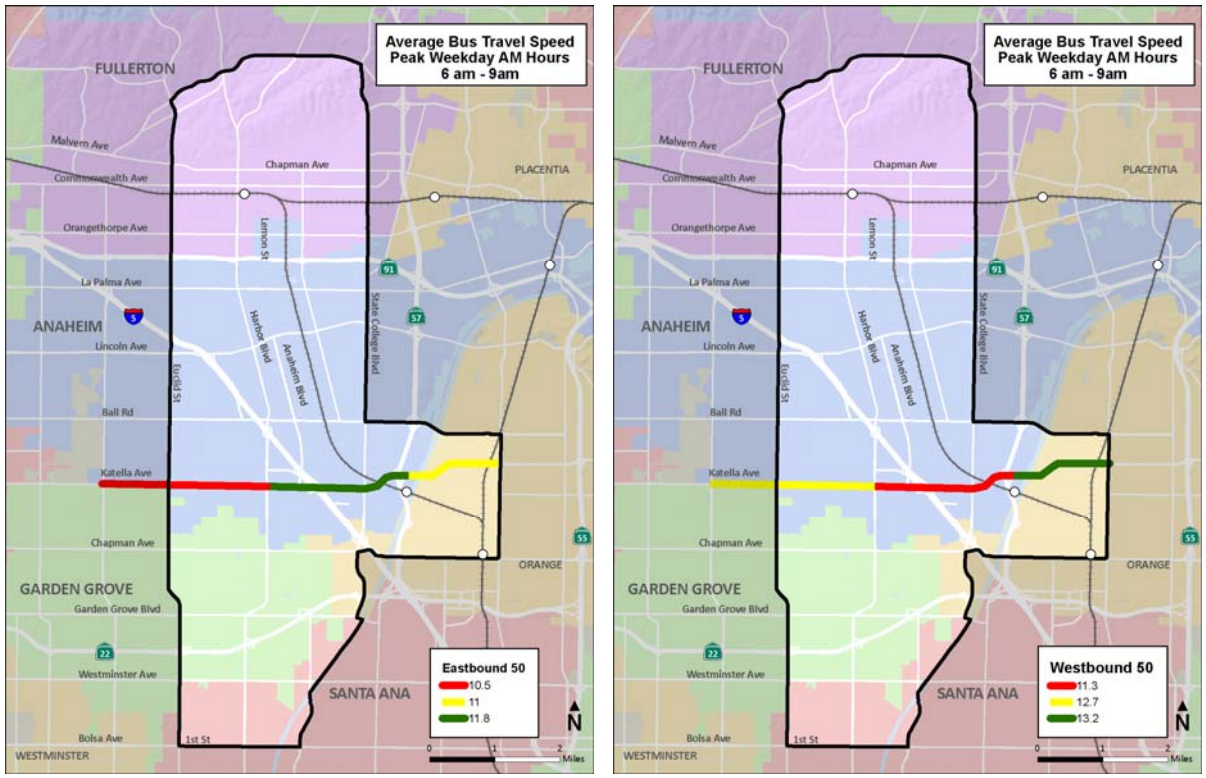
- **Mixed Traffic or Designated Transit lanes**: Designating a traffic lane to transit use during the peak period or all day can provide significant benefits to transit travel time. A high frequency of transit service is needed to make this strategy justified and traffic volume analyses need to be conducted to ensure the impacts to other modes can be minimized.

- **Transit Stop Dwell Time**: There are many strategies for reducing the amount of time it takes to load and off-load passengers: off-board fare collection, multi-door boarding, low-floor vehicles and level platform boarding, improved information, signage, and branding.

- **Address Traffic Choke Points**: Work with corridor cities to remove or alleviate bottlenecks and employ traffic signal timing refinements or "queue jumpers" at strategic intersections.

- **Traffic Signal Priority**: Evaluate the potential benefits and impacts of providing transit signal priority to high occupancy transit vehicles through strategic segments of the corridor.

Figure 6.3. Average OCTA Route 50 Travel Speeds during AM Peak [7]



Source: STV, 2016; OCTA, October 2015

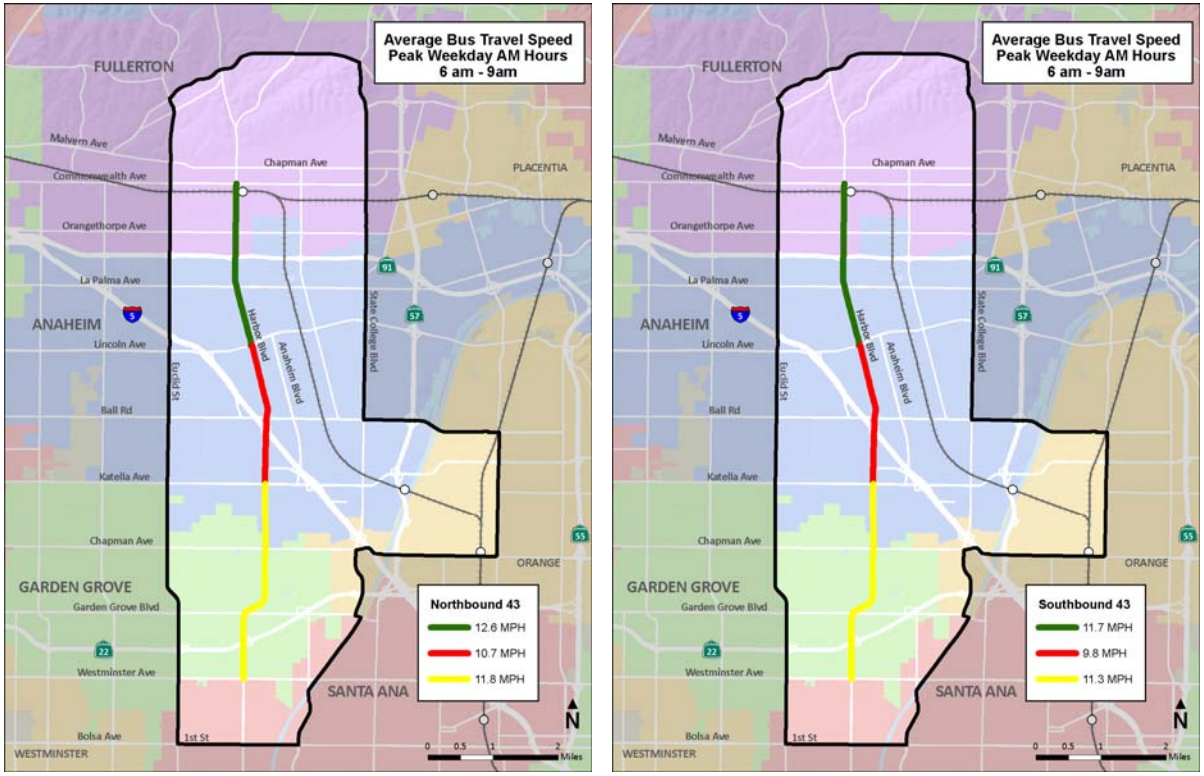
Table 6.4. Hourly Breakdown of Average OCTA Route 50 Speeds during AM Peak

	Monday-Friday: Eastbound				Monday-Friday: Westbound (Reverse Order)			
	Distance (Miles)	6 am	7 am	8 am	Distance	6 am	7 am	8 am
Brookhurst Ave – Harbor Blvd	2.6	11.7	9.2	10.7	2.6	13.2	12.4	13.6
Harbor Blvd - ARTIC	2.6	12.0	11.5	12.0	2.6	10.5	10.7	11.4
ARTIC – Glassell Street	1.7	11.6	9.9	11.6	1.7	10.5	10.1	9.7

Source: STV, 2016; OCTA, 2015

[7] Note: Average travel speeds during peak travel periods for all figures were weighted equally when calculating the overall average for the three hour period.

Figure 6.4 Average OCTA Route 43 Travel Speeds during AM Peak



Source: STV, 2015; OCTA, October 2015

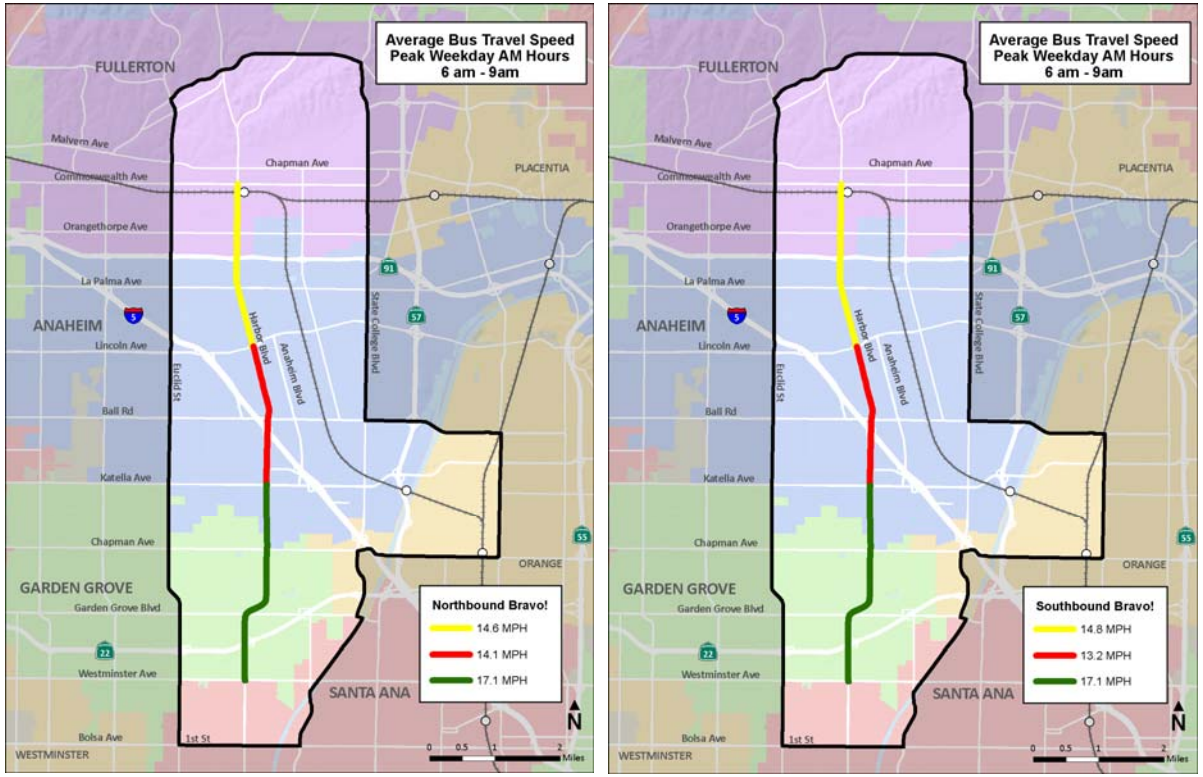
Table 6.5. Hourly Breakdown of Average Route 43 Speeds during AM Peak[8]

	Monday-Friday: Northbound				Monday-Friday: Southbound			
	Distance (Miles)	6 am	7 am	8 am	Distance	6 am	7 am	8 am
Westminster Ave – Katella Ave	3.2	12.1	11.4	12.1	3.2	11.6	11.2	11.2
Katella Ave – Lincoln Ave	2.1	11.4	10.4	10.4	2.2	10.9	9.3	9.3
Lincoln Ave – Orangethorpe Ave/FTC	1.9/0.9	12.4/11.4	12.4/12.7	12.4/14.2	1.8/1.0	14.1/11.6	12.0/10.3	12.0/10.3

Source: STV, 2015; OCTA, 2015

[8] Northernmost segments (FTC-Orangethorpe Ave and Orangethorpe Ave-Lincoln Ave) have been combined to correspond with other figures.

Figure 6.5. Average Bravo! 543 Travel Speeds during AM Peak



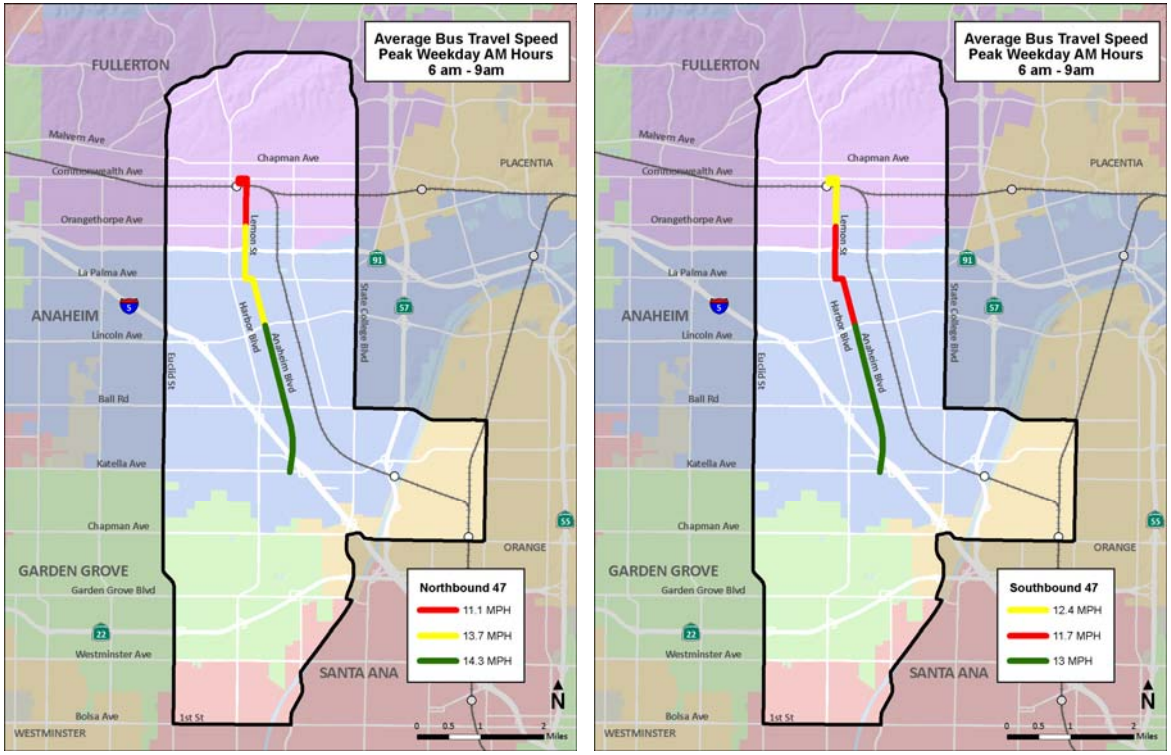
Source: STV, 2015; OCTA, October 2015

Table 6.6. Hourly Breakdown of Average OCTA Bravo! 543 Speeds during AM Peak

	Monday-Friday: Northbound				Monday-Friday: Southbound			
	Distance (Miles)	6 am	7 am	8 am	Distance	6 am	7 am	8 am
Westminster Ave – Katella Ave	3.2	17.6	16.1	17.6	3.2	18.0	16.2	17.0
Katella Ave – Lincoln Ave	2.1	16.0	12.8	13.6	2.2	14.9	12.3	12.5
Lincoln Ave – FTC	3.0	15.0	14.3	14.5	2.7	16.5	14.4	13.7

Source: STV, 2015; OCTA, October 2015

Figure 6.6. Average Route 47 Travel Speeds during AM Peak



Source: STV, 2015; OCTA, October 2015

Table 6.7. Hourly Breakdown of Average OCTA Route 47 Speeds during AM Peak

	Monday-Friday: Northbound				Monday-Friday: Southbound			
	Distance (Miles)	6 am	7 am	8 am	Distance	6 am	7 am	8 am
Katella Ave – Lincoln Ave	3.2	17.6 (mph)	16.1	17.6	3.2	18.0 (mph)	16.2	17.0
Lincoln Ave – Orangethorpe Ave	2.1	16.0	12.8	13.6	2.2	14.9	12.3	12.5
Orangethorpe Ave - FTC	3.0	15.0	14.3	14.5	2.7	16.5	14.4	13.7

Source: OCTA, October 2015

7. MOBILITY PROBLEMS

The Central Harbor Boulevard Study Area faces several obstacles that limit mobility for residents, employees, and visitors. Each of these obstacles fall under six "problem statements":

1. **Transit/Roadway Performance: Current traffic conditions limit the speed and reliability of existing transit service.** LOS in certain segments of the study area will likely continue to deteriorate as population and employment grow. Average travel speeds for transit during peak hours are around 10 mph. Modifications to transit operations can only go so far towards improving transit service without addressing traffic congestion during peak hours.

2. **User Experience: Stop amenities, branding, and information are inconsistent throughout the corridor.** People's perceptions of transit affect their mode choices. Poor perceptions can be addressed by improving transit station access and amenities. The majority of the stops within the study area (with exceptions in The Anaheim Resort) only provide basic amenities.

3. **Mode Choices: For many trips, few mode choices are competitive with the automobile.** OCTA core ridership includes a large number of transit dependent riders which rely on the transit system to meet all of their daily needs. All OCTA riders require frequent, reliable service. Increasing ridership among choice and tourist riders is difficult, as it requires creating a legible, attractive system that may require higher investments.

4. **Connectivity: Connections to/from major activity centers are time consuming and/or inconvenient for many transit users.** Non-Metrolink transit connections between the three transportation hubs (FTC, ARTIC, and SARTC) and major activity centers are not competitive with the automobile. Thus, personal auto usage is the dominant mode choice for commuters and people who live and work within the study area. Poor transit connections, combined with uncompetitive travel times, often make transit an unattractive option for many workers.

5. **Land Use: Some land uses prioritize automobile access over transit and pedestrian options.** The existing land use patterns along Harbor Boulevard vary and are sometimes not ideal for encouraging high transit usage. Additionally, the auto-centric nature of the corridor creates a heavy transportation burden on Title VI communities and carries environmental impacts.

6. **Infrastructure Constraints: Restricted street configuration supports auto use (limiting options for transit, bike, and pedestrian uses).** The ROW is constrained, with much of the corridor built out, and there is little room for roadway expansion. The space within the public ROW today is mainly dedicated to auto travel lanes, with fewer transit, bicycle, and pedestrian treatments.

8. GOALS AND OBJECTIVES

The following goal and objectives have been developed to address the problems listed in the previous page. These goals will inform the development of alternatives. The objectives with an asterisk (*) refer to criteria that match FTA New Starts funding criteria.

1. Enhanced Transit/Roadway Performance

- Increase average overall transit operating speed
- Person Throughput
- Travel Time Reliability / On-Time Performance
- Congestion Relief - New Linked Project Trips*

2. Encourage Transit Compatible Land Uses

- Transit-Compatible Land Uses - Station Area Population / Employment Density*
- Economic Development - Transit Supportive Plans and Policies*
- Environmental Benefits and Impacts - Traffic-Related (Traffic, Air Quality, etc.)*
- Other Environmental Benefits & Impacts (Noise, Historic, etc.)

3. Improve Local and Regional Connectivity

- Activity Center Connectivity
- Zero and One Transfer Rides
- Compliance with Long Range Regional Mobility Goals*
- First/Last Mile Connection – Bike/Ped Amenities & Linkages

4. Optimally Allocate Infrastructure by Mode

- Optimally Allocate Roadway Infrastructure
- Overall Safety / Collision Hot Spots
- Optimize Traffic Operations
- Physical Corridor Constraints (Bridges, Rail Crossings, etc)

5. Enhance User Experience / Improve Mode Choices

- New Riders (System-Wide)
- Mode Share
- Mobility Improvement - Linked Trips on Project*
- Station User experience / Level of Amenities

6. Pursue Projects that are Cost-Effective

- Cost Effectiveness - Capital + Operations & Maintenance Costs / Project Trips
- Incremental Cost per New Transit Trip*
- Farebox Recovery
- Financial Feasibility (Cost, Funding Suitability, etc)

7. Pursue Projects with Broad Support from the Community

- Community Support from Cities, Stakeholders, & Public

9. NEXT STEPS

This report summarizes findings from *Purpose and Need* (Tasks 2.1-2.4). This report and the reports prepared under Task 2 will inform the study as it progresses into the next phase: *Task 3: Alternative Development*.