Attachment 1

Draft Report

North Bayshore Area Trip Monitoring

Prepared for

City of Mountain View

Prepared by

AECOM

April 28, 2016

TABLE OF CONTENTS

Executive Summary 1
Introduction 4
Background 4
North Bayshore Area Existing Conditions 7
Land Use 7
Roadway Network 7
Existing Transit Services 9
ACE Shuttle Service 10
Caltrain 10
MVgo 10
Employer-Based Shuttles 10
Existing Bicycle and Pedestrian Facilities 12
Methodology 12
Data Collection – Hose Counts 12
Data Collection – Vehicle Classification Counts 13
Data Collection – Vehicle Occupancy Counts 14
Private Shuttles 14
Public Transit Vehicles 14
Trip Monitoring Results 14
Vehicle Trips 15
Vehicle Classification 19
Vehicle Occupancy 21
Conclusions 23

LIST OF FIGURES

Figure 1: North Bayshore Area 5
Figure 2: Existing Transit Facilities 9
Figure 3: Bus Definitions and Capacities 11
Figure 4a: Trip Count Locations 13
Figure 4b: Bus Stop Trip Count Locations 15

LIST OF CHARTS AND TABLES

Table E1: Inbound Gateway Available Capacity: Peak Period 1
Chart E1: Inbound Gateway Available Capacity: Peak Period 2
Table E2: Inbound Person-Trips by Mode 3
Table 1: Bus Types by Service Provider/Company and Approximate Person Capacity 10
Table 2: Inbound Gateway Volumes Comparison 16
Table 3: Inbound Gateway Available Capacity: Peak Period 17
Table 4: Inbound Gateway Available Capacity: Peak Hour 18
Table 5: Inbound Gateway Available Capacity: Peak Period “Shoulders 19
Table 6: Inbound Vehicles by Mode 20
Table 7: Vehicle Classification by Mode Comparison 20
Table 8: Inbound Person-Trips by Mode 22
Table 9: Inbound Person-Trips Mode Share Comparison 22
Table 10: Inbound Person-Trips Mode Share Time Series 23

APPENDICES

Appendix A "NBPP memo"
Appendix B Field Count Methodology
Appendix C Collected Data
Appendix D Inbound Vehicle Volume Count Calculations
Appendix E Vehicle Classification Count Calculations
Appendix F Person-Trip Calculations

Executive Summary

This report summarizes the results of the trip monitoring study undertaken in the North Bayshore area of Mountain View, California. The study had two major objectives 1) determine the traffic volumes entering the North Bayshore area and 2) estimate person-trip mode share.

Table E1 shows a comparison of the gateway capacities identified the *Final Transportation Impact Analysis*, *North Bayshore Precise Plan in Mountain View, California* (*NBPP TIA*) prepared in October 2014 and the volumes collected in Sept of 2015 and March of 2016. The person-trip averages and mode shares are summarized in **Table E2**. It should be noted that the AM peak hour person-trips reported in **Table E2** are for the motor vehicle peak hour, occurring between 9:00 AM and 10:00 AM. The analysis of data collected during the March 2016 trip monitoring effort shows little change in the inbound motor vehicle trips and person-trip mode shares for single-occupancy vehicles (SOVs) as compared to the data collected in September 2015.

Table E1: Inbound Gateway Available Capacity: Peak Period

Gateway / Roadway Segment	Weekday AM Peak Period						
	Gateway Capacity	March '15[1]		September '15[1]		March '16[1]	
		Vehicle Volume	Available Capacity	Vehicle Volume	Available Capacity	Vehicle Volume	Available Capacity
1. San Antonio Road	4,140	2,270	1,870	2,470	1,670	2,400	1,740
San Antonio Road Between Bayshore Parkway and Casey Avenue	1,250	700	550	830	420	850	400
Bayshore Parkway Between San Antonio Road and Garcia Avenue	2,900	1,570	1,330	1,640	1,260	1,550	1,350
2. Rengstorff Avenue Between US 101 NB Ramps and Garcia Avenue-Charleston Road	8,020	5,110	2,910	5,260	2,760	4,690	3,330
3. Shoreline Boulevard Between US 101 NB Ramps-La Avenida Street and Pear Avenue	6,740	6,290	550	5,530	1,210	5,740	1,000
Total	**18,900**	**13,670**	**5,230**	**13,260**	**5,640**	**12,830**	**6,070**

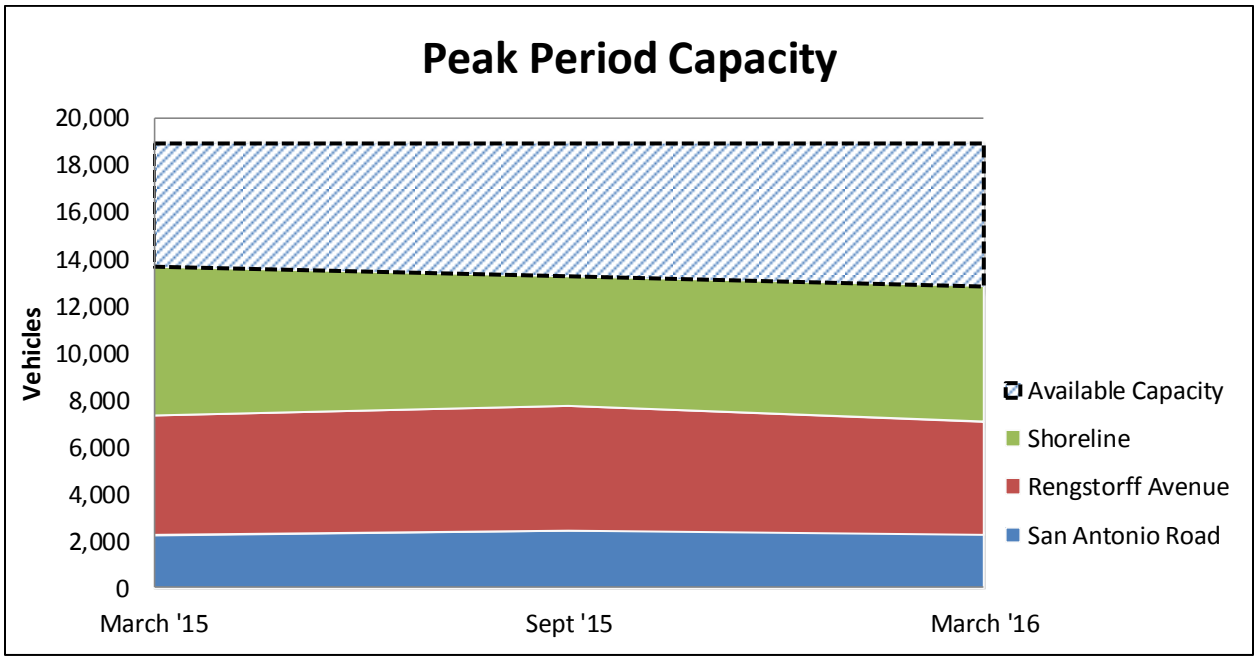
Source: AECOM, 2015-21016.

Notes:

[1] For the purposes of comparison, volumes were rounded to the nearest 10.

A total of 12,830 motor vehicles entered the North Bayshore area during the morning peak period and total of 5,780 motor vehicles entered the study area during the AM peak hour. The district-wide vehicle trip capacity identified by the *NBPP* is 18,900 inbound vehicles during the morning peak period. The March 2016 data show that the available motor vehicle capacity is approximately 6,070 vehicles during the AM peak period at the three gateways. Of the three gateways, San Antonio Road has the highest available capacity at 42%. Together, San Antonio Road and Rengstorff Avenue represent about 85% of the available capacity among the three gateways.

Chart E1: Inbound Gateway Available Capacity Time Series: Peak Period



Source: AECOM, 2015-2016

Table E2: Inbound Person-Trips by Mode

	Weekday AM Peak Period		Weekday AM Peak Hour[3]	
	Person-Trips	**Mode Share**	**Person-Trips**	**Mode Share**
Auto	**13,421**	**73.7%**	**6,111**	**75.2%**
Single-Occupancy Vehicle	*10,900*	*59.9%*	*4,971*	*61.2%*
High Occupancy Vehicle[1]	*2,521*	*13.8%*	*1,141*	*14.0%*
Transit	**3,460**	**19.0%**	**1,417**	**17.4%**
Employer Based Bus	*3,289*	*18.1%*	*1,322*	*16.3%*
Double Decker	*2,117*	*11.6%*	*923*	*11.3%*
Small	*98*	*0.5%*	*44*	*0.5%*
Standard	*1,074*	*5.9%*	*356*	*4.4%*
Public Transit Bus	*171*	*0.9%*	*95*	*1.2%*
MVgo	*134*	*0.7%*	*77*	*0.9%*
VTA	*7*	*0.0%*	*0*	*0.0%*
ACE	*30*	*0.2%*	*18*	*0.2%*
Other[2]	**190**	**1.0%**	**67**	**0.8%**
Bicycle	**906**	**5.0%**	**434**	**5.3%**
Pedestrian	**232**	**1.3%**	**100**	**1.2%**
All Modes Total	**18,209**	**100.0%**	**8,128**	**100.0%**

Source: AECOM, 2015-2016.
Notes:
(1) An average vehicle occupancy of 2.2 persons per vehicle was used to determine the HOV person trips.
(2) The "Other" category includes motorcycles, trucks, and intercampus Google shuttles at one person-trip per vehicle.
(3) Weekday AM peak hour, consisting of four consecutive 15-minute intervals with the highest recorded motor vehicle volumes.

An area-wide single-occupancy (drive-alone) mode share target established by the *North Bayshore Precise Plan* is 45 percent. The current trip monitoring effort shows that the target is not met. The weekday AM peak period and the weekday AM peak hour single-occupancy vehicle mode share are 59.9 percent and 61.2 percent, respectively. In September 2015, the reported SOV mode shares during the weekday AM peak period and the weekday AM peak hour were both 55 percent. Therefore from September 2015 to March 2016, there is an increase of over four percent in the SOV mode share during the AM peak period and an increase of six percent in the SOV mode split during the AM peak hour.

Introduction

This report summarizes the results of the trip monitoring study undertaken in the North Bayshore area of Mountain View, California. The study had two major objectives 1) determine the traffic volumes entering the North Bayshore area and 2) estimate person-trip mode share.

In this study, the concept of person-trips is used to estimate the single occupancy vehicle (SOV) mode split. The SOV mode split is the percentage of people who drive into the study area alone (as lone occupants of their motor vehicles), as compared to people who walk, bike, carpool, travel by bus, etc.

In the context of this report, a person-trip is a one-direction inbound movement into the study area by an individual person. Several person-trips may be associated with a single vehicle trip if the vehicle transports more than one person. For example, one carpool vehicle entering the study area with a driver and a passenger would result in two person-trips while representing only one vehicle trip.

Natural geographic features and the US 101 alignment limit motor vehicle access to the North Bayshore area to the following gateways as illustrated in **Figure 1**:

1. San Antonio Road
    a. San Antonio Road, between Bayshore Parkway and Casey Avenue
    b. Bayshore Parkway, between San Antonio Road and Garcia Avenue
2. Rengstorff Avenue
3. Shoreline Boulevard

In addition to the above gateways, pedestrians and bicyclists can also access the area using Permanente Creek and Stevens Creek trails.

The three-hour AM peak period (7:00 AM to 10:00 AM) inbound traffic volumes were calculated for the overall area and for each gateway individually. In addition to the peak period analysis results, peak hour volumes were also determined. For the three-hour AM peak period, the person-trip mode split for the entire North Bayshore area was calculated using vehicle classifications obtained during the data collection and estimated transit / shuttle vehicle occupancies.

The results were then compared to the vehicle trip cap and person-trip mode share targets established by the *North Bayshore Precise Plan* (December 2014) [(1)] (hereafter referred to as the "*NBPP*") for the weekday morning peak period (7:00 AM to 10:00 AM).

Background

The *NBPP* was developed by the City of Mountain View to implement the goals and policies of the *Mountain View 2030 General Plan* (July, 2012), for the North Bayshore area. Specifically, one of the Land Use and Development goals (LUD 17.2 Transportation Demand Management Strategies), requires developments in the North Bayshore area to include and implement Transportation Demand Management (TDM) strategies[(2)] to promote efficient use of existing transportation facilities. The *NBPP* subsequently established a vehicle trip and development monitoring program in an effort to implement the vision and objectives of the plan.

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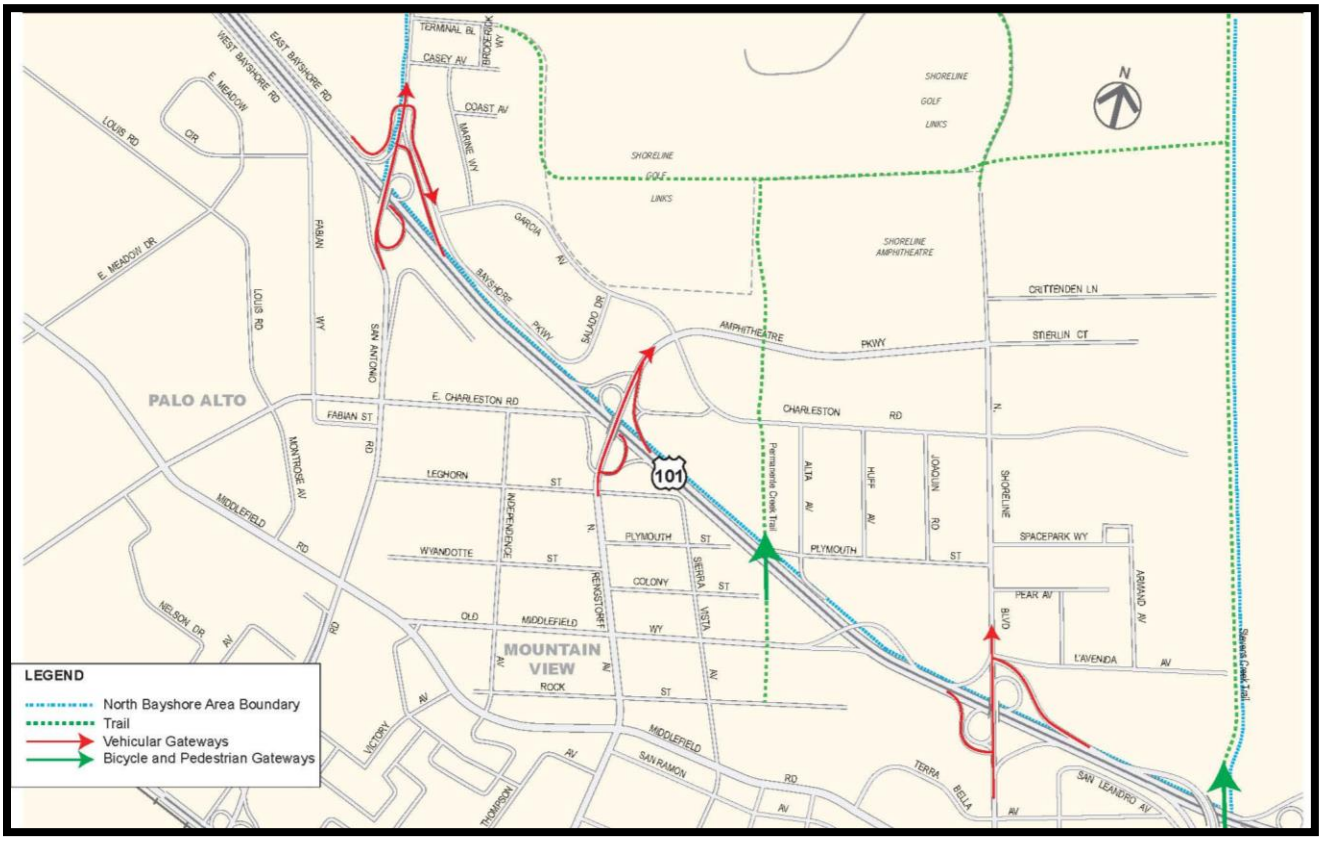
(1) City of Mountain View North *Bayshore Precise Plan* (December 2014).
Online: http://www.mountainview.gov/civicax/filebank/blobdload.aspx?BlobID=15038

(2) City of Mountain View Community Development Department *Mountain View 2030 General Plan* (July, 2012).
Online: http://www.mountainview.gov/civicax/filebank/blobdload.aspx?blobid=10702

Figure 1: North Bayshore Area



The *NBPP's* Transportation Demand Management program aims to reduce daily and peak hour vehicle trips below the capacity of the aforementioned gateways. The *NBPP* established a vehicle trip cap during the morning peak period (7:00 AM to 10:00 AM) for vehicles accessing the *NBPP* area, in compliance with the City of Mountain View trip reduction targets. A district-wide vehicle trip cap is initially set at 18,900 inbound vehicles while an area-wide single-occupancy (drive-alone) mode share target is 45 percent.

The transportation elements of the *NBPP* were analyzed as part of the *Final Transportation Impact Analysis*, *North Bayshore Precise Plan in Mountain View, California* (*NBPP TIA*)[3] prepared in October 2014. The initial vehicle trip cap was developed by analyzing traffic flow into and out of the North Bayshore Area via three main gateways described above. The vehicle trip cap is based on the existing vehicle throughput capacity of the main gateways. As described in the *NBPP TIA*, "For the purposes of this analysis, 'vehicle gateway capacity' is defined as the maximum number of vehicles that can be served in a specified time period while maintaining reasonable freedom of vehicle movement through the gateways. Rather than apply a theoretical per-lane capacity assumption, the vehicle capacity for each gateway was calculated based on observed vehicle demand, queuing characteristics, and available vehicle storage that could be accommodated without blocking other movements and causing gridlock." The individual vehicle gateway capacities were estimated for the peak hour first, and then, the peak period capacity was established based on the ratio between the existing peak period and peak hour vehicle counts.

[3] Fehr and Peers *Final Transportation Impact Analysis, North Bayshore Precise Plan in Mountain View, California* (October 2014). Online: http://www.mountainview.gov/civicax/filebank/blobdload.aspx?BlobID=14513

The *NBPP* also evaluated bicycle and pedestrian counts taken at the two bicycle/pedestrian trail segments that provide access to the North Bayshore Area.

The vehicle trip caps and occupancy targets developed as part of the *NBPP* were based on an analysis of the existing travel characteristics for the entry/exit points of the North Bayshore Area as summarized in the *North Bayshore Precise Plan EIR – Establishing Existing Travel Characteristics for North Bayshore* (March 12, 2014) memorandum, (hereafter referred to as the "*NBPP memo*" and included in **Appendix A**). The *NBPP Memo* serves as the first data point for the ongoing monitoring of TDM effectiveness and trip-making behavior in the North Bayshore area.

The *NBPP Memo* analyzed transportation data collected in February 2014 at the three vehicle gateways to the North Bayshore area. The analysis determined the peak period and peak hour vehicle trips, as well as the person-trip mode split during the peak period and peak hour.

As summarized in the *NBPP Memo*, the North Bayshore area generates 13,940 inbound trips during the AM peak period (7:00 AM to 10:00 AM). Shoreline Boulevard was identified as the most heavily-used access route and carried 47 percent of all inbound North Bayshore area traffic during the AM peak period. In the AM peak hour, Shoreline Boulevard served 41 percent of all vehicles entering the area.

The *NBPP Memo* also determined the person-trip mode share for the morning peak period and peak hour. The percentages of people who drove alone were 57 percent and 50 percent for the morning peak period and peak hour, respectively. The percentage of people who used transit and shuttle options to enter the study area during the AM peak period was 25 percent while 33 percent of people used the transit and shuttles during the AM peak hour.

The Trip Monitoring program established by the *NBPP* requires semiannual assessments of transportation characteristics of the North Bayshore area. The *NBPP* includes the following standards for Trip Monitoring for the NBPP area:

> The City shall monitor the number of vehicle trips during the morning peak period (7:00 AM to 10:00 AM) at each of the three major entry points to North Bayshore.
>
> If monitoring shows the established trip cap is reached at any of the three gateway locations after two consecutive data reporting periods, the City of Mountain View, will not grant any new building permits for new square footage within the *NBPP* area until the morning peak period vehicle trips is reduced below the trip cap.
>
> - The City shall prepare an annual North Bayshore vehicle trip cap report.
> - The City Council shall review the annual vehicle trip cap report and may adjust the trip cap to reflect any new capacity at the gateways. Failure to achieve the vehicle trip cap to the satisfaction of the City of Mountain View may result in the City Council considering (but is not limited to) any of the following:
>   - Require new developments to implement additional project and/or area-wide TDM strategies;
>   - Increase the amount of City or developer contributions to fund area transportation improvements; and,
>   - Implement a congestion pricing program for the area. [4]

[4] City of Mountain View North *Bayshore Precise Plan* (December 2014). Online: http://www.mountainview.gov/civicax/filebank/blobdload.aspx?BlobID=15038

Last year's vehicle trip cap report served as the first iteration of the ongoing trip monitoring process and established the methodology and work plan for conducting and analyzing traffic volume counts, vehicle classification counts, and vehicle occupancy counts.

North Bayshore Area Existing Conditions

Land Use

The North Bayshore Area is primarily comprised of various land uses including but not limited to office, research and development, commercial, residential, entertainment and open space land uses. The area includes a number of technology firms that generate a high level of work-based trips within the area. These technology firms represent major employment centers within the City of Mountain View, and include but are not limited to the following companies:

- Google Incorporated ("Google");
- Intuit;
- LinkedIn; and,
- Microsoft Corporation ("Microsoft").

The area's residential land use is limited and is primarily comprised of the Santiago Villa Mobile Home Park located in the eastern portion of the area (bounded by Space Park Way in the north, Villa in the south, Stevens Creek trail in the east and a fenced partition approximately 300 feet west of Armand Avenue), and several single-family residences. Approximately 50 percent of the area is comprised of parks and open space primarily concentrated in the northern portion of the area, including Shoreline at Mountain View regional park.

The largest entertainment land use is comprised of the Shoreline Amphitheater, an outdoor venue with 22,000 seats (a portion of which are comprised of lawn seating). The venue hosts festivals, concerts, and comedy shows, which generally attract a large number of person trips.

Roadway Network

The North Bayshore Area is served by an extensive regional and local roadway network described below.

US Highway 101 is a ten-lane (three mixed-flow lanes and two High Occupancy Vehicle [HOV] lanes in each direction in the project vicinity) freeway that runs east-west in the study area and serves as the southern boundary of the North Bayshore Area. The roadway provides access between the San Francisco (and points further north), and the southern San Francisco Bay area (and points south). Access to the North Bayshore Area is provided via on- and off-ramps at San Antonio Road, Rengstorff Avenue and North Shoreline Boulevard.

State Route 85 (SR 85) is a six-lane (two mixed-flow lanes and one HOV lane in each direction) freeway that extends northwest from the US 101 interchange in the City of San Jose to the US 101 interchange in Mountain View. Access to the North Bayshore Area is provided via the SR 85 interchange with US 101 located at the southeast boundary of the North Bayshore Area.

State Route 237 (SR 237) is a six-lane (two mixed-flow lanes and one HOV lane in each direction) freeway that runs east-west between the City of Mountain View and the City of Milpitas. Access to the North Bayshore Area is provided via an interchange with US 101 located approximately two miles south east of the North Bayshore Area.

Shoreline Boulevard is a four-lane (two lanes in each direction) north-south arterial roadway with a raised median that separates the two directions of travel. Shoreline Boulevard extends from El Camino Real in the south to the Shoreline at Mountain View park in the north. Within the North Bayshore Area

Shoreline Boulevard also features a Class 2 bicycle facility (dedicated road space in the paved right-of-way) in both directions.

Rengstorff Avenue is a four-lane (two lanes in each direction) arterial roadway that extends from El Camino Real in the south to its intersection with Garcia Avenue / Charleston Road within the North Bayshore Area. Rengstorff Avenue features a Class 2 bicycle facility in both directions.

San Antonio Road is a two-lane (one lane in each direction within the North Bayshore Area) arterial roadway that extends north from Foothill Expressway to Shoreline at Mountain View park.

Bayshore Parkway is a two-lane (one lane in each direction) street that runs east-west parallel to US 101 within the North Bayshore Area. The street extends from San Antonio Road to Saldo Drive within the North Bayshore Area.

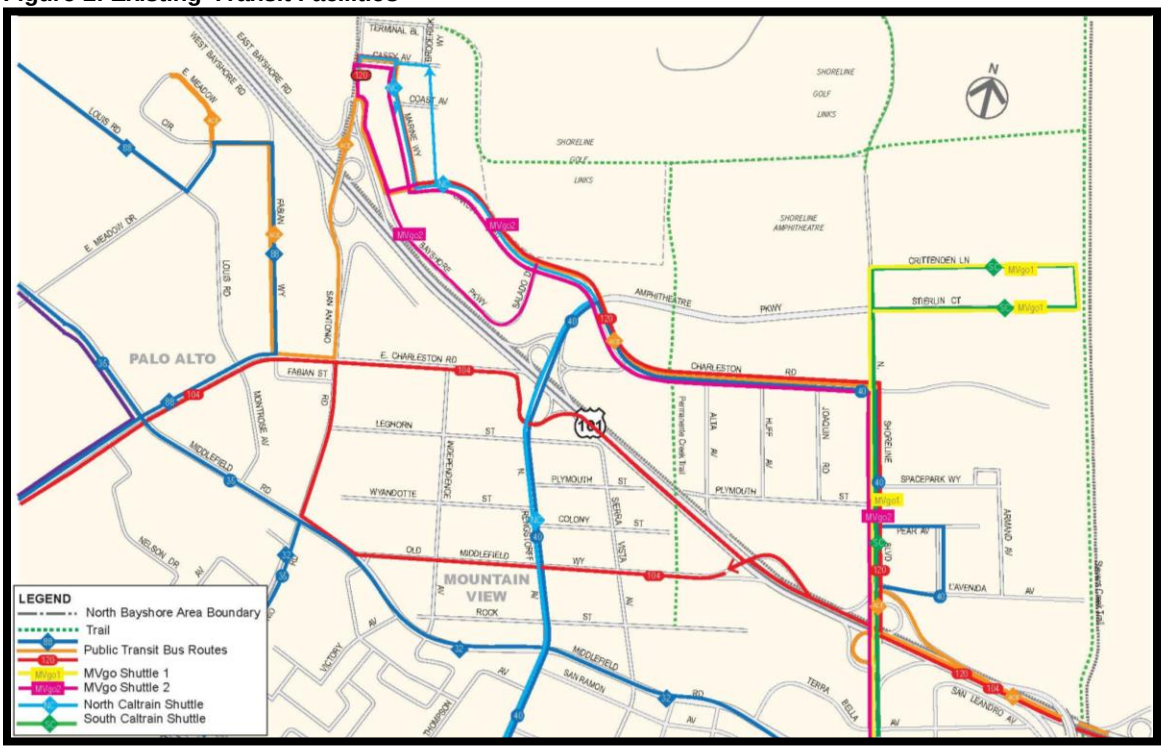
Existing Transit Services

The North Bayshore Area is served by both public (local and regional) and private (employer-based) transit options. Publicly available transit options are operated by various organizations including the Santa Clara Valley Transportation Authority (VTA). VTA provides local service within the City of Mountain View and regional service within Santa Clara County. Routes serving the North Bayshore Area include

- Route 40 – La Avenida and Inigo to Foothill College; and,
- Route 120 – Fremont Bay Area Rapid Transit (BART) to Lockheed Martin Transit Center/Moffett Park.

The public transit services serving the North Bayshore Area are illustrated in **Figure 2**, and discussed in more detail below.

Figure 2: Existing Transit Facilities



ACE Shuttle Service

The Altamont Commuter Express (ACE) is a passenger rail service that extends to San Jose with a stop at the Great America Station in Santa Clara. ACE and VTA provide free "last mile" connections to bring ACE passengers to major employment centers not directly served by the rail line.

The ACE Orange shuttle connects the Great America Station to eastern Palo Alto via US Route 101 Shoreline Boulevard, Charleston Road and San Antonio Road, with stops provided within the North Bayshore Area.

Caltrain

Caltrain provides commuter rail service along the full length of the 51-mile corridor owned and operated by the Peninsula Corridor Joint Powers Board (PCJPB) between San Francisco and San Jose. Caltrain operates bi-directional (both northbound and southbound) services and operates all-day. The closest Caltrain station serving the North Bayshore Area is located at the Downtown Mountain View Transit Center (600 West Evelyn Avenue) approximately one mile southeast of the area.

MVgo

MVgo is a service provided by the Mountain View Transportation Management Association (MTMA), a nonprofit organization comprised of Mountain View businesses and landowners. MVgo provides two shuttle routes that provide service between the Downtown Mountain View Transit Center and various segments of the North Bayshore Area.

Employer-Based Shuttles

Major employers within the North Bayshore Area provide extensive shuttle services that serve as a transit alternative on the primary leg of their employee's journeys. These commuter shuttles are designed to bring employees living in major cities in the San Francisco Bay Area (including but not limited to San Francisco, San Jose, Oakland and other areas of the East and South San Francisco Bay Area) to and from their jobs in the North Bayshore Area. The shuttles are owned and operated by private charter bus companies.

The aforementioned transit options are provided by a variety of bus types as illustrated in **Figure 3**. The transit services operating within the North Bayshore area utilize a variety of bus types, with varying capacity to accommodate existing demand. **Table 1** summarizes the bus types used within the North Bayshore Area and the approximate bus capacities.

Table 1: Bus Types by Service Provider/Company and Approximate Person Capacity

Service Provider/Company	Bus Type (Capacity) [1]		
	Double Decker (Capacity: 81 persons)	Small (up to 31 persons)	Standard (up to 56 persons)
Google	X		X
LinkedIn		X	X
Microsoft		X	
Intuit		X	X
MVgo		X	
VTA (Route 40)			X
ACE		X	

Source: AECOM, 2015, Fehr & Peers, 2014

Notes:

(1) Bus person capacities by type are estimated using information obtained for similar bus types. Online: http://www.abc-companies.com/bus/new

Figure 3: Bus Definitions and Capacities

Double Decker Bus (81 persons)

Standard Bus (up to 56 persons)

Standard Bus (up to 56 persons)

Small Bus (up to 31 persons)

VTA Bus (50 persons)

MVgo Bus (up to 31 persons)

Existing Bicycle and Pedestrian Facilities

In addition to the Class 2 bicycle facilities provided along Shoreline Boulevard and Rengstorff Avenue, as described above, the North Bayshore Area features an extensive bicycle and pedestrian network. Pedestrian facilities include sidewalks, curb ramps, crosswalks, and off-street paths generally provided along the existing roadway facilities within the North Bayshore Area. Three multi-use trails serve run through the length of the North Bayshore Area, and provide bicycle and pedestrian access to the office, research and development land uses within the area:

- **Permanente Creek Trail** extends south from Shoreline at Mountain View park, over US 101, under Old Middlefield Road and to its current terminus at Rock Street.
- **Stevens Creek Trail** extends south from Shoreline at Mountain View park, under US 101 and Old Middlefield Road and continues through Mountain View to Sunnyvale.
- **Bay Trail runs east-west along San Francisco Bay, north of Shoreline Park at Mountain View**

Methodology

The following section outlines the data collection efforts. Data collected as part of this effort represent the March 2016 conditions at the North Bayshore area. AECOM performed a field reconnaissance to determine the exact traffic count locations for the data collection efforts.

Data Collection – Hose Counts

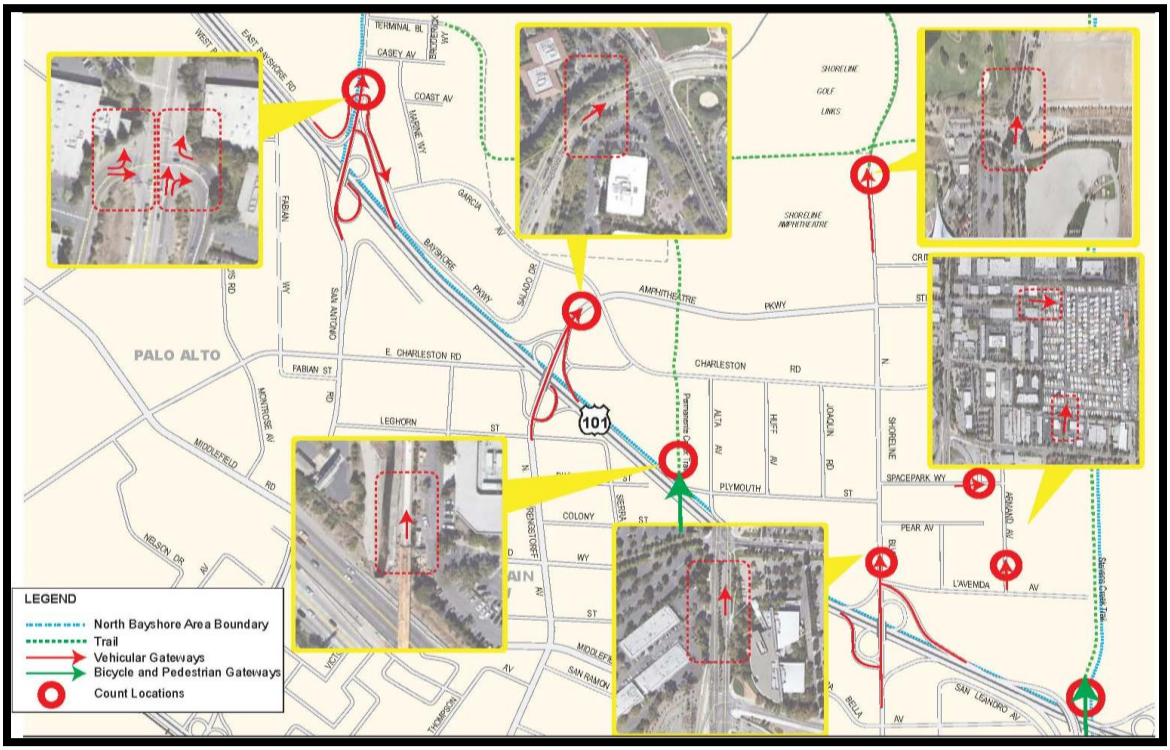
AECOM collected traffic counts using pressure hose vehicle counters. Directional (inbound) traffic counts were collected over a two-week period during three typical fair-weather mid-week work days (Tuesday, Wednesday, and Thursday) when the schools in the surrounding area were in session. Specifically, the counts were conducted on Tuesday, Wednesday, and Thursday of the following weeks (hereafter referred to as the “observation period”):

- Week of March 14, 2016, and
- Week of March 21, 2016.

Similar to the data collection efforts conducted for the *NBPP,* and documented in the *NBPP memo*, the counts took place during the AM peak period (7:00 AM to 10:00 AM), for traffic entering the study area using the gateways identified above. The count locations are illustrated in **Figure 4a**.

The hose count data were reported in 15-minute intervals for each of the count locations.

Figure 4a: Trip Count Locations



Although La Avenida Street was included as one of the gateways analyzed in the *NBPP memo*, it has not been included in this analysis. La Avenida Street is a one-way street in the westbound direction, and traffic along this street would represent outbound trips. As this analysis only includes inbound trips during the weekday AM peak period, counts from La Avenida Street were omitted.

Additionally, supplemental hose counts were collected at the entries to the Shoreline at Mountain View park and the Santiago Villa Mobile Home Park. As illustrated in **Figure 4a**, counts for vehicles accessing the Shoreline park area were conducted on Shoreline Boulevard just north of North Road (the entrance into Shoreline at Mountain View park). Vehicles accessing the Santiago Villa Mobile Home Park were counted on Space Park Way and Armand Avenue.

Data Collection – Vehicle Classification Counts

Manual vehicle classification counts, including pedestrian and bicycle counts, were conducted at the same gateway locations as the hose counts on Tuesday, March 15, 2016 and Tuesday, March 22, 2016 during the AM peak period (7:00 AM to 10:00 AM). Simultaneously, bicycle and pedestrian counts were conducted on Permanente Creek Trail between US 101 and Charleston Road and Stevens Creek Trail between US 101 and La Avenida Street. The trail count stations were established so that all people inbound into the North Bayshore area were counted (i.e. south of the first trail access to the North Bayshore area).

The purpose of the vehicle classification counts was to determine the number of single-occupancy vehicles (SOV), high occupancy vehicles (HOV) or carpool vehicles (vehicles with two or more people), trucks, transit vehicles, shuttle vehicles, bicyclists, and pedestrians accessing the North Bayshore Area. The transit and shuttle vehicles were further classified by the service provider (if available) and vehicle size, such as double-decker, standard, and small.

Potentially, some bicyclists and pedestrians observed during the classification counts had no destination within the study area, i.e. they proceeded through the study area to access the Shoreline at Mountain View park and the Santiago Villa Mobile Home Park. Though this study did not count the number of such trips, it is estimated that the proportion of these users is small

Data Collection – Vehicle Occupancy Counts

Private shuttle and public transit occupancy counts were conducted over two days in each week during the observation period. On Thursday, March 17, 2016 and Thursday, March 24, 2016, the data collection effort focused on passenger counts for riders disembarking from Google shuttle buses. The data collection effort on Wednesday, March 16, 2015 2016 and Wednesday, March 23, 2016 concentrated on passengers disembarking from buses operated by other transit and shuttle services providers.

Private Shuttles

Due to company policies, the data collection staff could not board the private buses to count passengers. Therefore, an alternative methodology was developed to provide an estimate of private bus occupancy rates. To determine the occupancy of Google buses, the data collection staff were positioned at six Google bus stop locations in the study area, and counted the number of passengers that alighted at each stop. The bus license plate number and type were also recorded for each bus. These counts were then aggregated using the license plate information to determine the number of passengers alighting from each specific bus within the study area during the morning peak period. As this period is generally associated with inbound commute trips, this methodology is considered an adequate representation of the number of inbound passengers using the Google buses.

As shown in **Figure 4b**, LinkedIn and Microsoft Corporation have only one bus stop each and Intuit has two bus stops (adjacent to their office locations). Counts taken of passengers alighting at each stop are considered representative of the inbound private shuttle trips for each company.

Public Transit Vehicles

To determine the occupancy of public transit vehicles (MVgo and VTA), the data collection staff boarded the bus at the first stop each route serves within the North Bayshore area, as shown in **Figure 4b**, and counted the number of passengers alighting at the stop. Staff proceeded to ride the bus to the next stop, counting all the passengers on the bus while on board. The number of passengers that alighted at the first stop was added to those that rode the bus to the next stop to determine the number of passengers entering the area on each bus.

The data collection staff boarded ACE shuttles at the first shuttle stop location within the North Bayshore area, as shown in **Figure 4b**, and remained on the bus until the last North Bayshore Area stop. While on board, staff counted the number of people getting off the bus at each stop (including the stop where the counter boarded) to determine the number of people traveling to the North Bayshore area on each ACE shuttle during the morning peak period.

The locations of staff during both vehicle classification and occupancy counts are illustrated in **Figure 4a** and **Figure 4b**, and a detailed description of the field count methodology is included in **Appendix B**. Detailed counts for the data collection effort described above are provided in **Appendix C**.

Trip Monitoring Results

The following subsections summarize results of the March 2016 trip monitoring effort.

Vehicle Trips

The hose count data obtained during the data collection effort were analyzed to determine the peak period and peak hour vehicle volumes entering the North Bayshore area.

Hose counts on San Antonio Road, between Bayshore Parkway and Casey Avenue, as illustrated in **Figure 4a**, are unable to capture vehicles that enter the North Bayshore area and then turn into one of three driveways south of the hose count location, thus, not reaching the hoses. In addition, some vehicles were observed making a westbound right turn at the intersection of San Antonio Road and Bayshore Parkway – these right-turning vehicles were already within the study area and if counted by the hoses on San Antonio Road would result in double counting. A one-day manual count was conducted on Tuesday, March 15, 2016 to estimate the number of vehicles accessing the three driveways. The estimated volumes entering the North Bayshore area and accessing the driveways before being counted by the hoses (approximately 166 vehicles over the three-hour AM peak period) were added to the San Antonio Road hose counts (collected between Bayshore Parkway and Casey Avenue) and these modified values are reported herein. Also, the March 15, 2016 manual count showed that a vast majority of vehicles (50 vehicles out of 66 counted during the AM peak period) making the westbound right turn at the San Antonio Road and Bayshore Parkway intersection were accessing the three driveways rather than proceeding further north on San Antonio Road so no adjustment of the hose counts to account for these vehicles was required.

Figure 4b: Bus Stop Trip Count Locations

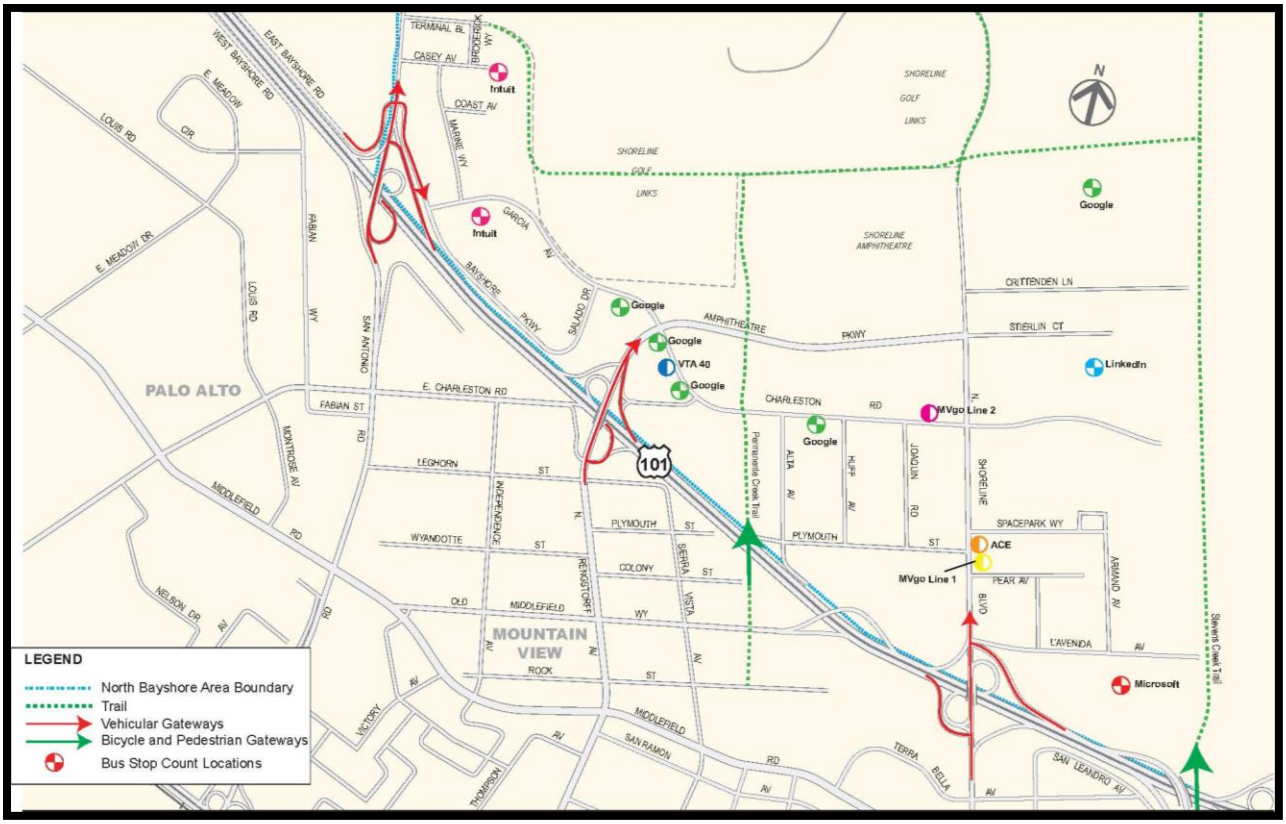


Table 2 shows a comparison of the vehicular traffic volumes collected in September 2015, as reported in the *North Bayshore Area Trip Monitoring Fall 2015 Results* memo, and the volumes collected in March 2016. The March 2016 weekday AM peak hour for vehicles occurs between 9:00 and 10:00 AM.

Table 2: Inbound Gateway Volumes Comparison

Gateway / Roadway Segment	Weekday AM Peak Period			Weekday AM Peak Hour[2]		
	Sept-2015[1]	Mar-2016[1]	Difference (Vol. / %)	Sept-2015[1]	Mar-2016[1]	Difference (Vol. / %)
1. San Antonio Road	2,470	2,400	-70 / -2.8%	1,180	1,150	-30 / -2.5%
San Antonio Road Between Bayshore Parkway and Casey Avenue	830	850	+20 / +2.4%	350	310	-40 / -11.4%
Bayshore Parkway Between San Antonio Road and Garcia Avenue	1,640	1550	-90 / -5.5%	830	840	+10 / +1.2%
2. Rengstorff Avenue Between US 101 NB Ramps and Garcia Avenue-Charleston Road	5,260	4,690	-570 / -10.8%	2,400	2,380	-20 / -0.8%
3. Shoreline Boulevard Between US 101 NB Ramps-La Avenida Street and Pear Avenue	5,530	5,740	+210 / +3.8%	2,180	2,250	+70 / +3.2%
Total	**13,260**	**12,830**	**--430 / -3.2%**	**5,760**	**5,780**	**+20 / +0.3%**

Source: AECOM, 2015-2016.
Notes:
[1] For the purposes of comparison, volumes were rounded to the nearest 10.
[2] Weekday AM peak hour, consisting of four consecutive 15-minute intervals with the highest recorded traffic volumes, 9:00-10:00 AM.

As shown in **Table 2**, a total of 12,830 motor vehicles entered the North Bayshore area during the morning peak period. A total of 5,780 motor vehicles entered the study area during the AM peak hour. There is an overall decrease of 430 inbound vehicles or 3.2 percent of the September 2015 total during the weekday AM peak period. The AM peak hour shows an increase of 20 inbound vehicles, constituting a slight increase of the September 2015 total. The 3.2 percent decrease from September 2015 values is interpreted as a minor fluctuation in traffic volumes.

On a peak period basis, Shoreline Boulevard is the busiest gateway into the North Bayshore area. It is the second busiest (after Rengstorff Avenue) on a peak hour basis. Rengstorff Avenue experienced the greatest vehicular traffic percentage change of all North Bayshore area gateways during both the weekday AM peak period (decrease of 10.8 percent or 570 vehicles), potentially indicating the shifting of traffic patterns.

Table 3 compares September 2015 and March 2016 inbound traffic volumes with gateway capacities for a weekday AM peak period. The total available capacity during the period is 6,080 vehicles. Nearly 85 percent of this capacity, or 5,080 vehicles, is attributable to the San Antonio Road and Rengstorff Avenue gateways.

Table 3: Inbound Gateway Available Capacity: Peak Period

Gateway / Roadway Segment	Weekday AM Peak Period				
	Gateway Capacity	Sept-2015[1]		Mar-2016[1]	
		Vehicle Volume	Available Capacity	Vehicle Volume	Available Capacity
1. San Antonio Road	4,150	2,470	1,680	2,400	1,750
San Antonio Road Between Bayshore Parkway and Casey Avenue	1,250	830	420	850	400
Bayshore Parkway Between San Antonio Road and Garcia Avenue	2,900	1,640	1,260	1550	1,350
2. Rengstorff Avenue Between US 101 NB Ramps and Garcia Avenue-Charleston Road	8,020	5,260	2,760	4,690	3,330
3. Shoreline Boulevard Between US 101 NB Ramps-La Avenida Street and Pear Avenue	6,740	5,530	1,210	5,740	1,000
Total	**18,910**	**13,260**	**5,650**	**12,830**	**6,080**

Source: AECOM, 2015-2016.
Notes:
[1] For the purposes of comparison, conditions volumes were rounded to the nearest 10.

Table 4 compares September 2015 and March 2016 inbound traffic volumes with gateway capacities during a weekday AM peak hour.

Table 4: Inbound Gateway Available Capacity: Peak Hour

Gateway / Roadway Segment	Weekday AM Peak Hour[2]				
	Gateway Capacity	Sept-2015[1]		Mar-2016[1]	
		Vehicle Volume	Available Capacity	Vehicle Volume	Available Capacity
1. San Antonio Road	1,530	1,180	350	1,150	380
San Antonio Road Between Bayshore Parkway and Casey Avenue	460	350	110	310	150
Bayshore Parkway Between San Antonio Road and Garcia Avenue	1,070	830	240	840	230
2. Rengstorff Avenue Between US 101 NB Ramps and Garcia Avenue-Charleston Road	2,960	2,400	560	2,380	580
3. Shoreline Boulevard Between US 101 NB Ramps-La Avenida Street and Pear Avenue	2,490	2,180	310	2,250	240
Total	**6,980**	**5,760**	**1,220**	**5,780**	**1,200**

Source: AECOM, 2015-2016.
Notes:
[1] For the purposes of comparison, conditions volumes were rounded to the nearest 10.
[2] Weekday AM peak hour, consisting of four consecutive 15-minute intervals with the highest recorded traffic volumes, 9:00-10:00 AM.

Table 4 shows that, during the weekday AM peak hour, similarly to the weekday AM peak period, the Rengstorff Avenue gateway possesses the greatest available capacity, at 48 percent.

A comparison was made for the time outside the peak hour, but still within the three-hour peak period. This time is called the peak period "shoulders." **Table 5** compares September 2015 and March 2016 inbound traffic volumes with gateway capacities for the "shoulders" of the peak period.

The values in **Table 5** indicate that over 50 percent of the available capacity is within the Rengstorff Avenue gateway.

Detailed calculations used to determine the inbound vehicle volumes during both the weekday AM peak period and the weekday AM peak hour are included in **Appendix D**.

Table 5: Inbound Gateway Available Capacity: Peak Period "Shoulders

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Gateway / Roadway Segment	Weekday AM Peak Period "Shoulders"[2]				
	Gateway Capacity	Sept-2015[1]		Mar-2016[1]	
		Vehicle Volume	Available Capacity	Vehicle Volume	Available Capacity
1. San Antonio Road	2,620	1,290	1,330	1,080	1,540
San Antonio Road Between Bayshore Parkway and Casey Avenue	790	480	310	370	420
Bayshore Parkway Between San Antonio Road and Garcia Avenue	1,830	810	1,020	710	1,120
2. Rengstorff Avenue Between US 101 NB Ramps and Garcia Avenue-Charleston Road	5,060	2860	2,200	2,310	2,750
3. Shoreline Boulevard Between US 101 NB Ramps-La Avenida Street and Pear Avenue	4,250	3,350	900	3,490	760
Total	**11,930**	**7,500**	**4,420**	**6,880**	**5,050**

Source: AECOM, 2015-2016
Notes:
[1] For the purposes of comparison, conditions volumes were rounded to the nearest 10.
[2] Weekday AM Period "Shoulders", consisting of time in the peak period outside of the Peak Hour (7:00-9:00 AM).

Vehicle Classification

The classification counts collected at the three gateways and the two bicycle and pedestrian trail segments were analyzed to classify all inbound trips used to access the North Bayshore area by modes of travel, namely single-occupancy vehicles, carpool vehicles (two or more people), trucks, transit vehicles, shuttle vehicles, bicyclists, and pedestrians accessing the North Bayshore area. Transit and shuttle vehicles were further classified on the basis of service provider and vehicle size, such as double-decker, small, and standard.

Google provided the number of its intercampus shuttles using Shoreline Boulevard during the three-hour AM peak period (51 standard size buses). The shuttles run between the main Google campus and other Google office locations outside the North Bayshore area. These shuttles were assumed to serve no commuter trips and were excluded from the transit calculations. The shuttles were assumed to be uniformly distributed over the three-hour AM peak period and included in the "Other" vehicle category.

Table 6 summarizes the total trip counts by mode during both the weekday AM peak period hour and the weekday AM peak hour.

As shown in **Table 6**, single-occupancy automobiles represent the highest number and proportion of vehicles entering the North Bayshore area during both the weekday AM peak period (10,900 vehicles or 80.3 percent) and the weekday AM peak hour (5,489 vehicles or 80.8 percent).

Table 6: Inbound Vehicles by Mode

	Weekday AM Peak Period		Weekday AM Peak Hour[3]	
	Volume	Proportion	Volume	Proportion
Auto	**12,046**	**88.7%**	**5,489**	**89.2%**
Single-Occupancy Vehicle	*10,900*	*80.3%*	*4,971*	*80.8%*
High Occupancy Vehicle	*1,146*	*8.4%*	*519*	*8.4%*
Transit	**200**	**1.5%**	**62**	**1.0%**
Employer Based Bus	*177*	*1.3%*	*55*	*0.9%*
Double Decker	*71*	*0.5%*	*31*	*0.5%*
Small	*38*	*0.3%*	*15*	*0.2%*
Standard	*69*	*0.5%*	*10*	*0.2%*
Public Transit Bus	*23*	*0.2%*	*7*	*0.1%*
MVgo	*16*	*0.1%*	*6*	*0.1%*
VTA	*4*	*0.0%*	*0*	*0.0%*
ACE	*3*	*0.0%*	*1*	*0.0%*
Other[2]	***190***	**1.4%**	***67***	**1.1%**
Bicycle[1]	***906***	**6.7%**	***434***	**7.0%**
Pedestrian[1]	***232***	**1.7%**	***100***	**1.6%**
All Modes Total[4]	**13,573**	**100.0%**	**6,152**	**100.0%**

Source: AECOM, 2015-2016.
Notes:
(1) In this table, "Vehicle" includes bicyclists and pedestrians.
(2) The "Other" category includes motorcycles, trucks, and intercampus Google shuttles.
(3) Weekday AM peak hour, consisting of four consecutive 15-minute intervals with the highest recorded motor vehicle volumes, 9:00-10:00 AM.
(4) Totals may not add to 100% due to rounding.

Table 7 compares vehicle classification data from September 2015 and March 2016 data.

Table 7: Vehicle Classification by Mode Comparison

Classification	Weekday AM Peak Period			Weekday AM Peak Hour[3]		
	Sept-2015[1]	Mar-2016	Difference	Sept-2015[1]	Mar-2016	Difference
Drive Alone (SOV)	76.0%	80.3%	4.3%	76.0%	80.8%	4.8%
Carpool (HOV)	9.0%	8.4%	-0.6%	10.0%	8.4%	-1.6%
Transit / Shuttle	2.0%	1.5%	-0.5%	2.0%	1.0%	-1.0%
Other[2]	2.0%	1.4%	-0.6%	2.0%	1.1%	-0.9%
Bicycle	9.0%	6.7%	-2.3%	9.0%	7.0%	-2.0%
Pedestrian	2.0%	1.7%	-0.3%	2.0%	1.6%	-0.4%

Source: AECOM, 2015-2016
Notes:
(1) Sept 2015 conditions classification percentages were rounded to the nearest whole number.
(2) The "Other" category includes motorcycles, trucks, and intercampus Google shuttles.
(3) Weekday AM peak hour, consisting of four consecutive 15-minute intervals with the highest recorded motor vehicle volumes, 9:00-10:00 AM.
(4) Totals may not add to 100 percent due to rounding.

As shown in **Table 7**, during both the weekday AM peak period and AM peak hour, the proportion of SOV increased by about 4.5 percent, which represents the greatest modal shift. The proportion of bicycles decreased about 2 percent in both the peak period and peak hour. SOVs continue to represent the most used mode of travel into the North Bayshore area.

Detailed calculations used to determine the inbound vehicle classification during both the weekday AM peak period and the weekday AM peak hour are included in **Appendix E**.

Vehicle Occupancy

The manual transit and shuttle occupancy counts were analyzed to determine the average bus occupancy for each transit vehicle size recorded. The buses were segregated into categories by size (double decker, small, and standard) and service provider (if available) and then the total number of passengers alighting from each bus category during the AM peak period was calculated. The total number of passengers disembarking from each bus category during the AM peak period was divided by the number of buses of that bus category that arrived during the period in question. The resultant number is the average occupancy for this particular bus category during the AM peak period.

Similarly, to compute the occupancy for the AM peak hour, the buses were segregated by size (double decker, small, and standard) and service provider (if available) and then the total number of passengers alighting from each bus category was calculated on a rolling hourly basis in 15-minute increments. For each rolling hour, the total number of passengers disembarking from each bus category was divided by the number of buses of that bus category that arrived during that hour. The resultant number is the average occupancy for this particular bus category during that hour.

The average occupancy for each bus category is then multiplied by the number of buses per time period in each bus category (obtained from the manual vehicle classification count for that week) to arrive at the number of person-trips for that bus category.

The average carpool occupancy was estimated at 2.2 people per carpool vehicle using the American Community Survey (census) estimates.

The total number of person-trips is calculated for each week and then an average is computed.

The person-trip averages and mode shares are summarized in **Table 8.** It should be noted that the AM peak hour person-trips reported in **Table 8** are for the motor vehicle peak hour, occurring between 9:00 AM and 10:00 AM.

Table 8: Inbound Person-Trips by Mode

	Weekday AM Peak Period		Weekday AM Peak Hour[3]	
	Person-Trips	Mode Share	Person-Trips	Mode Share
Auto	**13,421**	**73.7%**	**6,111**	**75.2%**
Single-Occupancy Vehicle	*10,900*	*59.9%*	*4,971*	*61.2%*
High Occupancy Vehicle[1]	*2,521*	*13.8%*	*1,141*	*14.0%*
Transit	**3,460**	**19.0%**	**1,417**	**17.4%**
Employer Based Bus	*3,289*	*18.1%*	*1,322*	*16.3%*
Double Decker	*2,117*	*11.6%*	*923*	*11.3%*
Small	*98*	*0.5%*	*44*	*0.5%*
Standard	*1,074*	*5.9%*	*356*	*4.4%*
Public Transit Bus	*171*	*0.9%*	*94.5*	*1.2%*
MVgo	*134*	*0.7%*	*77*	*0.9%*
VTA	*7*	*0.0%*	*0*	*0.0%*
ACE	*30*	*0.2%*	*18*	*0.2%*
Other[2]	***190***	**1.0%**	***67***	**0.8%**
Bicycle	***906***	**5.0%**	***434***	**5.3%**
Pedestrian	***232***	**1.3%**	***100***	**1.2%**
All Modes Total[4]	**18,209**	**100.0%**	**8,128**	**100.0%**

Source: AECOM, 2015-2016.
Notes:
(1) An average vehicle occupancy of 2.2 persons per vehicle was used to determine the HOV person trips.
(2) The "Other" category includes motorcycles, trucks, and intercampus Google shuttles at one person-trip per vehicle.
(3) Weekday AM peak hour, consisting of four consecutive 15-minute intervals with the highest recorded motor vehicle volumes 9:00-10:00 AM.
(4) Totals may not add due to rounding.

As shown in **Table 8**, single-occupancy vehicles represent the largest person-trip mode share during both the vehicle weekday AM peak period at 59.9 percent and the vehicle weekday AM peak hour at 61.2 percent. VTA transit buses serve the smallest person-mode share during both the weekday AM peak period (0.0 percent) and the vehicle weekday AM peak hour (0.0 percent).

Vehicle occupancy under March 2016 conditions was compared to that under September 2015 conditions. **Table 9** provides a mode share comparison from September 2015 and March 2016 data.

Table 9: Inbound Person-Trips Mode Share Comparison

Classification	Weekday AM Peak Period			Weekday AM Peak Hour[2]		
	Sept-2015[1]	Mar-2016	Difference	Sept-2015[1]	Mar-2016	Difference
Drive Alone (SOV)	53.0%	59.9%	6.9%	51.0%	61.2%	10.2%
Carpool (HOV)	14.0%	13.8%	-0.2%	14.0%	14.0%	0.0%
Transit / Shuttle	24.0%	19.0%	-5.0%	26.0%	17.4%	-8.6%
Other	1.0%	1.0%	0.0%	1.0%	0.8%	-0.2%
Bicycle	6.0%	5.0%	-1.0%	6.0%	5.3%	-0.7%
Pedestrian	1.0%	1.3%	0.3%	1.0%	1.2%	0.2%

Source: AECOM, 2015-2016.
Notes:
(1) Sept 2015 conditions classification percentages were rounded to the nearest whole number.
(2) Weekday AM peak hour, consisting of four consecutive 15-minute intervals with the highest recorded motor vehicle volumes, 9:00-10:00 AM.
(3) Totals may not add due to rounding.

Table 10 provides a mode share comparison time series for person trips from March of 2015 through September of 2015 and into March of 2016.

Table 10: Inbound Person-Trips Mode Share Time Series

	Mar-15		Sep-15		Mar-16	
Weekday AM Peak Period	**Person-Trips**	**Mode Share**	**Person-Trips**	**Mode Share**	**Person-Trips**	**Mode Share**
Single-Occupancy Vehicle	*11,809*	*55.1%*	*11,398*	*52.7%*	*10,900*	*59.9%*
High Occupancy Vehicle[(1)]	*2,719*	*12.7%*	*3,030*	*14.0%*	*2,521*	*13.8%*
Transit / Shuttle	*5,267*	*24.6%*	*5,284*	*24.4%*	*3,460*	*19.0%*
Other[(2)]	*301*	*1.4%*	*312*	*1.4%*	*190*	*1.0%*
Bicycle	*1,114*	*5.2%*	*1,315*	*6.1%*	*906*	*5.0%*
Pedestrian	*235*	*1.1%*	*280*	*1.3%*	*232*	*1.3%*
All Modes Total[(3)]	**21,443**	**100.0%**	**21,617**	**100.0%**	**18,209**	**100.0%**

Source: AECOM, 2015-2016.
(1) An average vehicle occupancy of 2.2 persons per vehicle was used to determine the HOV person trips.
(2) The "Other" category includes motorcycles, trucks, and intercampus Google shuttles at one person-trip per vehicle.
(3) Totals may not add due to rounding.

While Table 10 shows a decline in passenger trips across all modes, the net result is an increased mode share for single occupancy vehicles.

Detailed calculations used to determine the person-trips of inbound vehicles surveyed during the weekday AM peak period and the weekday AM peak hour are summarized in **Appendix F**.

Conclusions

The analysis of data collected during the March 2016 trip monitoring effort shows little change in the inbound motor vehicle trips and person-trip mode shares for SOVs as compared to the data collected in September 2015.

A total of 12,830 motor vehicles enter the North Bayshore area during the morning peak period and a total of 5,780 motor vehicles enter the study area during the AM peak hour. The district-wide vehicle trip capacity identified by the *NBPP* is 18,900 inbound vehicles during the morning peak period. The March 2016 data show that there is available capacity for approximately 6,080 additional vehicles during the AM peak period at the three gateways.

An area-wide single-occupancy (drive-alone) mode share target established by the *NBPP* is 45 percent. The current trip monitoring effort shows that the target is not met as both the weekday AM peak period and the weekday AM peak hour single-occupancy vehicle mode shares are at 59.9 and 61.2 percent, respectively. In September 2015, the reported SOV mode shares during the weekday AM peak period and the weekday AM peak hour were 53 percent and 51 percent, respectively. Therefore from September 2015 to March 2016, there is an increase of about 6 percent in the SOV mode share during the AM peak period and an increase of about 10 percent in the SOV mode split during the AM peak hour.