

Move Bay Area

A Blueprint for Sustainable Transportation through 2050



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Disclaimer: The information and views set forth in *Move Bay Area* are those of the authors and do not necessarily reflect the opinions of their employer or school affiliation.

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I. Executive Summary

The San Francisco Bay Area faces many challenges. The same attributes that have attracted 7.8 million people to live in the nine-county region threaten its very livability. Today, it has some of the planet's priciest real estate, worst traffic congestion and longest commutes. In San Francisco, the city is grappling with a rapid rise in ride-hailing vehicles on congested streets. All of this additional driving contributes to climate change, which threatens the entire region through sea level rise, heat waves, droughts and wildfire.

Move Bay Area: A Blueprint for Sustainable Transportation through 2050 is a plan to ensure that the region's transportation system can serve a population expected to grow to 9.7 million in three decades.

This plan prioritizes transit because, for over a century, it has proven to be the most space-efficient form of transportation for moving large volumes of people in physically-constrained regions. Transit is environmentally-friendly and inclusive regardless of race, gender identity, income or physical ability. Along with walking, transit can foster a pedestrian-friendly environment necessary to create livable communities.

The plan focuses on four areas: (1) leveraging existing rail rights-of-way, (2) expanding bus service, (3) improving service frequency and span of service, and (4) instituting fairer fares through regional fare coordination. Specific proposals include:

Improving Regional Transit

- *Constructing an electrified standard-gauge rail tunnel in the Transbay corridor*
- *Reorienting existing rail services into a new service pattern*
- *Improving service frequency on existing rail service*
- *Strengthening regional bus service to cover gaps in the rail network*
- *Extending BART's reach through Diesel Multiple Unit technology*
- *Increasing ferry service on existing routes*

Improving Local Transit

- *Increasing service levels with a particular emphasis on Communities of Concern*
- *Speeding up surface transit*
- *Expanding light rail*
- *Expanding Bus Rapid Transit*

Rationalizing Fares

- *Implementing a simple and fair fare integration policy across the region*

Move Bay Area is transformative because it finally starts to address what residents have long cited as barriers to adopting transit – infrequent, slow and unreliable transit service, overcrowding, lack of fare integration, and disconnected systems. It does not pretend to solve every problem – and may not even go far enough – but offers foundational steps towards transit ridership growth and a more sustainable future.

II. Introduction

The San Francisco Bay Area is unique. Surrounded by water, mountains, parks and open space, the region is blessed by a spectacular natural environment. It is home to a diverse population that comprises one of the nation's most progressive electorates, which helped spark social change and forward-thinking policies far disproportionate to its size. Well-renowned for its technological innovation, it is also a major center for the financial, education, medical, tourism and wine industries.

Yet the Bay Area also faces many challenges. The same attributes that have attracted 7.8 million people to live in the nine-county region threaten its very livability. Today, the San Francisco Bay Area has some of the world's worst traffic congestion. Faced by some of the priciest real estate in the world, many people endure two-hour long commutes to exurban housing tracts that devour open space. In San Francisco, the city is grappling with a rapid rise in ride-hailing vehicles on congested streets. All of this additional driving contributes to climate change, which threatens the entire region through sea level rise, heat waves, droughts and wildfire.

If the status quo continues, the situation will not get any better. By 2050, the region's population may swell another 25% to 9.7 million people. Hemmed in by mountains, the ocean, and the bay, the region does not have limitless land to expand.

Move Bay Area: A Blueprint for Sustainable Transportation through 2050 is a plan to ensure that the transportation system can support population and employment growth. It will enable Bay Area residents and visitors of the future to access employment, education, recreational and other destinations.

Rather than pushing for “pie in the sky” technology, the foundation for *Move Bay Area* rests on public transit – a scalable solution that has proven to move large volumes of people efficiently, foster economic hubs of activity, and create livable pedestrian-friendly communities. *Move Bay Area* does not pretend to solve every problem – and in some ways may not even go far enough – but offers solid foundational steps towards transit ridership growth and a more sustainable future.

III. The Case for Transit

Over the years, there have been many changes to transportation technology. In 1897, Boston built the first subway. In 1913, Henry Ford began mass-producing automobiles. Simultaneously, electric streetcars and interurban railways, including here in the Bay Area, began to expand rapidly and shape the development of cities and suburbs. Diesel buses and, briefly, electric trolley buses, nearly completely supplanted streetcars and interurbans. In the 2000s, mobile apps appeared and enabled new automobile-based forms of transportation such as ride-hailing. In the near future, cities may see fleets of autonomous vehicles with no drivers.

Throughout this rapid change, one thing has remained constant: public transit is the most space-efficient form of transportation for moving large volumes of people in physically-constrained metropolitan regions.

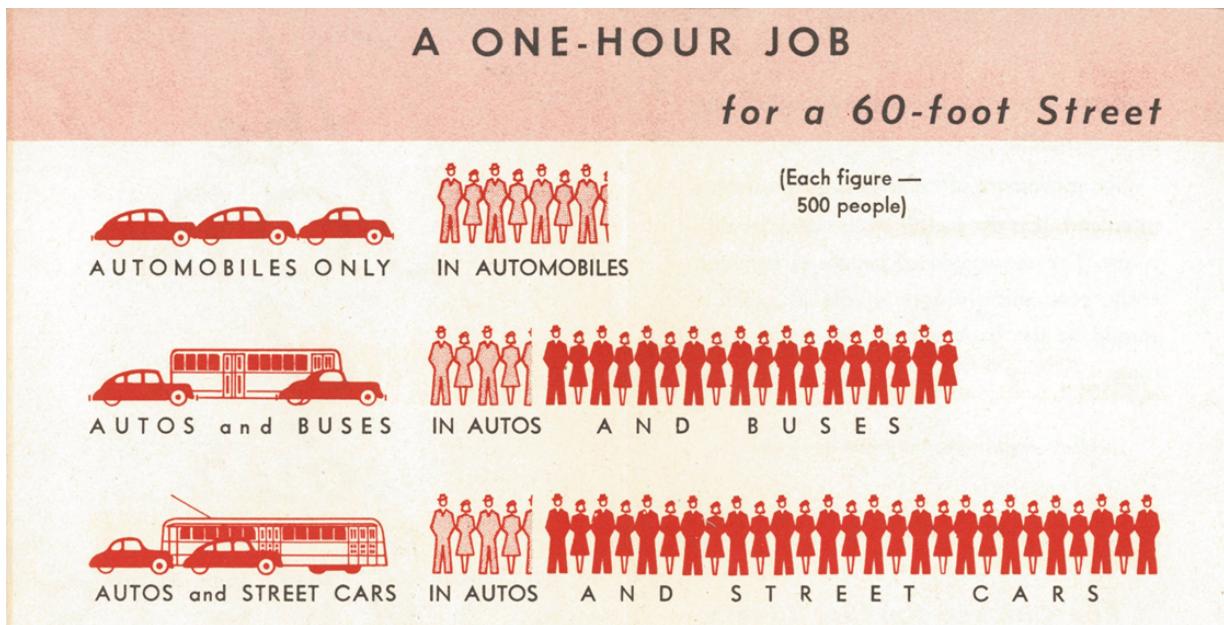


Figure 1: Space Efficiency of Transit vs. Automobiles
(Source: The Job of Your Streets, Chicago Surface Lines (1940))

Technology cannot fundamentally overcome the fact that cars – whether privately-owned, ride-hailed or autonomous – transport few people for the space they occupy. Nor can technology alter the unfavorable economics of transporting 1 or 2 people at a time. Even if autonomous vehicles eventually eliminate drivers, there are other expenses associated with cars such as fuel/power, maintenance, cleaning, storage and deadheading (when a vehicle is circulating without passengers).

There may very well be a place for new forms of mobility to supplement transit service, such as providing a last-mile connection from BART to home when the last connecting bus has stopped operating for the evening. However, they are not scalable to the volumes of passengers that transit currently carries, particularly along congested corridors with limited road capacity.

Unfortunately, transit service – and consequently transit ridership – has failed to keep pace with population growth as shown in Figure 2. During the dot-com bust in the early 2000s and Great Recession from 2008 to the early 2010s, many Bay Area transit agencies cut massive amounts of service, and ridership has not recovered to this day. Without a serious investment in transit, the Bay Area could enter a downward spiral of cut service, lost transit ridership, higher transit fares, and more congestion.

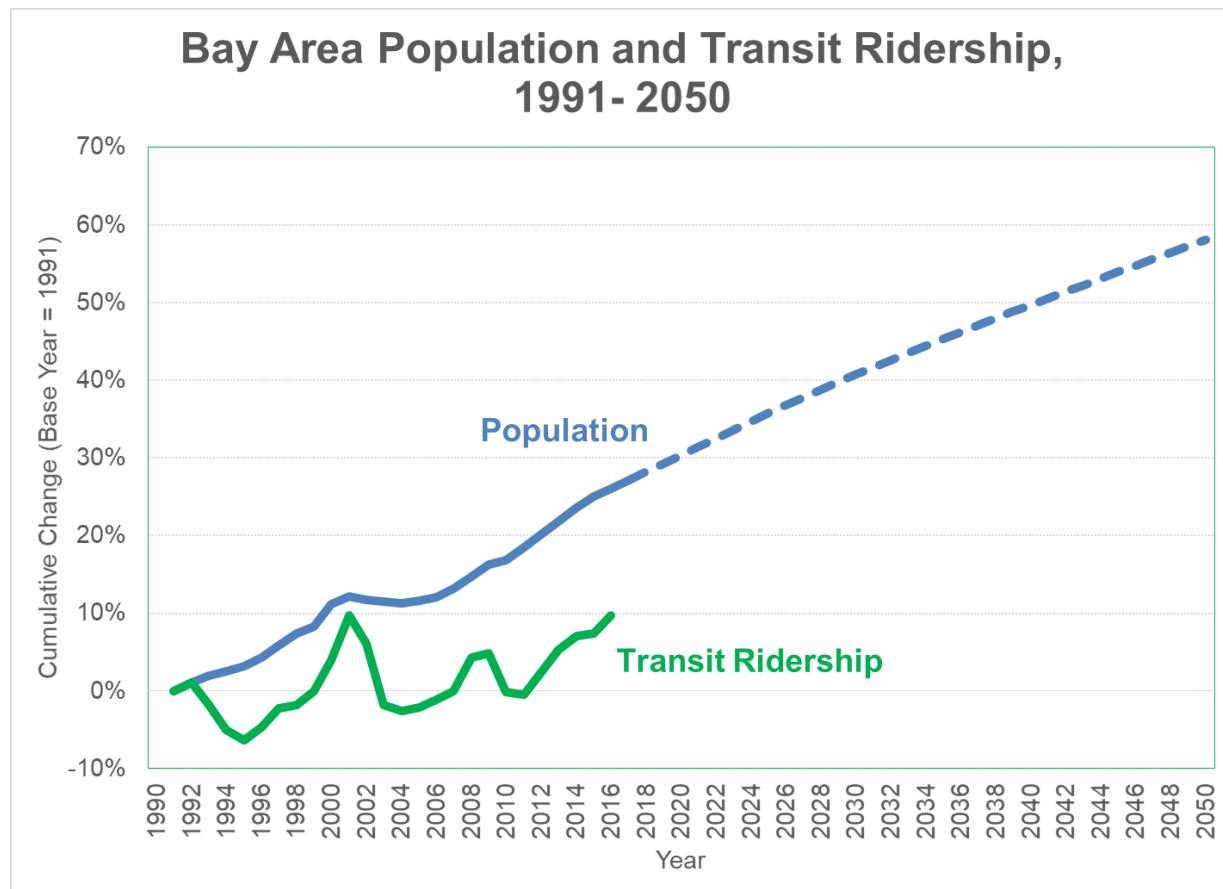


Figure 2: Population and Transit Ridership Growth

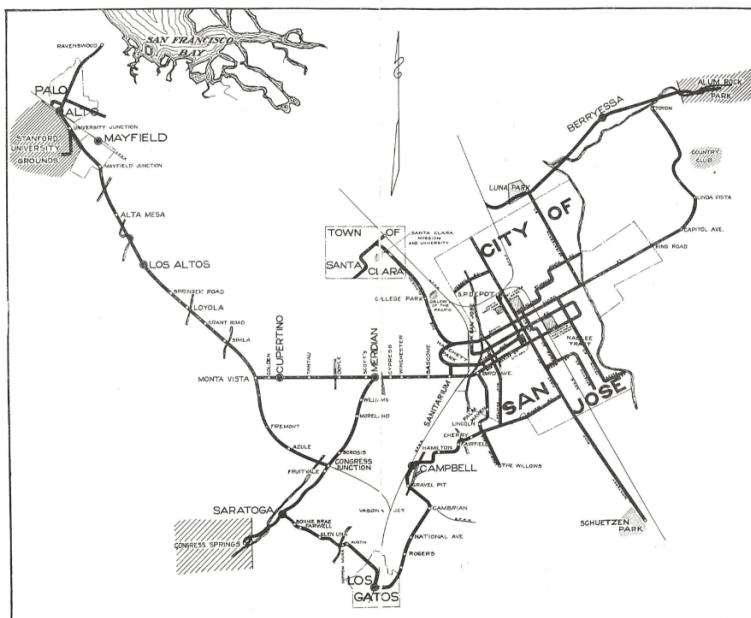
There are many reasons to support transit. It is environmentally-friendly and inclusive regardless of race, gender identity, income or physical ability. Along with walking, it is one of the few forms of transportation that can foster a pedestrian-friendly environment for creating human-oriented, livable communities. But there is also a very practical reason: In the Bay Area, there is simply no room to continue to design our transportation system around cars.

IV. A Retrospective Look: Back to the Future

A brief look at the Bay Area's transportation past can provide insights into how the region can tackle future challenges. It also refutes any notion that an automobile-based future is either inevitable or sustainable, much less desirable. In thinking about the next 30 years, it is important to remember that the decisions made over the last 100 years have created both the opportunities and challenges the region faces today.

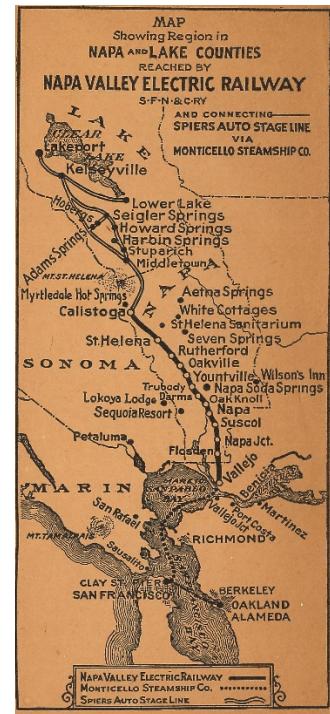
Like many large metropolitan areas in the United States, the Bay Area grew up around public transportation. Prior to the 1906 earthquake, San Francisco relied on its cable car system to navigate up city hills. By the early 20th century, electric streetcars plied major streets in San Francisco, Oakland, Berkeley and San Jose. The Ferry Building was once one of the largest transportation facilities in the world, linking San Francisco with the North and East Bay. Electric interurban trains connected the Bay Area with cities as far away as Sacramento and Chico, while interurbans also criss-crossed the then-agricultural Santa Clara Valley.

Map of the lines of the Peninsular Railway Company



In the Santa Clara Valley

(a) Santa Clara Valley



(b) Napa Valley

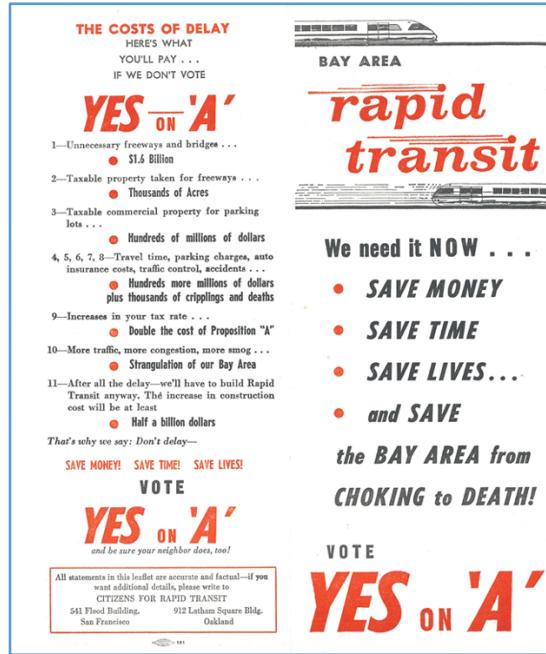
Figure 3: Historical Electric Rail Transit in the Bay Area. The Bay Area grew up around public transit in the early 20th century, with extensive systems including in outlying areas such as the Santa Clara and Napa Valleys

As important as the transportation services themselves were, they also fostered pedestrian-scale, mixed use development and walkable street patterns that facilitated a virtuous cycle of walk-up ridership and frequent transit service. The Bay Area is filled with examples of cherished commercial districts and neighborhoods that came of age during this era: West Portal and the Inner Sunset in San Francisco; Downtown

Berkeley, Rockridge, Fruitvale, Piedmont and Alameda in the East Bay; Mill Valley and Ross Valley in Marin County; Downtown San Mateo and Palo Alto along the Peninsula; Los Gatos, Saratoga and Alum Rock in the Santa Clara Valley; and Napa and Calistoga in the Napa Valley.



(a) The vision of a Market Street Subway for BART and San Francisco streetcars



(b) The Bay Area's first-in-the-nation campaign to fund a new rapid transit system

Figure 4: Bay Area Transit Leadership

With suburban growth and freeway building in full swing after World War II, the region dismantled virtually this entire network between 1938 and 1958 – except for the Southern Pacific rail line along the Peninsula (now Caltrain) and five streetcar lines in San Francisco.

Soon, however, the limitations of a car-based transportation strategy became clear. Freeways filled up as soon as they were built and pollution mounted from rapid growth in automobile ownership. In 1962, the voters of San Francisco, Alameda and Contra Costa Counties approved the construction of the Bay Area Rapid Transit system and a new subway for San Francisco's streetcars. While much of the rest of the country was focused on highways, in the Bay Area, citizens voted to tax themselves to build transit for the first time in American history.

Since then, rail transit has experienced a remarkable rebirth: BART has extended in four directions, Santa Clara County operates a light rail network, San Francisco has reopened streetcar lines and is building the Central Subway, the SMART train now connects Marin and Sonoma Counties, and Amtrak and ACE have brought new connections to the Central Valley.

V. Existing Conditions

Today's Bay Area's transportation network is under stress. One study, the INRIX Global Congestion Scorecard, found that San Francisco had the 5th worst traffic congestion in the world out of more than 1,360 cities. Although more than 45% of workers walk or take transit to work in San Francisco itself, this number is just 16% in the region as a whole. Without transit providing nearly 1.8 million average weekday trips, traffic would be even worse.

While rapid population growth has taxed the region's highway system for decades, the Bay Area has also been the epicenter of new forms of transportation in recent years aided by app-based technology. Examples include carsharing, bikesharing, private commuter vans, scooters, and Transportation Network Company (TNC) ride-hailing services.

While many of these services deliver personalized mobility by facilitating end-to-end travel with minimal trip-planning involved, sometimes they come at the expense of the greater public's transportation needs. For example, *TNCs Today: A Profile of San Francisco Transportation Network Company Activity*, a study developed by the San Francisco County Transportation Authority (SFCTA) in partnership with researchers from Northeastern University, TNCs comprise 20 to 26 percent of vehicle trips in Downtown San Francisco: areas where transit is the most robust, but also most vulnerable to congestion.

Transit in the Bay Area faces unique challenges and opportunities.

1. Bay Area Rail: The Challenges of Growth and an Aging System

BART

BART currently serves four Bay Area counties and will soon extend into a fifth. As evidenced by 80% ridership growth over the last 25 years, BART is arguably the Bay Area's most successful regional transit system. BART has many key advantages:

- *Central Business District Access* – BART station locations provide convenient access to jobs and other destinations in San Francisco, Oakland and, in the future, San Jose.
- *Carrying Capacity* – BART's exclusive right-of-way enables it to operate closely-spaced trains at high speeds. As a result, BART has a large carrying capacity of about 27,000 people per hour per direction – almost twice as much as the Bay Bridge.
- *Consistent Travel Times* – BART's exclusive right-of-way has also enabled it to maintain consistent travel times over time despite worsening traffic congestion on parallel roadways.
- *Service Frequency* – Except for evenings and weekends, BART operates at least every 15 minutes.

However, BART has reached capacity at certain hours of the day while its infrastructure is approaching 50 years old. In addition, proprietary technology and the need to grade-separate stations and trackway make BART extremely expensive. eBART, the recent extension from Pittsburg/Bay Point to Antioch, is a potential compromise technology that extends BART levels of service to outlying areas at a lower cost.

Regional Standard-Gauge Rail

Covering eight of the nine Bay Area counties, the region's standard-gauge rail network is even more expansive than BART. Moreover, trackage connects to other parts of California and the rest of the United States. California High-Speed Rail will also link the Bay Area with the Central Valley and Southern California.

However, the existing standard-gauge network faces several key limitations:

- *Terminal Locations* – Terminals in the region's three largest cities – San Jose, San Francisco and Oakland, are currently located about a mile away from the centers of their respective business districts. This small distance nevertheless poses a significant barrier to ridership.

The planned Caltrain extension from 4th & King to the recently-opened Salesforce Transit Center will help bridge the “last mile” gap in San Francisco, putting retail, hotels and offices within close walking distance of the transit hub. However, the physical configuration of existing railroad rights of way makes overcoming this “last mile” constraint virtually impossible in Oakland and San Jose. Both cities require either transferring to local transit or a long walk – including beneath a freeway – to reach the downtown core.

- *Lack of Transbay Connectivity* – The San Francisco Bay forms a major geographical barrier isolating large portions of the region's vast rail network. For example, trains that extend from the East Bay to Sacramento, the San Joaquin Valley and beyond come within 5 miles of San Francisco. This rail gap forces passengers to transfer to other services that are either oversubscribed (BART) or have much lower capacity (buses).
- *Service Frequency* – Particularly outside peak hours, service is either non-existent or runs infrequently (as shown in Table 1), discouraging ridership from people who have other transportation choices.

Table 1: Off-peak Standard-Gauge Rail Frequency

Rail System	Segment	Peak Frequency	Off-peak Frequency
ACE	Stockton-San Jose	30-75 minutes	No service
Caltrain	San Francisco-San Jose	10-30 minutes	1 hour
	San Jose-Gilroy	3 trains	No service
Capitol Corridor	Sacramento-Oakland	30-75 minutes	1 to 2½ hours
	Oakland-San Jose	60-90 minutes	1 to 5 hours
SMART	Santa Rosa-San Rafael	30-90 minutes	1 to 4 hours

- *Sensitive Habitats* – Some rights-of-way traverse sensitive habitats, which precludes double tracking and station placement. As a result, trains cannot operate frequently and bypass population centers. An example would be the Capitol Corridor and ACE alignment between Fremont and North San Jose (Alviso), which passes through the San Francisco Bay National Wildlife Refuge.
- *Freight Interference* – Particularly along the Capitol Corridor, passenger trains must share tracks with freight trains.

The standard-gauge rail network remains an underutilized resource with tremendous potential. This network parallels some of the most congested highway corridors with its right-of-way.

Local Light Rail

The Bay Area has two light rail systems: a legacy network in San Francisco dating back more than a century and a modern one in the Santa Clara Valley that began in the 1980s.

San Francisco is one of only seven cities nationwide to retain its original streetcar system – and then only on five routes with tunnels and other private rights-of-way. The construction of the Market Street Subway in the 1970s dramatically improved system speed in the downtown area. The San Francisco Municipal Transportation Agency (SFMTA) has pursued several extensions since then, including the Third Street light rail and the Central Subway, now under construction.

In the Santa Clara Valley, the Santa Clara Valley Transportation Authority (VTA) operates a large light rail network that has yet to reach its potential. The portion of the line serving the Golden Triangle (bounded between Highways 101, 237 and 880) serves low-density employment centers surrounded by free parking with little relatively little off-peak activity. In addition, trains stop a few miles short of key destinations.

Light rail systems in the Bay Area and elsewhere have proven to be very flexible. They can operate in subways, in freeway medians, other surface private rights-of-way and on city streets. They can stop at large underground stations, modest surface stations, boarding islands or at the curb. They also operate frequently – most light rail trains in the Bay Area come every 15 minutes or more often. Quiet and electrically-powered, light rail is well suited to many different operating environments.

2. Bay Area Buses: A Slow-Motion Crisis

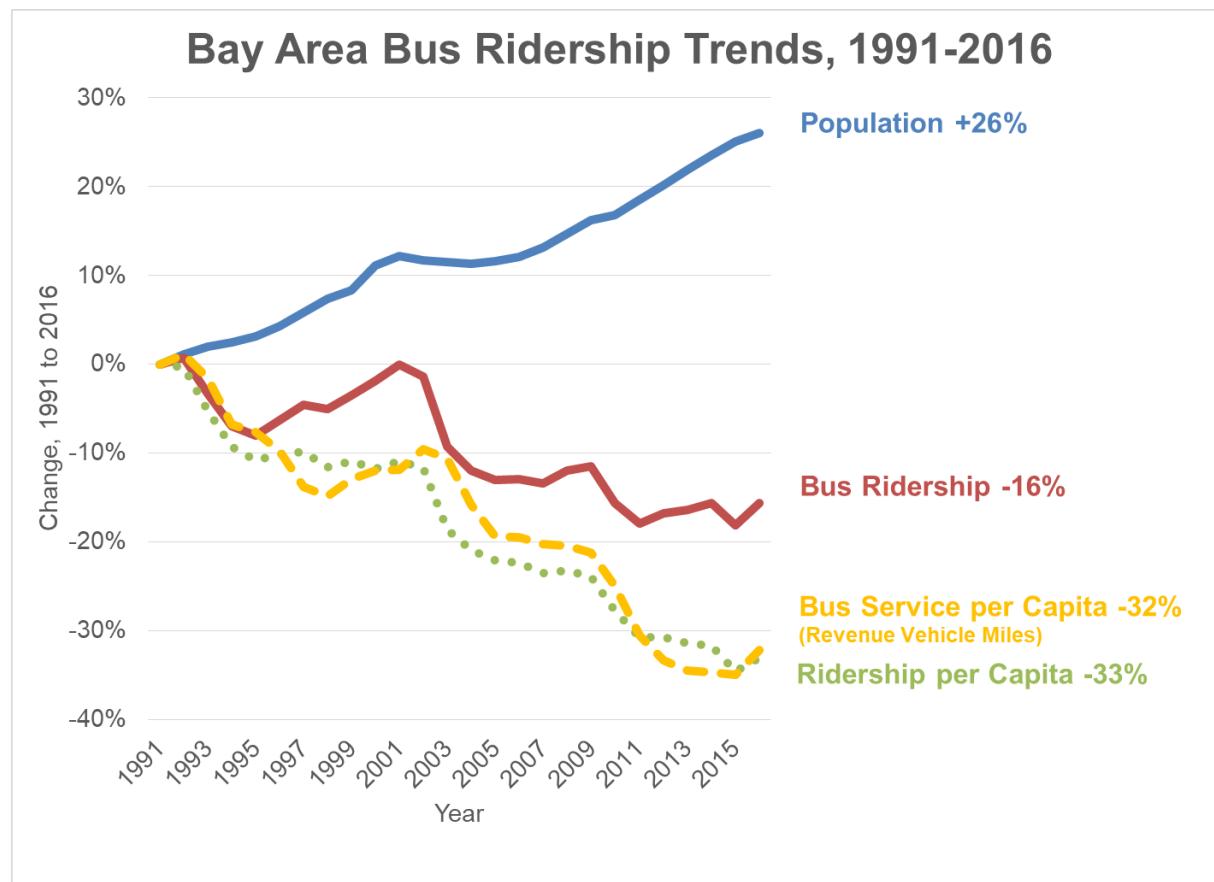
While the Bay Area has made much progress on expanding its rail network, bus service has contracted. Since 1991, the Bay Area's population has grown by 26% while bus ridership has fallen 16%. Between 1991 and 2016, both bus service (vehicle miles) and ridership on a per capita basis had declined by approximately one-third. If Bay Area transit agencies instead had been able to grow bus service and ridership at the same rate as population:

- Annual service (vehicle miles) would be 36 million higher than today – equivalent to AC Transit and Santa Clara VTA's current bus operations combined
- Annual bus ridership would be 142 million higher than today – equivalent to BART's ridership.

The Bay Area's intense economic cycles have tended to exacerbate bus system problems. During the dot-com bust and the Great Recession, operating funds dropped precipitously and transit agencies cut large amounts of service.

In an attempt to recapture ridership, some systems then reallocated the remaining resources from "coverage-oriented" to "productive" routes. As a result, the transit network became compromised: cancelling or severely curtailing "coverage" service created vast transit deserts and many riders lost their first/last mile connection to "productive" routes. Tens of thousands of riders abandoned transit altogether. As a result, some systems serving the North Bay, Peninsula and Santa Clara Valley lost over 30% of their bus ridership, most of whom never returned even after economic conditions improved.

Figure 5: Bay Area Bus Ridership Trends, 1991-2016



Increased automobile traffic due to population growth and lost bus ridership has resulted in longer bus travel times. In turn, this has made buses less attractive, leading

to a vicious cycle of further ridership losses, service cuts, more traffic and even longer bus travel times.

As illustrated in Figure 5, bus travel times have increased since the 1990s – in some cases dramatically. For example, despite the widening of Highway 101 in Marin County, Golden Gate Transit Route 70 now takes nearly two hours to travel between San Francisco and Novato during the afternoon, up 55% from 1 hour 17 minutes in 1993.

In contrast, the Bay Area's investment in rail transit over the past few decades has yielded huge benefits. Despite a huge growth in traffic, separate rights-of-way have enabled rail travel times to remain relatively constant or even improve. For example, taking BART between Embarcadero and Concord has actually gotten slightly faster over the past 25 years.

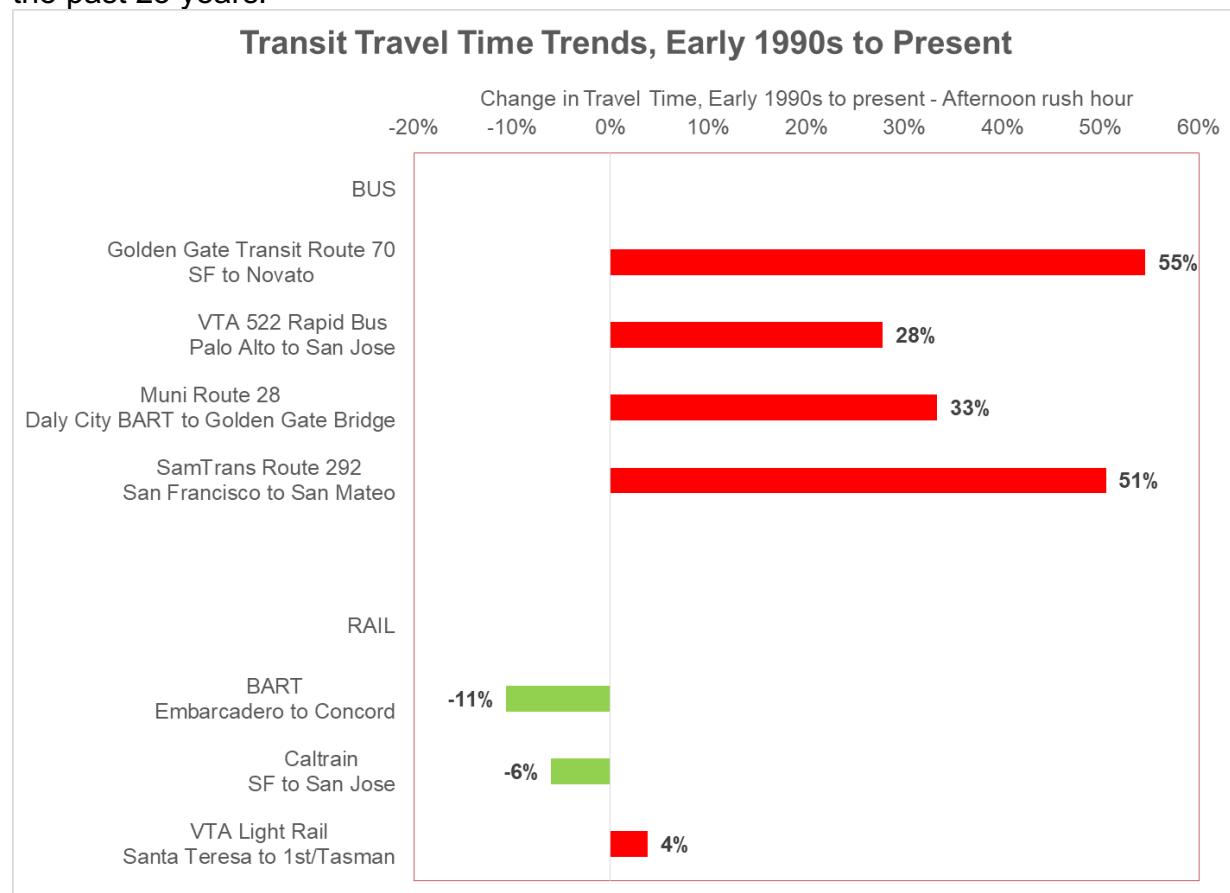


Figure 6: Sample Bus and Rail Travel Times, Early 1990s-Present

3. Bay Area Ferries: Successful but Constrained

Following their return in 1970, passenger ferry service has steadily grown with multiple routes linking San Francisco with the North and East Bay. Limited service is also available between the East Bay and South San Francisco. Ridership has grown throughout the system. The Larkspur Ferry is particularly well-used with its parking lot

often reaching capacity; the future connection to SMART rail trains may increase its ridership further.

Despite this success, the ferry system faces some significant limitations. Though the San Francisco Bay borders eight of the nine Bay Area counties, sensitive wetlands, a lack of harbors and other physical constraints preclude most potential docking locations. In addition, few destinations of regional significance – with the notable exception of Downtown San Francisco – lie within walking distance of a ferry terminal. On the other end of the trip, there are relatively few housing units located within walking distance of the ferry – necessitating large parking lots, commute-oriented feeder buses, and other first-mile/last-mile connections.

4. Fares: Lack of Integration Inhibits Regional Transit Travel

Historically, the geographical isolation of different parts of the Bay Area and competition among private transit enterprises prevented the formation of a single regional transit system. This legacy has led to over two dozen transit agencies today, each with its own fare structure.

A decade ago, the Metropolitan Transportation Commission (MTC) led the effort to bring a single regional fare card to the Bay Area. While the Clipper® Card has made it easier to pay, especially across multiple transit agencies, it did not bring any fare integration policies to ease the financial burden of transferring from one agency to another. In fact, the pre-existing BART Plus Pass, one of the few attempts to integrate local bus and regional rail fares, was discontinued in January 2016.

Each transit agency maintains its own fare structure and policies, resulting in a bewildering and complex array of different fare options (as shown in Table 2). Not only can these fare policies confuse potential riders and discourage regional travel, but they also can impose a hidden tax on long-distance travelers who must depend on more than one transit system to reach their destination.

The following two examples using Clipper® illustrate the large financial penalties for using different transit systems to make the first/last mile connections:

- Palo Alto to SFO: The 16.4-mile Caltrain trip from Palo Alto to Millbrae costs \$5.45. The 1.5-mile, one station BART ride from Millbrae to the San Francisco Airport costs \$4.55 – increasing the total fare by 83% to \$10.00. Perhaps in response to this fare policy, SamTrans initiated “Route SFO” in July 2018. This bus shuttle duplicates BART, but costs only \$2.05.
- East Oakland to UCSF Mission Bay – Consider a trip that involves taking a local AC Transit bus from East Oakland to the Coliseum BART station, then taking BART to the Embarcadero station, and finally transferring to the Muni’s T line to UCSF Mission Bay. This trip requires two transfers and three separate fares on AC Transit, BART and Muni (\$2.25, \$4.30 and \$2.50). The SFMTA offers a \$0.50 discount when transferring from BART to Muni, reducing the total cost by a modest 5.5% from \$9.05 to \$8.55. For commuters, the SFMTA and AC Transit both sell monthly passes at \$78 and \$84.60, respectively, while BART offers a

6.25% “high value” discount but no monthly passes. A commuter making 20-round trips per month would therefore pay \$323.85.

Table 2: Fare Policies for Major Bay Area Transit Operators

Fare Policy	AC Transit	BART	Caltrain	Contra Costa County Connection	Golden Gate Transit	Muni	SamTrans	VTA
Base Fares								
Flat Fare	✓			✓		✓	✓	✓
Zone Fare			✓		✓			
Station-to-Station Fare		✓						
Free Transfers within System								
Yes		✓		✓	✓	✓		✓
No	✓						✓	
Transfers to Other Systems								
Free with Base Fare	✓*			✓*	✓*			
Free with Monthly Pass			✓*			✓*		✓*
Discounted with Base Fare	✓*			✓*	✓*	✓*	✓*	✓*
Discounted with Monthly Pass								
* Free or discounted transfers only to some but not all connecting transit systems								
Passes								
Day	✓		✓	✓		✓	✓	✓
Monthly	✓		✓	✓		✓	✓	✓
Income-Based						✓		

VI. Approach

The following section provides the plan's general approach towards addressing the Bay Area's transportation challenges. This approach provides guidance to develop specific proposals, discussed in subsequent sections.

1. Leverage Existing Rail Rights of Way

As discussed under the Existing Conditions section, the Bay Area is fortunate to have possess an expansive standard-gauge rail network. Despite its current limitations of narrowly missing the center of the region's three largest cities, this rail network nevertheless presents some significant opportunities:

- By closing a few short, but strategic gaps in the system, the Bay Area could expand fast, high-capacity transit service throughout the region.
- In some corridors, the existing standard-gauge rail network parallels BART service and would offer overcrowding relief.
- Because rights-of-way largely already exist, investing in this standard-gauge rail network would be a much less expensive alternative to securing rights-of-way through densely-populated areas.
- With the addition of infill stations, the network could serve new communities and provide opportunities for transit-oriented development.

Currently, Union Pacific owns much of these rights-of-way and operates freight trains. While this represents a key constraint, it is not an insurmountable obstacle. Through the addition of passing tracks and negotiations to prioritize passenger operations over freight, the standard-gauge rail network could deliver much greater capacity.

2. Invest in Buses

In an area as large and geographically-constrained as the Bay Area, rail service cannot realistically serve all public transportation needs. Investing in buses is key to improving the region's transit network quickly and for a relatively low capital cost, providing multiple functions such as:

- Providing regional linkages where densities are too low and/or there are physical constraints that preclude new rail service
- Offering line-haul service along the region's major arteries
- Serving as the first-/last-mile connection to regional rail and bus services
- Providing lifeline service in lower-density communities

This plan envisions a major expansion of bus service – but one that is actually modest in scope compared to where the Bay Area has been in the recent past.

From 1991 to 2016, the amount of bus service Bay Area transit agencies provided fell 32% when accounting for population growth, from 14.5 miles to 9.8 miles per capita (see Figure 5). Not surprisingly, bus ridership plummeted 33% from 56 to 37 trips per capita.

This plan proposes, at a minimum, to reestablish 1991 per capita bus service levels by 2050. As shown in Table 3, this restoration would result in an 85% bus service increase

by 2050, with a potential average weekday ridership gain of 800,000 – more than Muni's current ridership. This service increase would enable the region to increase frequent service and provide more evening and weekend service in all counties, particularly outside of the region's core.

Table 3: Minimum Bus Service Expansion by 2050

1991 Bus Service Levels (Vehicle Miles per Capita)	14.5 miles
Projected 2050 9-County Bay Area Population	9.68 million
Projected 2050 Bus Service (Vehicle Miles)	140.2 million miles
Current (2016) Bus Service (Vehicle Miles)	75.8 million miles
Proposed Bus Service Increase, 2016-2050	+85%
Potential Bus Ridership Increase, 2016-2050	+240 million annually +800,000 weekdays



Figure 7: Buses. Investing in buses is key to improving the region's transit network quickly and for a relatively low capital cost. Re-establishing 1991 per capita bus service levels would result in an 85% service increase by 2050, possibly increasing average weekday ridership by 800,000.

3. Improve Service Frequency and Span of Service

Irrespective of transit mode, increasing service frequency and span of service can yield significant ridership benefits. In 2017, the SFMTA conducted a study asking customers how long they would be willing to wait for transit when arriving randomly at a stop without any real-time information. The median response was between 10 to 15 minutes; this wait tolerance declined significantly during the evening or at night, and for transfers.

In most parts of the Bay Area, particularly outside San Francisco, Oakland, Berkeley and central San Jose, most service only operates 30 to 60 minutes if at all. Currently,

there are simply not enough resources to offer the levels of service needed to attract discretionary ridership in much of the Bay Area.

Table 4: Wait Tolerance

Waiting Time Until Next Muni Vehicle	During the Day	During the Evening or At Night	When Transferring
5 min	97%	94%	93%
10 min	73%	67%	59%
15 min	35%	34%	22%
20 min	14%	15%	8%
30 min	5%	5%	3%

Table indicates the percentage of survey respondents willing to wait for transit at different service headways before seeking another form of transportation.

Likewise, expanding span of service (hours of operation) can increase transit usage. Many people travel outside of traditional commute hours for work, entertainment, recreation and other purposes. Though the Bay Area does currently offer a relatively extensive 24-hour transit network on some key corridors, there are many instances where important local services end early and/or do not operate on weekends. For example, local bus service in Santa Rosa ends by 7:45 pm on weekdays and Saturdays and by 5 pm on Sundays; in San Jose, Northern California's largest city, most bus routes end at around 9 pm.

Even modest service increases can yield significant ridership benefits. For example,

- In April 2016, the SFMTA increased weekday service on the 10 Townsend route from 20 to 15 minutes. Ridership has increased by 1,400 (+22%) over the past two years – one of the highest-growth routes on the Muni system. (Source: SFMTA Transtat)
- In June 2016, AC Transit increased off-peak service on the 52 line linking UC Berkeley and Albany from 35 to 20 minutes. Weekday, Saturday and Sunday ridership has climbed by 391 (+18%), 300 (+48%) and 339 (+55%), respectively. (Source: AC Transit 2017 Ridership and Route Performance Report)

This plan invests heavily in improving service frequency and span of service, two critical determinants of transit ridership.

4. Institute Fairer Fares

The Bay Area's current fare structure inhibits cross-jurisdictional and interagency transit travel. Though Clipper® provides a method to pay fares for different transit operators, only a few ad-hoc examples of true fare integration exist – and most of those offer relatively small discounts.

Though insufficient fare integration among Bay Area transit operators has been an issue since the days of the region's first-generation streetcar and ferry systems, its

consequences are especially noticeable today. Widening income disparities, the suburbanization of poverty, and the displacement of people to outlying areas where more affordable housing exists have placed a hidden tax on people who must commute long distances and use multiple transit systems to reach jobs.

Some advocates have called for consolidating the more than two dozen transit agencies that operate in the Bay Area. While combining some of these agencies – particularly the smaller ones – might yield some financial benefits and improve customer usability, complete transit unification is not necessary to achieve true fare integration. On the West Coast, Seattle's Puget Sound region and San Diego County provide models of fare integration across multiple transit agencies. For example, in San Diego, a \$5 day pass and a \$72 monthly pass allows one to travel throughout the county on any trolley or local bus regardless of operator.

A guiding principle behind this plan's proposed fare rationalization policy is that the region's fare structure should not hamper mobility and should make intuitive sense for customers.

The Plan

The following three sections outline specific proposals to improve the Bay Area's transit system through 2050. It assumes that the region will complete all transit projects currently under construction and included in Plan Bay Area 2020, such as the BART extension to San Jose and Santa Clara.

VII. Improving Regional Transit

According to the 2010 U.S. Census, over 880,000 residents of the nine-county Bay Area traveled to another county to work. More than two-thirds drove alone, while just 16% took transit. The result is some of the worst traffic congestion on the planet and increasing burden on the region's highway system and bridges. The proposed plan would strengthen regional transit significantly to make it a more competitive alternative – investing in high capacity rail and leveraging existing right-of-ways and station infrastructure.

1. Construct an Electrified Standard-Gauge Rail Tunnel in the Transbay Corridor

At only approximately 5 miles in length, including approaches, a second Transbay Tube linking the new Salesforce Transit Center in San Francisco with the East Bay would transform the regional transit network. Unlike BART's existing Transbay Tube, this one would accommodate standard-gauge rail to enable trains to travel directly on existing rail lines that reach the outer portions of the region.

Despite the significant cost and engineering challenges of constructing this tube, it would provide impactful benefits:

- It would relieve congestion on the most crowded portion of the BART system.
- It would relieve pressure to build another bridge across the bay, which would merely redistribute rather than reduce traffic and impact the environment

As opposed to a second Transbay Tube for BART trains, this tube for standard-gauge rail would extend direct train service from San Francisco to new locations apart from and beyond the existing BART corridor by leveraging existing railroad tracks. BART technology, which generally requires separate right-of-way acquisition, grade separation and non-standard rolling stock makes it cost-prohibitive to extend on a large-scale basis, particularly to less dense suburbs and through rural areas separating those suburbs.

2. Reorient Existing Rail Services into a New Service Pattern

The new Transbay Tube would permit new train routings that, either directly or with a single transfer, would connect different parts of the region with each other that is simply not possible today.

The following is an example of one such service pattern that would create direct service linking housing with some of the state's most significant employment, cultural and government destinations.

San Jose-San Francisco-Sacramento

This route would extend Caltrain from San Francisco to the East Bay through the new tunnel and over the existing Capitol Corridor to Sacramento. Electrification from Emeryville to Sacramento would permit trains to operate underneath the bay and continue to the Peninsula.

This line could be operated either as (a) one through-routed service with the same train traversing the entire route, or (b) two separate services with a cross-platform transfer at the Salesforce Transit Center. The former service plan might reduce congestion and improve rail capacity at the transit center, as trains would operate through the facility rather than turning back and causing delays. The latter service plan might improve reliability by breaking the route into smaller segments.

This alignment would have the following advantages:

- It would create a direct, frequent link between communities in Solano County, western Contra Costa County, Albany, west Berkeley and Emeryville with job-rich San Francisco and the Peninsula.
- It would enable future high-speed rail trains to reach Sacramento and possibly beyond, rather than terminating in San Francisco.
- It would relieve pressure from BART's Richmond line as some customers may find the stations along the new line more conveniently located.
- It would allow some AC Transit and WestCAT Transbay buses to feed local rail stations in the East Bay rather than traveling all the way to San Francisco. As a result, transit agencies could offer more frequent local service and improve resource efficiency by reducing deadheads and peak vehicle utilization.

Adding stations in Albany, Hercules and Crockett would increase the ridership catchment area of the rail line, with a relatively small increase in travel time. In particular, a strategically-placed Crockett station at the foot of the Carquinez Bridge would allow local buses from Vallejo and regional buses from Napa County to access San Francisco and the Peninsula with a single transfer. Currently, buses must travel all the way to El Cerrito del Norte BART along congested Interstate 80.

Emeryville-San Jose-Gilroy-Salinas/Monterey

This rail route would travel along the southern portion of the Capitol Corridor between Emeryville to San Jose, and then continue to Gilroy and Monterey County. In Monterey County, the rail line would continue to Salinas with a timed-transfer connection at Castroville to a shuttle train in Monterey, as envisioned by the Transportation Authority of Monterey County.

Unlike the San Jose-San Francisco-Sacramento route, this one would not be electrified, at least initially, and would operate less frequently (perhaps every hour). It would have lower projected demand due to parallel BART service and physical constraints that limit service frequency. Through Oakland's Jack London Square, for example, the rail line travels on city streets. Between Oakland and Union City, the existing Capitol Corridor is largely adjacent to BART. Between Fremont and north San Jose, this route mainly

travels along single track through environmentally-sensitive baylands, which limit opportunities for expansion.

This route would have the following advantages:

- It would provide direct rail service from Monterey County (Monterey and Salinas) to the Bay Area. The only existing rail option is Amtrak's Coast Starlight, which runs only once per day and serves only Salinas, not Monterey.
- Replacing Caltrain between San Jose and Gilroy, it would offer substantially higher levels of service than the current three weekday, peak-hour trains in each direction. Existing customers could change trains at San Jose to continue along the Peninsula. (Caltrain's electrification project does not extend south past San Jose, making transfers at San Jose necessary anyway even in the absence of this plan.)
- Ridership demand would be relatively consistent along the route alignment, matching constraints on the level of service given the route's physical infrastructure.

San Francisco-Stockton-San Joaquin Valley

Currently, Amtrak's San Joaquin trains provide five trips daily in each direction between the San Joaquin Valley and Jack London Square in Oakland. If desired, some or all of Amtrak's San Joaquin trains could enter San Francisco directly via the second tube, with dual-mode electric/diesel locomotives.

3. Improve Service Frequency on Existing Rail Service

Rail forms the backbone of the Bay Area's regional transit network. As such, it is imperative that trains operate frequently to minimize transfer times with connecting routes.

BART

Currently, BART operates every 15 minutes during weekday daytimes, but every 20 minutes during evenings and weekends. From 2008 to 2010, BART briefly operated 15-minute Monday-Saturday evening and all-day Sunday service, before reverting back to 20 minutes. Not only is 20 minutes beyond the time most people are willing to wait for transit, but it is also impossible to coordinate transfers consistently with other routes operating every 15 or 30 minutes. This plan would restore 15-minute headways to BART service during all off-peak hours.

Standard Gauge Rail

In some locations, single track or other track constraints currently preclude frequent service. Wherever possible, the plan would include capital improvements to build passing sidings and other track infrastructure to permit additional service. Table 5 shows recommended headways based on corridor densities and destinations.

Table 5: Recommended Off-peak Standard-Gauge Rail Headways

Rail System	Segment	Peak Headways	Off-peak Headways
ACE	Stockton-San Jose	30 minutes	60 minutes
Caltrain	Sacramento-Emeryville-San Francisco-San Jose	≤15 minutes	15 minutes
Capitol Corridor	Emeryville-Oakland-San Jose-Monterey	30 minutes	60 minutes
SMART	Larkspur-Santa Rosa	15 minutes	15 minutes
	Santa Rosa-Cloverdale	30 minutes	30 minutes



Figure 8: Sonoma-Marin Area Regional Transit (SMART). Even with relatively-infrequent service (30 minutes to 3 hours between trains), SMART ridership has exceeded expectations. Increasing service to every 15 minutes would likely boost ridership substantially. It would also make transferring to connecting services much more convenient, increasing ridership on the North Bay's entire transit network.

4. Strengthen Regional Bus Service to cover gaps in the rail network

Other regional corridors are candidates for higher-quality transit service. Unfortunately, geographical constraints and/or limited rights-of-way make rail either not technically viable or a lower priority than the corridors identified above.

In most of these corridors, regional bus service already exists. However, it may only offer limited off-peak/weekend service and may miss important connections or destinations. For example, currently, there is no transbay service south of the Bay Bridge corridor on weekends – an east/west gap of nearly 40 miles. This plan envisions increased all-day regional bus service operating every 15 to 30 minutes, depending on demand.

There are also several unserved corridors that are candidates for new regional bus service.

Table 6: Sample Regional Bus Corridors

Segment	Peak Headways	Off-Peak Headways	Notes
More frequent, longer hours and/or added weekend service to existing regional bus service			
San Mateo-Hayward-Castro Valley	15 min	15 min	AC Transit 'M' bus - extend to Castro Valley for better connectivity to BART's Dublin/Pleasanton Line
San Rafael-Richmond-El Cerrito Del Norte BART	15 min	15 min	Golden Gate Transit 40 bus - reestablish connection at Richmond BART to proposed Sacramento-San Francisco-San Jose rail line
Half Moon Bay-Daly City BART	15 min	30 min	Consolidate SamTrans 17 and 118 buses and eliminate transfer at Pacifica
Stanford-Palo Alto-Union City	15 min	15 min	Dumbarton Express
Crockett-Napa Valley-Calistoga	15 min	15 min	Napa Vine Transit 29 – add Crockett stop for direct connection to proposed Sacramento-San Francisco-San Jose rail line
Walnut Creek BART-San Ramon Valley-Dublin/Pleasanton	15 min	15 min	Consolidate CCCTA 95X/96X/97X and Wheels 70X
San Jose-Los Gatos-Santa Cruz	15 min	30 min	Highway 17 Express - Add stop in Los Gatos
Vallejo Transit Center – Benicia – Walnut Creek BART	15 min	30 min	SolTrans Yellow Line
San Rafael-San Francisco	15 min	15 min	Golden Gate Transit 30 & 70 buses
New Routes			
Petaluma-Sonoma-Napa	15 min	30 min	
Napa-Fairfield	15 min	30 min	
Vallejo-Novato	30 min	30 min	
San Rafael-19 th Ave-Daly City BART	15 min	30 min	

5. Extend BART's reach through Diesel Multiple Unit Technology

On May 26, 2018, BART opened its extension from Pittsburg/Bay Point to Antioch using Diesel Multiple Unit (DMU) trains to connect to conventional BART heavy rail trains.

The \$525 million project, known as eBART, was 60% less expensive than conventional BART. Shorter trains, simpler stations and non-electrification made it financially feasible to extend rapid rail transit to lower-density areas. It provides a model for additional rail extensions to outlying areas that would not otherwise be able to support traditional BART.



Figure 9: eBART. BART's new Diesel Multiple Unit (DMU) trains to Antioch has enabled rapid transit to extend to Bay Area exurbs at a more affordable cost than traditional BART technology. A timed cross-platform transfer makes it easy to connect to the rest of the BART system.

a. Extend eBART from Antioch to Brentwood

Since 1990, the population of Brentwood has exploded eight-fold from 7,563 to 60,532. Unfortunately, much of this development has been sprawling and low-density. By extending eBART from Antioch to Brentwood along an existing Union Pacific right-of-way, there is the potential to not only slow the growth of vehicle trips but also promote densification around stations.

b. Connect Dublin/Pleasanton BART to Stockton

While ACE provides limited commuter service between Stockton, Tracy, Livermore, and San Jose, there is no connection to BART, making travel to San Francisco difficult and contributing to congestion on the I-580 corridor. This plan recommends adopting the

proposal formed by the Tri-Valley - San Joaquin Valley Regional Rail Authority to connect BART to the Central Valley, with the exception of an alignment that travels through Downtown Livermore instead of the Interstate 580 median in order to support walkable communities and transit-oriented development. Over the Altamont Pass, the route would utilize abandoned Southern Pacific tracks now owned by Alameda County.

6. Increase Ferry Service

As discussed in the Existing Conditions section, the Bay Area's ferry system faces major constraints. Perhaps the most significant are environmental and geographical. Aside from Downtown San Francisco, existing and potential docking locations are not located within walking distance of major regional destinations.

A possible exception is the part of Downtown Oakland nearest to Jack London Square. While ferries can supplement BART, it is difficult for them to compete directly with the more frequent, more extensive and less expensive BART system which also has stations closer to the heart of Downtown Oakland.

Some existing ferry routes offer significant competitive advantages over other forms of transportation. For example:

- The Larkspur Ferry can take as little as 30 minutes, or half the time compared to crossing the Golden Gate Bridge. In addition, the SMART rail connection to Larkspur opens in 2019, although the 1/3 mile distance between the rail station and ferry may limit ridership growth.
- The Sausalito Ferry serves a popular tourist destination with limited parking and walkable residential neighborhoods. Taking a direct route across the bay, it is also faster than a circuitous trip on the Golden Gate Bridge.
- The Vallejo Ferry bypasses congestion along Interstate 80 and the Bay Bridge.

While this plan does not foresee major additions to the ferry route network, it does recommend increased ferry hours of operation on existing routes.

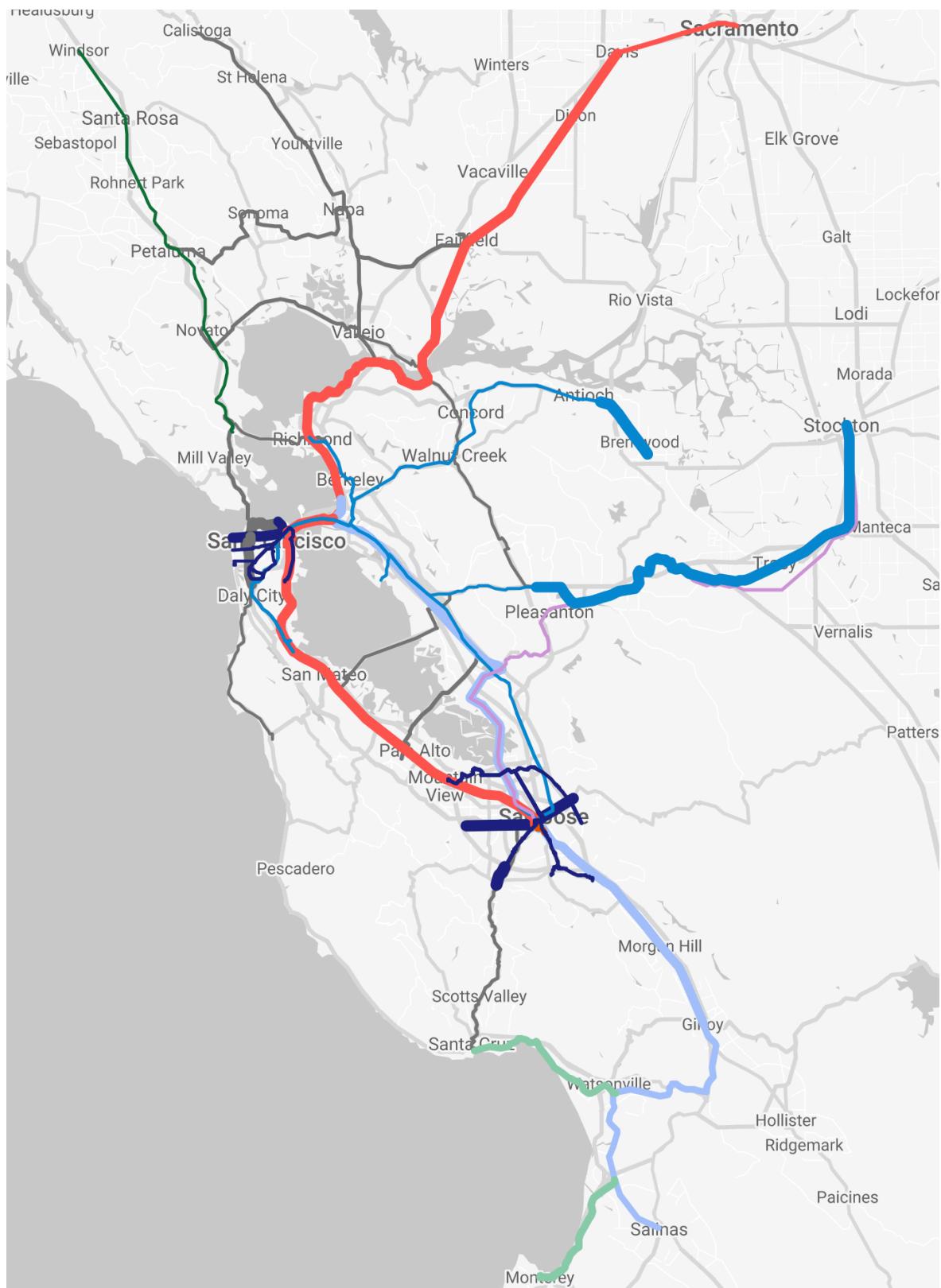


Figure 10: Regional Rail and Bus Map, 2050 (entire region and surrounding counties)
(Thicker lines indicate new or improved regional rail, light rail or bus rapid transit lines)

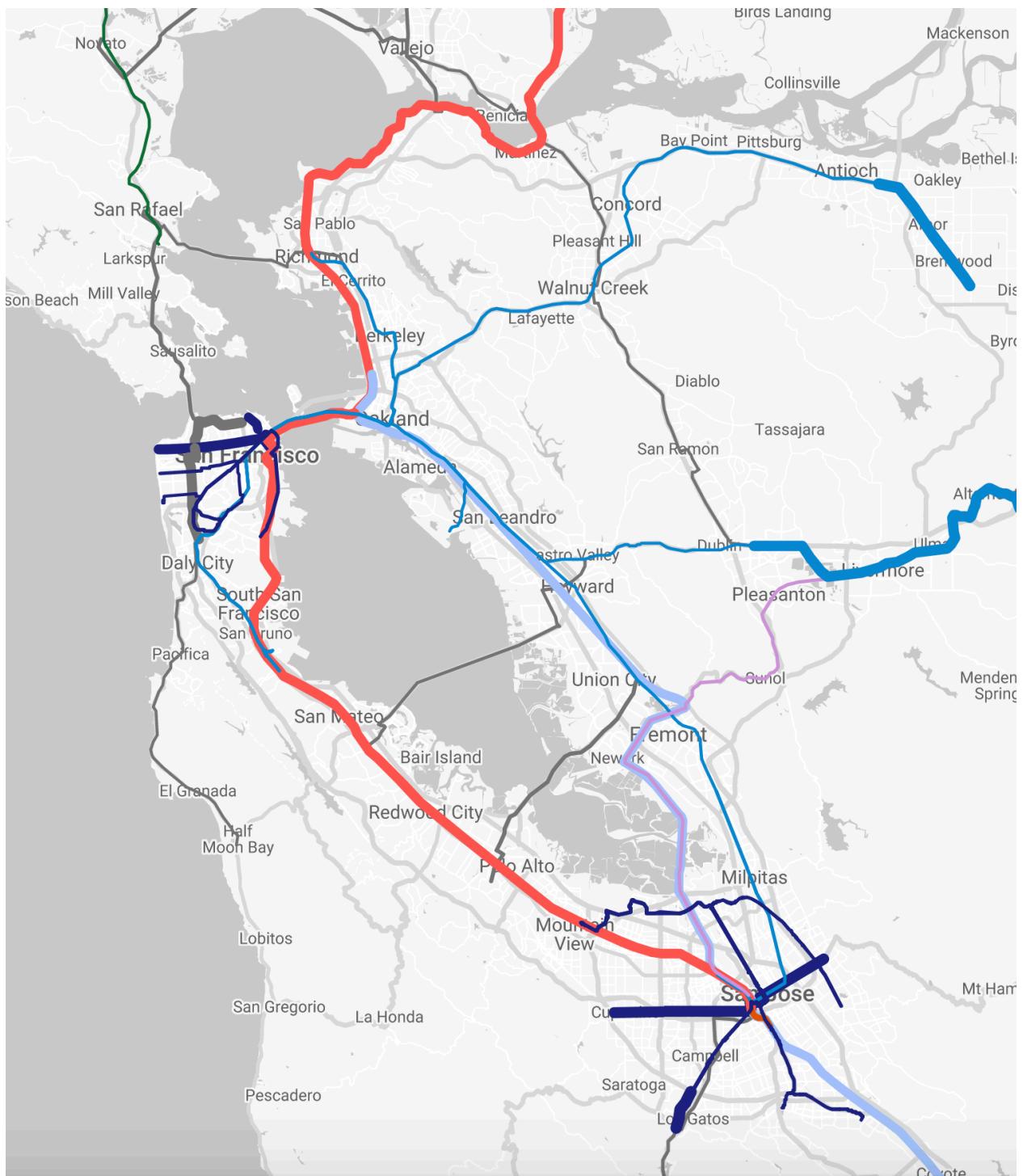


Figure 11: Regional Rail and Bus Map, 2050 (inner Bay Area region) (Thicker lines indicate new or improved regional rail, light rail or bus rapid transit lines)

VIII. Improving Local Transit

Though long-distance regional trips are a vital market for transit, shorter local trips are at least as an important component of the total transportation picture. According to the U.S. Census Bureau, 65 percent of Bay Area workers hold jobs in the same county in which they live. Moreover, certain types of trips such as going to the grocery store or to middle or high school are almost entirely local. Additionally, first/last-mile connections to regional rapid transit stations and ferries also rely on a robust local transit network.

1. Increase Service Levels

As the SFMTA found in its 2017 study, people are generally willing to wait up to 15 minutes when arriving for transit randomly at a stop without any real-time information. Any longer and there is a significant drop-off in potential ridership. The 30-to-60 minute headway found in many Bay Area communities fails to attract much ridership from customers with other transportation options; therefore, a critical mass of ridership never develops to justify service improvements. In contrast, a 15-minute base headway is generally sufficient to enable a transit system to start to realize latent demand. The resulting ridership gains can then motivate transit agencies to further boost service frequency due to the positive feedback loop of increased service and ridership.

a. Increasing Accessibility to Frequent Service

Currently, frequent service (15 minutes or better throughout daytime hours, 7 days per week) is relegated primarily to San Francisco, the inner East Bay around Oakland and Berkeley, and the Santa Clara Valley. The plan would increase the percentage of Bay Area residents within a 1/3 mile walk of a frequent service bus or rail route – from an estimated 15% today to 50%. It would concentrate in parts of the region with the highest ridership potential, but where service is currently inadequate.

Though the region should strive for a much higher number if it can secure the operating funding, an increase to 50% would nevertheless make transit significantly more attractive to an additional 3.7 million people and could boost ridership dramatically.

Table 7: Frequent Service, Current (2016) vs. Future (2050)

County	2016			2050		
	Population	Estimated Frequent Service Access (within 1/3 mile)		Population	Frequent Service Access Goal (within 1/3 mile)	
		Percentage	Population		Percentage	Population
Alameda	1,653,236	15%	247,985	2,117,320	60%	1,270,392
Contra Costa	1,138,645	2%	22,773	1,473,799	35%	515,830
Marin	261,532	5%	13,077	288,827	40%	115,531
Napa	141,649	0%	0	174,511	20%	34,902
San Francisco	876,103	80%	700,882	1,055,715	95%	1,002,929
San Mateo	769,561	5%	38,478	939,734	50%	469,867
Santa Clara	1,931,575	7%	135,210	2,486,815	50%	1,243,408
Solano	440,318	0%	0	578,847	20%	115,769
Sonoma	503,833	0%	0	563,027	20%	112,605
9-County Bay Area Total	7,716,452	15%	1,158,406	9,678,595	50%	4,881,233

b. Improving Evening, Night and Weekend Local Service

Mirroring nationwide trends, travel demand has increased outside of traditional peak hours. Many jobs, particularly in the retail, service and tourist sectors, require employees to work during evenings and on weekends. In addition, there is growing demand for recreational and entertainment travel at nights and on weekends, as evidenced by growing traffic congestion in places like the Bay Bridge, Muir Woods, Hayes Valley, the Mission District and other hotspots.

In many parts of the Bay Area, there is no service after 7 pm on weekdays, or at all on Saturdays or Sundays. Without transit, people without any other affordable or viable transportation options may be stranded in their homes for days at a time.

This plan would improve evening, night and weekend service throughout the region, with a particular emphasis in places with severe deficiencies, such as:

- Fairfield – add evening and Sunday service
- Santa Rosa – add evening service
- Santa Clara Valley – extend evening service beyond 9 pm on core routes; add weekend service on currently unserved routes
- San Mateo County – extend evening service on community routes
- Central Contra Costa County – expand weekend service coverage
- Western Contra Costa County – add evening and weekend service
- Vallejo – add evening and Sunday service
- Napa – add evening and Sunday service

c. Reduce Overcrowding

The plan would also devote additional resources to existing frequent service routes that are currently experiencing overcrowding, resulting in people are unable to board because vehicles are too full.

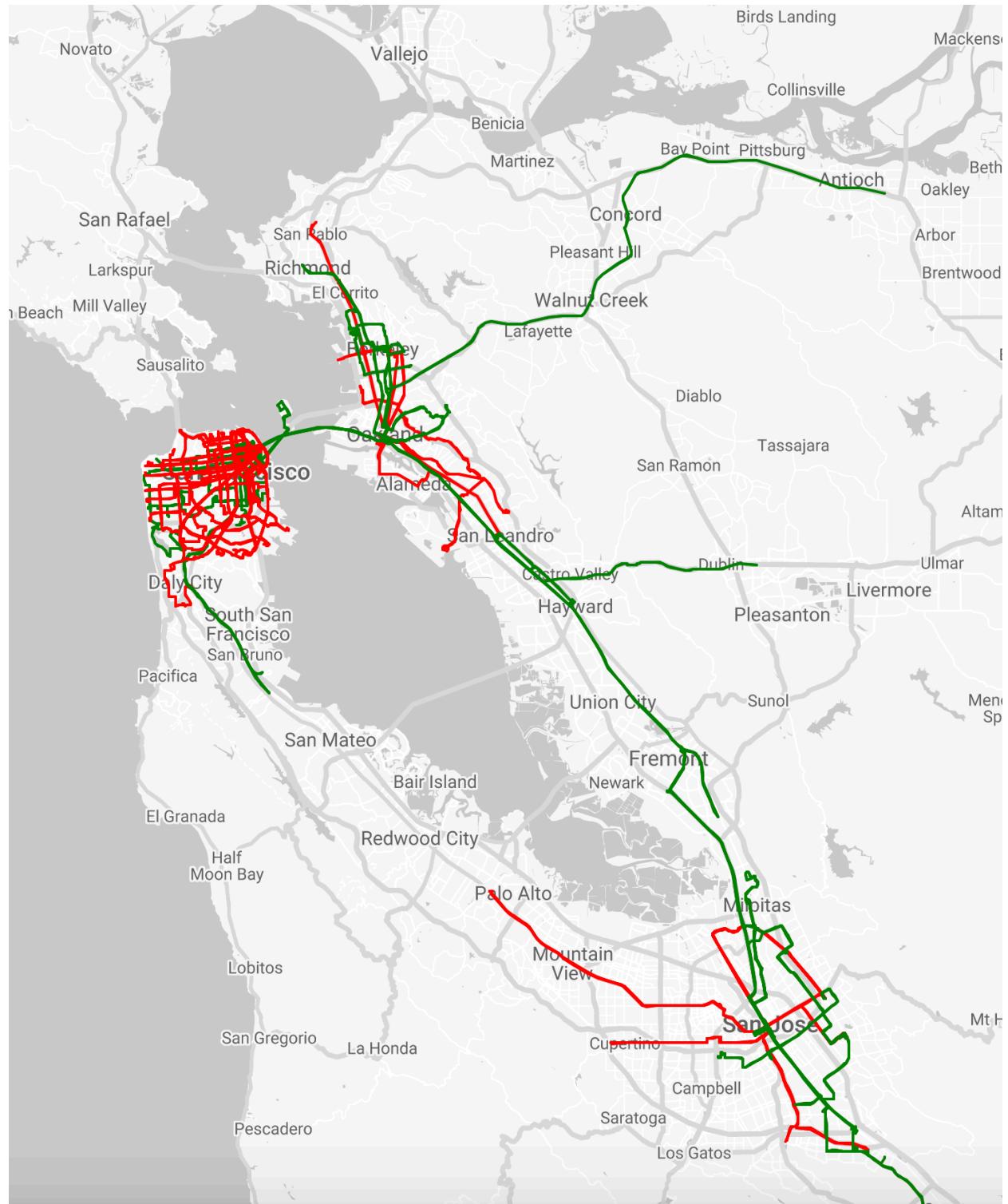


Figure 12: Existing Transit Service Frequency (red = 15 minutes or better daily; green = 20 minutes or better daily)

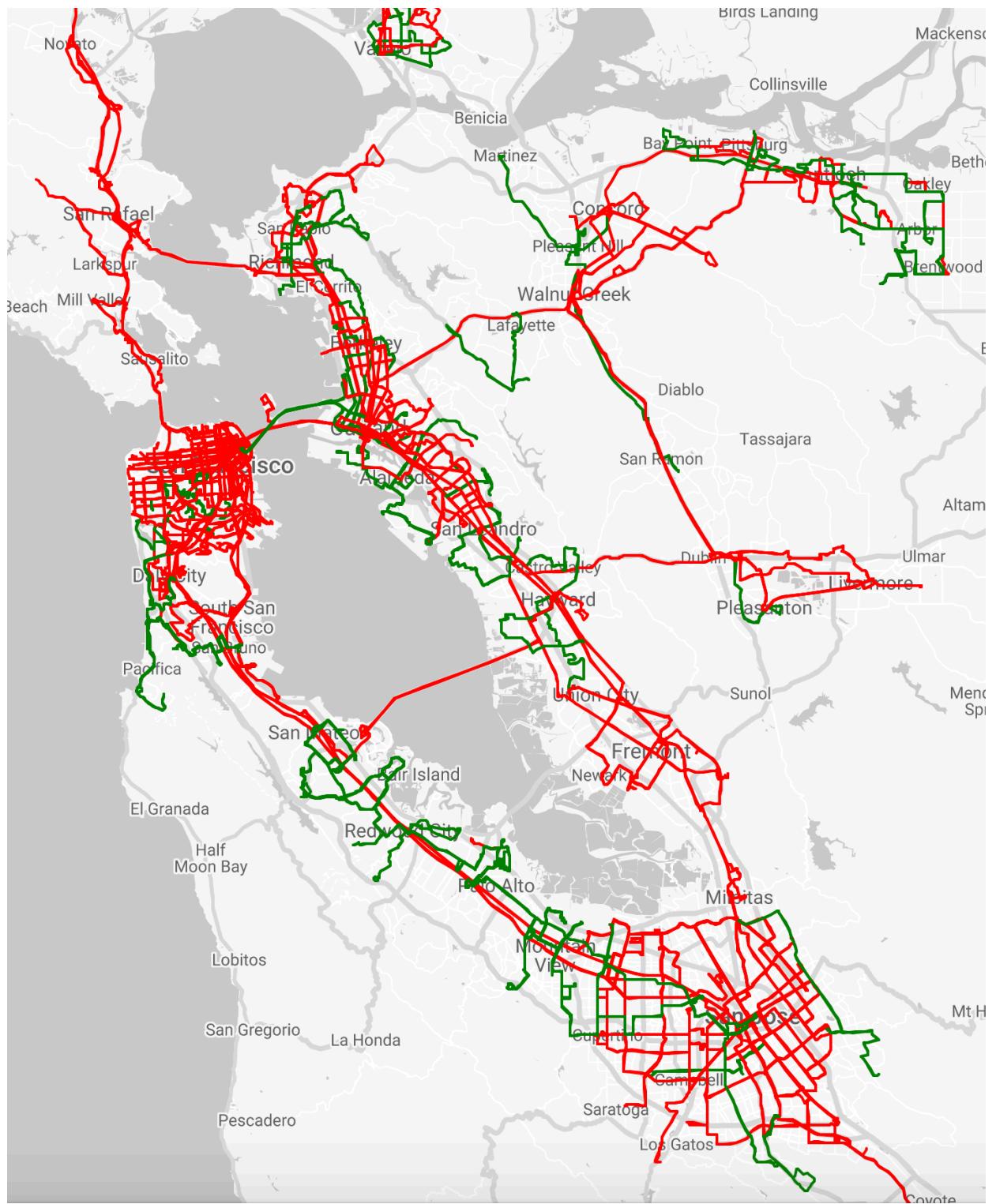


Figure 13: Proposed 2050 Transit Service Frequency (red = 15 minutes or better daily; green = 20 minutes or better daily)

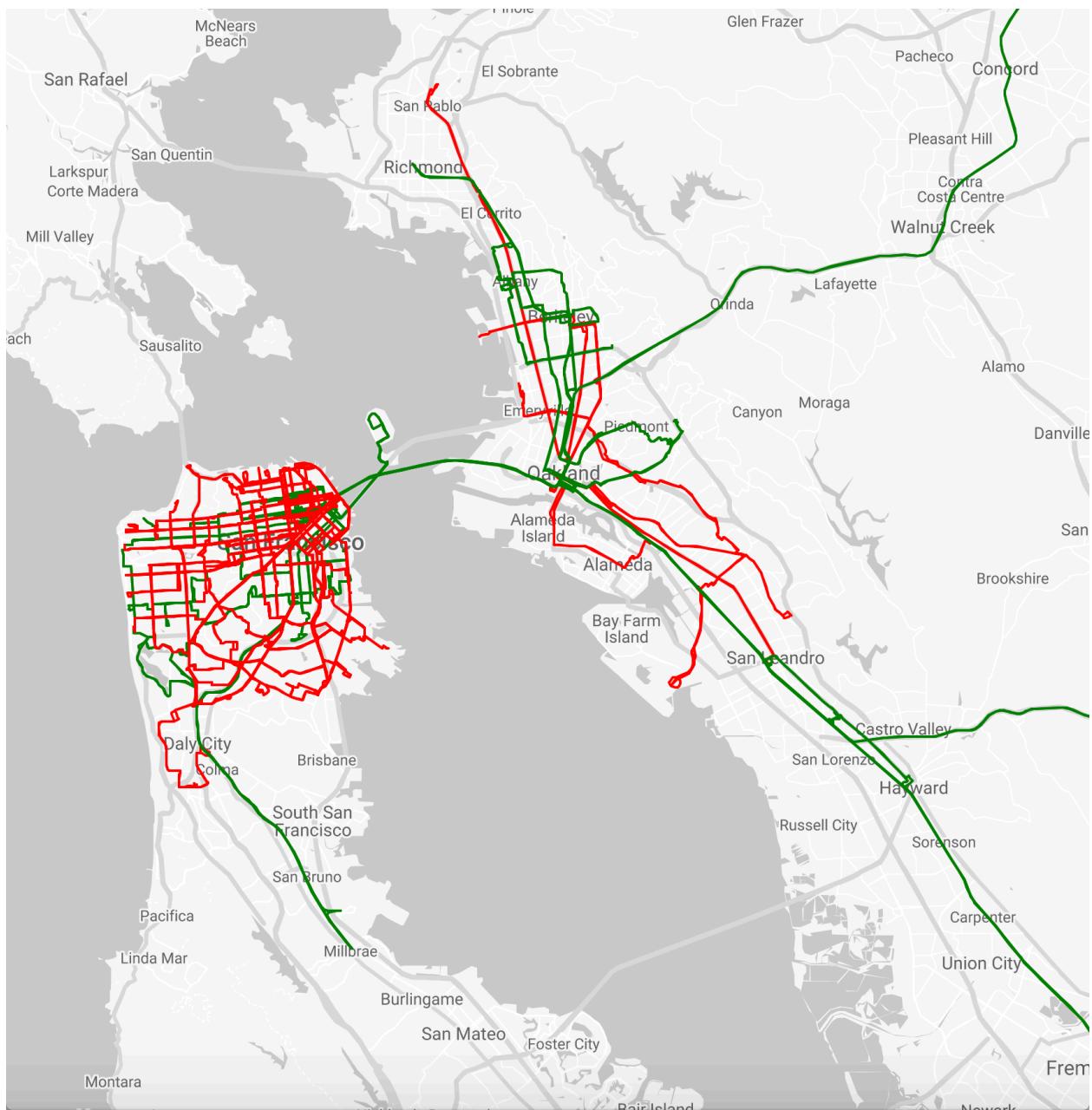


Figure 14: Existing Transit Service Frequency, Central Bay Area (red = 15 minutes or better daily; green = 20 minutes or better daily)

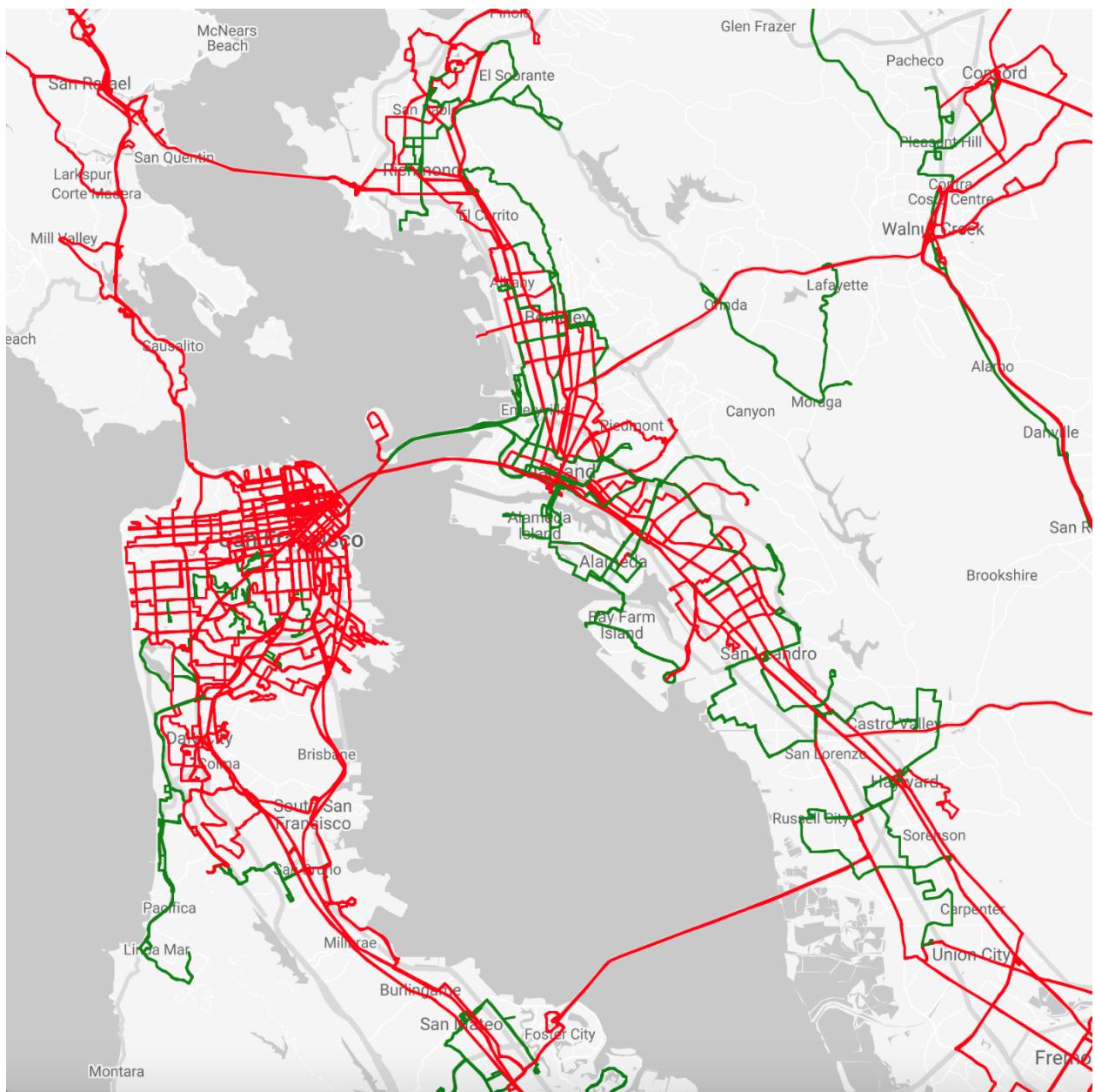


Figure 15: Proposed 2050 Transit Service Frequency, Central Bay Area (red = 15 minutes or better daily; green = 20 minutes or better daily)

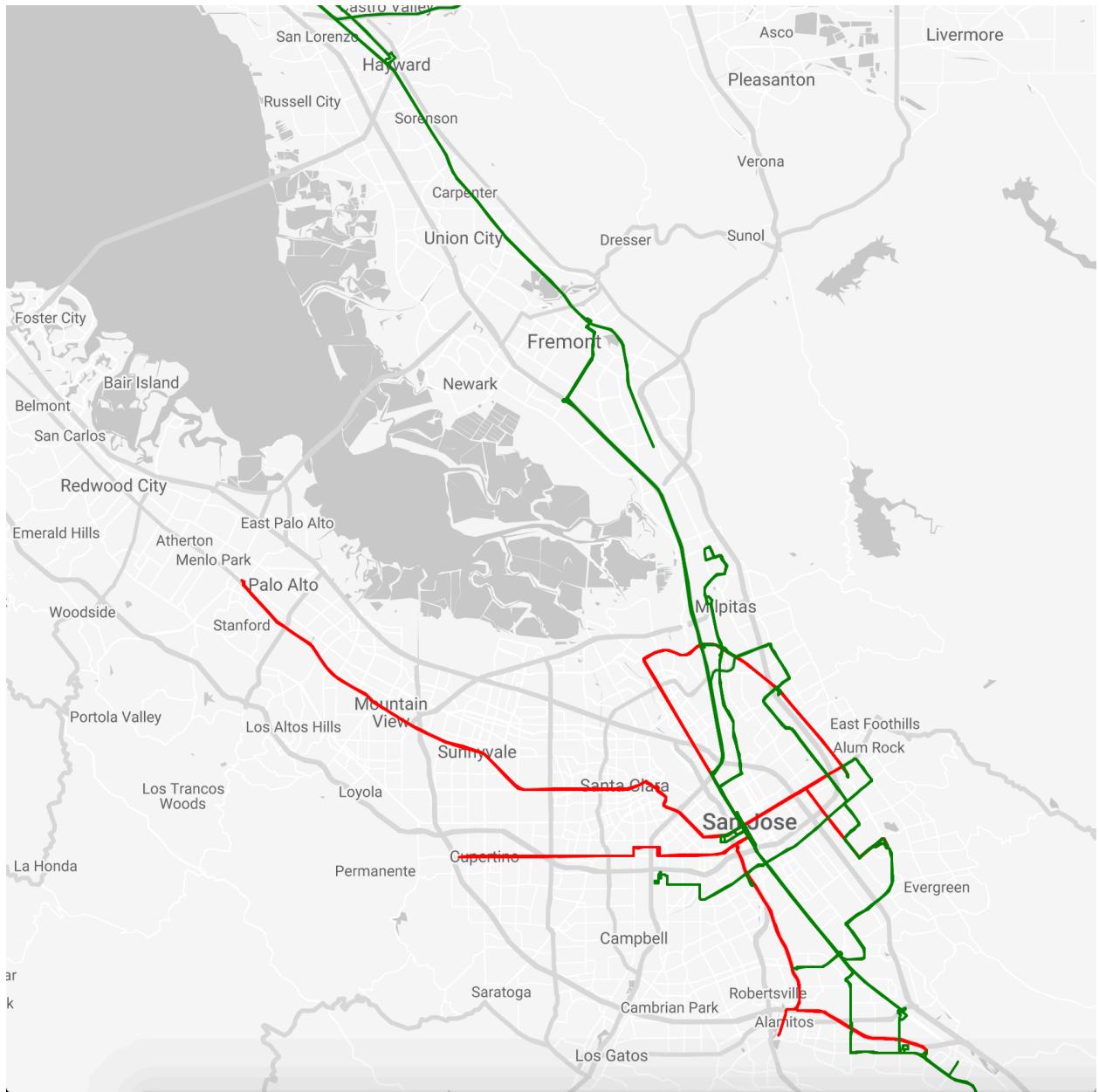


Figure 16: Existing Transit Service Frequency, South Bay (red = 15 minutes or better daily; green = 20 minutes or better daily)

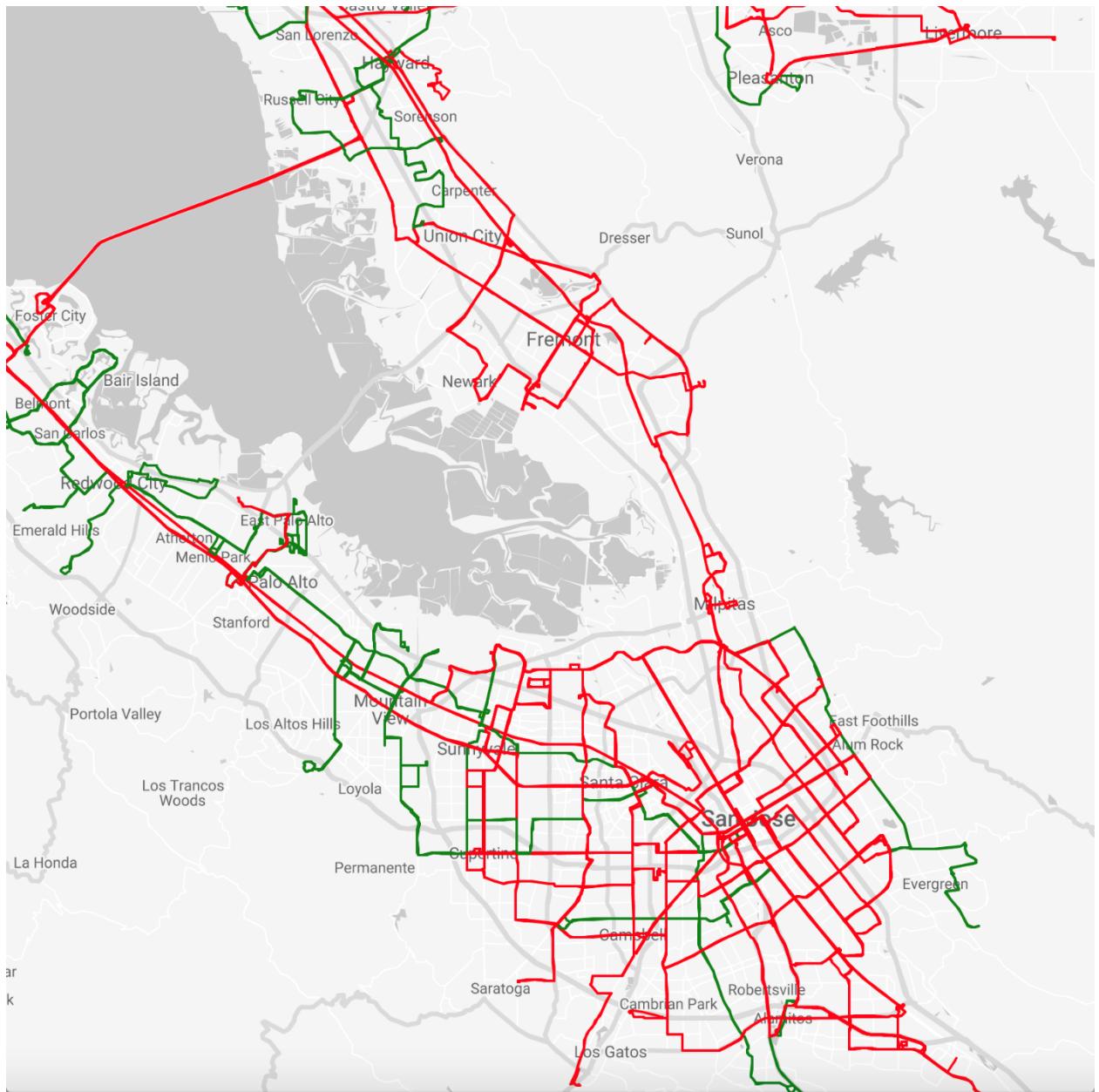


Figure 17: Proposed 2050 Transit Service Frequency, South Bay (red = 15 minutes or better daily; green = 20 minutes or better daily)

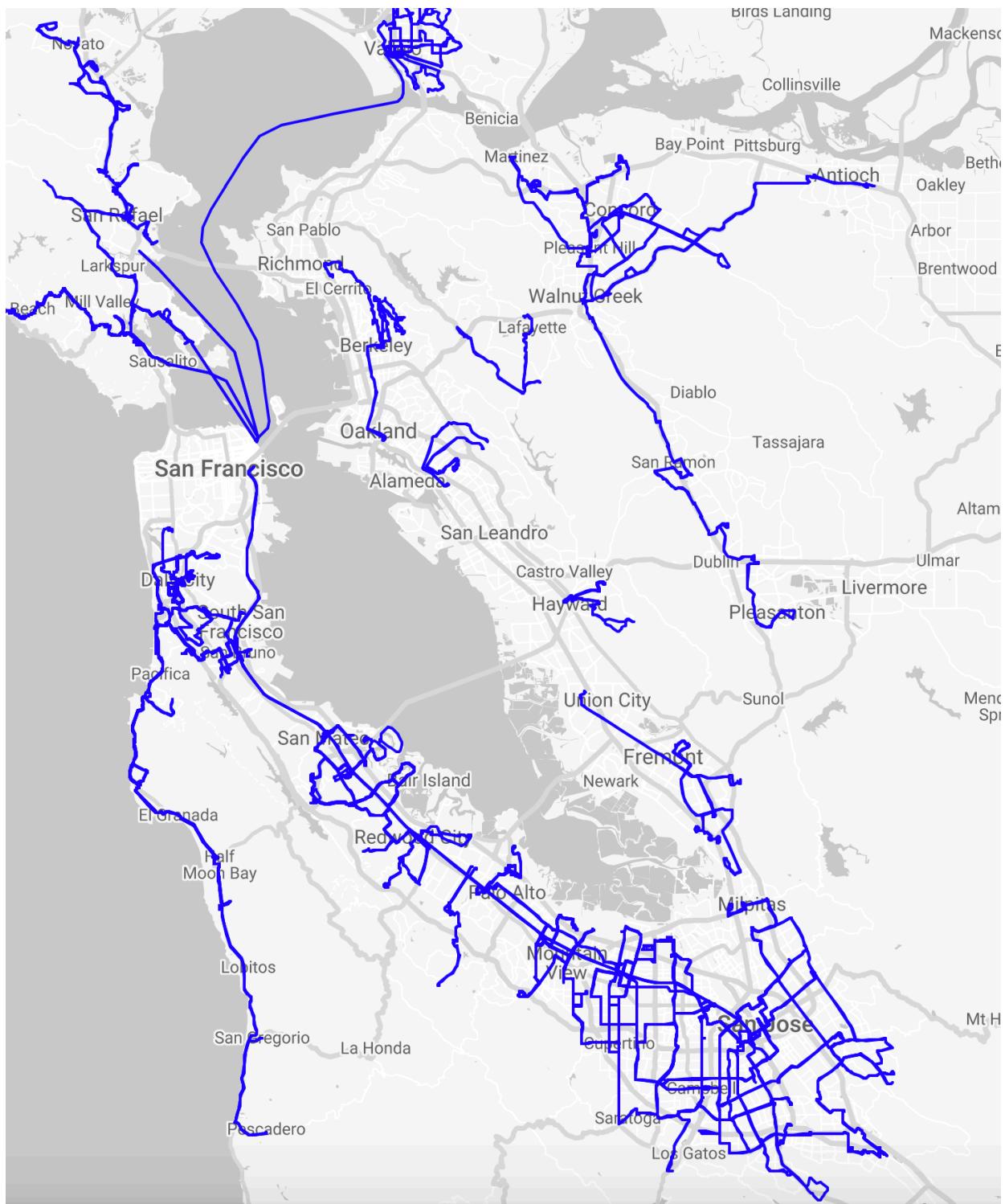


Figure 18: Proposed Routes with Improved Evening, Night and Weekend service

d. A Focus on Communities of Concern

Though all parts of the Bay Area would benefit from improved service levels, there would be a special focus on “Communities of Concern”. These communities are home to disadvantaged or vulnerable populations, including the working class and people of color, both currently and in the future due to potential displacement.

While many of these communities are close to job opportunities in the region’s core, many are not – especially those to where recently-displaced people have relocated due to gentrification. Some of these communities of concern are exurbs and first-generation postwar suburbs. While the spatial geography of these communities has not traditionally been conducive to transit, these areas are projected become denser and support more mixed-use and multi-family housing by 2050.

Having to own, operate and maintain cars places an additional financial burden on households. For this reason, this plan prioritizes improving transit frequency and span of service to these Communities of Concern. Examples of communities that would receive increased bus service include:

- Alameda County: North Oakland, West Oakland, East Oakland, Hayward
- Contra Costa County: Richmond, San Pablo, Concord, Antioch
- Marin County: San Rafael
- San Francisco: Excelsior, Visitacion Valley, Bayview/Hunters Point, Treasure Island
- San Mateo County: East Palo Alto, Redwood City
- Santa Clara County: Central San Jose, East San Jose, South San Jose
- Solano County: Vallejo
- Sonoma County: Santa Rosa

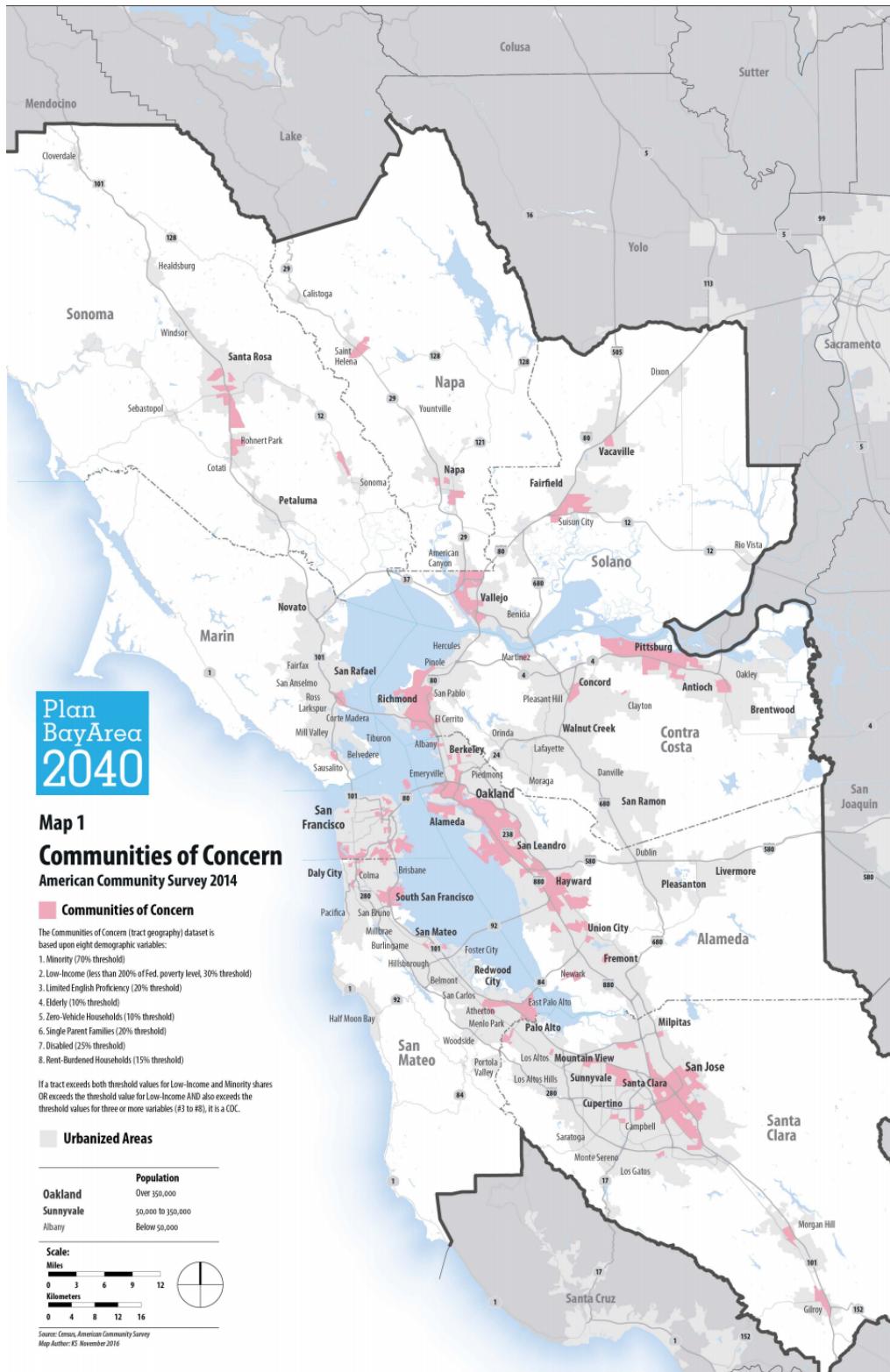


Figure 19: Bay Area Communities of Concern (Source: Plan Bay Area 2040 Final Supplemental Report, Metropolitan Transportation Commission)

2. Speed Up Surface Transit

As noted in the Existing Conditions section, surface transit – particularly buses – has slowed appreciably during the last 25 years. In some cases, scheduled travel times for line-haul buses are 25% to 55% longer than in the early 1990s. In San Francisco, Muni currently averages 8 miles per hour.

It is simply not enough to increase service if those additional resources become stuck in traffic. The result would then be higher operating costs without an appreciable increase in service frequency. To utilize resources most effectively, the plan also includes the following regionwide initiatives:

a. Transit Signal Priority (TSP)

TSP speeds up travel times by increasing the likelihood that transit vehicles will receive a green light at an intersection. As a bus or light rail train approaches an intersection, sensors mounted on top of the vehicle use GPS to communicate with the traffic signal. Based on the vehicle location and the current status of the traffic signal, the TSP decides to either hold the green light to allow the bus to get through, or shorten the length of a red light to reduce waiting time. When activated for pre-emption or TSP, the signal at the intersection will change the signal lengths for cross traffic and pedestrians, while still allowing pedestrians to finish crossing the street safely.

In San Francisco, where the SFMTA is undertaking a citywide program, TSP has resulted in faster transit service. For example, the SFMTA has realized a four-to-five minute improvement (10 percent) along the Mission Street corridor.

This plan would prioritize TSP for all frequent service and regional bus and light rail routes. TSP has the potential to improve service reliability and reduce vehicle requirements, which transit agencies could then reinvest into service on other parts of the network or to reduce overcrowding.

b. Exclusive Transit Lanes

Wherever space permits, the region should pursue exclusive transit lanes to enable surface buses and light rail to bypass congestion. In some cases, these lanes would travel along an entire corridor provided that transit comes every few minutes. In other cases, an exclusive transit lane might simply be a queue jumper at an intersection, which would allow a bus to bypass a long line of cars before merging back into general traffic.



Figure 20: Exclusive Transit Lanes. Exclusive Transit Lanes enable transit to bypass traffic congestion. (Source: Red Transit Lanes Final Evaluation Report)

c. All-Door Boarding

On July 1, 2012, the SFMTA became the first multimodal transit operator in North America to implement All-Door Boarding systemwide. Expanding a policy already applicable to light rail vehicles, the SFMTA began permitting customers with valid proof-of-payment to enter through any door of Muni buses and streetcars with fare enforcement conducted by Transit Fare Inspectors. The SFMTA found that the policy has contributed to shorter stops, slightly faster trips during a period of rapid growth in San Francisco, and improved fare compliance.

A single customer taking an extra five seconds to board through the front door instead of through the rear door could mean the difference between making or missing a traffic signal, and an additional 30 to 90 seconds of delay. Multiplied over dozens of stops, this incremental savings can translate into five or ten minutes over an entire route.

While the volumes of bus boardings in San Francisco are higher on average than the rest of the Bay Area, there are routes in other areas where All-Door Boarding could make financial sense and result in potential resource savings from faster travel times. Examples include major AC Transit bus routes along arterials in Oakland and Berkeley, or the El Camino Real corridor in San Mateo and Santa Clara Counties.



Figure 21: All-Door Boarding. As the first multimodal transit operator in North America to implement All-Door Boarding systemwide, the SFMTA has benefitted from faster boarding and shorter travel times.

3. Expand Light Rail

In the Bay Area, a few key corridors currently served by buses offer the ridership, densities and mixed-use development to support local light rail transit service. Although they may be significant startup costs, light rail transit offers major benefits:

- Increased capacity and labor productivity – The ability to couple individual light rail vehicles into two-, three- or even four-car trains increases the overall passenger capacity of a corridor.
- Ability to operate in different environments – The light rail systems in San Francisco and San Jose operate in a variety of different environments, including on city streets, on surface rights-of-way, in subways and in highway medians. These trains operate quietly and seamlessly in pedestrian corridors, and have the ability to encourage transit-oriented development.

The following are examples of major bus corridors in the Bay Area that would warrant light rail service.

a. Geary Blvd. (San Francisco)

Serving nearly 60,000 passengers daily, the 38 Geary/38R Geary Rapid and accompanying 38AX and 38BX express buses traverse the northern half of San Francisco, connecting the Richmond, Western Addition, Tenderloin, Union Square, the Financial District, and the Salesforce Transit Center. While the SFMTA has many improvements to this route in recent years, including red carpet lanes, transit signal priority, all-door boarding, and express buses, travel times and reliability continue to be constrained by the congestion and physical limitations of the section east of Van Ness, which travels through Union Square and on Market St.

Move Bay Area proposes a new light rail line to provide faster, more efficient service along Geary Blvd. The current ridership of 60,000 justifies this major investment; it is

far above any of Muni's other light rail routes and for the typical light rail line in the United States. Trains would operate in an exclusive right-of-way along the entire corridor, portions of which may be underground depending on technical feasibility. Given the Geary corridor's high ridership, operating three- or four-car Muni Metro light rail trains would not only increase the overall capacity of the Geary corridor but also potentially save on operating costs. Each train could carry as many as 4 times the number of people as an articulated bus, resulting in savings that the SFMTA could reallocate to improve service elsewhere in the system.

b. Central Subway Extension (San Francisco)

Scheduled for opening in 2019, the Central Subway will extend light rail service from the 4th & King Caltrain station to Chinatown through some of San Francisco's most congested streets. This plan endorses the SFMTA's effort to extend the Central Subway further north to North Beach and Fisherman's Wharf.

c. Cross Valley Corridor (Santa Clara Valley)

The Cross Valley Corridor traverses an economically and culturally diverse segment of the Santa Clara Valley. Starting in East San Jose, it proceeds west along Alum Rock Ave. to Downtown San Jose, where it continues on San Carlos Ave. and Stevens Creek Blvd. to Santa Clara and Cupertino. This corridor is one of the busiest in the VTA system, served by bus routes 23 and 323 and portions of routes 22 and 522, for a current combined ridership of more than 20,000 every weekday.

VTA has already implemented BRT-priority treatments along Alum Rock Ave., serving a dense area with high transit ridership currently classified as a Community of Concern. West of Downtown San Jose, auto dealerships and used car lots now buffer portions of the proposed alignment. However, the area is rapidly densifying and is adjacent to the Santa Clara Valley's largest shopping center, a hospital, a community college, offices and other trip generators.

d. Santa Clara Valley Light Rail Extensions

In the Santa Clara Valley, VTA's large light rail network stops only a few miles short of key destinations. With BART's upcoming arrival in Milpitas, and the future extension to Downtown San Jose, the light rail system will benefit from connecting to the broader regional rail network. This plan would include at least one relatively short extensions to improve transit connectivity:

- Winchester to Los Gatos – Extend the Vasona light rail line from the planned terminal at Highway 85/Winchester (under Plan Bay Area 2040) to Downtown Los Gatos, a pedestrian-friendly destination with limited parking and heavy congestion on parallel Highway 17



Figure 22 Santa Clara Valley Light Rail. BART will soon connect with the light rail system in Santa Clara County. A few key extensions would enhance the utility of the existing light rail network by reaching new destinations and connecting to more bus routes.

e. Other expansions

Over the next thirty years, there may be other opportunities for light rail. For example, bus rapid transit along International Blvd. in Oakland may prove so successful in terms of generating ridership as to warrant an upgrade to light rail.

4. Expand Bus Rapid Transit (BRT)

Recently, the region has undertaken several bus rapid transit projects with reserved rights-of-way and stations. These include Alum Rock Av. in East San Jose, International Blvd in Oakland, and Van Ness Av. and Geary Blvd. in San Francisco. While ridership on some of these bus rapid transit lines may justify light rail service over the next thirty years, others will remain more suitable for bus technology due to the street environment in which they operate.

a. 19th Ave/Park Presidio/Lombard BRT

One example of an opportunity to expand bus rapid transit is in San Francisco. The 28 19th Ave. Muni bus is a frequent route operating over Highway 1 through San Francisco's western neighborhoods. It provides a north-south connection from Daly City to BART to the Sunset and the Richmond, then proceeding to Van Ness via Lombard St. Mired by increasing congestion, travel times on the 28 from Daly City BART to the Golden Gate Bridge have increased by 33% since the early 1990s.

Bus Rapid Transit with exclusive transit lanes on 19th Avenue and Park Presidio Blvd. would not only improve local service on Line 28, but also allow for regional Golden Gate Transit connections between Daly City BART and the North Bay, as well as for potential

SamTrans connections from the Peninsula to the Sunset District or UCSF Parnassus areas.

Currently, virtually all Golden Gate Transit routes between San Francisco and the North Bay travel along Lombard Street. While the Van Ness BRT (now under construction) is expected to significantly improve regional trips between the North Bay and San Francisco, Lombard St. will continue to be a bottleneck both for local trips on Line 28 and for regional Golden Gate Transit trips. For this reason, the plan proposes to add BRT to Lombard St as well, as to form a seamless BRT corridor within San Francisco that will vastly improve both local and regional mobility.

IX. Rationalizing Fares

The Bay Area has more than two dozen transit operators. Under the leadership of the Metropolitan Transportation Commission, the region launched the Clipper® Card, an electronic smartcard that allowed one fare media to be used throughout Bay Area transit system.

However, each transit agency continues to maintain its own fare structure and policies. As discussed earlier, this results in a complicated regional fare “policy” and a hidden tax on riders for the inconvenience of having to depend on more than one transit system.

Recognizing the political challenges of attempting to institute a single regional fare or consolidating all transit agencies into one, the Move Bay Area plan would instead combine elements of successful fare integration involving multiple agencies, such as in Seattle and San Diego.

Detailed in Table 8, the proposed fare policy would preserve the ability for individual agencies to establish fares. However, it would institute a simple regional transfer policy with the following characteristics:

- Whether paying an individual single fare, a day or monthly pass using Clipper, riders would receive a local fare credit for inter-agency transfers
- Day and monthly passes would be valid for any and all transit agencies and transit modes within the nine-county region (some agencies currently do not offer passes, most notably BART and Golden Gate Transit)
- The price of the day and monthly pass would be capped at a regionally-determined multiplier of the single-ride price (e.g., the price of a day pass would be capped at twice the most expensive ride taken that day)

Confirming experiences in other cities, research conducted by the SFMTA in 2017 indicated that people who purchased passes were more likely to ride Muni than those who paid for each individual trip. This proposed fare policy would incentivize pass purchases for those who must ride more than one transit system, thereby encouraging ridership growth.

Table 8: Possible Regional Fare Structure

Fare Type	Local Service	Regional Service
Single Ride	<ul style="list-style-type: none"> • Flat fare determined by transit agency • Unlimited transfers to local services within and between agencies for 2 hours • Receives local fare credit when transferring to a more expensive service; difference paid through electronic cash value 	<ul style="list-style-type: none"> • Variable fare based on distance, determined by transit agency • Unlimited transfers to local services within and between agencies for 3 hours • Receives local fare credit when transferring to a more expensive service; difference paid through electronic cash value
Day Pass	<ul style="list-style-type: none"> • Passes interchangeable between transit agencies • Automatically capped at twice the most expensive trip taken that day 	
Monthly Pass	<ul style="list-style-type: none"> • Passes interchangeable between transit agencies • Available in different price increments based on a regionally-determined multiplier of the single ride fare • Receives credit up to the single-ride value of the pass when riding a more expensive service; difference paid through electronic cash value 	

X. Conclusion

The Bay Area is at a crossroads. Considered one of the world's most attractive regions, it is now beset by escalating housing costs, worsening traffic congestion and lengthy commutes. Although this region has invested in transit, it has also continued to support a car-based transportation system and related land uses. Over-relying on cars also fuels climate change, which has already devastated California with record heat, drought and wildfires.

By 2050, the region's population is projected to grow by 25% to 9.7 million. The situation will not improve on its own.

As the Bay Area looks to the future, it can either choose a sustainable path or not. Over the past decade, the region has jump-started many technology-based transportation innovations. On-demand ride-hailing through mobile apps, autonomous vehicles, the hyperloop and scooters are just some examples.

New technology is only part of the big picture. A technically-advanced vehicle must still fit within the context of the broader urban environment. What seemingly benefits an individual user can often be problematic from a systemwide perspective when considering the physical constraints of the street network. The region is starting to learn that these innovations are not necessarily a long-term, scalable solution from an economic, labor, traffic or land use perspective.

Though transit may not be the flashiest initiative, it is a tried-and-true solution that has grown along with the Bay Area for more than a hundred years and is the most space-efficient form of transportation. It is also inclusive and democratic, accommodating all people regardless of race, gender identity, income or physical ability. Perhaps there is a mutually-beneficial role for new forms of transportation to supplement – but not supplant – transit.

Move Bay Area is transformative because it finally starts to address what residents have long cited as barriers to adopting transit – infrequent, slow and unreliable transit service, overcrowding, lack of fare integration, and disconnected systems.

Three decades from now, people will look back to this time of great change and wonder if the Bay Area made the right decision to address its transportation crisis. Perhaps the region would have placed its bets on a technological, but fundamentally automobile-oriented approach – continuing to double down on land use choices that consume open space, preclude sustainable transportation and make it even more difficult to wean the region off cars.

Or, the Bay Area will have chosen the *Move Bay Area* approach. If implemented, *Move Bay Area* would dramatically improve public transit and increase ridership. Ultimately, this will help slow congestion growth, help mitigate climate change, ensure equitable access to jobs, schools and housing, and make the region more sustainable and livable.



Without transit, the Bay Area would cease to be one of the world's most vibrant economic and cultural centers