SFMTA | Municipal Transportation Agency

2010
SFMTA TRANSIT FLEET MANAGEMENT PLAN

Prepared by:

San Francisco Municipal Transportation Agency

Revised April 2011

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This report was produced by the SFMTA Sustainable Streets Division-Long Range Planning and Policy unit with key input from the Transit Operations, Finance and Capital Construction divisions.

For more information please contact Timothy Papandreou, Deputy Director of Long Range Planning & Policy at timothy.papandreou@sfmta.com or Darton Ito, Long Range & Capital Planning Manager at darton.ito@sfmta.com

I. Introduction

Introduction to the SFMTA

The San Francisco Municipal Transportation Agency (SFMTA) is the principal multi-modal agency responsible for planning, implementing and operating transportation services in the City and County of San Francisco. It is governed by a Board of Directors and is a business unit within the City and County of San Francisco. The SFMTA has the primary responsibility for the transportation system in San Francisco, providing the Agency with the unique ability to plan, design, construct, operate and manage (with key partnership from other agencies) the transit, paratransit, streets, bicycle, pedestrian, parking, traffic, taxi and commercial vehicle systems in San Francisco.

The SFMTA operates the oldest and largest transit system in the San Francisco Bay Area, transporting close to 43 percent of all transit passengers in the region. In addition, it is the seventh largest transit system in the nation, carrying more than 200 million passengers annually. The Agency's transit fleet is among the most diverse in the world, featuring:

- an historic collection of streetcars from the U.S. and around the world;
- modern light rail vehicles;
- bio-diesel and hybrid-electric bio-diesel buses;
- electric trolley coaches;
- the nation's only operating cable cars; and
- a range of paratransit services.

As part of its mission, the SFMTA strives to provide a convenient, reliable, accessible and safe transportation system that meets the needs of all transportation users within the City and County of San Francisco.

Purpose of the SFMTA Transit Fleet Management Plan

The 2010 SFMTA Transit Fleet Management Plan (Transit Fleet Plan) maps out a systematic approach to the ongoing management and planning for rehabilitation and replacement of the SFMTA's fleet of transit vehicles over the next 20 years. This Transit Fleet Plan anticipates changes in service delivery, vehicle demand, fleet composition, rehabilitation, replacement, and ridership, employing these factors to determine the number and mix of vehicles that the SFMTA needs to meet its peak transit demand. The Transit Fleet Plan guides the programming of funds from multiple sources for vehicle replacements and potential fleet expansions. Additionally, the Transit Fleet Plan demonstrates the SFMTA's focus to maintain the vehicle fleet needed to provide the level of service necessary to meet current and anticipated transit demand. It also ensures that sufficient managerial, mechanical and financial resources are coordinated to maintain and replace the vehicle fleet in such a manner as to adequately meet existing and future service demand levels.

This 2010 update of the Transit Fleet Plan incorporates projections showing increased housing and employment in San Francisco between now and 2030. The San Francisco County Transportation Authority (SFCTA) 2030 travel demand forecast estimates that in 20 years, the SFMTA will need to carry up to one million daily transit boardings, from the approximately 700,000 today. The Transit Fleet Plan translates this forecasted 46 percent increase in transit ridership into a service plan and associated vehicle demand projections. Additionally, the Transit Fleet Plan analyzes the SFMTA's maintenance float and describes how maintenance practices will evolve over time. Finally, this update begins to address some of the questions and issues that require ongoing study, such as transit facility needs.

Organization of the Transit Fleet Management Plan

The 2010 Transit Fleet Plan is divided into the following chapters:

Chapter 1: "Introduction" provides background information on the SFMTA as an organization, and providing the purpose and approach of this Transit Fleet Plan.

Chapter 2: "Current System Design" focuses on the SFMTA's existing transit system, providing important background and context. It also provides an overview of the Transit Effectiveness Project (TEP), the first system-wide analysis of the structure of transit services provided in San Francisco in over 25 years.

Chapter 3: "Preparing for Urban Growth" explains how peak vehicle demand numbers are projected through Fiscal Year 2029/2030 (FY 2030) based on the SFCTA's travel demand model estimates and optimized fleet assignments for the period leading up to 2030. Additional details include information on how interim year growth projections were determined.

Chapter 4: "Fleet Maintenance" details the SFMTA's sub-fleets of transit vehicles and explains the documented FY 2010 maintenance demand by activity (Preventive Maintenance, Major Overhaul/Heavy Repair and Campaigns) and maintenance plan needs by sub-fleet through FY 2030.

Chapter 5: "Future Fleet Requirements" explains how the SFMTA brings together its service demand and maintenance demand needs through FY 2030 to appropriately plan for vehicle expansion, and the distribution of some sub-fleets, in upcoming years. These changes will be coordinated with existing transit fleet replacement cycles.

Chapter 6: "Future Facility Needs" describes and quantifies the principal facility implications of this transit fleet plan.

Chapter 7: "Funding Plan" describes the principal capital costs of vehicle acquisitions and the operating funding for the maintenance program described.

II. Current System Design

While the SFMTA owns and operates a multi-modal fleet of transportation vehicles including transit, parking citation and non-revenue vehicles, this report focuses only on the transit fleet.

Transit Fleet Basics

The SFMTA operates five modes of transit service, as well as providing for a range of paratransit services. This includes motor coach, trolley coach, light rail, historic streetcar and cable car. Each mode is described further in the sections below.

Motor Coach Fleet

The SFMTA operates a fleet of 459 motor coaches, carrying nearly 280,000 passenger boardings on an average weekday,[1] or roughly 40 percent of the SFMTA's total passenger load. The motor coach fleet includes 30-foot small, 40-foot standard, and 60-foot articulated vehicles, as listed in Figure 1, below.

Figure 1: Active Motor Coach Fleet (June 2010)

Motor Coach Type	In Service Year	Manufacturer	Vehicles
Small (30ft)	2007	Orion	30
Standard (40ft)	1999	NABI	44
Standard (40ft)	2002-2003	Neoplan	205
Standard (40ft)	2006	Orion	56
Articulated (60ft)	2002-2003	Neoplan	124
Total			459

In addition to the revenue fleet, a reserve fleet of 47 motor coaches is maintained to provide substitution and supplemental service (see Appendix E). The reserve fleet is composed of 41, 1993 Gillig 40-foot standard motor coaches and 6, 1991 New Flyer 60-foot motor coaches.

Electric Trolley Coach Fleet

The SFMTA's 313 vehicle electric trolley coach fleet is the largest in North America, carrying over 227,000 passenger boardings each weekday, about one-third of the SFMTA's total passenger load. Electric Trolley coaches are zero-emission, rubber-tired vehicles, powered electrically through a pair of overhead wires above the street right-

[1] Boarding figures in this chapter are "Average Weekday Ridership" figures as reported for FY 2009 in the Statistical Summary of Bay Area Transit Operators: FYs 2005 through 2009, published by the MTC.

of-way. Trolley coaches operate with very little noise and perform effectively on grades far steeper than most rail vehicles can climb. The SFMTA operates a mix of 40-foot standard and 60-foot articulated coaches as shown in Figure 2, below.

Figure 2: Active Trolley Coach Fleet (June 2010)

Trolley Coach Type	In Service Year	Manufacturer	Vehicles
Standard (40ft)	2000	ETI	240
Articulated (60ft)	1992	New Flyer	40
Articulated (60ft)	2003	ETI	33
Total			313

The 1992 New Flyer 60-foot articulated trolley coaches are the oldest vehicles in the transit fleet. They have passed their 15 year Federal Transit Administration (FTA) useful life cycle, and of the 60 originally purchased, 20 have been retired, leaving 40 vehicles remaining in the fleet.

Light Rail Vehicle Fleet

The SFMTA's fleet of 151 Breda light rail vehicles (LRV), which entered service between 1997 and 2003, carry about 140,000 passenger boardings each weekday, or 23 percent of the SFMTA passenger load. LRVs are used in the operation of the six Muni Metro Lines (J, K, L, M, N and T). The vehicles operate in conditions which range from level boarding and exclusive right-of-way in the Muni Metro Subway and on some corridor segments, to high floor, mixed flow operation on a number of streets outside the core. LRVs provide an efficient, high capacity means of transporting large numbers of passengers.

Historic Streetcar Fleet

The historic streetcar fleet is a collection of electric rail vehicles used on the F Market & Wharves Line, carrying roughly 19,000 passenger boardings per weekday. These include Presidents' Conference Committee Cars (PCCs), "Milan cars" with a Peter Witt

design from Milan, Italy, and other vintage streetcars from the U.S. and around the world.

The SFMTA currently operates 24 historic streetcars in regular daily revenue service. This fleet is supported by additional vintage vehicles available for special and reserve service. The F Line has been extremely successful, and future additional service is planned for the E Embarcadero line. These are both factors in increased demand for additional cars.

Cable Car Fleet

Cable cars operate on three lines: Powell/Mason, Powell/Hyde, and California. Weekday passenger boardings on the three cable car lines total just over 20,000, or three percent of the SFMTA passenger load. The current fleet of cable cars includes 28 Powell type cars and 12 California type cars, for a total fleet of 40 vehicles.

Both types of cable car are composed of the same basic parts: trucks which combine with the propulsion system, and a frame and body constructed mostly of hardwood with steel bracing and side panels. Window frames, doors, and other details vary slightly. The major difference between the two types of cars is that California cars are larger and are double-ended, i.e., there are grip and brake controls at both ends of the car and the vehicle can be operated from either end. An inventory of the cable car is included as Appendix F.

System Operating Policies

Transit First Policy

Since 1973 the City and County of San Francisco's Transit First Policy has established principles by which the SFMTA manages, promotes and improves the transportation system. It prioritizes public transit, including taxis and vanpools, bicycling and walking as alternatives to travel by private automobile. Other key provisions directly impacting public transit include:

- Decisions regarding the use of limited public street and sidewalk space shall encourage the use of public rights of way by pedestrians, bicyclists, and public transit, and shall strive to reduce traffic and improve public health and safety.
- Transit priority improvements, such as designated transit lanes and streets and improved signalization, shall be made to expedite the movement of public transit vehicles (including taxis and vanpools) and to improve pedestrian safety.
- Parking policies for areas well served by public transit shall be designed to encourage travel by public transit and alternative transportation.

Existing Transit Service Guidelines

The SFMTA's transit service structure is based on a specific set of service design standards. The service guidelines shape decisions to determine the spacing of routes and lines throughout the City, the frequency of buses and streetcars, the spacing of stops along a route or line, and the average and maximum loads experienced by passengers on vehicles. The service guidelines also influence development of other programs that contribute to improved transit service. The guidelines consist of the following standards:

A. Facilitate multi-destination travel that allows most trips to be made with a maximum of one transfer.

B. All residential locations in San Francisco should be within approximately one-quarter mile of an SFMTA route or line.

C. Core service should operate at least 19 hours per day.

D. The SFMTA's transit policy headways represent the maximum amount of time allowed between arrivals for the various route and line types, as shown in Figure 3.

Figure 3: Policy Headways

	Peak	Base	Evening	Owl
Weekday Route and Line Type				
Radial	10	15	20	30
Express	10	--	--	--
Cross-town	15	15	20	30
Feeder	20	30	30	--
Weekend Route and Line Types		**Base**	**Evening**	**Owl**
Radial	NA	15	20	30
Cross-town	NA	20	30	30
Feeder	NA	30	30	--

E. Provide passenger stop spacing of approximately 800-1000 feet on motor coach and trolley coach routes, except where there are grades of over 10 percent; and stop spacing of 1000-1200 feet on LRV surface lines. For rapid and bus rapid transit, no specific stop spacing standards have been established; however, the SFMTA hopes to develop a common set of standards to support the implementation of the Transit Effectiveness Project.

F. Operate service such that the peak period passenger load factor does not exceed the service standard goal of no greater than 85 percent of planning capacity. The SFMTA's peak load factor standards are further detailed in the next section.

G. Construct appropriate transit guideways in major corridors to reduce transit travel time and increase capacity.

H. Provide increased capacity at equal or lower cost by substituting articulated trolley and motor coaches where loads and frequencies warrant. The assignment of transit vehicle types is described at the end of Section V.

I. Adjust service (without exceeding policy headways) on routes that continuously experience diminished ridership.

System Peak Vehicle Requirements

Peak Period Passenger Load Factor

Future fleet needs are based on travel demand modeling performed by the San Francisco County Transportation Authority (SFCTA), which currently outputs ridership based on three-hour peak periods. The SFCTA uses Peak Hour Factors to convert from the three-hour peak period to peak hour figures, currently using 44 percent for the a.m. peak period and 37 percent for the p.m. peak period. These factors are empirically derived, based on San Francisco travel patterns. The use of a 15-minute peak of the peak time period, as requested by FTA, is too precise for this planning level exercise.

The SFMTA has a peak period passenger load factor service standard goal of "no greater than 85 percent of combined seating and standing capacity." The SFMTA has established planning capacities (representing full buses, but not necessarily crush loads) that accommodate a reasonable number of standees and seated customers. However, in order to account for service variability and concentrations within the peak hour, an 85 percent standard is used. The planning-level maximum load per vehicle is multiplied by 85 percent to find the per-bus-load used to calculate the required headway and number of buses. Figure 4 indicates the load factor standards for Muni fleet vehicles. In addition, the 85 percent standard is a useful tool in the route evaluation process.

Figure 4: Load Factor Standards

Fleet	Representative Vehicle Planning Capacity	85% Load Standard
Motor Coach		
-Small (30')	45	38
-Standard (40')	63	54
-Articulated (60')	94	80
Trolley Coach		
-Standard (40')	63	54
-Articulated (60')	94	80
Light Rail Vehicle	119	101
Historic Streetcar	70	60
Cable Car	63	54

Current Peak Vehicle Demand

The number of revenue vehicles needed to provide daily service is expressed as the peak (regular service) vehicle demand. Peak vehicle demand is defined as the largest number of vehicles required to be on the streets at any single moment of a day. Passenger loads are measured at the maximum load points on each route and line in the peak travel direction, in hourly increments, to determine appropriate headway and fleet requirements.

Vehicle demand figures for the three most recent service signups in May 2009, December 2009 and May 2010 are presented in Figure 5 below. The 2009 Transit Fleet Management Plan was based on peak demand for May 2009. This information is supplemented by fleet requirements to reflect December 2009 and May 2010 service modifications, which were implemented under severe economic conditions. The SFMTA restored 60 percent of the May 2010 reduction in September 2010, and plans to restore the balance as early as 2011.

Figure 5: Peak Vehicle Demands

Vehicle Type	May 2009	Dec. 2009	May 2010
Motor Coach 30’	20	18	13
Motor Coach 40’	259	259	265
Motor Coach 60’	101	97	99
Trolley Coach 40’	183	172	153
Trolley Coach 60’	58	54	45
Light Rail Vehicle	119	119	109
Cable Car	27	27	27
Historic Streetcar	20	20	20
Total	787	766	731

Transit Effectiveness Project

The Transit Effectiveness Project (TEP), approved in 2008, is an effort by the SFMTA and City partners to comprehensively review and evaluate the SFMTA’s transit system. The study was designed to strengthen the Agency’s transit system’s ability to respond to current travel needs, provide a blueprint for future service, apply best practices to service delivery and promote the system’s long-term financial stability and operational viability.

The TEP process prioritized transparency and sought a balance between rigorous technical analysis, extensive stakeholder input and in-depth research of best practices from other transit systems. TEP objectives included:

- Making the SFMTA transit service more reliable, convenient and attractive to its customers;
- Contributing to the SFMTA's long-term financial stability; and
- Developing a five-year roadmap to transform the Agency’s transit service and better meet customer and employee needs.

Over the course of two years, the project team gathered an unprecedented level of ridership data, studied best practices from other transit systems and conducted extensive stakeholder outreach. As a result of this work, the following three key initiatives emerged that aim to transform the Agency's transit system so customers can get where they want to go more quickly, reliably and safely:

Transit Reliability Initiatives. The SFMTA's transit service reliability challenges require a variety of solutions to meet customer demands. The first focus of the TEP is to build customer confidence by making existing service more predictable before implementing proposed route and line changes.

Route and Line Updates. The TEP project team developed a comprehensive package of draft route and line change proposals to get people where they want to go, when they want to get there. These proposals are based on a service policy framework that establishes four route categories. The highest level of investment would go into the "Rapid Network," which the majority of the SFMTA's transit customers use regularly. The other three categories are the "Local Network," "Community Connectors," and "Specialized Services".

Travel Time Improvement Initiatives. Reducing transit travel times would make service more attractive to the SFMTA's transit customers and would generate operational savings that could be reinvested into more service on the highest-demand routes and lines. Over time, such improvements would also minimize the need for fleet expansion by enabling the SFMTA to accommodate some service increases without additional vehicles. Unnecessary travel delays can be reduced through strategies such as transit-only lanes, transit signal priority, bus stop consolidation on high-ridership routes and lines, and quicker boarding of passengers through level boarding, proof of payment and other techniques.

On October 21, 2008, the TEP reached an important milestone when the SFMTA Board of Directors voted unanimously to endorse the TEP recommendations for the purpose of initiating any required environmental assessment, and the implementation process is continuing to move forward. Further details regarding the TEP recommendations can be found at http://www.sfmta.com/cms/mtep/tepover.htm.

New Revenue Vehicle Type

The SFMTA has been requested on numerous occasions to use alternate vehicles to replace standard buses on lightly traveled routes to reduce noise and operating costs. Acknowledging that community feedback, the TEP has recommended adding a more neighborhood-friendly fleet of smaller vehicles designed to operate on lighter ridership routes and serve some of San Francisco's narrower neighborhood streets. Vehicle options that can accommodate approximately 20 to 25 passengers and prioritize low emissions and accessibility to all of the SFMTA's customers are being researched. These new vehicles are referred to as "Community Vans" throughout this document.

Towards a Zero Emission Fleet

While over half of the vehicles in the SFMTA's transit fleet are driven by electric propulsion, based on the City's 2004 Clean Air Plan, the SFMTA has embraced a long-term fleet procurement strategy focused on converting agency vehicles to electric drive. At this point, the SFMTA is committed to introducing hybrid buses to the system as a transition to zero emission vehicles. While the Agency is interested in fully exploring alternative technologies (e.g., fuel cell) that allow it to convert the entire bus fleet to zero-emission vehicles, it will continue to depend on hybrid vehicles in the interim. Alternative technologies have not yet been adequately developed to the point of ensuring that three key criteria are met: unit prices are acceptable, the new vehicles are reliable and performance is maintained. Initially, staff had hoped that alternative technologies would be available by 2018, when a new round of procurements is scheduled; however, until the three criteria are met, the SFMTA will continue to introduce hybrids to the fleet. This strategy has the advantage of promoting electric-based vehicles that could later be converted to fuel cell if and when there is a market to support it.

III. Preparing for Urban Growth

A significant feature of this Transit Fleet Plan update is a detailed analysis of growth in San Francisco and its expected impacts on ridership. The Transit Fleet Plan ties together valuable information from a number of official sources. The Association of Bay Area Governments (ABAG) is the Bay Area regional agency responsible for producing population, household, jobs, labor force, and income projections for the entire San Francisco Bay Area. Local agencies like the San Francisco Planning Department determine important details about where development should be encouraged. For determining projected service demand on the SFMTA's transit system, the use of SFCTA's travel demand model projections for FY 2030 has been invaluable.

Population and Employment Forecasts

As shown in Figure 6, over the next 20 years, ABAG Projections 2009 estimates that the region will experience a 28 percent increase in population and a 26 percent increase in employment. Within San Francisco, they estimate a 20 percent increase in population and a 16 percent increase in employment.

Figure 6: Employment and Population Forecasts for San Francisco and the Region

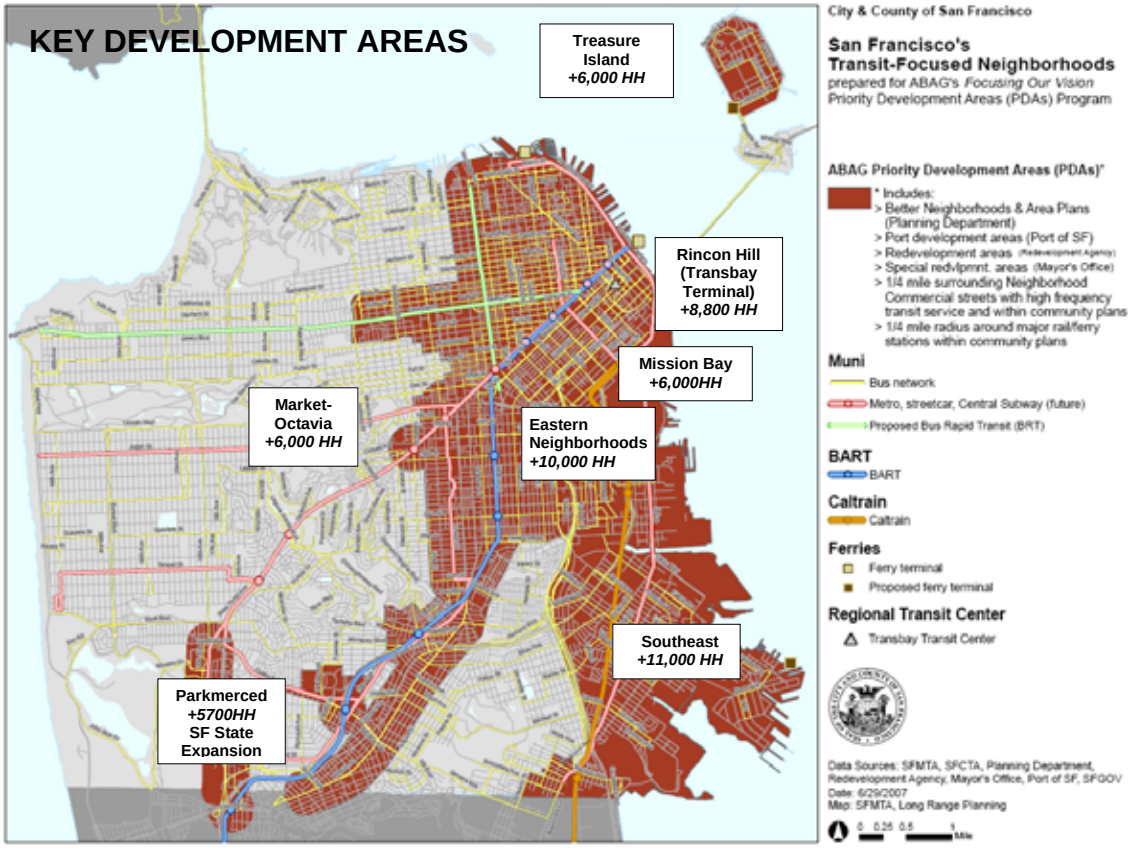
	2000	2005	2010	2015	2020	2025	2030
Population							
San Francisco	776,733	795,800	810,000	837,500	867,100	900,500	934,800
Change from 2000		2.5%	4.3%	7.8%	11.6%	15.9%	20.4%
SF Bay Region	6,783,762	7,096,100	7,341,700	7,677,500	8,018,000	8,364,900	8,719,300
Change from 2000		4.6%	8.2%	13.2%	18.2%	23.3%	28.5%
Total Jobs							
San Francisco	642,500	553,090	568,730	606,540	647,190	694,830	748,100
Change from 2000		-13.9%	-11.5%	-5.6%	0.7%	8.1%	16.44%
SF Bay Region	3,753,460	3,449,740	3,475,840	3,734,590	4,040,690	4,379,900	4,738,730
Change from 2000		-8.1%	-7.3%	-0.5%	7.7%	16.7%	26.2%

Source: ABAG Projections 2009

Growth in Key Development Areas

Many San Francisco agencies including the Planning Department, Redevelopment Agency and SFMTA, are currently working on seven major land use projects that will concentrate future growth primarily in the eastern third of the city. Other growth areas include the City's college and medical campuses, Parkmerced in the west, as well as Treasure Island in the northeast. Figure 7 identifies the location of key land use projects currently underway or recently approved by the San Francisco Planning Commission and Board of Supervisors.

Figure 7: Household Growth in Key Development Areas



Sources: ABAG Projections 2007 and San Francisco Planning Department

The San Francisco Planning Department, the San Francisco Redevelopment Agency and the Treasure Island Development Authority have been engaged in a series of specific efforts intended to realize these changes. The City's western areas—about the westernmost two-thirds of San Francisco's land mass—are largely developed and under present City zoning policies unlikely to change substantially. In contrast, the eastern ribbon along the shore of the San Francisco Bay is expected to be significantly transformed between now and 2030.

Future Forecasts of System and Service Expansion

Planning Department staff provided estimates of anticipated build out of developments in the pipeline. The 2010 starting point was developed as a composite of the 2005 San Francisco County Transportation Authority (SFCTA) travel demand model run, based on a 2005 land use base and the existing 2009 scheduled peak demand. The Transit Effectiveness Project (TEP) Budget-Neutral recommendations were used for demand projections for FY 2015 and beyond. The 2030 end point was developed using a 2030 SFCTA travel demand model run, reflecting significant new development in areas including Hunters Point, Candlestick Point, Executive Park, Treasure Island, Rincon Hill, Market Octavia, Park Merced, and the Eastern Neighborhoods, as shown in the Figure 7.

These year-by-year peak demand totals reflect projected estimates and offer a pragmatic sense of the fleet procurement cycles.

The growth in employment and households in San Francisco and the Bay Area translates into an increased demand for transit services. The major project areas, combined with overall growth, are expected to cause an increase in the SFMTA's transit weekday boardings from approximately 700,000 today to over 1,000,000 in 2030.[2] The TEP's recommendations, which will create a rapid transit network, redistribute transit service based on market demand, and reduce travel times on San Francisco's busiest corridors, are also anticipated to increase transit demand over the next five years.

The SFCTA estimates transit ridership based on an activity-based travel demand model, which predicts average daily transit, auto and non-motorized (bicycle and pedestrian) trips. It currently has two versions of the travel demand model (see Figure 8, below):

- SF-CHAMP: San Francisco Chained Activity Modeling Procedure – which estimates travel patterns within San Francisco, but considers regional trips fixed based on the Metropolitan Transportation Commission (MTC) travel demand model.
- RPM9: Nine-County Regional Pricing Model – which is a nine county model that captures travel patterns within San Francisco and the surrounding area.

Currently, CHAMP (used in Central Subway New Starts projections) and RPM9 are both accurately predicting current conditions in the 2005 base year. However, RPM9 predicts a greater number of transit trips in 2030 than does CHAMP. According to the SFCTA, RPM9 more accurately captures regional travelers who transfer to the SFMTA's transit services once they travel into the city via BART, the Alameda-Contra Costa Transit District (AC Transit), or other regional transit operators. This in part explains the discrepancy between the two models, but the SFCTA is continually refining both models to improve their outputs. The Transit Fleet Plan primarily relied on the RPM9 estimates, with some adjustments on the light rail predictions, which were questionably high in the reverse peak direction.

Figure 8: SFMTA 2030 Transit Ridership Forecasts Using RPM9, CHAMP Models

SFMTA Transit 2030 Daily Weekday Ridership Summaries	RPM9	CHAMP
All routes and lines:	1,041,872	863,896
Motor Coach /Trolley Coach Routes	692,238	592,936
Light Rail/Historic Streetcar/Cable Car Lines	349,634	270,960

Sources: SFCTA SF-CHAMP 2030 Model Run and Feb. 2009 RPM9 2030 Model Run

When the model showed crowding beyond the SFMTA's planning capacity at the route or line level, additional service was allocated to these routes and lines, which translated into an increased demand for peak vehicles. In some cases, it was also recommended to change the vehicle type assigned to the route to minimize operating costs. For example,

[2] Source: SFCTA Feb. 2009 RPM9 2030 Travel Demand Model Run

Muni's 108 Treasure Island Route, is planned to be upgraded from a 40-foot motor coach to a 60-foot motor coach as the island develops.

A summary of the change in peak vehicles by sub-fleet is provided in Figure 9. The table shows the peak vehicle requirements at five year increments, starting with the current FY 2010 demand through the TEP build out plan (which assumes the completion of the Van Ness and Geary Bus Rapid Transit projects) for FY 2030 demand. For a complete summary by route and line, see Appendix A.

Figure 9: Summary of Peak Vehicle Demand by Sub-Fleet

Transit Sub-fleet	FY 10	FY 15	FY 20	FY 25	FY 30
30' Motor Coach	20	17	18	19	19
40' Motor Coach	259	262	275	288	291
60' Motor Coach	101	140	154	168	171
Community Vans	0	14	14	14	14
40' Trolley Coach	183	158	153	148	147
60' Trolley Coach	58	62	76	92	96
Light Rail Vehicles	119	132	150	170	175
Cable Cars	27	27	27	27	27
Historic Streetcars	20	28	32	36	37
Total Transit Fleet	787	840	899	962	977

Sources: TEP Analysis and SFCTA Feb. 2009 RPM9 2030 Model Run

Timeline for Vehicle Demand Growth

The 2030 growth is anticipated to occur over time, based on market conditions and other factors, such as environmental clearance of major development projects. Currently, several of the major land use projects are in draft form (*e.g.*, Parkmerced) and have not been approved by the San Francisco Board of Supervisors. As these plans proceed through the approval process, the Transit Fleet Plan will be updated to reflect changes where needed.

In this update of the Transit Fleet Plan, minimal growth was assumed to occur between FY 2010 and FY 2012 due to the current global economic recession. This is consistent with current economic forecasts, which do not predict a budget recovery until FY 2013.

Subsequently, approximately 40 percent of the estimated growth is expected to occur by FY 2018, and the remaining 60 percent to occur between FY 2018 and FY 2030. These figures were informed by discussions between the SFMTA and other local agencies including the San Francisco Planning Department, San Francisco Redevelopment Agency, and the SFCTA. The timeline varies based on the specific details of each project, so this plan uses an informed aggregate projection for the pace of actual developments. As the City refines the land use changes and timelines, adjustments to this Transit Fleet Plan will be made.

Central Subway

In the case of the Central Subway project, the Transit Fleet Plan anticipates adding vehicles to cover peak vehicle requirements. In later years, this peak vehicle demand will gradually increase, requiring that three additional peak light rail vehicles (LRVs) and one additional maintenance spare be added to service the Central Subway line by its opening in 2019. This LRV procurement will be combined with other LRV expansion needs totaling 24 LRVs as shown in Figure 10, below.

Figure 10: LRV Fleet Forecast

	No. of Vehicles
Current Operating Fleet	143
State of Good Repair Vehicle Rehabilitation	8
System Capacity Growth	10
Mission Bay	10
Central Subway	4
2018/2019 LRV Fleet Forecast	175

The current timeline of activities to ensure that the necessary LRVs are available when the Central Subway opens for revenue service is shown in Figure 11, below.

Figure 11: LRV Procurement Plan

	Period
Planning/Research/Conceptual Development	2011–2012
Specification Development	2012–2013
Bid / Award	2013
Engineering and Production	2014-2017
Vehicle Delivery / Commissioning	2017-2018
Vehicles in Revenue Service	2018-2019

Van Ness and Geary Bus Rapid Transit Projects

The SFMTA is currently studying the preferred approach to bus rapid transit (BRT) in the Van Ness Avenue and Geary Boulevard corridors. BRT is an enhanced level of bus service that strives to provide light rail like service using buses. To this end, BRT as it is envisioned for Van Ness and Geary would include a dedicated transit-way, transit signal priority, proof of payment, and enhanced boarding areas.

For the Van Ness BRT service, the current plan is for the 49 Line to continue to be served by trolley coaches and for the 47 Line to remain motor coach. New buses will be purchased to provide BRT service on Van Ness, but they will replace existing vehicles on a one-for-one basis, so the total number of vehicles in the fleet is not anticipated to change to initiate the BRT service. The significant change is that the 47 will be operated

with 60-foot hybrid coaches, instead of the current 40-foot buses. This change is needed to accommodate the projected ridership demand on this enhanced bus corridor. Additional service on Van Ness will come primarily from reinvesting travel time savings due to the project.

For the Geary BRT service, new buses will be purchased, but they will replace existing vehicles on a one-for-one basis, so fleet expansion is not anticipated to be needed to initiate the BRT service. Like the Van Ness BRT, increased transit service on Geary will come primarily from reinvesting travel time savings.

The Transit Fleet Plan will be evaluated and updated as needed to incorporate any future changes to these projects, and it can incorporate new projects which may impact the future fleet mix or pace of ridership growth.

IV. Transit Fleet Maintenance

This section of the Transit Fleet Plan outlines the Maintenance Demand Program from the present through 2030 and captures the impact on maintenance activity as the vehicle fleets age, undergo rehabilitation and are replaced with new vehicles. In general, this section presents a plan that shows the ebb and flow of maintenance activities and explains why a portion of the fleet is not available for revenue service each day because of maintenance activity. The Maintenance Demand projection for the fleet reflects a thoughtful, consistent approach to planning appropriately for necessary maintenance activities.

Maintenance Demand Categories

To determine the total number of vehicles required in the various fleets that the SFMTA operates, it is necessary to account for both maintenance and peak period service demands. The SFMTA Service Planning Section determines the service demand. The vehicle demand needed to fulfill the service requirements is discussed in Section III of this Transit Fleet Plan and detailed in Appendix A. The SFMTA Transit Maintenance Sections determine the maintenance demand that is detailed in this section. To determine the projections that constitute the maintenance demand, the SFMTA Transit Operations, Transit Maintenance and Service Planning managers reviewed historic data from the Shop History and Online Part System (SHOPS) and held a series of meetings to review the maintenance demand history and projected new demands. Key considerations included the use of the American Recovery and Reinvestment Act of 2009 (ARRA) funding for campaigns and factoring in planned future fleet purchases.

The maintenance demand requires a vehicle to be put on hold and removes it from the pool of vehicles available for scheduled service. Vehicles on hold for maintenance fall into four categories: Preventive Maintenance, Major Overhaul/Heavy Repairs, Campaigns and Reconstruction.

Preventive Maintenance

Preventive Maintenance (PM) is a key component of the SFMTA's maintenance effort. PM is performed on a regular, programmed basis to keep equipment in good working order, to prevent in-service failures, and to meet certain vehicle regulatory requirements. Scheduled preventive maintenance is essential to providing safe, reliable and attractive service. Maintenance managers have been using data from SHOPS to schedule preventive maintenance more accurately, plan better resource utilization and build a more cost effective maintenance program.

The PM program is designed to maintain vehicle availability and reliability by detecting potential defects and correcting them before they fail. Inspections ensure that vehicle equipment remains in good working order and equipment is inspected, adjusted, serviced and repaired or replaced to prevent premature failure due to fatigue and aging. Minor defective equipment is replaced during the inspection. Vehicles are withdrawn

from service at regular mileage-based intervals to conduct preventive maintenance activities.

Quality Assurance (QA) is another component of the PM category. During QA, routine inspections of vehicles coming out of PM are performed, as well as heavy duty and running repair. An annual simulated California Highway Patrol (CHP) inspection is also performed at each of the motor coach divisions to ensure vehicles will be prepared for key regulatory inspections. In addition, QA and Engineering staff inspects vehicles held for accidents and perform inspections of vehicles related to complaints.

Major Overhaul/Heavy Repairs

This category includes work performed by the Support Shop and Paint and Body Shop. The Support Shop performs all major component replacements and heavy repair work. Depending on vehicle type, the scope of work includes tasks such as repairing or replacing engines, transmissions, trucks, brakes, HVAC units, couplers, pantographs, pneumatic packages, brake system components, door and step systems, frame repair and wheel profiling. The Paint and Body Shop repairs accident damage and performs ongoing programs to enhance fleet appearance.

The amount of work required for these repairs has the greatest impact on vehicle availability. Major Overhauls/Heavy Repairs comprises the largest number of maintenance vehicle holds. A plan focused on light rail vehicle reinstatement is discussed in detail below.

Campaigns

Maintenance Campaigns vary by vehicle type. Typically these campaigns address a fleet defect that appears after newer vehicles have begun regular service or after long term service wear. Campaigns may also occur as a result of a needed modification to address a deficiency. Maintenance staff, usually in conjunction with Transit Fleet Engineering, develops a schedule for campaigns that takes into account staff resources, maintenance pit space and parts availability. Major campaigns also include mid-life overhauls that are undertaken to extend a vehicle's service life.

Based on past experience with putting a new fleet into revenue service, an increase in the daily maintenance demand for campaigns is expected to occur with the warranty claims of the new fleet. In addition, past experience shows that often a hidden fleet defect is found after coaches are in long term revenue service that requires all coaches to be brought into the shop so the manufacturer can address the defect. Examples of fleet defects in recent acquisitions include: cooling system, transmission clutches, structural repairs and articulation section repair.

Light Rail Vehicle Reinstatement Plan

The SFMTA has developed an action plan for the reinstatement of Light Rail Vehicles (LRVs) that are out of service for moderate to severe accident damage. The goal of the

action plan is to return all existing damaged LRVs to service by 2015, and describe the process for addressing future damaged vehicles, should they occur.

The plan for reinstating LRVs that have suffered accident damage back into service will be addressed through one, or a combination, of the following:

- Outsourcing the repair work under sole source contract to the original equipment manufacturer;
- Outsourcing the repair work through competitive bid to a vendor capable of doing this type of restoration work; and
- In house repair using SFMTA staff.

There are currently eight LRVs on long-term hold due to accident-related damage. The degree of damage is determined as severe structural and systems damage. These eight LRVs will be repaired in the following manner. Seven LRVs will be outsourced for repair under a sole source contract to Ansaldo Breda Inc (ABI), the OEM. Of the seven LRVs, five of the LRVs will be repaired under the base contract, and of these five, two LRVs will be fitted with new ABI propulsion systems. This will allow SFMTA to evaluate the new propulsion system to inform future LRV procurements. The eighth and last LRV with severe damage will be repaired by ABI under provisions for damaged vehicle repair in LRV procurement Contract #309. Also, there are two options negotiated into the contract; Option 1 is for the repair of two vehicles, and Option 2 is for the repair of future damaged vehicles, under a Task Order to the OEM, ABI. The reason for negotiating a contract with options is to proceed with the current available funding, while exercising the options when more funding becomes available. The SFMTA completed negotiations with ABI in March 2010, and the forecasted contract award for the repair of the seven LRVs is October 2011. Once the contract is in place, a specific schedule will be developed to return the LRVs to service. The forecasted contract completion is in 2015.

The level of damage is the determining factor of whether the vehicles will be repaired in-house or outsourced. Moving forward, an LRV that sustains accident damage will be assessed by Transit Fleet Engineering. In addition, the Body Shop will provide a repair estimate, and in some cases, a repair estimate will be provided by an independent consultant. Internal and independent assessments can be completed in 3 to 6 weeks after release of vehicle(s) from investigation hold.

In general, the SFMTA will need to take the following factors into account when determining where specific LRV repairs are to be undertaken:

- Geneva Body Shop is currently equipped to make some car body repairs; however, it can only perform light to moderate body repair work.
- Body Shop must rely on other craft shops to do this work before completing the body work.
- LRV mechanics perform all disassembly and reassembly of interior components and wiring, and of all undercar components and wiring.

- The sheet metal, and machine shops fabricate many of the exterior body panels, and skirts, and the welding shop does the welding as required.
- Carpenter shop staff removes and replaces floors, while the glazier shop does all glass and window work, and the Geneva paint shop does all painting.
- Moderate body damage and moderate structural damage, are typically outsourced, and repairs can take from 12 to 16 months.
- Severe body and structural damage, is outsourced, and can take 12 to 20 months to return to service.

The Funding Plan for LRV restoration/reinstatement includes $22 million in identified funding for LRVs with severe damage; and the use of only non-federal funding sources (e.g., Breda Lease Back, Local Prop. K and State I Bond).

Reconstruction

This category is unique to two types of rail vehicles that the SFMTA operates—cable cars and historic streetcars. Cable cars are largely made of wood and so have a limited life span. No external manufacturer builds cable cars, so the SFMTA has a long tradition of using internal carpentry forces to manufacture and restore its fleet. Manufacturing a cable car is a process that can take up to two years to complete.

The second type of rail vehicle that needs reconstruction is the historic streetcars that the SFMTA operates on the Muni F Line. These vehicles can be over 75 years old. Therefore they need to undergo extensive reconstruction to make them serviceable. This work is usually contracted to specialty contractors who have the facilities to perform this work.

In contrast to the SFMTA's motor coach, trolley coach and light rail vehicle fleets, the cable car and historic streetcar fleets consist of a collection of unique vehicles, many of which are distinctive and found nowhere else. The following sections describe the historic streetcar and cable car fleets, as well as their future maintenance and reconstruction programs.

Cable Cars

Cable cars currently operate on three lines: Powell/Mason, Powell/Hyde, and California. Weekday ridership on the three cable car lines totals 20,000. The current fleet of cable cars includes 28 Powell-type cars and 12 California-type cars, for a total of 40 vehicles.

Cable Car Rehabilitation Program: This Program provides for the phased overhaul and reconstruction of the Cable Car Fleet. The estimated service life of a cable car falls between 60 and 70 years, with scheduled intermediate mid-life (major) and minor overhauls. The reconstruction process takes approximately 18 months and can include replacement or upgrades to all major vehicle components such as trucks, frame, woodwork, glass, roof, and floors. A major overhaul takes about nine months; while minor overhauls take about six months to complete and include replacement of rotted wood, electrical work, and painting.

Cable Car Expansion: In the past, a number of extensions to the cable car system have been proposed, however, none of these proposals are being developed and the SFMTA has not identified funding for the proposals. As these proposals are developed, the capital needs associated with their implementation will be added to the capital program.

Cable Car Extension to Fisherman's Wharf: This project would extend the existing Powell/Mason cable car line one block north to North Point. This project could effectively improve service for the many riders who are travel to Fisherman's Wharf. In addition, it may also improve passenger safety and traffic circulation in the area.

Historic Streetcars

The historic streetcar fleet is a collection of electric rail vehicles used on the F-Market & Wharves line, carrying close to 19,000 passengers per weekday. This fleet includes 16 Presidents' Conference Committee Cars (PCCs), 10 cars from Milan, Italy, five vintage cars and other historic streetcars from the U.S. and around the world. In addition, as part of a current capital rehab project, 16 additional PCCs should become "active" by 2014. Along with the existing F Line, additional historic streetcar service is planned for the E Embarcadero Line, creating demand for additional streetcars and accelerating the need to have the existing cars overhauled.

Historic Streetcar Maintenance /Overhaul Program

Due to their historic nature, these vehicles are not replaced on a regular schedule, making a program of regular rehabilitation critical to the long-term operation of this fleet. Major overhauls are currently scheduled for every 15 years a vehicle is in service, extending the useful life of each vehicle and ensuring ongoing reliable operation. The following historic streetcar vehicle overhauls are being coordinated:

- *Car #1 Overhaul*: Muni Car #1 is in the process of being rehabilitated, with scheduled completion in 2012.
- *Former SEPTA and Muni PCC Overhaul*: The 13 former Southeastern Pennsylvania Transportation Authority (SEPTA) PCCs and three double-ended Muni PCCs are scheduled to be overhauled, including rehabilitation of the mechanical, electrical and body components of the vehicles.
- *Former New Jersey Transit (NJT) Car Overhaul:* The SFMTA purchased 11 PCCs from New Jersey Transit. The propulsion system in each of these is being replaced with rebuilt Westinghouse PCC propulsion and braking equipment.
- *Double and Single-Ended PCCs Rehabilitation*: The SFMTA is planning to overhaul this fleet. This process will include rehabilitation of the mechanical, electrical and body components of the vehicles to an as new condition.
- *Milan Car Overhaul and Enhancements:* The ten Milan streetcars will be overhauled beginning in 2013. During the overhaul, the Milan cars will also get a number of enhancements.

- *Major Overhauls of Other Pre-War Cars:* Following Car #1 into an overhaul program will be the other pre-war cars: vehicles 189, 913, 130, 496, and 578J. These double-ended streetcars will provide support and back-up on the E Line.

Running Repair

The SFMTA also performs ongoing Running Repair work, but this is not considered a hold, as it addresses minor unscheduled in-service failures that can be repaired in a short time frame. Most repairs are completed in the off-peak hours before the vehicle is needed for the peak demand. The goal of Running Repair is to get vehicles ready for the next peak period pullout. If repairs cannot be made in time to meet pullout, vehicles are moved into a hold category, usually Heavy Repair.

Enhanced Road Service Activities

As part of the effort to keep the SFMTA's maintenance demand down, enhanced road service activities need to take place as an important complement to other maintenance activities. The Road call Incident Reduction Pilot (RIRP) project was conceived to minimize the number of coaches that are routinely sent in to the shop following a driver's complaint or mechanical breakdown. The RIRP program is designed to coordinate the SFMTA's repair trucks by assigning each truck to one of six zones in the City. Each team has the appropriate staffing to be able to deal with either motor coaches or trolley coaches that are in distress in their zone.

The program aims to reduce shop response delay times and to improve customer service. By making skilled diagnoses and repairs on the spot, they can keep up to 80 percent of coaches in service, thereby increasing the Mean Distance Between Failures (MDBF) of all bus service fleets. From all aspects of measurement, this pilot program has proven the concept that skilled personnel responding quickly with proper equipment and repair parts can play a significant role in keeping vehicles in service. The program will be expanded citywide in phases, as personnel can be reallocated and equipment acquired.

Maintenance Demand by Fleet

The following section explains maintenance demand needs for the various fleets that the SFMTA operates. Appendix B shows in detail the daily number of vehicles planned to be in maintenance each year by category. The specific maintenance demand needs during key years are described below.

Motor Coach Maintenance Demand by Year Projection

The Maintenance Demand projection for the motor coach fleets reflects a plan to create a consistent approach to maintenance activities. By keeping a regular Preventive Maintenance cycle, it is anticipated that the newer motor coach fleets will be kept in a state of good order without the dips and spikes in the hold count that have occurred in the past. Additionally, the SFMTA has received ARRA funds for Motor Coach Component Life-Cycle Rehabilitation. The scope of this project includes, but is not

limited to, engine and transmission replacement, rehabilitation of the propulsion system, cooling system, brakes, air compressors, doors and body systems for a portion of the motor coach fleet. This project aims to improve current vehicle availability and reliability, reduce the defects at pull-in, and increase the Mean Distance Between Failures (MDBF). The funds would be used between FY 2010 and FY 2014.

30-foot Motor Coaches

The 30-foot Motor Coach Fleet projection shows a consistent approach to maintenance activities (as illustrated above), in terms of the number of coaches on hold in each category throughout the life of the vehicle. As previously mentioned, this fleet is expected to have a maintenance demand of 30 percent, due to the small number of vehicles in this fleet and the difficulty in substituting other vehicle types to cover service needs.

40-foot Motor Coaches

The plan for the 40-foot Motor Coach Fleet, the backbone of motor coach service, shows that holds for Major Overhaul/Heavy Repair will decrease in the next four years. This should occur as the older NABI fleet is retired, a new fleet goes into service and a rigorous maintenance cycle is established.

The plan is to increase the Preventive Maintenance activities by increasing the number of holds from seven coaches a day to 12 coaches a day. This increase in Preventive Maintenance activity would pay off over the life of the fleet with improved reliability and availability. Initially, this will entail a drop in the number of vehicles available for revenue service.

As mentioned earlier in the summary about Campaigns, an increase in daily maintenance demand for Campaigns is expected to occur with the warranty claims of the new fleet. Also, past experience shows that a hidden fleet defect is often found after coaches are in service, requiring coaches to be brought into the shop so the manufacturer can address the defect. These two conditions are expected to negatively impact the availability of motor coaches following new procurements. The plan tries to anticipate these conditions and lays out a strategy for dealing with them effectively while keeping Maintenance Demand for 40-foot coaches at 20 percent.

60-foot Motor Coaches

The plan for the 60-foot Motor Coach Fleet shows that holds for Major Overhaul/Heavy Repair will remain constant until FY 2013 where there is an anticipated slight increase as the Neoplan Coaches reach the end of their service life. In FY 2016 and FY 2017, the plan shows an increase in campaigns as the 124 Neoplan Coaches are retired and a new fleet is put into revenue service.

Campaigns, such as the engine change out program, have been identified and will add slightly to the holds in the Campaign category. Also, as with the 40-foot motor coaches, the plan accounts for an increase in warranty claims of the new fleet as well as

anticipating the possibility of fleet defects that need to be addressed. These factors will impact the availability of 60-foot motor coaches for service and increase Maintenance Demand, beginning in FY 2013.

Trolley Coach Maintenance Demand by Year Projection

40-foot Trolley Coaches

The projection for the 40-foot Trolley Coach Fleet shows that holds for all categories will remain constant until FY 2019, when the plan shows an increase in Campaigns as 105 of the 40-foot ETI trolley coaches are retired and a new fleet is put into revenue service. An additional 55 of these ETI trolley coaches are retired in FY 2020, and the remaining 80 ETI trolley coaches are retired in FY 2023. The plan accounts for an increase in warranty claims of the new fleet as well as anticipating the possibility of fleet defects that need to be addressed by increasing Campaign holds by two coaches. With the retirement of the older, less reliable coaches, the SFMTA can plan for fewer holds in the Major Overhaul/Heavy Repair category by two daily coaches.

The next significant change occurs in FY 2022 when holds for Major Overhaul/Heavy Repair are reduced by three and Campaign holds are increased by three from FY 2021. Based on recent experience, the plan accounts for the complicated Campaign work needed to rectify the defects that are likely to appear in a new fleet. This work has proven to take much longer to complete than the Campaigns on the Motor Coach Fleet.

The plan remains consistent until FY 2027 when there is an increase of two coaches in holds for Major Overhaul/Heavy Repair due to the aging fleet. This is offset by a reduction of two coaches for Campaigns which should have been completed by this time.

60-foot Trolley Coaches

The projection for the 60-foot Trolley Coach Fleet shows that holds for Major Overhaul/Heavy Repair will remain constant until FY 2013 where there is an anticipated slight increase as the trolley coaches age. In FY 2013, the plan shows an increase in campaigns as the New Flyer trolley coaches are replaced and new trolley coaches are added. The plan accounts for an increase in warranty claims of the new fleet as well as anticipating the possibility of fleet defects that need to be addressed by increasing Campaigns by one coach. Completing this work would have the positive benefit of reducing the daily demand for Major Overhaul/Heavy Repair by one coach. The plan tries to anticipate these conditions and lays out a strategy for dealing with these factors, effectively keeping Maintenance Demand stable just above the 25 percent target.

The Maintenance Management plan tries to keep this consistent approach as much as possible with only slight increases in holds as the trolley coaches age and then plans for a slight increase in Campaigns as a new fleet goes into revenue service. Changes are planned to occur in FY 2020 with the replacement of the 33 ETI coaches and again in FY 2030 with the replacement of the 60-foot coaches purchased in FY 2013.

LRV Maintenance Demand Projection by Year

There are significant changes in the near term for maintenance demand of LRVs. There are two factors contributing to the increase in the number of vehicles in Campaigns that will be started in the next fiscal year. Eight LRVs with severe accident damage will be moved off property and repaired by a contractor. This work will be completed by 2015.

In addition, ARRA money is available to begin "systems" overhauls on the LRV fleet. This effort will allow major work to be performed on truck, motor, propulsion, door, steps and brake systems. It is anticipated that seven LRVs at a time would be on hold for this Campaign work. During this time, existing Campaigns by Breda will also continue.

These efforts will increase the hold count between FY 2011 and FY 2014 until all the LRVs with accident damage are returned to service. Once this work is complete, then the "Systems" campaigns will continue at a steady state for the foreseeable future.

As the fleet ages, the number of holds for Major Overhaul/Heavy Repair would increase by two LRVs in FY 2018 as the LRVs near the end of their useful life and not all LRVs would have been able to be campaigned. This trend would continue until a new fleet is acquired and begins entering service starting in FY 2023.

Historic Streetcars Maintenance Demand Projection by Year

There will be a need for a midlife overhaul of the original PCC fleet in FY 2016 that will occur over about four years. During that time, six PCCs at any one time will be in the overhaul program.

The Milan fleet will undergo a reconstruction effort beginning in FY 2022 as shown in the Reconstruction category. During this time, two Milan streetcars will be in the program at any given time. This program will extend to FY 2026.

Cable Car Maintenance Demand Projection by Year

The Cable Car Vehicle Rehabilitation Program provides for the phased overhaul and reconstruction of the Cable Car Fleet. The estimated service life of a cable car is between 60 and 70 years, with a midlife major overhaul scheduled at 30 to 35 years in service. In addition, minor overhauls are scheduled for 15 years of service. At any given time, up to four cable cars can undergo rehabilitation: two in reconstruction, one major overhaul, and one minor overhaul. The reconstruction process takes approximately 18 months and can include replacement or upgrades to all major vehicle components such as trucks, frame, woodwork, glass, roof, and floors. A major overhaul takes about nine months, beginning with a full vehicle inspection to determine the work that needs to be accomplished. This can include upgrades to the frame and supports, woodwork replacement, glass replacement, metal parts refinishing, roof work, floors, electrical wiring, and painting. Finally, the minor overhauls take about six months to complete and include replacement of any rotted wood, electrical work, and painting.

Each cable car is unique so parts must often be fabricated for individual vehicles. The Woods Carpentry Shop and the Special Machine Shop at 700 Pennsylvania carry out this

work. While the SFMTA has a goal of standardizing the cable cars across each fleet, currently the vehicle components that need replacement must be used to fabricate the replacement part. This leads to a long down time when a car requires maintenance, which contributes to the relatively high maintenance demand for this fleet.

System Spare Ratio

The spare ratio is calculated by dividing the number of spare vehicles by the regular peak vehicle demand. The number of spare vehicles is the difference between the total fleet and the regular peak demand. Federal Transit Administration (FTA) standard guidelines state that the spare ratio for motor coaches should not exceed 20 percent of the vehicles operated in regular peak service. For other vehicles, FTA requires that the SFMTA provide a reasonable justification for the spare ratio assigned to those modes.

This Transit Fleet Plan provides a strategy for maintaining a fleet size that allows the SFMTA to meet fleet maintenance demands, while achieving reasonable spare ratio targets. Based on the maintenance program described previously (and shown in Appendix B: Maintenance Demand Plan), the SFMTA expects to be able to meet appropriate spare ratios. The range of target spare ratios that the SFMTA proposes for each mode is summarized as follows in Figure 12, below.

Figure 12: SFMTA Fleet Spare Ratio Summary

Vehicle Type	Spare Ratio Target
Motor Coach	
30-ft.	30%
40-ft.	20%
60-ft.	20%
Trolley Coach	
40-ft.	25%
60-ft.	25%
Light Rail Vehicle	20%
Historic Streetcar	50%
Cable Car	50%
Community Van	30%

For 40-foot and 60-foot motor coaches, as well as for light rail vehicles, the SFMTA expects to be able to achieve the recommended 20 percent spare ratio. Since the 30-foot motor coaches are a small fleet of vehicles that serve lines where it is difficult to substitute a 40-foot motor coach, the fleet requires a 30 percent spare ratio. When community vans are added to the fleet in the future, as recommended under the TEP, a 30 percent spare ratio will be needed for these as well.

For trolley coaches, the SFMTA proposes to establish 25 percent as the appropriate target spare ratio. The higher maintenance demand for trolley coaches results from two factors. First, the Trolley Coach Fleet is a specialized fleet with few suppliers other than the original builder to support it. This has resulted in longer than normal procurements for parts (purchased from the Czech Republic), which has affected vehicle availability. Additionally, larger than expected post-manufacture modifications have been required to keep vehicles operating. The result of these has been a series of intensive campaigns requiring vehicles to be on hold. Because the market for these vehicles is not expected to change in upcoming years, the SFMTA anticipates that these types of issues will continue to be a challenge that requires intensive planning in the future.

Finally, since the historic streetcars and cable cars are special vehicles (requiring unique maintenance and reconstruction), the SFMTA seeks a 50 percent target spare ratio.

Vehicle demand figures for the three most recent service signups in May 2009, December 2009 and May 2010, were analyzed to determine whether the Agency's spare ratio targets were reasonable. The SFMTA's *2009 Transit Fleet Management Plan* provided the peak demand and maintenance spare totals by subfleet for May 2009. This information is supplemented here by fleet requirements to reflect December 2009 and May 2010 service modifications, which were implemented under severe economic conditions. The SFMTA restored 60 percent of the May 2010 reduction in September 2010, and plans to restore the balance as early as 2011.

Over the last year, the SFMTA has seen a reduction in peak vehicles due to a reduction in resources, as a result of both reduced funding and maintenance staff. While this short term comparison of spare ratios with the existing transit fleet shows that the Agency is exceeding its spare ratio targets, the SFMTA plans to use future vehicle procurements as opportunities to right-size the fleet.

The spare ratios in Figure 13 (below) indicate that service modifications have generally reduced the peak demand, as well as increasing the corresponding number of maintenance spares. The maintenance spare numbers represent the number of spares available in each fleet, as opposed to the modal requirement based on peak demand. For this reason, the spare ratios sometimes exceed the Agency's target.

In the case of 40-foot motor coaches, the spare ratios remain under the 20 percent target; however, since this is the largest fleet of vehicles that the Agency operates, there is greater flexibility than for other, smaller fleets. In contrast, spare ratios for the 40-foot and 60-foot trolley coach vehicles have exceeded the 25 percent target. This is largely due to the long lead time needed to acquire parts from the Czech Republic. The spare ratio for the 30-foot motor coaches is well above the target 30 percent, however, this is largely due to the limited number of 30-foot motor coaches in the fleet. On many of the routes on which these vehicles operate, larger vehicles cannot be substituted due to geometric constraints.

The spare ratios for light rail vehicles (LRVs) have exceeded the 20 percent target. This is in large part due to the eight LRVs that are on long term hold due to accident-related

damage. The degree of damage is determined as severe structural and systems damage. The Agency's goal is to return all existing damaged LRVs to service by 2015.

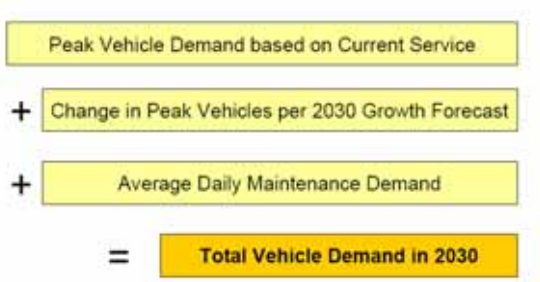
In addition, the number of Historic Streetcars scheduled for revenue service is currently low, resulting in a relatively high spare ratio. However, over the next 20 years, the SFMTA intends to more than double its revenue fleet (from 24 to 56 vehicles), allowing for a more representative spare ratio target to be reported. Major overhauls are currently scheduled to be administered every 15 years a vehicle is in service, extending the useful life of each vehicle and ensuring ongoing reliable operation.

Figure 13: Spare Ratio Comparisons

Vehicle Type	Spare Ratio Target	FY10 Fleet	Peak Dem. May 2009	Peak Dem. Dec. 2009	Peak Dem May 2010	Spares May 2009	Spares Dec. 2009	Spares May 2010	Spare Ratio May 2009	Spare Ratio Dec. 2009	Spare Ratio May 2010
Motor Coach											
30-ft	30%	30	20	18	13	10	12	17	50%	67%	131%
40-ft	20%	305	259	259	265	46	46	40	18%	18%	15%
60-ft	20%	124	101	97	99	23	27	25	23%	28%	25%
Trolley Coach											
40-ft	25%	240	183	172	153	57	68	87	31%	40%	57%
60-ft	25%	73	58	54	45	15	19	28	26%	35%	62%
LRV	20%	151	20	119	109	32	32	42	27%	27%	39%
Streetcar	30%	24	20	20	20	4	4	4	20%	20%	20%
Cable Car	50%	40	27	27	27	13	13	13	48%	48%	48%
TOTAL		987	787	766	731	200	221	256			

V. Future Transit Fleet Requirements

Total Future Vehicle Demand



When the FY 2010 - FY 2030 peak vehicle demand information is brought together with the maintenance demand requirements over those years, the SFMTA is able to provide an estimate of the total fleet size needed by sub-fleet through FY 2030. The Vehicle Demand for 2030 is calculated by taking the sum of the Existing Peak Vehicle Demand, the Change in Peak Vehicles (generated by the 2030 Growth Forecast), and the Average Daily Maintenance Demand.

Figure 14 shows the total fleet size needs by sub-fleet, based on the maintenance plan and the growth projections. It explains how the total vehicle needs in 2030 differ from the current fleet.

The following section explains how the additional vehicles will be procured and phased in over time. Some fleets will shift, either in vehicle type, *i.e.* 40-foot standards to 60-foot articulated, or modes, *i.e.* trolley coach to motor coach. Additionally, for the unique Cable Car and Historic Streetcar Fleets, special vehicles are not included as part of the revenue fleet but are able to provide supplemental service, effectively filling in a portion of the difference for those sub-fleets.

Source: RailPicturesNet Image Copyright© M.J. Scanlon, 2004

Figure 14: 2030 Estimated Total Vehicle Demand

Vehicle Type	Spare Ratio	FY 2010 Current Fleet	FY 2010 Est. Need	FY 2030 Est. Need	Change
Motor Coach 30'	30%	30	*26*	25	-5
Motor Coach 40'	20%	305	*311*	349	+44
Motor Coach 60'	20%	124	*121*	207	+83
Community Vans	30%	0	*0*	18	+18
Trolley Coach 40'	25%	240	*229*	184	-56
Trolley Coach 60'	25%	73	*73*	121	+48
Light Rail Vehicle	20%	151	*141*	208	+57
Cable Car	50%	40	*40*	40	0
Historic Streetcar	50%	24	*30*	56	+32
Total		987	971	1208	+221

Procurement of New Vehicles

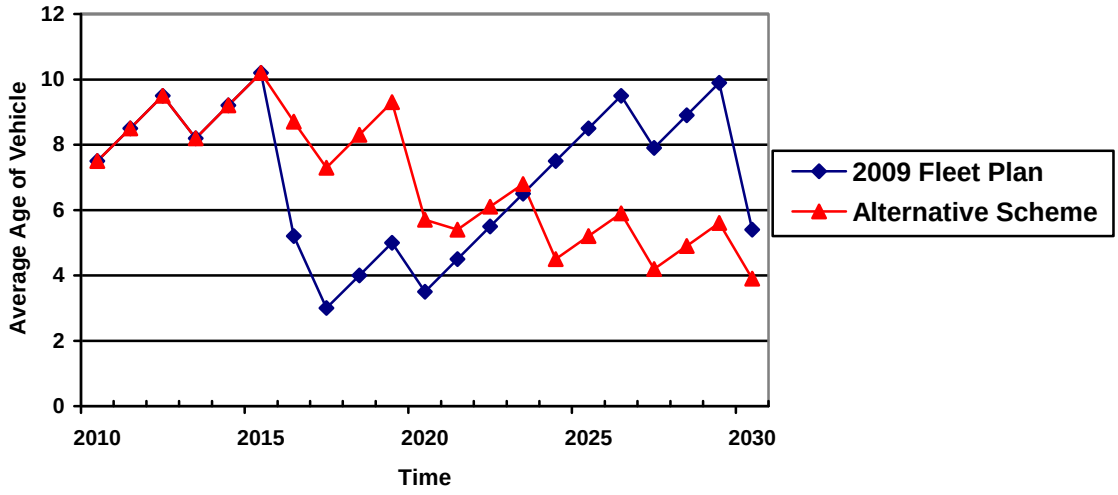
Based on past procurement practices, there are advantages to strategically investing in transit vehicles and facilities through a coordinated program of acquisition and retirement strategies, effectively spreading out procurements over time. The decision to extend the useful life of a vehicle can help stabilize the average age of the fleet, allowing for the number and frequency of procurements to even out over time and for cost savings to be realized over the 20-year life of the Transit Fleet Plan (and beyond). While it is important to ensure fleet turnover in order to maintain service performance, there are also advantages to continuously renewing rolling stock and evenly distributing procurement costs.

Currently, motor coach procurements are not evenly spread out over time, creating long intervals between vehicle acquisitions and bringing a high number of vehicles into the fleet at a specific time, perhaps every five to 10 years, at best. Often, this practice results in a large proportion of the fleet needing to be replaced at one time, and consequently, a significant capital outlay and the introduction of new vehicles and technologies requiring a significant amount of staff training. In addition, large procurements can be problematic if specific models are found faulty.

An even distribution of procurements can systematically provide ongoing turnover, effectively ensuring fewer changes in fleet technologies between vehicle series. In the short-term, the ongoing procurement of vehicles every two to three years would require extending the useful life of a number of vehicles. Due to their relative importance in the overall network, the SFMTA would strategically consider extending the useful life of some of the vehicles in fleets beyond what was proposed in the 2009 Transit Fleet Management Plan. These extensions, along with a balanced procurement cycle, i.e., one that provides ongoing vehicle turnover and coordination between sub-fleets, would allow for some fleets to be renewed every few years. In the long-term, this strategy could spread out capital outlay for vehicle procurements and stabilize vehicle age.

For example, under an alternative procurement scheme, a specific number of 40-foot standard motor coaches could be extended from three to four years, allowing for procurements to be more consistently spaced out over time (see Figure 15). Here, the principal goal is to stabilize the average age of this motor coach sub-fleet, so that it ranges from approximately four to seven years. This goal can be reached in 2020.

Figure 15: Average Vehicle Age (40' MC): 2009 Transit Fleet Plan, Alternative Scheme



Average Age of Vehicle by Year: 2010-2020

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2009 Fleet Plan	7.5	8.5	9.5	8.2	9.2	10.2	5.2	3.0	4.0	5.0	3.5
Altern. Scheme	7.5	8.5	9.5	8.2	9.2	10.2	8.7	7.3	8.3	9.3	5.7

Average Age of Vehicle by Year: 2021-2030

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2009 Fleet Plan	4.5	5.5	6.5	7.5	8.5	9.5	7.9	8.9	9.9	5.4
Altern. Scheme	5.4	6.1	6.8	4.5	5.2	5.9	4.2	4.9	5.6	3.9

Under this alternative scheme, a number of useful life extensions would be made to the 40-foot motor coach fleet. While fewer vehicle procurements would be provided under this scheme than under the 2009 Transit Fleet Management Plan, to extend the life of the vehicles specified in the alternative scheme a number of vehicle rehabilitations would need to be scheduled, and those costs included in the capital program.

Transit Vehicle Fleet Useful Life

The useful life for SFMTA's transit vehicle fleets are determined by a combination of Federal Transit Administration (FTA) and Metropolitan Transportation Commission (MTC) policies and guidelines, as shown in the table below.

FTA establishes guidelines in FTA Circular 5010.1D, which determine the frequency with which revenue vehicles can be replaced using federal funds. These replacement cycles establish the minimum useful life over which the vehicle must operate.

In addition, the MTC establishes policies at the regional level that govern fleet replacement cycles. Under the MTC Transit Capital Priorities guidelines, a transit operator is only eligible to program federal funds for vehicle replacement once the vehicle has reached the end of its useful life. Thus, due to the time needed to develop specifications, award the procurement, and to test and receive the vehicles, transit vehicles must effectively remain in revenue service for two years beyond their useful life. The time needed to procure trolley coaches and light rail vehicles may be greater than the two years assumed here, and will need to be evaluated as part of the individual procurement projects. Additionally, the MTC Transit Capital Priorities guidelines require that 30-foot motor coaches must reach 12 years before federal replacement funds are programmed, despite the shorter FTA minimum. When the additional time needed to procure the vehicles is added, the result is a 14 year effective life. It is this combination of FTA and MTC requirements that establish the effective replacement cycles for the SFMTA's revenue fleet as shown in Figure 16, below.

Figure 16: Transit Vehicle Life

Vehicle Type	FTA Useful Life	MTC Effective Life
Motor Coach		
30-ft.	10	14
40-ft.	12	14
60-ft.	12	14
Trolley Coach		
40-ft.	15	17
60-ft.	15	17
Light Rail Vehicle	25	27

Sources: FTA Circular 5010.1D and MTC Resolution No. 3908

Transit Fleet Capital Costs and Funds

The Transit Fleet Plan establishes a program of capital needs related to fleet rehabilitation, replacement, enhancements, and expansions. There are a number of changes described in the Transit Fleet Plan that will be coordinated with the Capital Plan. The SFMTA is in the process of updating the Capital Plan, and will present a revised Capital Plan to the SFMTA Board by the end of 2010.

Fleet Expansion

Based on the plan's projections for total future vehicle demand and the SFMTA's planned procurement cycle, this plan anticipates the need to purchase new vehicles to

grow the transit fleet. Where practical, procurement of additional vehicles will be tied to scheduled fleet replacement cycles to benefit from the economies of scale that arise from a larger procurement. Also, where future growth is projected, fleet procurements are sized to accommodate the growth forecasted for the next few years beyond the procurement year. This is done to minimize the transit fleet surplus or deficit, while at the same time having the vehicles necessary to meet projected service and maintenance demand. When procurement cycles are many years apart, attention is paid to ensure that enough vehicles are purchased to avoid a sizable deficit in the future years.

Appendix C shows the total transit vehicle demands and the planned fleet size by year by sub-fleet from FY 2010 to FY 2030, bringing together the information from Appendices A, B and D in the following manner:

- The "Peak Vehicle Demand" numbers are projected by vehicle type for the twenty years between 2010 and 2030, incorporating major transit projects and estimates of anticipated build out of developments (from the Planning Department); while the SFMTA Maintenance Sections determine the maintenance demand, i.e., detailed from figures in the Maintenance Demand Plan, taking both maintenance and peak service demands into account.
- The "Maintenance Float" row is calculated by dividing the Maintenance Demand by the Peak Vehicle Demand, consistent with FTA's spare ratio definition.
- The Peak Vehicle Demand and Maintenance Demand added together equal the "Total Fleet Size Demanded."
- The difference between the planned "Total Fleet Size Planned" (based on the procurements summarized in Appendix D) and the "Total Fleet Size Demanded" equals the vehicle surplus or deficit for each sub-fleet.

The SFMTA will continue to refine this table as the City develops more refined land use plans and the SFCTA continues to refine its model estimates. The SFMTA will fully comply with Federal Transit Administration (FTA) regulations and best practices for each vehicle procurement process undertaken.

Appendix D summarizes the procurement cycle and shows where sub-fleets are expected to grow or contract to accommodate changing demand for service. The uncertainty of future growth in peak travel limits the SFMTA's ability to accurately project demand levels for individual years within the 20-year period covered by the Transit Fleet Plan. For this reason, the peak vehicle demand values shown in Appendix D represent an interpolation (or smoothing out) of values at five-year increments. In practice, service expansion will be coordinated in increments, based on near-term growth projections and a commitment to serve new and expanding communities and other significant trip generators as they evolve. More importantly, the SFMTA will regularly monitor the progress of development projects and system demand, aligned with upcoming procurement opportunities, and make adjustments to service demand as needed. Consequently, the SFMTA may occasionally choose to not meet the calculated

peak demand (through fleet expansion), but instead, manage overcrowding through targeted adjustments to service levels.

Assignment of Transit Vehicle Types

The SFMTA operates 75 transit routes, 11 of which are operated with articulated motor coaches (MCs) and trolley coaches (TCs). The current fleet includes 124 articulated motor coaches and 73 articulated trolley coaches. Over the next 20 years, the transit fleet is projected to increase the number of articulated buses operated, to cost effectively increase the transit system's passenger carrying capacity. In 2030, the SFMTA anticipates the fleet to include 207 articulated MCs and 121 articulated TCs.

To maximize operating efficiencies, the SFMTA seeks to operate the largest vehicle possible, maintaining frequent service and working within geographical, topographical and roadway constraints. The SFMTA considers conversion from a standard 40-foot bus to an articulated 60-foot bus when the resultant headway is 10 minutes or shorter. This approach holds true for converting from a one-car light rail vehicle (LRV) to two-car LRVs. Conversely the Agency is looking to shift some 30-foot routes to community vans to better reflect demand and to better work within geometrical roadway constraints.

This shift is most significant for the trolley coach fleet. Over the next 20 years, the Transit Fleet Plan anticipates replacing a portion of the 40-foot trolley coach fleet with 60-foot trolley coaches, resulting in a 5.6 percent increase in vehicle capacity (over 20-years), while slightly reducing the total number of trolley coaches in the fleet. The 40-foot trolley fleet will be reduced, from 240 to 188 vehicles (52 fewer vehicles), while the 60-foot trolley fleet will expand, from 73 to 121 vehicles (48 more vehicles). This switch to 60-foot vehicles is expected to yield operational efficiencies, consistent with the objectives of the Transit Effectiveness Project (TEP). The TEP focused on utilizing the existing trolley coach network, recommending strategic gap closures or operating efficiency projects for new overhead lines. The TEP carefully weighed the full cost considerations of building new trolley coach lines in developing its recommendations.

Grades and vertical curves influence whether an articulated bus can feasibly use the route. Too much flexing can wear out the articulated joint. A combination of a horizontal and vertical curve can be destructive to the joint. Sharp vertical sag curves can cause the front end of the bus to bottom, hitting the wheelchair ramp.


T-Third Street
Arriving 8 9 min

VI. Future Transit Facility Needs

This Transit Fleet Plan identifies the urgent need to increase transit facility space in San Francisco. Based on an analysis of the facility needs documented in the SFMTA's 2010 *Strategic Real Estate Management Plan (2010)*, it is estimated that the SFMTA will require over 17 acres of additional space to accommodate the transit fleet in 2030, requiring approximately 35 acres equivalent floor space to accommodate the growth in demand.

The following section summarizes the 2030 transit facility space needs for each mode, based on expected growth in transit demand, a function of future development and changes in modal behavior. These future needs were established using agency standards, as shown in Figure 17.

Figure 17: Projected Transit Fleet and Space Needs for 2030

Fleet/Facility	Current Fleet (vehicles)	Projected Fleet (vehicles)	Change (vehicles)	Additional Space Req'd (in acres)
Motor Coach	459	599	140	6.4
Trolley Coach	313	311	-2	1.0
LRV	151	208	57	4.0
Historic Streetcar	24	56	32	2.0
Cable Car	40	40	0	0.0
Reserve Motor Coach	47	47	0	0.8
1399 Marin Replacement	NA	NA		3.2
Total	**1,034**	**1,261**	**227**	**17.4**

Modal Implications

SFMTA's current transit facilities include three motor coach, two trolley coach, two light rail vehicle, one historic streetcar and one cable car. These transit facilities provide space for the storage and maintenance of the Agency's transit fleet. In addition to the existing motor coach facilities, the SFMTA is developing a new motor coach facility along Islais Creek. The characteristics of these facilities are shown in Figure 18.

Figure 18: SFMTA Transit Facilities

Operating Facility	Location (address)	Size (acres)	Modes Accommodated	Vehicles Assigned
Woods Division	1095 Indiana St.	7.2	40' Motor Coaches	233
Kirkland Division	151 Beach St.	2.6	40' Motor Coaches	140
Islais Creek Division	2600 Indiana St.	8.3	40' Motor Coaches (Future)	0 (165 future)
Flynn Division	1940 Harrison St.	6.5	60' Motor Coaches	130
Potrero Division	2500 Mariposa St.	5.9	40' Trolley Coaches 60' Trolley Coaches	191
Presidio Division	949 Presidio Ave.	6.3	40' Trolley Coaches	165
Green Division	San Jose Ave. (north of Geneva)	7.0	Light Rail Vehicles	93
Geneva Yard	Geneva Ave. (west of San Jose)	2.6	Historic Streetcars Light Rail Vehicles	50
Metro East	25th St. at Illinois St.	13.0	Light Rail Vehicles	58
Cable Car Barn	1201 Mason St.	1.9	Cable Car	40

Motor Coach

The motor coach fleet, which currently totals 459 vehicles, will need to expand by at least 140 vehicles to 599 by 2030 (see Figure 19), requiring an additional 6.4 acres of space to accommodate this growth, bringing the total amount of required space to 14.8 acres. Currently, the motor coach fleet includes 30 30-foot; 305 40-foot, and 124 60-foot coaches, but is expected to comprise 25 30-foot, 349 40-foot, 207 60-foot and 18 vans by 2030 as shown in the table below. Given that the Agency's existing motor coach facilities are either at or exceed their design capacity, the increase in motor coaches projected over the next 20 years will require that the SFMTA to construct one new motor coach facility. It should also be noted that there is a significant increase in the number of articulated coaches which require roughly 50 percent more storage space than standard coaches, and maintenance facilities that are sized accordingly.

Figure 19: Projected Changes in Motor Coach Fleet: 2010-2030

Vehicle Type	Current Fleet	Projected Fleet	Change
Vans	0	18	+18
30’ Small	30	25	-5
40’ Standard	305	349	+44
60’ Articulated	124	207	+83
Total	459	599	+140

Trolley Coach

While the total number of trolley coaches in the fleet is not projected to grow in the next 20 years, the mix of vehicles will change substantially (with the addition of articulated trolley coaches), necessitating the addition of one acre of space, bringing the total required space to 2.3. The trolley coach fleet includes 240 40-foot, and 73 60-foot articulated coaches, but is expected to comprise 188 40-foot and 123 60-foot coaches by 2030, as shown in Figure 20. To accommodate more 60-foot articulated trolley coaches, additional space for storage and maintenance will be required. One option is to purse the redevelopment of the existing Presidio or Potrero Divisions to provide space without having to construct a new trolley coach division.

Figure 20: Projected Changes in Trolley Coach Fleet: 2010-2030

Vehicle Type	Current Fleet	Projected Fleet	Change
40’ Standard	240	188	-52
60’ Articulated	73	123	+50
Total	313	311	-2

Light Rail Vehicle

The light rail fleet currently consists of 151 vehicles, but will need to expand to 208 vehicles by 2030, a 26 percent increase over the next 20 years. While this fleet expansion will require an additional 5.3 acres of space, most of the required need can be addressed through development of the four undeveloped acres at the Muni Metro East (MME) facility. The maintenance capabilities of the MME will need to expand further, as some of these capabilities were deferred at the time of its initial construction.

Historic Streetcar

Currently, there are approximately 100 historic streetcars in the SFMTA's fleet, some used in revenue service, others available for limited use and a number of currently inoperable vehicles. The historic streetcar revenue fleet, which presently totals 24, will need to expand to 56 vehicles in 2030, requiring an additional 2.0 acres (to accommodate both revenue and non-revenue streetcars) and bringing the total required space to 4.6 acres in 2030. If the SFMTA were to reduce the total inventory of Historic Streetcars to match its needs for revenue service vehicles, the entire streetcar fleet could be housed at the existing Geneva facility.

Cable Car

The cable car fleet consists of 40 vehicles, with no anticipated changes to fleet size between 2010 and 2030. As a result, no additional space will be required (over the 1.9 acres of space currently held).

Reserve Motor Coach

In addition to the revenue motor coach fleet described above, the SFMTA will need to accommodate the 47 reserve (contingency) vehicles currently stored at Woods, i.e., 41 40-foot vehicles and six 60-foot vehicles. As a result, the SFMTA will require an additional 0.8 acres of space, bringing the total required space to 1.8 acres.

Taken together, over the next 20 years, the Agency's total transit facility expansion needs come to 17 acres. The capital cost and potential funding plan to meet the future facility expansion need will be included in the Capital Plan update to be released by the end of 2010.

Van Ness BRT

As discussed previously, while the 49 route is currently anticipated to continue to operate with 60-foot trolley coaches when BRT is implemented on Van Ness Avenue, the 47 route will shift from 40-foot motor coaches to 60-foot hybrid coaches. If it is determined that there is inadequate space for the maintenance of 60-foot motor coaches at the existing facilities, staff has identified facilities at Marin, Islais Creek and

Metro East that vehicles could be shuttled to. This modification would incur annual costs of about $800,000 to $1,000,000. Alternatively, if space were made available, a facility for 60-foot vehicles could be developed, at least on a temporary basis until a full function facility can be constructed. The SFMTA is developing a Strategic Real Estate Plan to address this and other future facility needs.

VII. Funding Plan

In response to future land use modifications and resulting changes in transit demand, the SFMTA will need to strategically invest in transit vehicles and facilities through a coordinated program of acquisition and retirement strategies, as well as regular maintenance of vehicles. While it is important to ensure fleet turnover throughout the system, motor coach and trolley coach vehicles carry a significant proportion of daily travelers and can more easily be expanded to increase system capacity (e.g., more 40-foot and 60-foot motor coaches). For example, between 2010 and 2030 it is projected that 220 additional vehicle will need to be added to the Agency's fleets.

A comprehensive approach to balancing the overall capital costs of new vehicles with the necessary funding for operational maintenance is essential. Through its recently completed 2010 Financial Plan the SFMTA has identified a funding strategy for ensuring needed capital and maintenance expenditures over the next 20 years, as detailed in Appendix G.

Capital Costs

Vehicle acquisitions, including vehicle replacement, rehabilitation and expansion, represent only one component of agency-wide capital costs. The SFMTA Financial Plan, detailed in the FY 2012 New Starts Criteria Report for the Central Subway Project, provides a set of cost estimates for all the SFMTA's anticipated capital investments over the next 20 years (2010-2030). These agency-wide project capital costs, which total more than $3 billion for the 2010-2015 period and $13 billion for the 2010-2030 period (in 2010 dollars), include costs associated with the Central Subway, State of Good Repair, Transit Effectiveness Project, Van Ness Bus Rapid Transit, Expansion, Rehabilitation and Replacement of existing vehicles, facilities and rights of way, multi-modal expansion and other capital uses.

As part of the agency-wide capital costs, the most recent Capital Plan and the State of Good Repair (SGR) reports identify the replacement and rehabilitation costs for all modes identified in this Transit Fleet Plan, including motor coach, trolley coach, light rail vehicle, cable car, historic streetcar, paratransit and non-revenue vehicles (see Figure 21). Over the next 20 years, these replacement and rehabilitation costs are projected to total more than $3 billion (in 2010 dollars), with almost 80 percent of that expense coming from replacement costs and the remaining 20 percent coming from rehabilitation costs. If the replacement and rehabilitation costs are collectively broken down by mode, motor coach, trolley coach and LRV jointly represent about 90 percent of the total.

The 20-year procurement costs listed in this Transit Fleet Plan represent part of these costs, totaling more than $300 million between 2010 and 2015 and $2 billion from 2010 to 2030 (see Figure 19). These costs cover a significant expansion of the motor coach fleet (40-foot and 60-foot vehicles) and the light rail vehicle fleet, as described in Section V.

Figure 21: Twenty-year Capital Needs for Transit Fleet Plan (in million 2010 $)

Investment Type	2010-2030 Needs
Motor Coach	
Rehabilitation	$164
Replacement	$1,022
Subtotal	**$1,186**
Trolley Coach	
Rehabilitation	$105
Replacement	$531
Subtotal	**$636**
Light Rail Vehicle	
Rehabilitation	$219
Replacement	$768
Subtotal	**$987**
Historic Streetcar	
Rehabilitation	**$130**
Cable Car	
Rehabilitation	**$27**
All Modes	
Expansion	**$575**
TOTAL COST	**$3,541**

Source: *SFMTA 2010 State of Good Repair (SGR) Report,* p. 59

Maintenance Costs

In addition to capital costs of replacement, rehabilitation and future expansion of the transit fleet, the Fleet Plan accounts for future operations and maintenance (O&M) costs. According to the *FY 2012 New Starts Criteria Report for the Central Subway* submitted to the FTA, O&M costs (in 2010 dollars) will reach $746 million in FY 2020 and $759 million in FY 2030.

For the purposes of this Transit Fleet Management Plan, vehicle maintenance costs over the next 20 years will comprise a key component of the O&M costs. Figure 22 provides annual cost estimates for revenue vehicle maintenance by mode for 2010, 2020 and 2030.

Figure 22. Annual Revenue Vehicle Maintenance Costs (in million 2010 $)

Mode	2010	2020	2030
Motor Coach	$65.67	$83.49	$85.11
Trolley Coach	23.16	24.36	26.54
Light Rail Vehicle	36.37	57.15	63.56
Cable Car	6.20	6.86	7.53
Historic Streetcar	10.54	19.08	20.86
TOTAL COST	**$141.94**	**$190.94**	**$203.60**

Source: *SFMTA Financial Plan 9/2010*, AECOM

VIII. Conclusion

This Transit Fleet Plan describes the SFMTA's approach to maintaining, rehabilitating and replacing the Agency's transit fleet. It establishes the policies and guidelines by which transit service is structured and quantifying the fleet of vehicles needed to support this service. It anticipates and lays out a strategy to change vehicle types and fleet size to best meet projected demand. Finally, the Transit Fleet Plan establishes the resources necessary to maintain the existing system, while improving and building upon it for the future.

The Transit Fleet Plan also identified a number of challenges, including:

- Identifying the funding needed to support the maintenance, rehabilitation, replacement and expansion of the transit fleet, including the federal transit reauthorization bill.
- Optimizing the use of the SFMTA's existing facilities and identifying land for new facilities to support the projected expansion of the transit fleet.
- Exploring procurement strategies that provide an optimum level of service quality at minimum cost.
- Breaking the cycle whereby large portions of the fleet are procured, age and are replaced at the same time.

The Transit Fleet Plan is intended to be a living document that will be updated and refined as conditions change. It is the SFMTA's intent to formally review the document at least every two years. Staff will also establish a monitoring program to ensure the progress of key elements of the plan.

List of Appendices