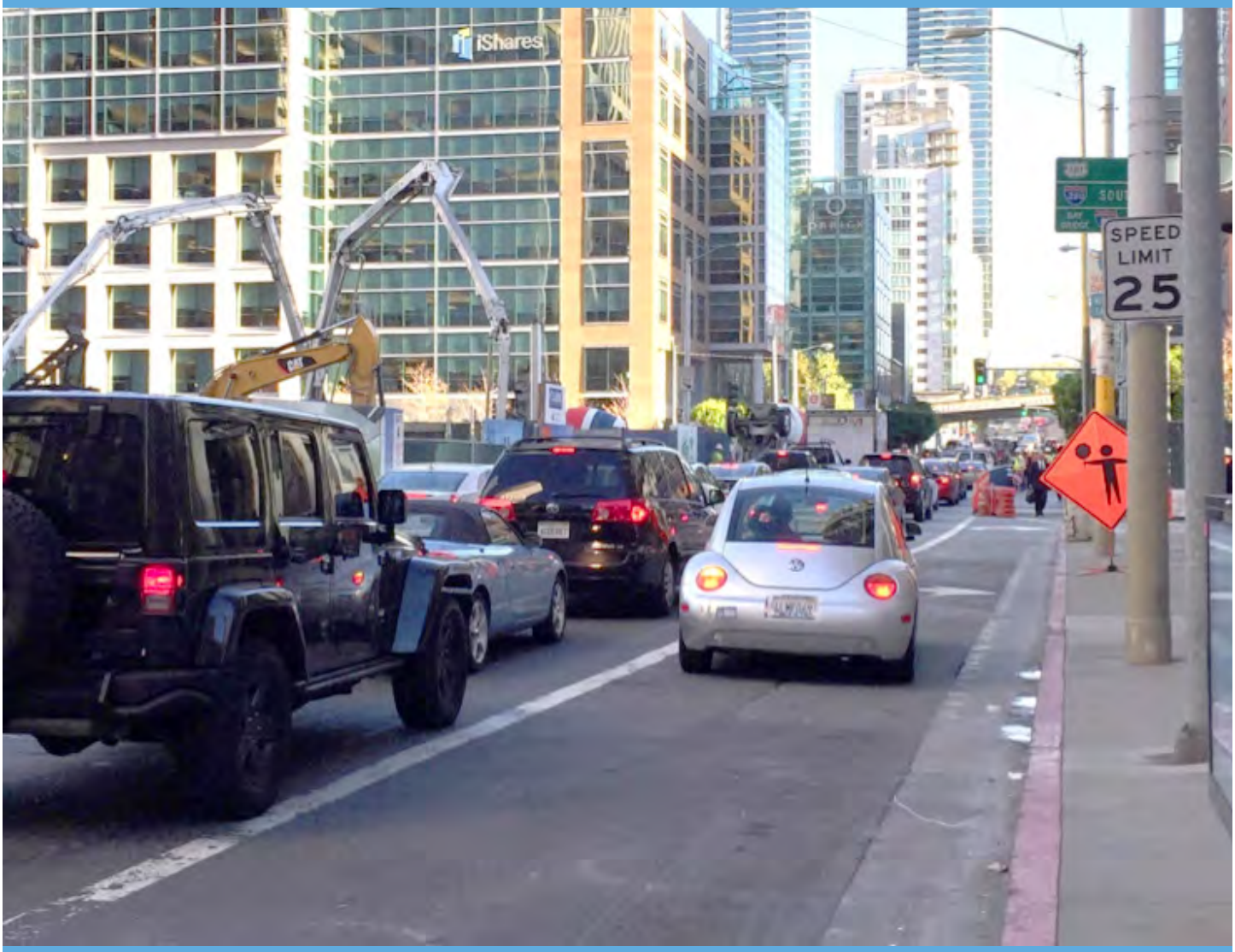



# Waterfront Transportation Assessment

## "PHASE 2": SOMA/MISSION BAY/CENTRAL WATERFRONT TRANSPORTATION ANALYSIS FINAL REPORT

AUGUST 2015

## ACKNOWLEDGEMENTS

The San Francisco County Transportation Authority (SFCTA) prepared this report under contract to the San Francisco Municipal Transportation Agency (SFMTA) in support of the SFMTA-led Waterfront Transportation Assessment. SFCTA's involvement was at the request of Transportation Authority Board Chair Scott Wiener and Commissioner Jane Kim.

Those involved in developing the content presented here include:

**LIZ BRISSON,** San Francisco County Transportation Authority, directed the work as Project Manager

**ELIZABETH SALL, DAN TISCHLER, DREW COOPER,** San Francisco County Transportation Authority, contributed methodological, forecasting, and analytical support.

**PETER ALBERT, ERIN MILLER, SHANNA HURLEY** led community and stakeholder engagement, "Phase 1", and served as the client for this work.

**BONNIE NELSON, MICHAEL EISEMAN, JOSHUA KARLIN-RESNICK,** Nelson\Nygaard Consulting, led technical work.

**TONY BRUZZONE, MICHAEL ISWALT,** Arup North America, provided expertise related to roadway and transit capacity.

Many others served as expert advisors including:

**TILLY CHANG, ELIZABETH SALL, DAVID UNIMAN, JOE CASTIGLIONE, MARIA LOMBARDO,** San Francisco County Transportation Authority

**ED REISKIN, ALICIA JEAN-BAPTISTE, TOM MAGUIRE, VIKTORIYA WISE, JULIE KIRSCHBAUM, JEFF FLYNN, GRAHM SATTERWHITE, SCOTT JEFFERIS, DARBY WATSON, MONICA MUNOWICH,** San Francisco Municipal Transportation Agency

**GILLIAN GILLETT,** San Francisco Mayor's Office

**KEN RICH, MICHAEL MARTIN, ADAM VAN DE WATER, SARAH DENNIS-PHILLIPS,** San Francisco Office of Economic and Workforce Development

**DAVID BEAUPRE, BRAD BENSON, DIANE OSHIMA,** San Francisco Port

**GIL KELLEY, JOSHUA SWITZKY, BRETT BOLLINGER, SUSAN GYGI, AMNON BEN-PAZI,** San Francisco Planning Department

**CATHERINE REILLY, SAN FRANCISCO OFFICE OF COMMUNITY** Investment and Infrastructure

**VAL MENOTTI, DUNCAN WATRY, ELLEN SMITH,** BART

**SEBASTIAN PETTY,** Caltrain

**ROBERT DEL ROSARIO, LINDA MORRIS, JOHN URGO,** AC Transit

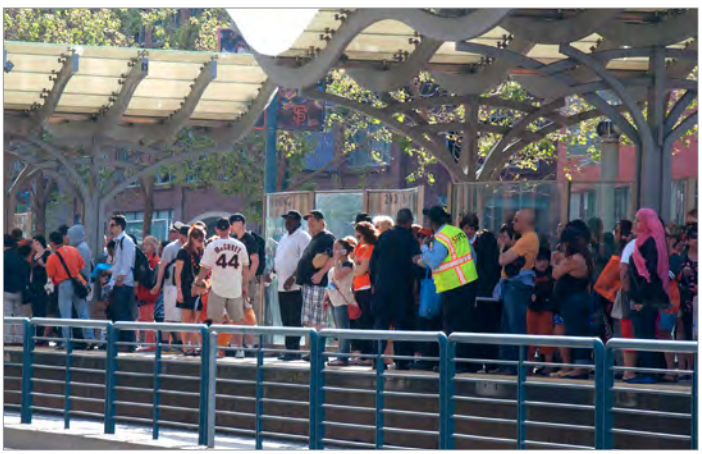
**ERIK ALM,** Caltrans

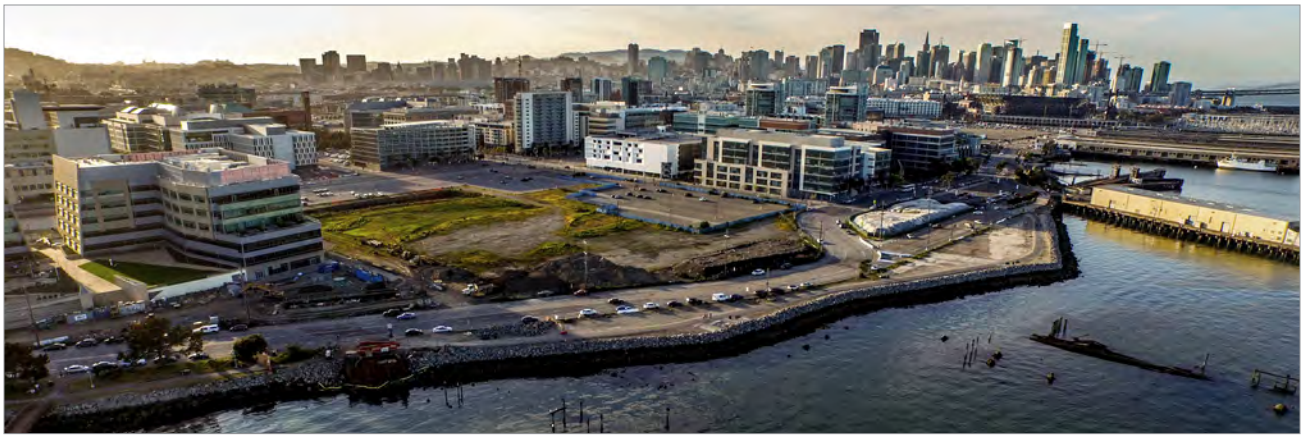
**REPORT DESIGN** by Bridget Smith, SFCTA

**PHOTO CREDITS** appear on page 26


# Contents







# EXECUTIVE SUMMARY

## Purpose of the Waterfront Transportation Assessment

The San Francisco Municipal Transportation Agency (SFMTA) and the San Francisco County Transportation Authority (SFCTA) have been partnering with community stakeholders and other government agencies to conduct the Waterfront Transportation Assessment (WTA). The WTA recognizes that San Francisco's population and job growth have outpaced needed transportation improvements in the neighborhoods of SoMa, Mission Bay, and the Central Waterfront (Study Area, Figure 1). Approved plans (e.g. Transbay Center District, Rincon Hill, Eastern Neighborhoods, Mission Bay) are building out and additional development is under discussion. It is clear that we must make significant transportation investments within the Study Area in order to meet the needs of a growing city by creating reliable transit and safe conditions for walkers and cyclists while facilitating traffic flow and reducing modal conflicts.

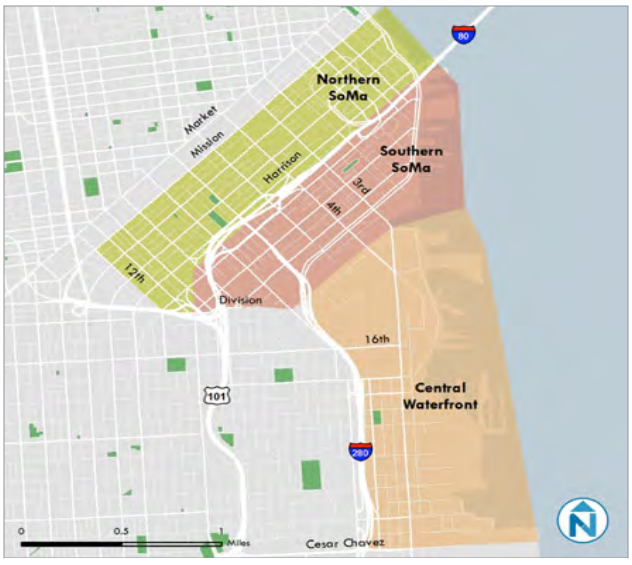


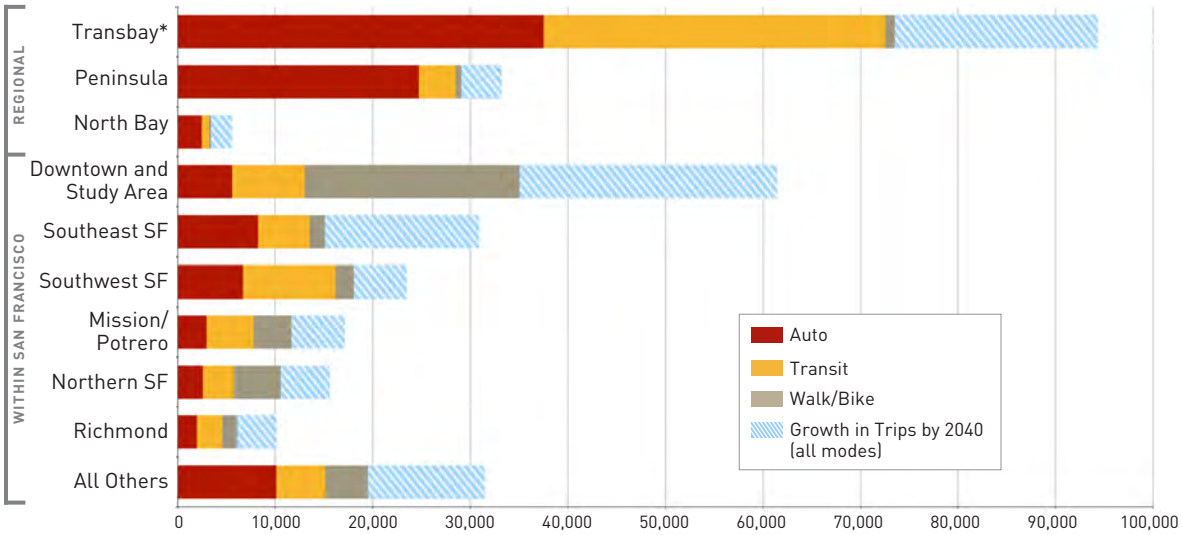

**Figure 1. Study Area and Sub-areas**

In support of the SFMTA-led WTA, SFCTA has forecasted future travel demand, analyzed existing roadway and transit capacity, and reported the types of projects and policies that could address transportation conditions in five years and twenty-five years. The purpose of this report is to summarize the findings and recommendations from SFCTA's tasks in contribution to the overall effort (also referred to as "Phase 2"). It will inform the update to San Francisco's countywide transportation plan and San Francisco's input to the Regional Transportation Plan.

## Study Area travel demand is anticipated to increase by 50% by 2040

We focused our analysis on the evening peak period since it is the time of day when the most overall travel happens. We also focused on understanding trip-making that is internal, outbound, and/or passes through the Study Area, referred to as "trips of interest," since they represent the largest trip markets. Today, approximately 220,000 people make trips within the Study Area or in the outbound peak direction during the weekday peak period (about 20% of total citywide travel demand during this time period) and by 2040, that number is expected to increase by almost 50% to approximately 320,000. The majority of these trips, just over half, are trips within San Francisco, with the three largest local corridors being: 1) Within the Study Area and Downtown; 2) Between the Study Area and Southeast San Francisco; and 3) Between the Study Area and Southwest San Francisco (see Figure 2, next page). Another one-

**Figure 2. Study Area "trips of interest" by corridor by mode, 2012, 3-hour PM Peak, and growth in trips by all modes by 2040**




* Note that for East Bay-bound trips from Downtown, driving trips are Study Area through-trips because they would require driving on SoMa streets to access Bay Bridge on-ramps, while technically BART-bound trips would never enter the Study Area. For this analysis we represent Downtown-to-East Bay BART trips as Study Area through trips to allow East Bay-bound driving and transit trips to be treated equivalently.

third of the trips are destined for the East Bay, 13% are destined for the South Bay, and the remaining 2% for the North Bay.

## Bay Bridge eastbound is at capacity during pm peak today, Southern SoMa and Central Waterfront are at 80–85% and 75–80% of outbound capacity, respectively

During the afternoon rush hour, Northern SoMa operates essentially at capacity in the outbound direction due to the downstream bottleneck of the Bay Bridge. Those traveling through Northern SoMa are affected by the same congestion even if they are not destined for the Bay Bridge. SoMa south of the freeways and Mission Bay/Central Waterfront are not as capacity constrained today, but are vulnerable to become so in the future. While Southern SoMa, Mission Bay and the Central Waterfront are much less intensely traveled today and will continue to experience a relatively smaller share of demand in the future, the limited number of entrance and exit points mean that an increase in outbound peak period vehicle traffic of 15-20% in Southern SoMa and 20-25% for Mission Bay/Central Waterfront could cause the network to approach the level of congestion experienced in Northern SoMa today.[1]

Muni, along with BART and Caltrain, have been experiencing unprecedented ridership, resulting in crowded conditions.

## Transit capacity: All operators have major capacity expansion plans with funding shortfalls

Between BART, Caltrain, and Muni Metro, the highest capacity rail transit lines in the entire Bay Area region serve the Study Area today, supplemented by local and regional bus service and regional ferry service. Recently, transit serving the Study Area has experienced unprecedented levels of ridership growth and is regularly experiencing extremely crowded conditions. At times, passengers are unable to board some vehicles due to overcrowding. Each operator has major expansion plans that have been identified but still seeking funding including:

- BART's "Big 3" investments in rail-car expansions, new maintenance facility, and automated train control system upgrades that would allow approxi-

[1] Arup, 2015 using Synchro analaysis of intersection capacity at key gateway intersections: see Appendix A for detailed methodology.

The analysis' Mode Share Vision sizes up the potential to attract new trips to walking, cycling, and transit.

mately 7,000 more passengers/hour in the Transbay tube.

- Muni's Fleet Plan which would provide approximately equivalent total peak direction capacity to BART Transbay service by 2040, accommodating approximately 33,000 passengers/hour across all corridors leaving the Study Area.
- Caltrain's Modernization Program including Electrification and Extension to Downtown San Francisco, which, along with High-Speed Rail would more than double Study Area-to-Peninsula capacity by 2040, from 3,250 passengers/hour to almost 7,000/hour.

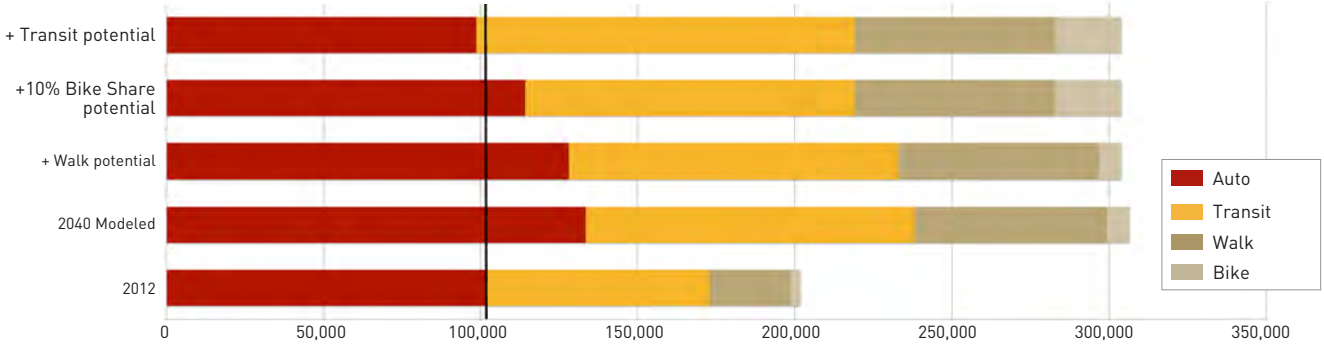
As transportation demand intensifies, best practices indicate that strategies to accommodate additional demand should include a combination of expanding capacity and managing demand by encouraging some trips to shift outside the peak period or to the shoulders of the peak. This analysis does not identify the balance between the additional amount of transit capacity that should be planned for versus level of effectiveness that demand management strategies can provide in shifting trips out of the peak. A more robust analysis of existing and future transit capacity needs is underway as a part of the Metropolitan Transportation Commission-led Bay Area Core Capacity Transit Study that will recommend short-, medium-, and long-term solutions to provide additional transit capacity in the Transbay corridor and in the Muni Metro system in partnership with the SFMTA, SFCTA, BART, Caltrain, AC Transit and the Water Emergency Transit Authority (WETA).

## Mode share vision: modest trip-making changes could allow population and job growth while maintaining today's levels of Study Area vehicle trips

To inform the city's planning to accommodate growing Study Area demand, we used San Francisco policy goals and national and international examples to identify a future mode share vision that might be plausible and desirable to strive for.

Figure 3 presents the results of this analysis (assumptions documented in Chapter 4). As shown, the potential to attract additional trips to walking, cycling, and transit could result in serving more than the entire forecast increase vehicle trips by other modes.

**Figure 3. Mode Share Vision Analysis Results, 3-hour pm peak, Study Area trips of interest**



**San Francisco transportation plans are on the right course, but we must continue to plan, fund, and deliver transportation projects and policies to accommodate the mobility needs that will be created by anticipated growth.**

Our findings can be summarized as follows.

- The Study Area is rapidly growing, and many game-changing investments that will begin to address these needs are already planned and funded but still must be delivered such as the Central Subway, Muni Forward treatments citywide including on 16th Street, the downtown Ferry terminal expansion, a first phase of Muni's and BART's fleet expansions, and implementation of initial phases of the Bicycle Strategy and WalkFirst.
- Other investments are committed local and regional priorities but still have funding shortfalls such as Caltrain Electrification and its extension to Downtown; BART's train signal upgrade and new maintenance facility; the rest of Muni's fleet expansion; and implementation of the rest of the Bicycle Strategy and WalkFirst.
- Finally, there are some areas where needed investments are less well-defined but in early stages of planning such as transit capacity for BART and Muni Metro (through the Metropolitan Transportation Commission-led Bay Area Core Capacity Transit Study) and smarter management of San Francisco's freeways network (through the SFCTA-led Freeway Corridor Management Study).

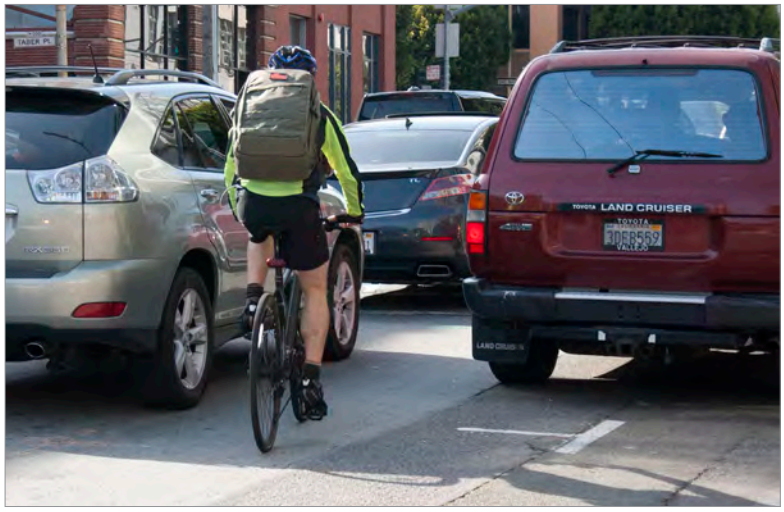
This report does not present specific project costs or funding shortfalls for these investments as transportation investment prioritization and funding strategy work typically happens through citywide efforts such as the San Francisco Transportation Plan, Transportation 2030, and regional efforts like the Regional Transportation Plan (RTP)[2]. As of Summer 2015, the SFCTA has begun the process to update the SFTP and forward priorities into the 2017 RTP. In the meantime, new development under discussion can contribute to addressing the transportation impacts of "baseline" growth through coordination between those development plans and the needs for which there are shortfalls or undefined implementation strategies.

[2] See <wwwmovesmartsf.com>, <transportation2030.sfplanning.org>, <planbayarea.org>.

Ferry ridership to AT&T Park represents between 8 and 16% of all transit trips taken to a Giants' game.

# CHAPTER 1: INTRODUCTION

The San Francisco Municipal Transportation Agency (SFMTA) and the San Francisco County Transportation Authority (SFCTA) have been partnering with community stakeholders and other government agencies to conduct the Waterfront Transportation Assessment (WTA). The WTA recognizes that San Francisco's population and job growth have outpaced needed transportation improvements in the neighborhoods of SoMa, Mission Bay, and the Central Waterfront (Study Area). Approved plans (e.g. Transbay Center District, Rincon Hill, Eastern Neighborhoods, Mission Bay) are building out and additional development is under discussion. Long-time residents have been joined by newer residents with different demographic profiles and travel preferences, and more and more people are also working in and visiting these areas. It is clear that we must make significant transportation investments within the Study Area in order to meet the needs of a growing city by creating reliable transit and safe conditions for walkers and cyclists while facilitating traffic flow and reducing modal conflicts.



People riding bicycles must navigate on Study Area streets not designed with bicycle safety and comfort in mind.

The SFMTA and SFCTA have conducted the following tasks in support of the WTA:

- **SFMTA** has led stakeholder engagement, developed and vetted conceptual transportation strategies to respond to immediate needs and future demand, kept the community apprised of projects that are moving forward in their neighborhoods, and coordinated with proposed development to identify potential land-use/transportation coordination opportunities and community benefits.
- **SFCTA** has forecasted future travel demand, analyzed existing roadway and transit capacity, and reported the types of projects and policies that could address transportation conditions in five years and twenty-five years. The purpose of this report is to summarize the findings and recommendations from SFCTA's tasks in contribution to the overall effort (also referred to as "Phase 2"). SFCTA's work builds on prior work that was conducted as a part of the San Francisco Transportation Plan (SFTP) (see call-out: WTA Builds Upon Recently-Adopted SFTP).

### What We Did

We focused on understanding existing area-wide conditions and "baseline" future conditions.[3] We undertook the following steps:

1. Quantify the anticipated increase in afternoon peak period travel demand over the respective time horizon (by all modes).
2. Quantify existing roadway and transit capacity of the Study Area and document potential future scenarios of transit capacity additions that are committed or under discussion.
3. Develop a mode share vision informed by San Francisco policy goals and performance, and national and international examples.
4. Identify the types of projects and policies that could move us closer to the desired mode share vision identified.

These steps are summarized in the following four chapters, respectively. The full methodology, assumptions, and other documentation associated with this effort are available for review by request in a separate technical report. Technical work was carried out by Nelson\Nygaard and Arup under the direction of the SFCTA.

[3] We did not explicitly forecast the travel demand increase associated with waterfront developments under discussion (e.g. Warriors, Mission Rock, Pier 70) though they are covered within the forecast increase in population and jobs represented. In addition, each of these efforts is preparing a detailed transportation impact study through their environmental review processes.

## How We Did It

Many factors affect transportation behavior, including population, jobs, availability of travel choices (roads, subways, buses, bike lanes, sidewalks), the travel time and cost of different travel choices, individual preferences, generational differences in preferences, and demographic characteristics (e.g. gender, age, income level). Transportation planners use models to forecast future travel demand based on observed data and assumptions about how each of these factors will change over time. Models are not absolute, but use the best available research and data to test how land use and transportation changes might affect future travel patterns. SF-CHAMP is San Francisco's internationally recognized modeling tool that is regularly updated and improved.[4] In this effort, we used SF-CHAMP to forecast future travel demand assuming that the growth in population and jobs anticipated by 2020 and 2040 as forecast by the Association of Bay Area Governments in Plan Bay Area occurs[5] as shown in Figure 4, representing about 20% of the population increase and 50% of the job increase anticipated citywide by 2040.

The forecast is informed by land use changes that have been approved after years of community planning reflected in multiple Board of Supervisors-approved Area Plans.

We also used the latest available assumptions about anticipated future transportation investments including major planned investments like the Central Subway, the Downtown Extension of Caltrain, and implementation of Muni Forward treatments such as on 16th Street. These assumptions are further documented in Appendix A. For this effort, we estimated the increase in future travel demand from SF-CHAMP and then developed mode share goals by adjusting the modeled mode share using San Francisco policy goals and national and international examples.

## What We Did Not Do

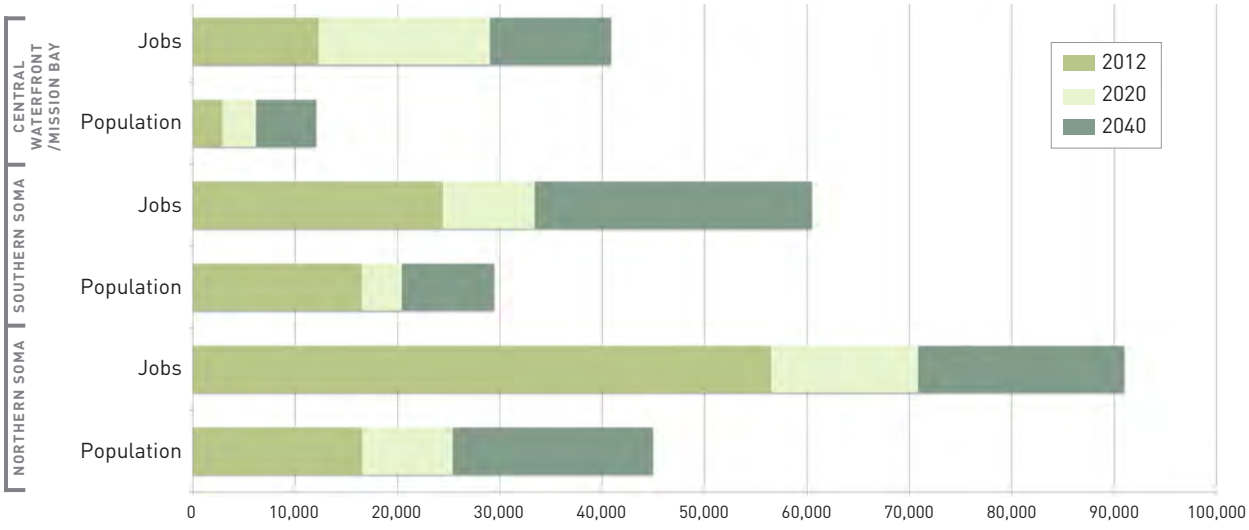
This report does not present project costs or funding shortfalls for these investments because the types of projects and policies needed to address the Study Area's transportation needs are of citywide and regional scale. Citywide and regional transportation investment prioritization and funding strategy work typically happens through citywide efforts such as the San Francisco Transportation Plan, Transportation 2030, and regional efforts like the Regional Transportation Plan (RTP)[6]. In Summer 2015, SFCTA began the process to update the SFTP and forward priorities into the 2017 RTP. In the meantime, new development under discussion can contribute to addressing the transportation impacts of "baseline" growth through coordination between those development plans and the needs for which there are shortfalls or undefined implementation strategies as discussed in Chapter 5 of this report.

[4] Interested stakeholders can learn more by visiting: <www.sfcta.org/modeling-and-travel-forecasting>.

[5] Association of Bay Area Governments and Metropolitan Transportation Commission. *Plan Bay Area* <planbayarea.org>.

[6] See <wwwmovesmartsf.com>, <transportation2030.sfplanning.org>, <planbayarea.org>.

**Figure 4. Assumed increase in population and jobs in Study Sub-Areas**



## WTA BUILDS UPON THE RECENTLY-ADOPTED SAN FRANCISCO TRANSPORTATION PLAN

In December 2013, the SFCTA Board approved the San Francisco Transportation Plan (SFTP). As a part of the SFTP, a focused analysis was conducted on existing and future transportation conditions in San Francisco's "core" areas: the Downtown, South of Market, and Market/ Octavia neighborhoods. Relevant to the needs of the growing "core," the SFTP recommended the following, all of which have advanced since completion of the plan and are discussed further in Chapter 5:

- Build the pedestrian and bicycle strategies to establish safer neighborhoods citywide.
- Increase investment in employer, school, and community trip reduction programs
- Continue to develop pricing/incentive-based approaches to congestion management
- Continue rapid transit network development by implementing Muni Forward investments


The San Francisco Transportation Plan is the city's 30-year blueprint that guides investment in San Francisco's transportation system.

- Set a vision for managing the city's freeway network
- Identify the next generation of transit capacity expansion priorities for BART, Caltrain, and Muni

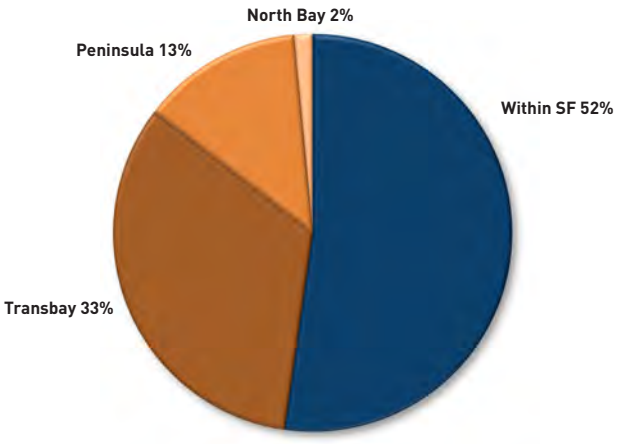
# CHAPTER 2: DEMAND

## Approach

We focused our analysis on the evening peak period since it is the time of day when the most overall travel happens. We focused on a subset of trips that we refer to here as "trips of interest" that included those that are internal, outbound, and/or pass through the Study Area, since they represent the peak direction where travel demand-capacity imbalances occur (see Figure 5) for illustrative examples of trips considered). We present demand estimates in this chapter for an approximate 3-hour pm peak period[7]. By segmenting demand into major corridors, we determined that seven major corridors explain that vast majority of travel demand: each has unique characteristics in terms of overall size, mode share, and pace of growth, and therefore imply different solutions to accommodate travel demand sustainably.

Today, approximately 220,000 "trips of interest" occur during the weekday peak period (about 20% of total citywide travel demand during this time period) and by 2040, that number is expected to increase by almost 50% to approximately 320,000. The majority of these trips, just over 50%, are trips within San Francisco. Another 33% are destined for the East Bay, 13% are destined for the South Bay, and the remaining 2% for the North Bay (Figure 6).

**Figure 6. Study Area trips of focus: local vs. regional, 3-hour PM peak, 2012**




We segmented "trips of interest" into corridors that represent their most common destinations. Figure 7 and 7a show how future demand is anticipated to grow by corridor. Figure 8 presents an estimate of how these trips break down by mode today and total forecast increase in demand by all modes. In whole, about 80% of these trips are adjacent to high-capacity transit, including BART, Caltrain, Muni Metro, and major Muni bus lines.

The following highlights about existing and future travel demand can be drawn from these figures.

[7] In the following chapter that quantifies supply, we represent transit capacity for the peak 1-hour as this is the most common way to represent. Approximately 40% of transit trips in the 3-hour peak occur in the peak 1- hour.

**Figure 5. Study Area "trips of interest" as compared to all trips (left). Representative outbound and internal trips (right).**

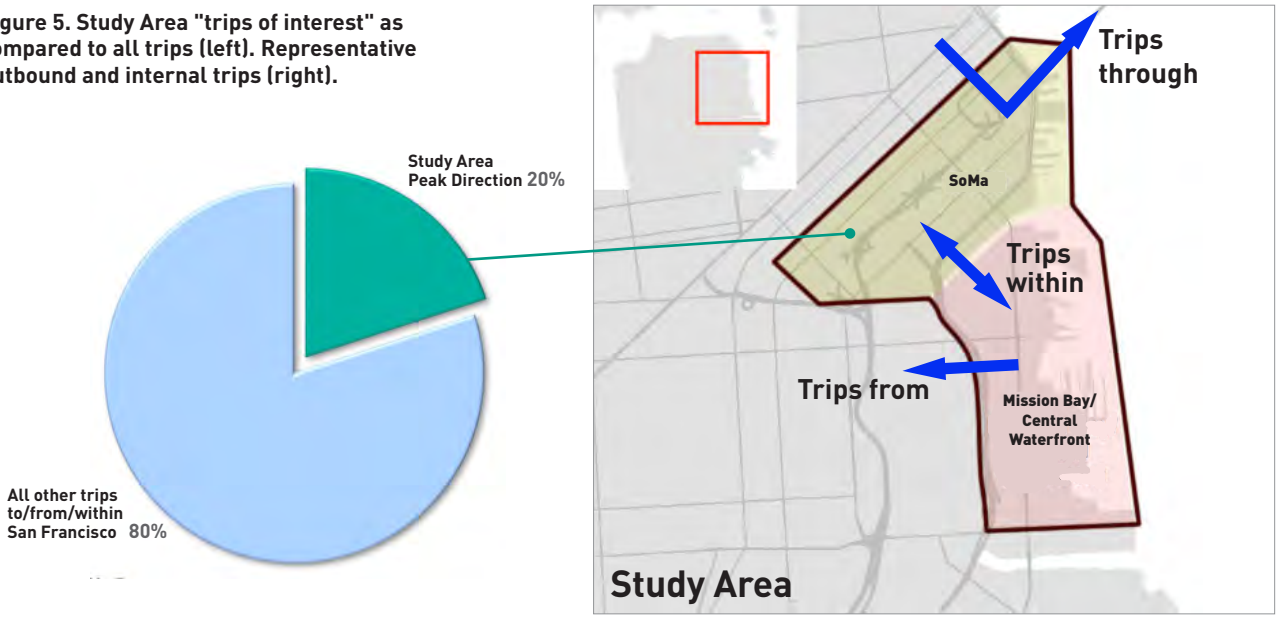
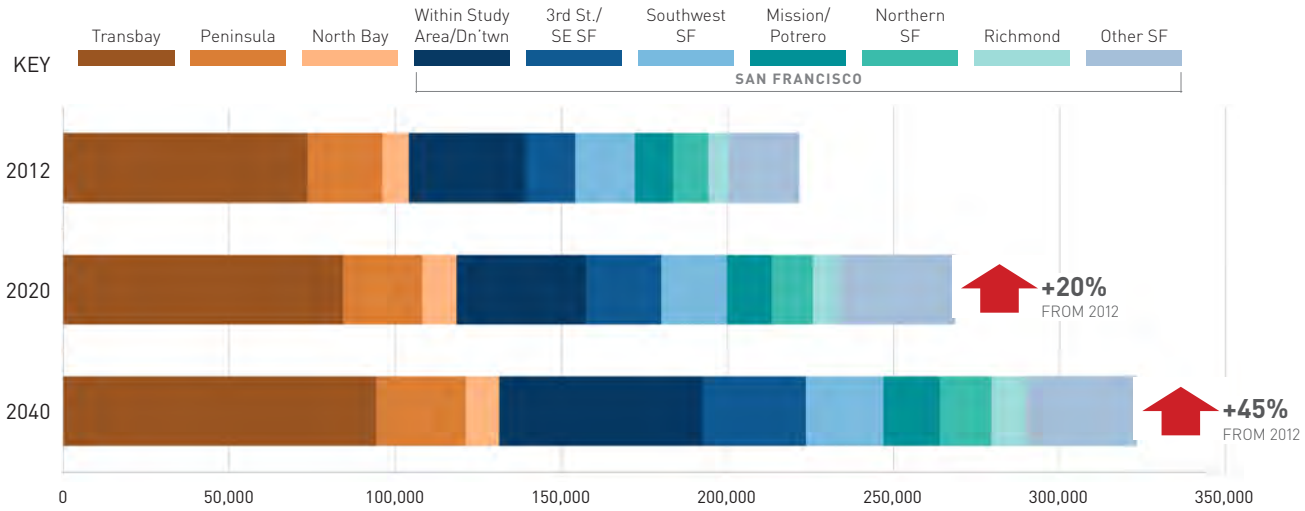


**Figure 7. Growth in Study Area "trips of interest" by corridor, 3-hour PM Peak**




- **TRANSBAY CORRIDOR** has the largest number of overall trips and driving trips. About 33% of "trips of interest" are destined for the East Bay, the single largest Study Area travel corridor. The Transbay corridor already sees a very high share of transit trips, almost 50%, but its sheer size means it also represents the single largest driving travel corridor, even more than the Peninsula corridor.
- **STUDY AREA AND DOWNTOWN** has the most walk/bike trips and second largest number of overall trips. Trips within the Study Area and Downtown are forecast to almost double by 2040. Already more than half these trips are walk and bike trips.
- **SOUTHEAST CORRIDOR** is one the fastest growing and the highest auto mode share within San Francisco. Today, an estimated 55% of trips from the

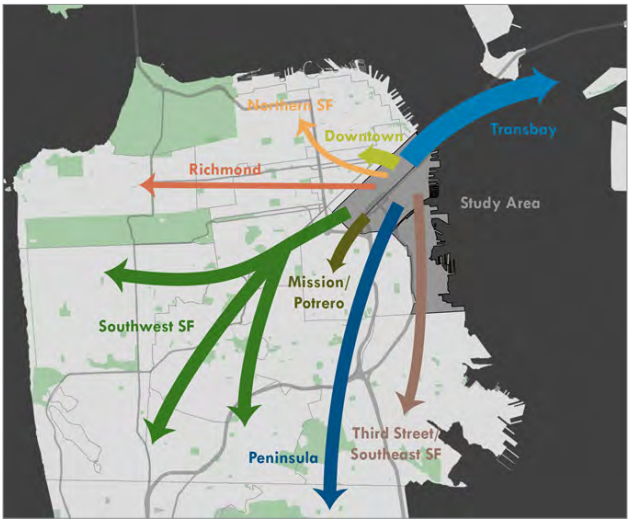
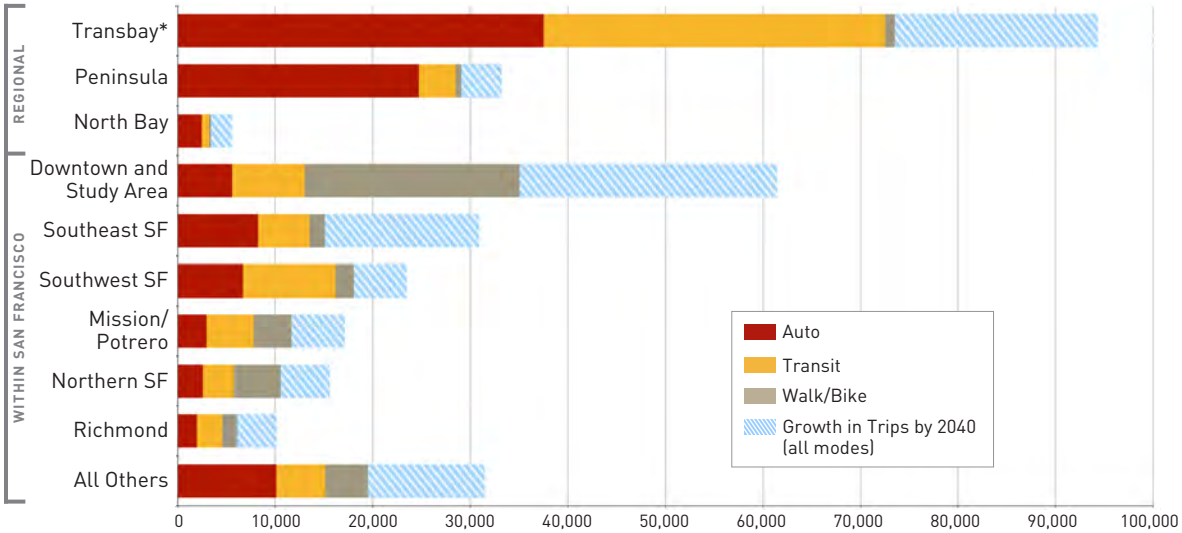



**Figure 7a. Study Area corridors**

**Figure 8. Study Area "trips of interest" by corridor by mode, 2012, 3-hour PM Peak, and growth in trips by all modes by 2040**




* Note that for East Bay-bound trips from Downtown, driving trips are Study Area through-trips because they would require driving on SoMa streets to access Bay Bridge on-ramps, while technically BART-bound trips would never enter the Study Area. For this analysis we represent Downtown-to-East Bay BART trips as Study Area through trips to allow East Bay-bound driving and transit trips to be treated equivalently.

Study Area to Southeast San Francisco are by car, making the corridor the only local Study Area corridor with a higher than 50% auto mode share. By 2040, trips between the Study Area and Southeast San Francisco are anticipated to double.

- **PENINSULA CORRIDOR** has the highest auto-mode share, but growing more slowly. About 13% of Study Area trips are destined for the South Bay and a substantial share of these trips, about 80%, are drive trips.
- **SOUTHWEST CORRIDOR** is the fourth largest, but growing more slowly. Southwest San Francisco makes up about 8% of total Study Area travel today, but its slower growth will make it only the fifth largest by 2020.
- **NORTHERN CORRIDOR** has a notable share of overall Study Area demand and non-motorized trips. In particular, Northern San Francisco generates the second highest number of non-motorized trips from the Study Area.
- **MISSION/POTRERO CORRIDOR** is in the top three for walk/bike mode share.

About half of trips leaving the SoMa/Mission Bay/Central Waterfront Study Area during pm peak hours are destined for another Bay Area county outside of San Francisco.

- **RICHMOND AND NORTH BAY CORRIDORS** have relatively small shares of travel from the Study Area. While a substantial number of trips occur between the Geary corridor and Downtown, the Richmond represents a very small share of Study Area travel as do trips from the North Bay.

# CHAPTER 3: SUPPLY

This chapter presents existing roadway and transit capacity, as well as scenarios of potential transit capacity expansion in the planning stages. While the prior chapter summarizes peak *period* demand over an approximate three-hour period, we summarize hourly transit capacity as it is customary to express capacity in terms of passengers per hour.

As transportation demand intensifies, best practices indicate that strategies to accommodate additional demand should include a combination of expanding transit capacity and managing roadway and transit demand by encouraging some trips to shift to times outside the peak period or to the "shoulders" of the peak. This analysis does not identify the balance between the additional amount of transit capacity that should be planned for and the level of effectiveness that demand management strategies can provide in shifting trips out of the peak. A more robust analysis of existing and future transit capacity needs is underway as a part of the Metropolitan Transportation Commission (MTC)-led Bay Area Transit Core Capacity Study that will recommend short-, medium-, and long-term solutions to provide additional transit capacity in the Transbay corridor and in the Muni Metro system in partnership with the SFMTA, SFCTA, BART, Caltrain, AC Transit and the Water Emergency Transit Authority (WETA).

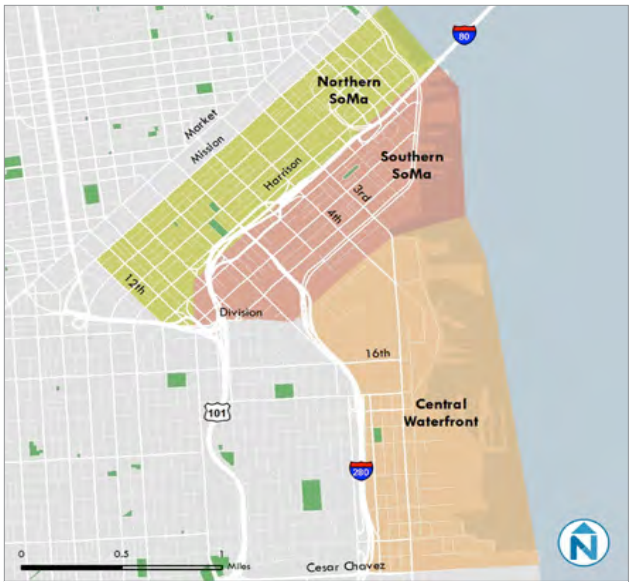



**Figure 9. Study Area Sub-Areas Used for Roadway Capacity Analysis**

## Roadway Capacity

The Study Area has three distinct sub-areas with very different roadway network characteristics as shown in Figure 9. The Northern SoMa street network is defined by a large grid and is heavily used during PM peak hours by motorists traveling to the Bay Bridge on-ramps, including a substantial number coming from Downtown and other locations north of Market Street. Southern SoMa and Mission Bay/Central Waterfront are more constrained by the presence of I-280, the Caltrain railyard, and the Mission Bay channel. Therefore, capacity is more constrained by a select set of entrance and exit points. We used a combination of travel forecasting tools and professional judgment to make the following key findings about roadway capacity.

- The Bay Bridge is essentially at capacity during peak hours, creating queues through Northern SoMa that affect most other travelers through this area. During the afternoon rush hour, Northern SoMa operates essentially at capacity due to the downstream bottleneck of the Bay Bridge. Those traveling through Northern SoMa are affected by the same congestion even if they are not destined for the Bay Bridge. Given this phenomenon, SoMa's congestion challenges would be best addressed by a solution that holistically manages demand in the I-80 corridor connecting to the Bay Bridge, including the on-ramps throughout SoMa (1st/Essex/Sterling, 5th Street, 8th/Bryant), and the freeways feeding it (Central Freeway, US 101). In the meantime, its impacts to other movements, including vehicles traveling north, west or south, as well as its impacts to buses, pedestrians, and bicycles can be managed through rigorous "Don't Block the Box" enforcement at congested intersections.
- Southern SoMa and Mission Bay/Central Waterfront are not as capacity constrained today, but are vulnerable to become so in the future. Southern SoMa and Mission Bay/Central Waterfront are much less intensely traveled today and will continue to experience a relatively smaller share of demand in the future. Because the number of entrance and exit points in these sub-areas are constrained, an increase in peak period vehicle traffic of 15-20% in Southern SoMa and 20-25%

for Mission Bay/Central Waterfront could cause the network to approach the level of congestion experienced in Northern SoMa today[8]. Options to prevent such traffic congestion include ensuring strong transit, walk, and bicycle access to and from this area from all directions.

## Transit Capacity

BART, Caltrain, and Muni Metro, the highest capacity rail transit lines in the entire Bay Area region serve the Study Area today, and are supplemented by local and regional bus service and regional ferry service. Recently, transit serving the Study Area has experienced unprecedented levels of ridership growth and is regularly experiencing over-crowded conditions, resulting in times when passengers are unable to board overcrowded vehicles. This section describes existing hourly transit capacity and documents some expansion plans under discussion[9]. All capacity numbers in this section represent what is determined by each transit operator as their planning capacity, or 85% of full potential capacity. At loads beyond 85% of capacity, rider comfort can be compromised and pass-ups may occur in the most peaked 15- or 30-minute window of the peak hour.

### Transbay capacity: BART, AC Transit, and Water Emergency Transportation Authority (WETA)

The Transbay corridor is by far the highest-capacity transit corridor serving the Study Area and the entire Bay Area region. Today, Transbay capacity is provided primarily by BART, which delivers capacity for about 22,000 passengers/hour through the Transbay tube. BART capacity is supplemented by AC Transit Transbay buses which carry approximately 5,000 passengers/hour and WETA ferry service, carrying another ~1,000 passengers/hour. BART is already experiencing substantial crowding, with average morning loads per car of 140 instead of BART's standard of 107 per car.[10] See Figure 10 for an illustrative comparison of these loads.

**Figure 10. Illustration of typical peak hour BART crowding (bottom) as compared to BART standard (top)**

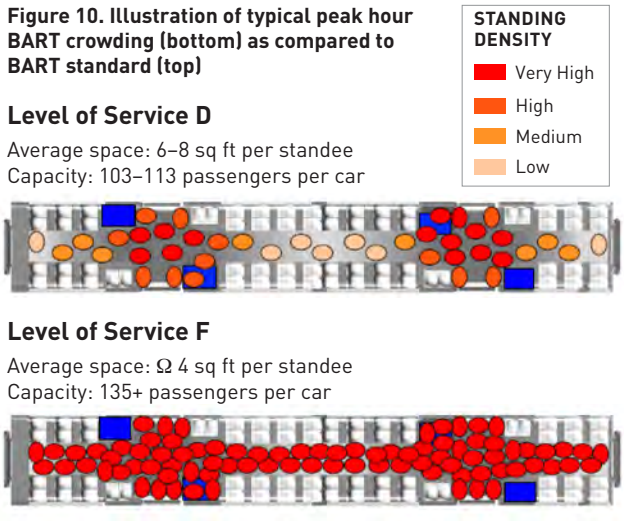
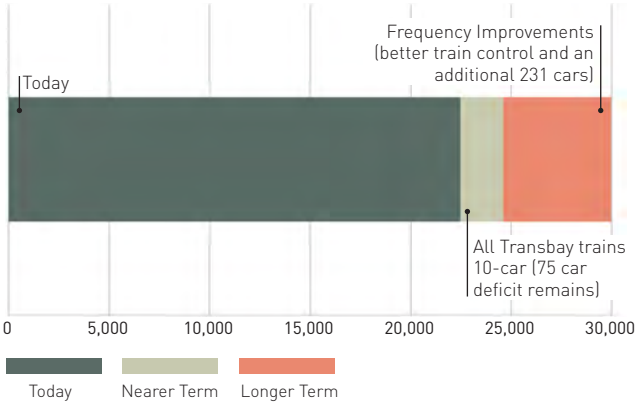



Figure 11 shows the capacity increases associated with two capacity expansion scenarios that BART is planning for, but still seeking funding for, that would provide additional peak hour capacity. Today, the limiting factor on providing more peak hour Transbay service is the total number of railcars that BART owns. BART's signal system can handle 24 trains/hour through the Transbay tube, but due to vehicle constraints, BART only schedules 23 trains/hour with some train sets running with 8-car or 9-car consists, instead of the 10-car consist that stations can accommodate. The first scenario illustrates that approximately 2,000 more passengers per hour can be accommodated by buying enough new rail-cars to accommodate all 10-car trains. The second scenario shows that an additional 5,000 passengers per hour can be accommodated with an upgrade to the Automated Train Control Signal (ATCS) system that could allow 28 trains per hour through the tube.

BART's *Fleet of the Future* project includes replacement

**Figure 11. Existing and Planned Future BART Peak Direction Transbay Capacity (assumes only existing Transbay tube)**




[8] Arup, 2015 using Synchro analysis of intersection capacity at key gateway intersections: see Appendix A for detailed methodology.

[9] Note this section presents hourly capacity, while the prior chapter presents 3-hour peak period demand. Approximately 40% of transit trips in the 3-hour peak *period* occur in the peak 1- hour.

[10] BART. "Expand Capacity, Manage Demand." Presentation at BART Board workshop, January 29, 2015.

of the existing fleet of 669 vehicles as well as purchase of additional vehicles to expand the total fleet size by approximately 50% to 1,081 vehicles[11]. The current contract includes expansion to 775 vehicles, 60 to accommodate the BART extension to Beryessa, and 46 to relieve crowding and grow capacity[12]. To enable all 10-car Transbay trains, a total of 850 vehicles are needed, or 75 more than what is currently funded. A net additional 231 vehicles must be funded to provide the total 1,081 vehicles needed to enable the second scenario[13]. To enable this fleet extension BART will also need a new maintenance and storage facility to service new vehicles. They are seeking funding to acquire and improve properties near the existing Hayward Yard to build the Hayward Maintenance Complex.

BART is exploring improvements like platform screendoors and faster elevators to address over-crowded conditions at Embarcadero and Montgomery stations.

BART also expects to approach station capacity limitations at Embarcadero and Montgomery in the short- to medium-term. These stations have the highest ridership in the entire BART system, yet they also have the narrowest platforms. As ridership at these stations grows, there will reach a point where there would not be adequate vertical circulation elements (elevators, escalators, stairs, etc.) to allow un-loading passengers to leave the station platform level before the next train unloads. To address this aspect of transit capacity needs, the BART-led Embarcadero Montgomery Capacity Implementation Plan is evaluating both short-term low-cost improvements like platform screendoors and faster elevators and escalators as well as more expensive options like new "side platforms" that allow passengers to exit both sides of the BART train.

While BART serves many more trips than AC Transit and WETA and is the only operator in the Transbay corridor that is experiencing recurrent over-crowded conditions, AC Transit and WETA service may become of increasing importance to accommodate near-term capacity expansion needs. AC Transit Transbay buses have excess capacity today and can more quickly scale up capacity in the future, with the new Transbay Terminal designed to accommodate more than three times the number of peak period buses as today (from 85 to 300 per hour). Fully utilizing the new Transbay Terminal bus storage could increase AC Transbay capacity from about 5,000 passengers/hour to almost 24,000 with double-decker buses.

WETA also contributes transit capacity today via its routes traveling between Vallejo and San Francisco and Alameda/Oakland and San Francisco, providing hourly capacity of approximately 1,140 passengers per hour. WETA plans to open new service between San Francisco and Richmond by 2018, between the Ferry Building and Treasure Island in about that same time frame, and is also considering near-term expansion to Berkeley[14].

An important function of WETA (and of Golden Gate Ferry, from Larkspur and the 580-to-80 Corridor) is relieving demand for Transbay capacity for special events in this area of San Francisco. According to surveys commissioned in 2007 by the San Francisco Giants, ferry ridership to AT&T Park represented between 8 and 16%[15] of all transit trips taken to a Giants' game, a much higher percentage of the overall transit mode split than ferries currently represent in daily commuting to San Francisco (less than 1%)[16].

Increasing Transbay corridor transit capacity is of particular importance to meet Study Area mobility needs as well as citywide and regional mobility needs. In this effort, we have documented that Study Area "trips of interest" to Transbay destinations is the single largest Study Area corridor and will grow by almost 30% more

11 BART. <https://www.bart.gov/about/projects/cars>

12 "New Train Procurement" Presentation to MTC Programming and Allocations Committee. September 10, 2014.

13 Ibid.

14 WETA. <http://sanfranciscobayferry.com/weta/expansion>

15 <http://www.sfport.com/ftp/uploadedfiles/port_commission/RFP%20Appendix%20H.pdf>

16 <http://www.plsinfo.org/healthysmc/28/how_residents_commute.html>

peak period trips by 2040. This effort does not document how much more capacity should be planned for in different horizon years based on anticipated increase in travel demand across multiple markets.

SFMTA plans are moving forward to substantially expand the Muni bus and light-rail fleet to meet anticipated ridership growth.

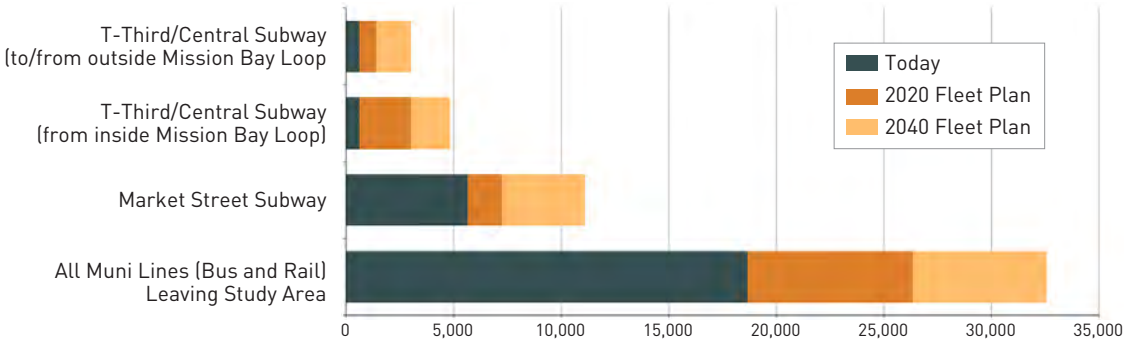
## Local SFMTA Muni Capacity

SFMTA regularly conducts a Fleet Management Plan to identify additional transit vehicles that will be needed to accommodate service increases necessitated by growth in ridership. The 2014 Fleet Plan lays out vehicle expansion needs for a 2020 and 2040 horizon year which includes growing from 136 to 260 light-rail vehicles and from 185 to 435 articulated trolley and motor coach buses, while decreasing standard trolley and motor coaches from 537 to 462[17]. Much of the funding needed to accommodate these fleet expansions has been identified but shortfalls remain. Figure 13 and Figure 14 (next page) illustrate the increase in peak hour capacity that would be provided with full implementation of these expansion plans. With implementation of the Fleet Plan, the following key capacity increases are expected to occur:

- Collectively, the Muni Metro lines operating in the Market Street subway (J, K, L, M, N) deliver peak direction capacity for approximately 5,000 passengers per hour and would more than double capacity to just over 11,000 passengers per hour by 2040 with the fleet expansion. Similar to BART, Muni Metro is currently experiencing major crowding and the biggest constraint to additional service is more vehicles. Muni Metro faces additional challenges beyond BART's in that Muni Metro is not a fully grade-separated system. As a result, it is more challenging to deliver service exactly as it is scheduled because there is additional unpredictability associated with surface operation constraints like signals, shared right-of-way, etc. In particular, the operations of the trains entering and exiting portals constrain delivered capacity. Preliminary analysis by SFMTA indicates that average peak direction loads across all Muni Metro lines are almost 5,700 passengers per hour during morning rush hour, approximately 700 more than SFMTA's planning capacity threshold based on delivered capacity. Like BART, SFMTA is also moving forward with investments to provide additional peak hour capacity. This includes increasing the vehicle fleet to enable upgrading the N-Judah from 2-car to 3-car trains by 2020, upgrading the J-Church and K-Ingleside from 1-car to 2-car trains by 2040, as well as increasing frequencies. Together, these changes would result in an increase

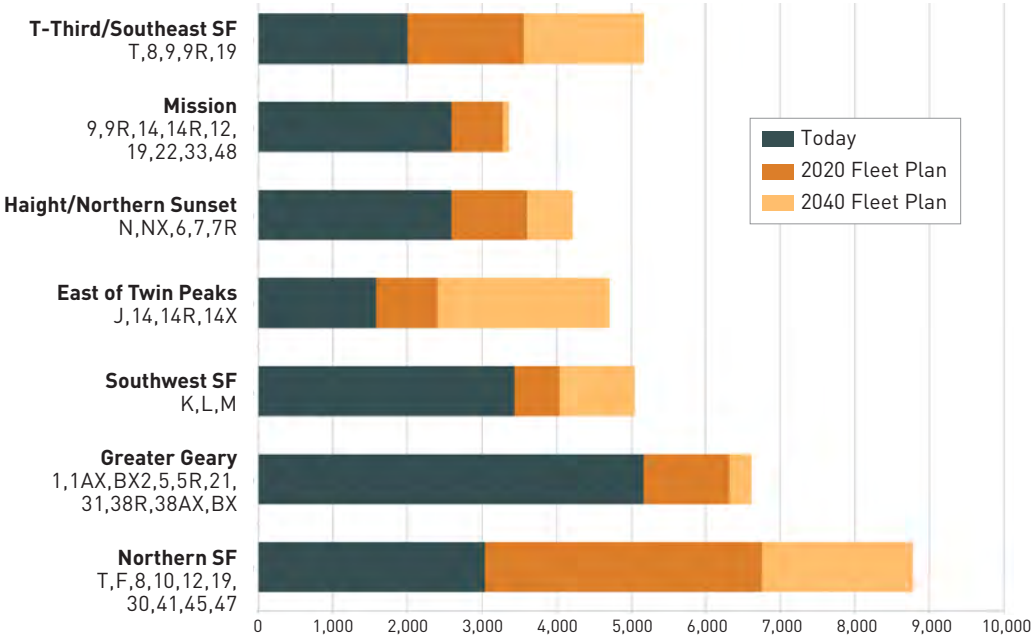
[17] SFMTA. *2014 SFMTA Transit Fleet Management Plan*. March 2014.

**Figure 13. Existing and Planned Future Muni Capacity: Summary**




85% planning capacity; 101 for light-rail, 54 for standard bus, 80 for articulated bus

**Figure 14. Existing and Planned Future Muni Capacity-By Corridor**




85% planning capacity; 101 for light-rail, 54 for standard bus, 80 for articulated bus

in peak direction capacity to 7,000 passengers/per hour in 2020 and 11,000 in 2040.

- Peak direction transit capacity between Southeast San Francisco and the Study Area would more than double from about 2,000 passengers/hour today, to more than 5,000 passengers/hour by 2040. This includes the existing and planned capacity provided by the 19, 9, 9R, 8AX, 8BX, and the T-Third. The most notable increase will be T-Third capacity, which will more than double from about 600 passengers per hour to more than 1,400 passengers per hour on opening day of the Central Subway (and the needed expansion vehicles to provide this increase are fully funded), and quintuple to serve more than 3,000 passengers per hour by 2040. This reflects an upgrade from the one-car KT-line that currently operates every nine minutes during peak hours to a two-car T-line that will operate the entire line every eight minutes, starting the year the Central Subway opens in 2019 and increase to every five minutes by 2040.
- Peak direction Muni transit capacity between the Study Area and points north in San Francisco would almost triple from 3,000 passengers/hour to almost 9,000 passengers/hour by 2040. This includes the existing and planned capacity provided by the 8x, 10, 12, 19, 30, 41, 45, 47, and F today. The future estimate also reflects the opening of the Central Subway that will run a two-car light-rail every four minutes in each direction in the Central Subway and increase to every 2.5 minutes by 2040. This increase represents about three times the capacity that is provided in this corridor today, or room for almost 9,000 passengers per hour when considering all lines traveling between the Study Area and Northern San Francisco.
- In whole, all Muni lines serving the Study Area would provide approximately equivalent total peak direction capacity to BART Transbay service by 2040, accommodating approximately 33,000 passengers/hour., The corridors where Muni has planned the most substantial capacity increase are Southeast San Francisco, East of Twin Peaks, and Northern San Francisco, all planned for a more than doubling of transit capacity relative to today's level.

## Peninsula Capacity: Caltrain and High-Speed Rail, Bus and Ferry

While Study Area-to-Peninsula trips represent a smaller share of overall existing and future demand than BART or Muni, approximately 13% of total Study Area demand, it is necessary to provide sufficient transit capacity in this corridor. Caltrain, like BART and Muni is experiencing record ridership and crowding. Based on data from February 2014, the fullest trains during peak hours are on average at 106% of seated capacity. Furthermore, there was a 50% increase in the number of trains at 95% of seated capacity as compared to 2013[18]. In the near-term, Caltrain's plans to add a sixth car to the regular train consists are underway, and its Electrification Project will convert the current diesel fleet to electric and enable more frequent and faster service. In the longer-term, Caltrain and the

[18] Caltrain.*February 2014 Caltrain Annual Passenger Counts Key Findings*. Page 8. <http://www.caltrain.com/Assets/_Market-Development/pdf/2014+Annual+Passenger+Count+Key+Findings.pdf>

California High-Speed Rail Authority are planning for joint operation of High-Speed Trains between Los Angeles and San Francisco (including express between San Jose and San Francisco) in addition to regular Caltrain service. Figure 15 illustrates the increase in peak hour capacity that would be provided with full implementation of these expansion plans: Peninsula-to-Study Area capacity would more than double by 2040, from 3,250 passengers/hour to almost 7,000/hour.

Around 2020, assuming full funding of Caltrain Electrification, capacity would increase from five five-car trains to six six-car trains, accommodating up to 4,500 peak direction passengers per hour. As Caltrain's second phase of modernization plans is implemented to enable six eight-car trains plus four High-Speed Rail trains providing express service between San Jose and San Francisco, corridor capacity would further increase to almost 7,000 peak direction passengers per hour. These plans would require substantial station improvements to accommodate longer trains, which are currently not funded.

Peninsula transit service to San Francisco provided by SamTrans bus and WETA Ferry (from South San Francisco) represent so small a percentage of transit trips made within this corridor that their expansion in terms of frequency or capacity is not included in this analysis.

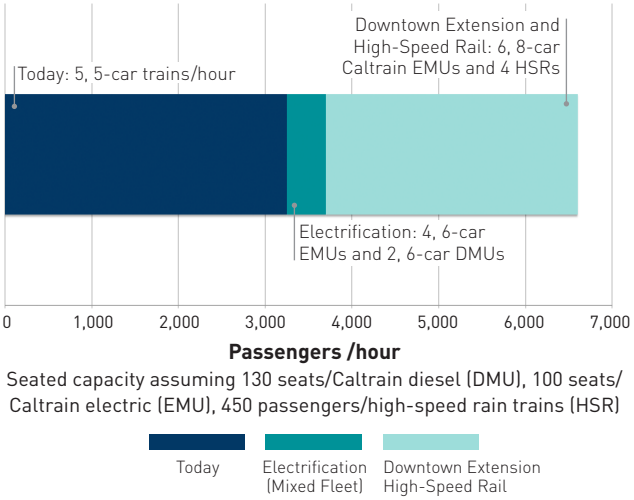

Caltrain is advancing the Downtown Extension project to extend the system's northern terminus to the new Transbay Terminal.

## Transit Capacity Summary

In addition to the above points broken down by corridor, the following points are relevant to consider across all systems:

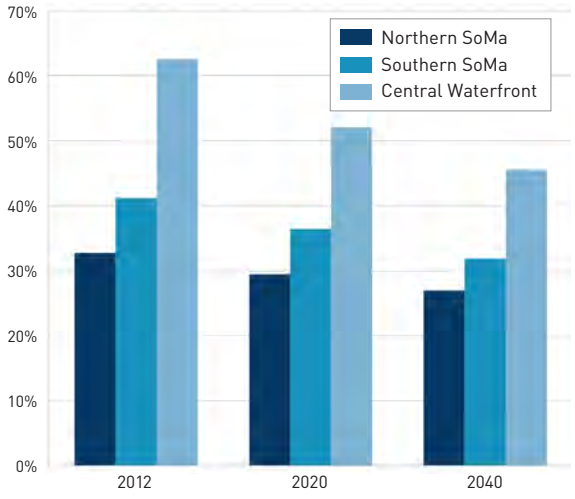
- This analysis sums up transit capacity from the Study Area as a whole, but the distance to BART and most of the Muni Metro rail lines makes this transit capacity more peripheral to the Mission Bay and Central Waterfront neighborhoods than to SoMa. Figure 16 further illustrates this point, showing how the forecast auto mode share varies by sub-area. While all sub-areas are anticipated to decrease their auto mode share by 2040, the num-

**Figure 15. Existing and Planned Future Caltrain and High-Speed Rail service**




Seated capacity assuming 130 seats/Caltrain diesel (DMU), 100 seats/Caltrain electric (EMU), 450 passengers/high-speed rain trains (HSR)

**Figure 16. Forecast Auto Mode Share by Sub-Area, 3-hour PM peak**




Source: SF-CHAMP, 4.3.

ber of overall trips are forecast to increase, indicating a potential for additional auto trips in the future. The Central Waterfront/Mission Bay sub-area is projected to have a relatively higher share of auto trips than Southern SoMa or Central Waterfront, even taking into account planned transit improvements, which could indicate the need to further strengthen transit access, particularly in the east-west direction.

- Transit capacity findings shown here assume the major transit corridors remain the ones that have been provided or planned to date, but new efforts will consider whether to re-shape demand by opening up new major transit corridors. In particular, the Metropolitan Transportation Commission-led Bay Area Core Capacity Transit Study (CCTS) will be considering ways to increase transit capacity in the Transbay and Muni Metro corridors. It is also important to note that the Muni transit capacity expansion planning represented here has been conducted primarily to determine future fleet expansion needs. The CCTS will update the expansion plans described here, focusing on identifying ways to also improve speed and reliability of the Muni Metro rail lines.

# CHAPTER 4: MODE SHARE VISION

The previous chapters quantify travel demand and capacity using a travel forecasting model and planned transit capacity investments. To inform the city's planning to accommodate this growing demand, we quantified mode share scenarios for drive, transit, walk and bike "trips of interest"[19] to inform what level of mode shift might be plausible and desirable to strive for to accommodate the growing transportation demand. Specifically, we quantified the following scenarios, all focused on peak 3-hour period demand for Study Area "trips of interest". In all cases, these calculations were done by adjusting the SF-CHAMP forecast of future 2040 Study Area trips by mode and based on San Francisco's policy goals and experiences of other cities. The four scenarios quantified were:

- **FOR DRIVE TRIPS:** if planned population and job growth come to the Study Area, while vehicle person trips stay constant at today's levels, how many fewer vehicle person trips would there need to be relative to SF-CHAMP forecast levels?
- **FOR BIKE TRIPS:** If the city were to achieve its bicycle mode share goal of 20% of trips by bicycle, how many more Study Area trips could be served by bicycle? What about if the city only achieved a 10% mode share?
- **FOR WALK TRIPS:** If the share of walk trips of two miles or less increased by five percentage points, how many additional trips could by served by walking?[20]
- **FOR TRANSIT:** Based on the experience of other cities with major transit-oriented employment centers, how many additional trips might be served on transit with reliability, speed, and capacity improvements[21]

Figure 17 summarizes the answers to the above questions:

- We would need to shift about 22,000 person trips that are forecast to travel by car to another mode or another time of day to hold today's level of vehicle trips constant in 2040.
- We would serve 30,000 more trips by bicycling if we achieved a 20% bike mode share goal (while not pictured in the figure—we would only shift about 11,000 if we achieved a 10% bike mode share goal [22]), with Downtown, the Study Area, Mission/Potrero, Third Street/Southeast San Francisco representing the four corridors with the highest potential.
- We could serve about 2,500 new trips as walk trips on top of the very high level of trips already forecast to be walk, with the largest markets being the Study Area, Downtown, and Northern San Francisco.
- Approximately 15,000 additional people would be served by transit (across all corridors).
- The total walk, transit, and bike additional trip potential based on these assumptions is almost

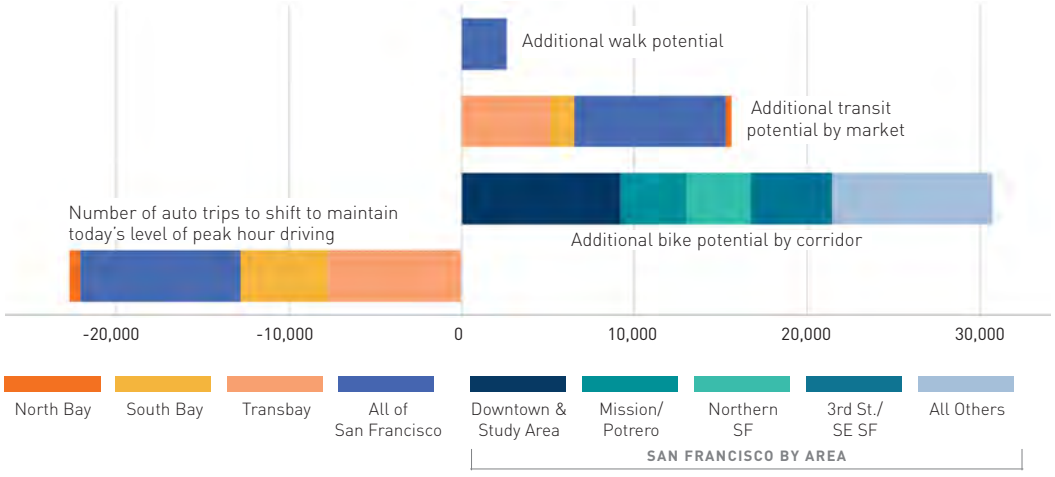
[19] As described in Chapter 2, "trips of interest" are defined as those that are internal, outbound, and/or passes through the Study Area during the 3-hour pm peak period, since they represent the peak direction where travel demand-capacity imbalances occur.

[20] Appendix A details the assumptions and rationale for this question.

[21] Ibid.

[22] The analysis takes into account trip distance and considered all San Francisco trips, though presents only the implication for Study Area trips. Short trips make up a larger share of this subset of PM-peak-period trips than they do of trips throughout the City as a whole, and as such, the change from 10% to 20% citywide bike mode share means that the number of bike trips associated with the Study Area would need to triple.

**Figure 17. Mode Share Vision Analysis Results, 3-hour pm peak, Study Area "trips of focus"**

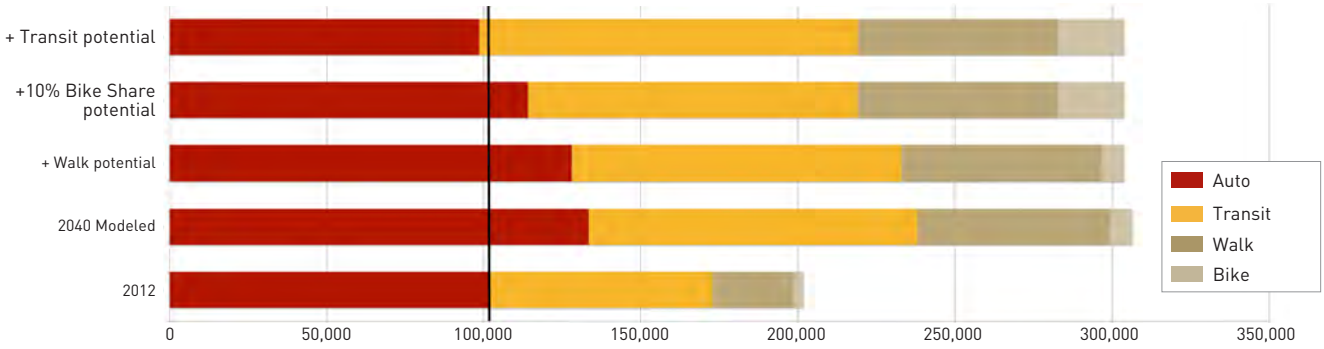


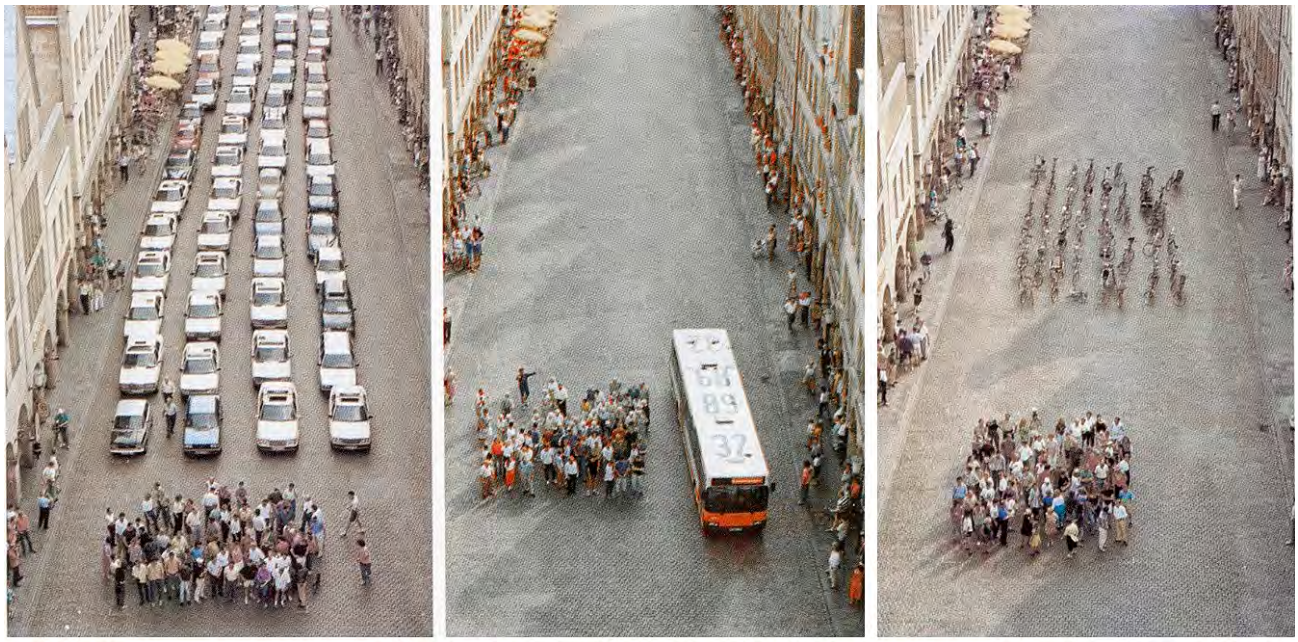
50,000 trips, more than twice the forecast level increase in Study Area auto trips. In other words, while the level of walk, bike, and transit trip increase contemplated is ambitious, even half this level of increase would still allow Study Area drive "trips of interest" to remain constant at approximately today's number of peak period vehicle trips.

This is further illustrated in Figure 18 that shows how these mode shift changes could affect total forecast Study Area "trips of interest" by all modes during the pm peak period. As shown, the potential to attract additional trips to walking, transit, and by just achieving a 10% bike mode share, could result in serving more than the entire forecast increase vehicle trips by other modes.

In considering the potential for this level of mode share to be realized, it is important to consider the following point: supply-side strategies are unlikely to be effective without demand-side strategies. While building bicycle and pedestrian infrastructure, implementing supportive policies, and providing fast and reliable public transportation options with enough capacity are likely to encourage people to shift trips, an area as dense and trip-attractive as the Study Area will likely always be attractive for driving trips, particularly when other parts of the region are very auto-oriented. Building better walking, cycling, and transit infrastructure may encourage some people to shift modes, but may also induce even more trips, including more driving trips. For this reason, transportation demand management (TDM) strategies are also needed to achieve the level of mode shift shown here. Chapter 5 further discusses recommendations related to TDM and include ideas like area-wide incentives and pricing adjustments, parking supply restrictions or demand-based pricing, and/or encouraging telecommuting and flexible work schedules, to name a few.

**Figure 18. Mode Share Vision Analysis Results, 3-hour pm peak, Study Area trips of interest**



As the number of Study Area trips increase, we must plan ways to serve more people in the same amount of roadway space. These photographs from the Muenster (Germany) Department of Transportation show the amount of street space required for 60 people to travel by car, bus, and bicycle.

# CHAPTER 5: RECOMMENDATIONS

Based on the analytical findings described in the prior chapters, we present recommendations to improve transportation conditions for Study Area travel, organized into three categories.

1. Continue to develop and implement local network improvements to improve conditions for walking, bicycling, and surface transit.
2. Advocate for full funding for critical transit capacity investments.
3. Pursue next steps to define new infrastructure and policy.

The first two categories can be thought of as delivering what is planned and underway, while the latter category can be thought of as adding new transportation projects to the pipeline.

These types of next steps and their rationale are summarized in Table 1 and detailed in the rest of the chapter.

**Table 1. Recommendations Framework**

| | Category | Description | Rationale |
|---|---|---|---|
| DELIVER WHAT IS PLANNED | 1. Continue to develop and implement local network improvements to increase traffic safety and improve transit reliability. | Street design and operation changes within and in close proximity to the Study Area that have already been identified, many of which require additional work to be defined as projects. E.g. new protected bike lanes, wider sidewalks, streetscape improvements, safer intersections, transit priority treatments, ongoing "don't block the box" enforcement. | With increased intensity of trip-making in the Study Area, the street network should be re-designed to prioritize more space-efficient modes (transit, bicycling, walking). The framework to do so has already been developed through the Bicycle Strategy, Pedestrian Strategy/WalkFirst, Muni Forward programs. More work is needed to develop and deliver the types of projects that these efforts recommended. |
| | 2. Advocate for full funding for already prioritized, critical transit capacity investments. | Defined projects that have gone through agency process to define need and prioritize. E.g. Caltrain Electrification, Downtown Extension of Caltrain, BART, Muni, and Caltrain fleet and facilities expansions. | A 50% increase in pm peak period Study Area trips will require substantially more trips to be served by transit than today. BART, Muni, and Caltrain are all at currently at capacity and all have funding shortfalls to deliver their defined fleet and facilities expansion plans. |
| ADD NEW TRANSPORTATION PROJECTS TO THE PIPELINE | 3. Pursue next steps to define promising new infrastructure and policy. | Promising ideas that have not yet completed a process to define purpose/need, evaluate effectiveness, get policy-maker approval to advance, but will need funding for any next stages of work. E.g. MTC Core Capacity Transit Study, Railyard Alternatives + I-280 Boulevard Feasibility Study, Freeway Corridor Management Study, expanded Transportation Demand Management (e.g. incentives, pricing). | Many significant ideas are under discussion that would directly affect the Study Area and appear promising in their ability to improve Study Area transportation conditions. Feasibility-level studies are underway or being scoped. Funding to support any next stages of work that are recommended by these efforts is important to begin securing now, particularly because early-stage work is typically harder to secure funding for than detailed design and construction phases. |

## Continue to develop and implement near-term local network improvements

1. Implement projects to make it feel safe and attractive to bicycle. As described in Chapter 4, achieving the city's 20% bike mode share could attract around 30,000 Study Area "trips of interest." This increase in trips could be particularly helpful if the attracted trips substitute trips that would otherwise have been made by auto or transit, thereby relieving capacity constraints. The SFMTA Bicycle Strategy is the overarching document guiding San Francisco's actions towards achieving this goal[23]. The Strategy's "System Build-Out Scenario" identifies major investment needs including upgrading 200 miles of the existing bicycle network to premium (safer more comfortable facilities) adding 35 new miles of bicycle facilities, upgrading 200 intersections with better bicycle treatments, as well as expanding secure bicycle parking and bicycle-sharing, and funding ongoing support and education programs. Many of these types of projects are already in the works: a few examples relevant to the Study Area include the Embarcadero Enhancement project, the 2nd Street project, the Blue Greenway, the expansion of the Bay Area Bikeshare System by a factor of 10, and provision of secure bicycle parking such as the bike valet station at the proposed Warriors arena. The corridors with the greatest potential to support mode shift (relevant to Study Area needs) are internal to the Study Area as well as between the Study Area and Downtown, Southeast San Francisco, and Mission/Potrero.
2. Implement projects to make it feel safe and attractive to walk. As described in Chapter 2, more than half the Study Area and Study Area-to-Downtown trips are already walk trips and they are anticipated to more than double by 2040. To accommodate these trips safely and attractively, San Francisco must continue moving forward with implementation of WalkFirst, a multi-agency effort to execute on San Francisco's Pedestrian Strategy[24]. Major strategies include upgrading 44 miles of streets to improve pedestrian safety and comfort, re-timing signals at 800 intersections to give extra pedestrian crossing time, creating more plazas and parklets, re-opening 20 closed crosswalks, installing pedestrian countdown signals, removing sidewalk impediments, shortening and/or widening crosswalks, and implementing the Green Connections network of green streets connecting to parks and the waterfront. The SFCTA is also working with SFMTA and Caltrans to assess the need and opportunities to improve the safety of San Francisco's freeway ramps.
3. Implement treatments to prioritize surface transit through Muni Forward. As discussed in Chapter 2, more than half of Study Area demand is going to and from somewhere else in San Francisco, and as discussed in Chapter 3 Muni has plans to substantially increase its transit capacity. Muni Forward is a program to create a safer and more reliable Muni system through route changes and service improvements, implementation of a rapid network of core routes, optimizing use of existing fleet for increased capacity/efficiency, enhancing comfort and safety for all customers and making the system smarter through technology improvements. One important example relevant to the Study Area is the 16th Street Multi-Modal corridor project that will provide transit priority treatments along 16th Street for the 22-Fillmore.
4. Implement Vision Zero, traffic safety and congestion management operational improvements such

[23] SFMTA. *SFMTA Bicycle Strategy.* April 2013. <http://sfmta.com/sites/default/files/BicycleStrategyFinal_0.pdf>

[24] WalkFirst website <http://www.sf-planning.org/walkfirst> SFMTA. *San Francisco Pedestrian Strategy.* January 2013. <http://archives.sfmta.com/cms/rpedmast/documents/1-29-13PedestrianStrategy.pdf>

as continued "Don't block the box" enforcement and education. As discussed in Chapter 3, congestion associated with the Bay Bridge on-ramps negatively affects everyone traveling through Northern SoMa. Until we reduce Bay Bridge auto demand from today's levels, the likelihood of regular intersection "box blocking" will continue. As a result of SFMTA's "Don't Block the Box" Enforcement pilot that demonstrated this strategy's effectiveness[25] (also a WTA Phase 1 Strategy), continued regular enforcement is a strategy that should continue to be implemented to mitigate the congestion and safety impact this phenomena has to all modes.

### Advocate for full funding for already prioritized critical transit capacity investments

5. Fund BART's fleet and facilities expansion and system modernization, and short-term capacity improvement strategies. As discussed in Chapter 2, the Transbay corridor is the single largest Study Area travel corridor, serving about one-third of total Study Area trips. And as discussed in Chapter 3, it is also the single largest Study Area transit corridor, already providing an hourly capacity of about 25,000 passengers/hour and able to grow to around 33,000 passengers/hour by expanding its fleet from 669 to 1,081 rail-cars, building a new storage/maintenance facility, and implementing a better train control system[26]. In addition, BART will need to move forward with projects to expand station capacity at Embarcadero and Montgomery through improvements like platform screen-doors and faster elevators and escalators to accommodate demand safely[27]. These investment needs all have funding shortfalls. BART is moving forward with multiple funding strategies including a request for Federal Transit Administration Core Capacity grant funds and a potential BART revenue measure on the 2016 ballot.
6. Fund Muni's fleet and facilities expansion, system modernization, and short-term capacity improvement strategies. As discussed in Chapter 3, by 2040 Muni is expected to provide equivalent transit capacity from the Study Area as BART. To do so, Muni will need to expand its rail and bus fleet, as well as find and build additional facility space to store and maintain these new vehicles. So far, SFMTA has secured funding to replace all of its 150 light-rail vehicles and expand to 215. Funding for an additional 45 to allow for a fleet of 260 light-rail vehicles is still needed. SFMTA has also developed the SFMTA Real Estate Vision for the 21st Century[28] that considers future vehicle facility needs, although the 2014 Transit Fleet Management Plan determines that an addendum to the Real Estate Vision should be prepared based on the additional fleet expansion needs[29].

   In addition, SFMTA is in process of finalizing a Rail Capacity Strategy that identifies short- medium-, and long-term capacity and reliability projects at a conceptual level. Three key near-term projects have already been prioritized for the next five years including: 1) a new rail pocket on the Muni Metro Extension (a strategy first developed as a part of Phase 1 of the WTA); 2) West Portal conflict reduction; and 3) Muni Metro Extension Pocket MMX

25 SFMTA. *South of Market Intersection Gridlock Enforcement Pilot Final Report*. December 2014. <http://www.sfmta.com/sites/default/files/projects/2014/141204-DontBlockIntersection_FinalReport.pdf>

26 BART. *Expand Capacity Manage Demand*. Presentation at BART Board Workshop, January 29, 2015.

27 Ibid.

28 SFMTA. *SFMTA's Real Estate and Facilities Vision for the 21st Century*. January 2013. <http://archives.sfmta.com/cms/cmta/documents/1-29-13VisionReport.pdf>

29 SFMTA. *2014 SFMTA Transit Fleet Management Plan*. March 2014. <http://www.sfmta.com/sites/default/files/2014%20Transit%20Fleet%20Management%20Plan_Website.pdf>

Transit Signal and Train Control/Tramway Enhancement to reduce travel time between the Folsom and the 4th and King stations[30]. These projects are expected to improve overall reliability and capacity for the overall Muni Metro system. Mid- and long-term improvements will be further developed and evaluated through the MTC-led Core Capacity Transit Study.

7. Fund Caltrain electrification and extension to Downtown San Francisco, fleet and facilities expansion projects, and system modernization. As discussed in Chapter Two, trips to the Peninsula are anticipated to be about 13% of total PM peak-hour Study Area trips, and this corridor is expected to have the highest auto mode share of any serving the waterfront. Like BART and Muni, Caltrain is experiencing crowding issues today as discussed in Chapter Three. A funding shortfall exists both for the capacity upgrades enabled by Caltrain Electrification, as well as additional aspects of the Caltrain Modernization Program to further expand the fleet and station platforms to enable eight-car trains[31]. In addition, the Downtown Extension of Caltrain (DTX) has been a long-standing priority for San Francisco and the region. Most relevant to the travel needs of the Study Area is that DTX would: 1) relieve pressure on Muni for first-mile and last-mile connections through SoMa from Caltrain commuters coming to/going from Downtown; and 2) encourage people who currently drive through the Study Area between Downtown and the Peninsula to switch to Caltrain.

### Pursue next steps to define promising new infrastructure and policy.

8. Pursue next steps identified through the Freeway Corridor Management Study to maximize person throughput on US 101, I-280, and I-80 mainlines and ramps during peak hours. As discussed in Chapter 2, about 45% of Study Area demand is destined either for the East Bay or the Peninsula. And as discussed in Chapter 3, traffic congestion in Northern SoMa cannot be effectively addressed without managing travel demand on the Bay Bridge. The Freeway Corridor Management Study (FCMS) is a new effort led by the SFCTA. FCMS seeks to advance strategies to improve San Francisco freeways' performance in the context of other San Francisco goals including livability, economic vitality, environmental health, and equity[32]. FCMS will analyze the effectiveness of strategies like converting general purpose lanes to carpool lanes and/or tolled Express lanes. These strategies could help address the needs of the Study Area by accommodating the increased number of trips forecast within the same amount of freeway space and can provide improved reliability for Muni, Samtrans and private transit using the freeways. FCMS' initial work is focused on US 101 and I-280 with Feasibility Study phase work anticipated to be complete by Spring 2017. Study of I-80 and the Bay Bridge is anticipated as a later phase of work.
9. Pursue next steps identified through the Railyard Alternatives and I-280 Boulevard Feasibility Study. As discussed in Chapter 3, the lack of a well-connected street grid and limited access points into and out of in Southern SoMa and Mission Bay/Central Waterfront makes these areas much more vulnerable to future traffic congestion as approved

[30] SFMTA. *SFMTA Rail Capacity Strategy*. Presentation to SFCTA Plans and Programs Committee. April 2015.

[31] Caltrain. *Short Range Transit Plan Draft Highlights*. Presentation to Caltrain Board of Directors. February 2015. < http://www.caltrain.com/Assets/__Agendas+and+Minutes/JPB/Board+of+Directors/Presentations/2015/2015-02-05+JPB+BOD+SRTP+Draft.pdf>

[32] Freeway Corridor Management Study website: <www.sfcta.org/fcms>

plans build-out. The San Francisco Planning Department (SF Planning) is leading a multi-agency planning effort called the Railyard Alternatives and I-280 Boulevard Feasibility Study[33]. This study includes consideration of replacing a portion of I-280 with a surface boulevard and re-locating the 4th/King railyard, both of which would enable new Mission Bay/Central Waterfront street connections to SoMa and to Mission/Potrero. These new street connections would make the area more resilient in the face of the anticipated increases in travel demand. The Feasibility Study phase of this effort is anticipated to be complete by Summer 2016.

10. Pursue next steps identified through the Core Capacity Transit Study to expand Transbay and Muni Metro capacity. As discussed in Chapter 2, the Transbay corridor is the single largest travel corridor and is anticipated to grow by about 30% by 2040, and the Southwest San Francisco corridor served by Muni Metro also serves a sizable share of Study Area travel. Chapter 3 discusses the overcrowded conditions that exist in both corridors today and the substantial expansions in capacity that could be provided with full funding of fleet expansion and facilities plans and improved train control systems. Yet major challenges remain that a new study, led by the Metropolitan Transportation Commission in partnership with SFCTA, SFMTA, BART, AC Transit, Caltrain, and WETA will tackle. The Bay Area Core Capacity Transit Study will identify short- medium- and long-term solutions to provide additional transit capacity specifically focused in these two corridors. For the Transbay corridor, this study will serve as the initial alternatives analysis work for a second transbay rail crossing and will also identify ways to better utilize AC Transit transbay bus service, WETA ferry service, create High Occupancy Vehicle lanes on the Bay Bridge, or provide new regional bus service to close capacity gaps in the very short-term. For Muni Metro, it will consider major investments to increase the speed, reliability, and capacity of the existing lines. Promising ideas under consideration include:

- Second Transbay rail crossing
- Additional Muni and BART crossovers/tail tracks to increase service flexibility
- Take one or more Muni rail lines out of the Market Street subway to improve reliability/capacity of existing services
- Provide new east-west rail service to Mission Bay and/or the Central Waterfront
- Prioritize M-Ocean View and N-Judah to be Muni Metro core capacity lines and implement infrastructure needed to provide fast, frequent reliable service such as new subway segments and additional tail tracks and crossovers.
- Manage Bay Bridge to improve/maintain AC Transit Transbay travel times and/or to enable new regional bus services
- New ferry landing at or near the eastern terminus of 16th Street

The Study is anticipated to continue through the summer of 2017 and launch follow-on work to advance the most promising ideas.

11. Implement additional transportation demand management strategies. As discussed in Chapter 4, modest changes in travel choices could allow the increase in trip-making forecast to happen while reducing peak period auto trips relative to today's levels, but the type of supply-side strategies needed for walking, cycling, and transit to be more attractive options will only be effective if complemented with demand-side strategies. Transporta-

[33] Railyard Alternatives and I-280 Boulevard Feasibility Study website: <www.sf-planning.org/index.aspx?page=3717>

tion Demand Management (TDM) strategies use market signals to reduce drive-alone trips and can include information and education, incentives, physical changes, technology, and pricing. A variety of TDM strategies in use in San Francisco, and the TDM Partnership Project[34] recently started allowing for the four agencies involved in implementing TDM in San Francisco (SFCTA, SFMTA, SF Planning, and the Department of Environment) to develop a coordinated work program for ongoing activities. Additional effective strategies exist and should continue to be pursued, including:

- Create robust TDM development requirements through the Transportation Sustainability Project
- Limit parking supply associated with new development and expand mandated residential and commercial parking unbundling
- Manage parking demand at the curb by prioritizing carsharing, and continue to implement performance-based pricing
- Promote, incentivize and optimize off-peak transit service for visitors to tourist destinations and special events, particularly where demand might coincide with peak-period travel
- Mandate secure bike parking with new developments in areas where it is not already required and expand minimum requirement in areas where already mandated
- Pilot innovative use of travel incentives to decongest core BART and Muni stations downtown
- Work with employers to offer flexible work arrangements and hours and to provide transit incentives
- Advance a shared mobility strategy that sets a vision for how San Francisco should coordinate with new services such as Lyft, Uber, Leap, point-to-point car-share, etc.
- Continue to expand bikeshare services

## Conclusion

This analysis has demonstrated that Study Area travel demand is anticipated to increase by 50% by 2040 on top of a system that is already often-times strained today. The Bay Bridge is at capacity during peak hours today; Southern SoMa and the Central Waterfront have roadway capacity for 15-20% and 20-25% growth in auto vehicle trips, respectively. The good news is that modest trip-making changes could allow population and job growth while maintaining today's levels of Study Area vehicle trips. Transit is over-crowded, but major capacity expansion plans are under development and seeking funding. San Francisco transportation plans are on the right course, but we must continue to plan, fund, and deliver transportation projects and policies to accommodate the mobility needs that will be created by anticipated growth.

This report does not present project costs or funding shortfalls for needed investments as transportation investment prioritization and funding strategy work occur at regular intervals through citywide efforts such as the San Francisco Transportation Plan, Transportation 2030, and regional efforts like the Regional Transportation Plan. In Summer 2015, the SFCTA began the process to update the SFTP and forward priorities into the 2017 RTP. In the meantime, new development under discussion can contribute to addressing the transportation impacts of "baseline" growth through coordination between those development plans and the needs for which there are shortfalls or undefined implementation strategies.

[34] TDM Partnership Project website <www.sfcta.org/tdm>

## PHOTO CREDITS

Uncredited photos are from the Transportation Authority photo library or project sponsors. Unless otherwise noted, the photographers cited below, identified by their screen names, have made their work available for use on flickr Commons: https://www.flickr.com/, with the license agreements as noted.

Table of Contents (middle): Omar Bárcena[2]
p. 1: Jim Maurer[4]
p. 2: Torbakhopper[4]
p. 4: Arthur Crowther[1]
p. 10: Victor Solanoy[1]
p. 13: Rocor[2]
p. 19: Daniel J. McKeown[5]
p. 22: Tim Adams[1]
p. 24: Daniel Hoherd[2]
p. 25: eosdude[5]

Licensing information:
1 https://creativecommons.org/licenses/by/2.0/legalcode
2 https://creativecommons.org/licenses/by-nc/2.0/legalcode
3 https://creativecommons.org/licenses/by-nd/2.0/legalcode
4 https://creativecommons.org/licenses/by-nc-nd/2.0/legalcode
5 https://creativecommons.org/licenses/by-sa/2.0/legalcode