Muni Metro Capacity Study

(Muni Metro Modernization Planning Study)

Final Report

Approved by SFMTA Board on December 2, 2025

METROPOLITAN TRANSPORTATION COMMISSION

CalSTA CALIFORNIA STATE TRANSPORTATION AGENCY

Caltrans

San Francisco County Transportation Authority

SFMTA

Letter of support from Community Working Group

November 30, 2025

The undersigned members of the Muni Metro Core Capacity Study Community Working Group express strong support for the Final Report and its recommendations. The Working Group reached broad consensus through a collaborative, well-facilitated process between SFMTA staff and engaged public participants and observers. The study recommendations are suited to the varied geography of San Francisco's neighborhoods and will help address future capacity needs, reinforcing our city's commitment to robust public transit as it evolves over the next several decades.

Key reasons for our support include:

- **A focus on practical, cost-effective infrastructure improvements.** The study prioritizes upgrades that build on the existing Muni Metro system rather than large-scale, disruptive, and expensive overhauls such as systemwide high-level platforms or transitioning the entire fleet to low-floor Light Rail Vehicles.
- **Longer trains to expand capacity.** The plan supports three-car trains on the high-ridership M Ocean View and N Judah lines, allowing critical capacity to be added as demand increases.
- **Greater operational flexibility with limited route restructuring.** The recommended investments provide operational flexibility alongside capacity, and position the system to serve future development in areas like Park Merced and Ocean View. This common-sense approach limits controversial route restructuring that would remove a line from the subway.

We also wish to underline SFMTA's collaborative process. The agency's "early and often" approach to public engagement builds trust well in advance of any construction. SFMTA staff committed to an iterative process, repeatedly coming back to the table in response to participants' questions and feedback. We especially appreciate the staff's pivot from the original pre-pandemic ridership projections to a broad range of potential "high/medium/low" ridership forecasts. The staff also excelled at explaining highly complex technical material.

Because of both the strength of the recommendations and the collaborative process to develop them, the Working Group enthusiastically endorses the final report and respectfully encourages the Board to adopt it.

Sincerely,

Karl Aguilar, K Ingleside, L Taraval, M Ocean View; former partner of Papehausen Hardware
Tammy Chan, N Judah, T Third; Senior Planner, UCSF
Lian Chang, street safety advocate, Secretary of the Westside Family Club
Alice Duesdieker, L Taraval, N Judah; Vice-President of Outer Sunset Neighbors
Dylan Fabris, J Church, K Ingleside, L Taraval, M Ocean View, N Judah; Community and Policy Manager, San Francisco Transit Riders

Cyrus Hall, K Ingleside, L Taraval, M Ocean View, N Judah; Inner Sunset resident
Sally Hatchett, K Ingleside, L Taraval, M Ocean View; West Portal resident
Aaron P. Leifer, J Church; Chair, SFMTA Citizens' Advisory Council (CAC)
Adrienne Leifer, K Ingleside
Mark Sawchuk, J Church; Board Chair, San Francisco Transit Riders
Caitlin Steele, M Ocean View; Director of Sustainability and Energy, San Francisco State University
Felicia Thibodeaux, M Ocean View, T Third; Southwest Community Corporation
Kath Tsakalakis, K Ingleside, L Taraval, M Ocean View; co-founder of Lakeside Village Business Council
Jean-Paul Torres, K Ingleside, L Taraval, M Ocean View, N Judah; Hayes Valley resident

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Technical appendices available by request.

Executive summary

Introduction

Muni Metro is the backbone of San Francisco's high-capacity transit system, carrying about 117,000 riders on an average weekday (as of September 2025). Muni Metro is experiencing both aging pains and growing pains. Much of the Muni Metro system's infrastructure is old and in need of replacement. SFMTA's 2023 State of Good Repair Report found that we would need $424 million per year to replace transit critical assets over the next 20 years. At the same time, we are experiencing crowding in some portions of the system today. Ridership continues to recover from pre-pandemic levels. As of September 2025, Muni Metro ridership is over 70% of pre-COVID ridership, and almost 20% higher than September 2024. We need to be prepared to handle higher ridership in the future to ensure that passengers have reliable, efficient, and comfortable transportation. If we are not prepared, riders could face crowding, pass-ups, and unreliable service.

Study goals, purpose, and outcomes

The ConnectSF Transit Strategy identified the need for a package of investments to increase capacity, reduce transit crowding, and increase frequency and reliability along San Francisco's rail network. To develop a plan for these investments, the SFMTA conducted the Muni Metro Modernization Planning Study (Muni Metro Core Capacity Study) between 2022 and 2025. The Study's primary goals are to 1) provide enough capacity to accommodate growing ridership and 2) make progress towards bringing aging Muni Metro infrastructure into a state of good repair.

The federal Core Capacity Capital Investment Grant program represents a unique opportunity to fund improvements that expand capacity on portions of existing rail systems that are overcrowded or forecast to be in the next ten years. These grants can top one billion dollars and cover up to 80% of the costs of a project. BART and Caltrain have previously received grants from this program. We tailored the capital program recommended by the Study to be eligible for this grant.

Right now is a challenging time for the SFMTA. We are working to address a financial crisis so we can keep running Muni. It might seem strange to do a long-range study like this one in the midst of this crisis. However, we do not want near-term challenges to stop us from doing the long-range planning that we need. We are starting now because grant opportunities like the Core Capacity program can take five or more years from application to funding award.

Process

We began by establishing primary and secondary goals to guide the Study. Building from past studies, we identified a number of potential strategies that could enhance capacity and/or modernize the Muni Metro system. Then, we conducted ridership forecasting to understand how many more riders we may need to serve in the future. Next, we assessed strategies based on engineering feasibility, potential contributions to increased capacity, costs, and implementation considerations. We then

eliminated some strategies, and mixed and matched others to form a set of packages that could meet forecasted future ridership levels. From this, we developed recommendations of which strategies to pursue further. We also developed the initial stages of an implementation plan. Throughout the entire Study we used a variety of outreach strategies to incorporate public feedback into the Study's technical approach and recommendations. Finally, we documented the process and findings in this final report.

Forecasting future ridership and crowding

There is uncertainty in the level of future ridership growth Muni Metro needs to accommodate. It will depend on both when post-pandemic recovery stabilizes and the pace of population and job growth in San Francisco. Because of this uncertainty, we developed low-, medium-, and high-ridership growth scenarios to help understand what may differ about the mix of investments we may need to make.

We expect that if Muni Metro frequency remains at today's levels, there would be overcrowding in the next 10-15 years in the Market Street Subway, the Twin Peaks Tunnel, and on portions of the N Judah and J Church, even in the lowest ridership growth scenario (see Figure 1). These segments meet the eligibility criteria for the Core Capacity grant.

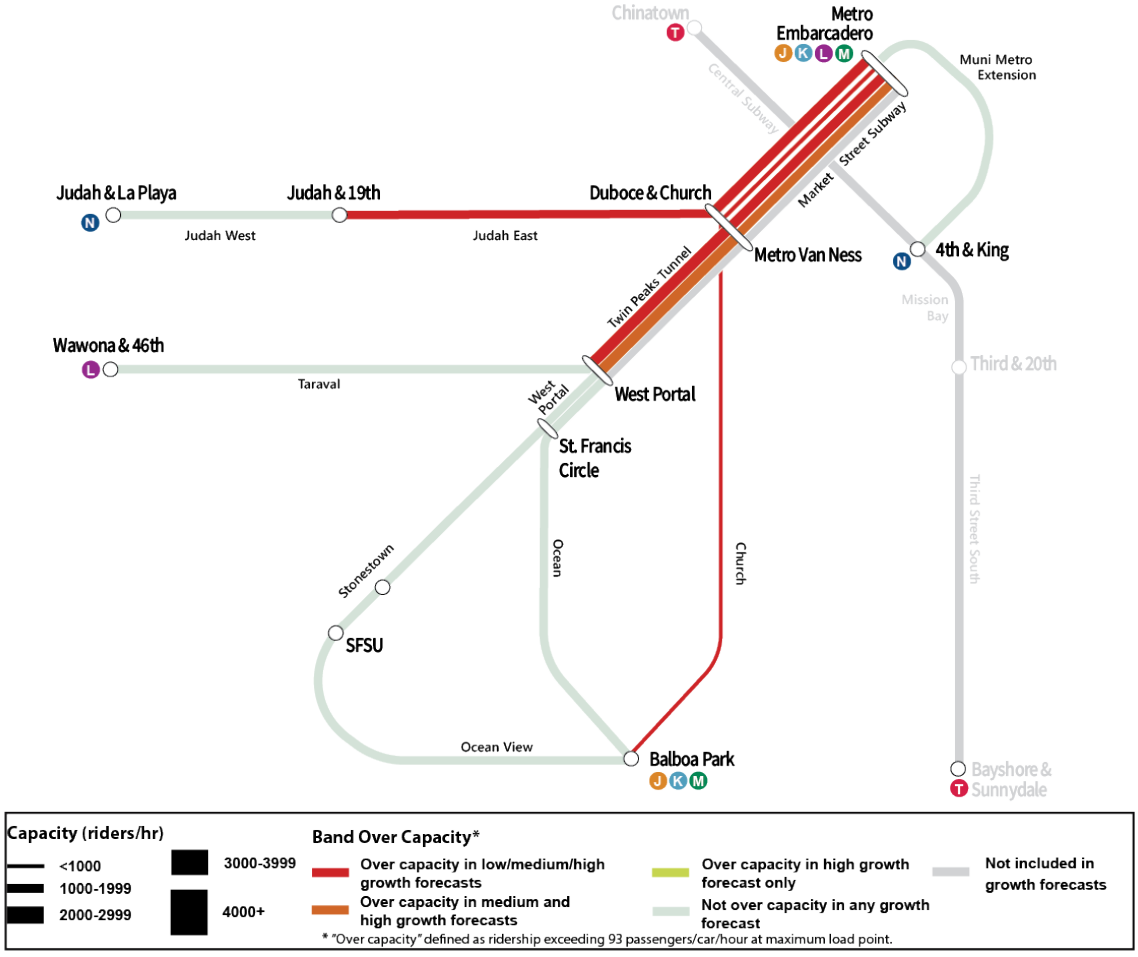


Figure 1: Forecasted crowding in the next 10-15 years. This analysis assumes a planning capacity of 93 passengers per light rail car.

Strategy screening and evaluation

We developed our recommendations informed by three sequential steps of technical work. First, the Study team generated a list of potential capacity strategies that could potentially expand capacity on the existing Muni Metro system. Next, the Study team conducted assessments on the potential improvement strategies, looking at engineering considerations to assess technical feasibility; cost considerations, including capital and operating cost estimates, where applicable; and other implementation factors. Finally, the Study Team created five packages to meet the projected capacity needs of the low- medium- and high-ridership forecasts over the next 10-15 years. We layered improvements in sequence, from solutions that might involve less disruption to ones that might involve more. We also evaluated the packages' performance against our goals framework.

Core capacity capital program recommendations

The Study recommends a capital investment program to address future overcrowding. It focuses on the Market Street Subway, Twin Peaks Tunnel, N Judah and the M Ocean View between West Portal and SF State. Investments along the M Ocean View corridor would help address overcrowding in the Twin Peaks Tunnel and the Market Street Subway. To complement these capital investments, we would increase frequency and use other operational strategies throughout the rest of the system. For example, the forecast increase in overcrowding on the J Church could be addressed through increases in frequency. Together, these capital and operational strategies could solve our future capacity needs across all three growth scenarios.

The Study recommends the following capital program:

1. **Capacity-enhancing upgrades of old infrastructure**. Anticipated rail replacement projects for portions of the N Judah and M Ocean View lines give us a timely opportunity to install modern, capacity-enhancing infrastructure rather simply replacing the existing, outdated infrastructure. Capacity-enhancing components could include modern track embedded in concrete, new or upgraded traction power substations, upgraded switches, and re-alignment of track.
2. **Expand infrastructure that prioritizes transit.** We recommend continuing to apply the Muni Forward program's transit priority toolkit to on-street Metro locations that do not yet have these types of treatments. This includes consideration of transit lanes where they are not yet in place. In addition, we recommend signalizing stop-controlled intersections and upgrading more signals to provide transit signal pre-emption. We also recommend considering crossing gates at select locations.
3. **Upgrade infrastructure to accommodate three-car trains.** We recommend pursuing upgrades for three-car service on the N Judah, as well as on the M Ocean View between SF State and downtown. Each three-car train that replaces a two-car train increases capacity by 50%. Infrastructure would include:
    - **Boarding infrastructure for three-car trains.** To provide a safe place for riders to board at each door of the train, some street space would need to be used to extend platforms or boarding islands for all doors of a three-car train. For the M Ocean View, we recommend

upgrading rail stops between West Portal and SF State with level boarding platforms so no one needs to use the stairs to get on a train. For the N Judah, due to technical constraints with installing level boarding platforms, we recommend upgrading rail stops with mini-high ramps that provide level boarding at one door.

- **Infrastructure to provide flexibility for different service patterns in the future.** Approved plans call for three-car M Ocean View trains to turn around past SF State in Parkmerced, operating as an M Short line. (Or, if the Parkmerced development does not build out as planned, this infrastructure could instead be provided in the median of 19th Avenue south of San Francisco State University). We also recommend building new infrastructure to make it possible to extend the J Church to Stonestown. Any service changes would be explored later as a part of a community planning process***. We recommend that combined service frequency in the Oceanview remain the same as today's frequency (every 10 minutes during weekday daytime hours) so that introducing three-car M Ocean View service does not negatively impact service frequencies in the Oceanview.*** Extending the J Church to Stonestown and continuing to operate some M Ocean View service to Balboa Park could accomplish this. Future service planning would also need to consider available operating budget.

What is not recommended

We considered several strategies that are not recommended:

- **Systemwide all-door level boarding**: Accessible platforms are an important and necessary part of improving and modernizing Muni Metro. One idea we studied was to build full-length high-level platforms at all stops. This would make the system completely accessible, decrease travel time by reducing dwell time at stops, and eliminate the need for maintenance-intensive moving stairs. However, we found that there are difficult tradeoffs to fitting these platforms on many of the narrower streets Muni Metro operates along. We would have to remove parking and possibly impact access to driveways. It also would be more difficult or impossible to fit other elements such as transit lanes. We are recommending full-length high-level platforms along the M Ocean View between SF State and downtown, where only a few stops would need to be upgraded and the street width is adequate. Along the N Judah, we recommend mini-high platforms instead of full-length high-level platforms. Mini-high platforms would provide accessibility with fewer tradeoffs.
- **Systemwide low-floor fleet**: We studied the feasibility of converting the entire Muni Metro system (except the T Third) to low-floor vehicles. This would include new boarding platforms about 14 inches above street level, which require shorter ramps than high platforms and have less visual impact. We found it might be possible to switch the system to low-floor vehicles, but it would be very expensive and cause significant disruption. To shift to a systemwide low-floor fleet we would have to make several changes to the Twin Peaks Tunnel and Market Street Subway, estimated to cost over $250 million (cost estimate is for construction costs in 2024 dollars). The benefits would also be limited, as we would still face the same problems with limited street space that make it hard to build fully level boarding platforms on streets with narrow right-of-way.
- **Surface-only L Taraval/K Ingleside line**: We considered interlining (combining) the L Taraval and K Ingleside as a part of the Study's assessment of route restructuring (see next

section). This would involve joining the surface portions of the L Taraval and K Ingleside to form a surface-only route between Balboa Park and the Zoo. LK riders would transfer to the subway at West Portal Station and use M Ocean View and subway shuttle trains. While it is possible to operate a surface-only LK, we found that it would not help address capacity constraints and would disbenefit L and K riders destined for Downtown who would need to transfer.

- **Four-car trains**: The platforms in the Market Street Subway and on the Embarcadero are long enough to serve four-car trains. Four-car trains could provide double the capacity of two-car trains. But along most of the rest of the Muni Metro lines, the street blocks are not long enough to fit four-car trains. Many intersections would have to be closed to cross traffic. Even at the highest projected demand, three-car trains would be enough to handle ridership for the next 25 years for regular daily service.

Consideration of route restructuring

Route restructuring involves changing one or more lines by combining all or parts of lines, shortening lines, and/or removing lines from the Market Street Subway. Some forms of route restructuring would improve capacity by allowing space in the subway for longer trains. In some cases, they would involve removing one or more existing lines from the subway, with a transfer needed to continue downtown.

At this time, we are not recommending any route restructuring. We can accommodate future ridership in the next 10-15 years with the recommended capital program which does not include route restructuring. We can keep exploring this strategy as we track ridership increases and subway performance. If ridership growth is very high, we may need additional strategies beyond those in the recommended capital program by 2050.

If we see a trend toward higher ridership or declines in subway performance, we would consult with the community before we take any action. We could also consider upgrading another line for longer trains instead of pursuing route restructuring. We did not analyze technical feasibility of longer trains on other lines in the Study but should consider it if future ridership levels warrant it. If any potential route restructuring ideas are pursued in the future, they should also include transfer improvements such as policies for holding trains at transfer locations and physical improvements at stations to minimize inconvenience to passengers.

Community engagement

The study included multi-faceted engagement with Muni Metro riders, stakeholders, and community groups including the following:

Community Working Group: The Study team met eight times with members of a Community Working Group that provided community feedback throughout the Study. Staff vetted ideas, strategies and study methodology with this group. Group members provided questions, comments and suggestions that helped shape the Study's approach and recommendations.

Community group meetings: Staff met with community groups who reached out, including SaveMuni, People of Parkside Sunset (POPS), the Restore the J Working Group, Senior Disability Action, and the Merced Extension Triangle Neighborhood Association.

Muni Metro rider focus groups: We held four rider focus groups in English, Cantonese and Spanish in October 2024. These focus groups helped the study team understand Muni Metro rider opinions on the potential strategies under consideration.

Boards and commissions: The study team provided informational updates to the SFMTA Citizen's Advisory Council, SFMTA Board, SFCTA Citizen's Advisory Committee, SFCTA Board of Commissioners, and SFMTA Multimodal Accessibility Advisory Committee at select milestones.

Inter-agency Technical Advisory Committee: The study team convened a Technical Advisory Committee of city and regional agency partners to provide guidance on the Study. The TAC met twice, to review the Study's process and provide feedback on the Study's recommendations and interconnections between other relevant planning and policy work.

Project webpage and subscriber updates: The Study team has maintained a webpage—SFMTA.com/MetroStudy—that overviews the Study's purpose and status. We also provided occasional project updates to an email and text subscriber list.

Draft recommendations outreach: The study team made draft recommendations available for review and comment via an interactive website available in English, Chinese, Spanish, and Filipino. The team also presented these recommendations to interested groups.

The feedback received from this engagement directly shaped the Study's technical approach and recommendations. Key themes that emerged from the outreach include:

- Muni Metro's continued success is imperative.
- Plan for multiple future scenarios.
- Focus on rider priorities.
- Set up future corridor-based outreach for success.
- Removing a line from the subway should be left as a last resort.
- Maintain service frequency in the Oceanview

Initial Core Capacity grant program definition

The proposed capital program would be advanced as two or three related projects:

- N Judah Core Capacity Project between Church Street and La Playa
- M Ocean View Core Capacity Project, primarily between West Portal and SF State
- Potentially, a third project, depending on the scope and locations of capacity-enhancing upgrades to old infrastructure. This could include work in the subway and/or minor upgrades to other lines.

The N Judah and M Ocean view projects would include any upgrades to track, Overhead Catenary System (OCS, also known as overhead wires), track switches, and traction power (the electricity that powers trains) needed as a part of planned re-railing and that could be considered capacity-enhancing.

The N Judah project would also include:

- Signalizing up to 50+ stop-controlled intersections and expanding signal priority/pre-emption
- Boarding platforms for three-car trains with mini-highs at all stops
- A new La Playa terminal to accommodate 3-car trains
- Any traction power upgrades needed to operate 3-car trains

The M Ocean View project would also include:

- Signalizing up to five stop-controlled intersections and expanding signal priority/pre-emption at other signals
- Potentially crossing gates at Ocean, Eucalyptus, and Rossmoor
- New high-level platforms at Ocean/Eucalyptus (consolidated) and St. Francis Circle (or relocated location)
- Platform expansion for three-cars at Stonestown and SF State
- Stonestown terminal infrastructure for a potential J Church extension
- Balboa Park trackwork to for a potential J Church extension
- SF State or Parkmerced terminal infrastructure for potential M Short service
- Any traction power upgrades needed to operate 3-car trains

We estimated the cost of the recommended improvements is $915 million to $1,200 million. This includes costs to complete planning, preliminary engineering, detailed design and construction. Costs are escalated assuming construction begins in ten years and lasts ten years. Since the scope of capacity-enhancing upgrades to old infrastructure is not yet identified, we have included a placeholder range. Further phases of project planning will refine this estimate.

Next steps

Following completion of this Study, staff will conduct additional implementation planning work. This will include further analysis of infrastructure needs as well as conceptual engineering work. Improvements to the N Judah and M Ocean View will be developed as two distinct projects that are staggered in their planning, design, and construction. They will be advanced as a project "bundle" as is an option in the federal Capital Investment Grant process. Each would have its own public corridor planning processes that would be conducted prior to bringing each to the SFMTA Board for approval. A potential third project may also be advanced once the full scope of capacity-enhancing upgrades to old infrastructure is defined. Each project would proceed through the different stages of the Capital Investment Grant process which includes Project Development, Engineering, receipt of a Full Funding Grant Agreement, and Construction.

1. Introduction

Muni Metro is the backbone of San Francisco's high-capacity transit system, carrying about 117,000 riders on an average weekday (as of September 2025). Muni Metro is experiencing both aging pains and growing pains. Much of the Muni Metro system's infrastructure is old and in need of replacement. SFMTA's 2023 State of Good Repair Report found that we would need $424 million per year to replace transit critical assets over the next 20 years. At the same time, we are experiencing crowding in some portions of the system today. Prior to the pandemic, overcrowding was common on Muni Metro. Riders often experienced slow, congested trips in the Market Street Subway. Currently, Muni Metro ridership is at about 70% of pre-pandemic levels. As a result, we've been able to run less service and still meet demand. This has also reduced subway congestion and delays. Ridership has increased by almost 20% in the last year (from September 2024 to 2025) and crowding has begun to re-emerge on some lines during peak hours. We need to be prepared to handle higher ridership in the future to ensure that passengers have reliable, efficient, and comfortable transportation. If we are not prepared, riders could face crowding, pass-ups, and unreliable service.

Study goals, purpose, and outcomes

The ConnectSF Transit Strategy is San Francisco's long-range transit vision, completed in 2021. It identified the need for a package of investments to increase capacity, reduce transit crowding, and increase frequency and reliability along San Francisco's rail network. To develop a plan for these investments, the SFMTA conducted the Muni Metro Modernization Planning Study (Muni Metro Core Capacity Study) between 2022 and 2025.

What is "capacity"? *In this Study, we use the term "capacity" to mean whether or not there is enough room on the train for everyone who wants to ride. If a train is very crowded, some riders may get passed up by a full train and have to wait for the next one. This Study focuses on identifying what we need to do so there will be enough room for riders in the future and no one gets passed up.*

We established the following goals framework to guide the Study.

Primary Goals

- **Provide enough capacity:** Provide sufficient capacity to accommodate growing ridership while maintaining a high quality of service.
- **Replace aging infrastructure**: Make progress towards bringing aging Muni Metro infrastructure into a state of good repair.

Secondary Goals

- **Cost effectiveness:** Deliver improvements to capacity and infrastructure renewal at a reasonable cost.
- **Speed and reliability:** Improve train speeds and reliability to directly support crowding relief and provide benefits to riders.

- **Accessibility:** Make more stops accessible for passengers with disabilities or other mobility constraints across the system.
- **Equity:** Benefit communities identified in the Muni Equity Strategy and support the City's broader equity goals.
- **Managing trade-offs:** Achieve a balanced overall program that manages the pros and cons of different solutions.

The Study's purpose is to develop a program of capital projects for the next 10-15 years. These projects would allow us to meet our primary goals to expand system capacity and replace old Muni infrastructure.

The federal Core Capacity Capital Investment Grant program represents a unique opportunity to fund improvements that expand capacity on portions of existing rail systems that are overcrowded or forecast to be in the next ten years. We tailored the capital program we are recommending to be eligible for this grant (discussed in more detail later in this report).

Right now is a challenging time for the SFMTA. We are working to address a financial crisis so we can keep running Muni. It might seem strange to do a long-range study like this one in the midst of this crisis. However, we do not want near-term challenges to stop us from doing the long-range planning that we need. We are starting now because grant opportunities like the Core Capacity program can take five or more years from application to funding award.

Process

We began by establishing primary and secondary goals to guide the Study. Building from past studies, we identified a number of potential strategies that could enhance capacity and/or modernize the Muni Metro system. Then, we conducted ridership forecasting to understand how many more riders we may need to serve in the future.

We conducted assessments of strategies' engineering feasibility, potential contributions to increased capacity, costs, and implementation considerations. We then eliminated some strategies, and mixed and matched others to form a set of packages that could meet forecasted future ridership levels. From this, we developed recommendations of which strategies to pursue further. We also developed the initial stages of an implementation plan.

Throughout the entire Study we used a variety of outreach strategies to incorporate public feedback into the Study's technical approach and recommendations. Finally, we documented the process and findings in this final report.

Centering Muni Metro rider needs

The Study's recommendations have been designed to address Muni Metro rider priorities as shown in Figure 2. These needs have been identified through the Study's outreach as well as other SFMTA outreach.

Figure 2 - Muni Metro rider priorities that Study recommendations have been designed to address

Muni Metro Modernization program

In addition to the investments recommended by this Study, a broader set of SFMTA projects form the SFMTA's Muni Metro Modernization Program. They include:

- **Subway Renewal Program.** The Subway Renewal Program is a 10-year plan to make capital investments in the subway to address a backlog of capital work and modernize the system. This program has been underway for a few years and encompasses five capital investment areas: the Train Control Upgrade Project (see next item), track and wayside equipment,

traction power, tunnel safety, security and resiliency, and station enhancement and passenger comfort.

- **Train Control Upgrade Project (TCUP).** TCUP is a critical, once-in-a-generation investment to replace the outdated system that currently controls our Metro trains in our subways with new, state-of-the-art technology. It will also extend the new technology to all on-street Metro corridors throughout San Francisco. TCUP will help make Muni Metro safer, faster, more reliable and more efficient. The project's planning and design are well underway with Phase 1, the Initial Technology Demonstration phase, anticipated to begin installation in late 2026 followed by overlapping phases to replace the technology in the subway and extend it citywide. The final on-street installation is expected to be completed in 2034.
- **Muni Forward rail projects.** Upgrades to improve transit speed and reliability on several portions of the Muni Metro system are in various stages of planning, design, and implementation. This includes the J Church Safety and Accessibility Project, Church and Market Street Intersection Improvements (J Church), M Ocean View Transit and Safety Project and the K Ingleside Rapid Project, which have completed planning, project approvals and quick-build upgrades, with full project implementation planned within the next few years. Signal timing and transit signal priority improvements are also currently underway on the T Third that will be completed within the next one to two years. In addition, there will be a future project along portions of the N Judah that would be implemented prior to the 10-15 year timeframe of this Study's capital program recommendations.
- **Light rail vehicle fleet.** The SFMTA is nearing completion of the procurement of its newest light rail vehicle fleet. Constructed by Siemens, the first new trains began operation in 2017. When the procurement is complete in 2027, Muni Metro will have a fleet size of 219. This is a significant increase—68 vehicles more than our prior 151-vehicle Breda fleet.

Organization of this report

The rest of this report is organized into the following chapters:

- **Chapter Two** summarizes Muni Metro's history, highlighting some of the unique challenges of our 100-year-old light rail system and the implications they have for the future.
- **Chapter Three** provides information about the federal Core Capacity grant program that this Study has developed a draft investment program for.
- **Chapter Four** summarizes the work we did to forecast future ridership and crowding.
- **Chapter Five** explains the technical analysis we did to inform our recommendations.
- **Chapter Six** presents our recommendations on infrastructure to include in the Core Capacity capital program in the next 10-15 years. It also explains possible strategies that are not needed in the next 10-15 years but may be needed by 2050, as well as those strategies that were considered and are not recommended.
- **Chapter Seven** describes how outreach with community members has guided the study.
- **Chapter Eight** presents our initial core capacity grant program definition.
- **Chapter Nine** concludes by describing the next steps in readying the recommended program for implementation.

2. Muni Metro history: the unique challenges of a 100-year-old system and implications for the future

Muni Metro's historical legacy affects how we envision the future. Muni Metro is one of only a handful of "legacy" systems in the country. Much of the system's origins date back over a hundred years. Muni Metro, as we know it today, was born in the 1970s. This is when Muni's streetcar lines began running in the Market Street Subway.

This unique history means Muni Metro is different from newer Metro systems.

Figure 3: First day of revenue service in the Muni Metro Subway with passengers. Boeing Light Rail Vehicle on N Judah in Powell Station, February 1980

Operating on narrower streets. Some portions of the system operate on narrow streets and tight curves. The small streetcars that ran 100 years ago could navigate these conditions easily. But streets like these would not have been selected for today's larger, modern trains. New light-rail system construction must adhere to modern standards for accessibility.

Figure 4: N Judah at 9th Avenue and Judah, October 18, 1940

Light rail vehicles with stairs. When the Market Street Subway was constructed, light rail vehicles with low floors were not commonly available. Subway platforms were built for vehicles that were higher above the ground. But we did not build platforms for all the stops at street level. This means our trains have to lower their stairs at street level and raise the stairs inside the subway. At many of the street-level stops of the system, riders must climb stairs to get on board.

Figure 5: Boarding at N Judah stop in Inner Sunset

Ramps for accessible boarding. To make Metro stops on the street accessible for people of all physical abilities, we build ramps to high platforms. These ramps take up street space. Sometimes, there are already driveways on the street and many of our streets are narrow. This makes ramps difficult to build at every Metro stop. The result is a system that is not fully accessible.

Figure 6: L Taraval mini-high ramp for accessible boarding

Implications for the future. The Study has considered this legacy past in developing our recommendations. Recommendations are different than what would make the most sense if we were designing a system from scratch.

3. Core Capacity grant opportunity: positioning for federal funding designed for systems like Muni Metro

The Muni Metro Capacity Study identifies a program of capital projects to ensure there is sufficient capacity for projected future ridership growth. This program has been designed to be eligible and competitive for a federal Core Capacity Capital Investment Grant.

This grant is administered by the Federal Transit Administration (FTA). It is perfect for systems like Muni Metro. Our system has aging infrastructure overdue for replacement. We also need to expand capacity for growing ridership at the same time.

A federal Core Capacity grant can fund up to 80% of project costs. Recent grants have topped $1 billion dollars. As shown in

Table 1, several portions of the Muni Metro system meets the eligibility criteria for the program.

While the federal environment is uncertain, we must do all we can to be competitive. It can take four to six years between entering the grant pipeline and receiving an award. BART recently received $1,170 million in funding and Caltrain received $647 million.

What is "Core Capacity"? *Many transit systems have plenty of capacity at most parts of the system and at most times of day. "Core capacity" refers to the parts of the system where more capacity is needed. These locations are typically where crowding is worst, are near major destinations like downtown, and are where multiple lines converge. For Muni Metro, our core capacity needs are most significant in the Market Street Subway.*

Table 1: Federal Core Capacity grant eligibility based on 2024 observed ridership (eligible segments in bold). Any segment below 5.4 square feet per passenger is considered currently above capacity and eligible for Core Capacity funding, while segments below 10.8 square feet per passenger are expected to reach capacity within the next 10 years and are therefore also eligible.

Segment	Endpoints	Peak Hour Square Feet Per Passenger)[1]	Eligible	Percentage Ridership Growth Needed for Eligibility
Market Street Subway	**Embarcadero – Van Ness**	**8.6**	**Yes**	**N/A**
Twin Peaks Tunnel	**Van Ness – West Portal**	**10.2**	**Yes**	**N/A**
Ocean View	SF State – Balboa Park	22.8	No	111%
Stonestown	St. Francis Circle – SF State	23.2	No	115%
West Portal	West Portal – St. Francis Circle	24.9	No	131%
Judah East	**Van Ness – Judah/19th**	**6.3**	**Yes**	**N/A**
Judah West	Judah/19th – Judah/La Playa	16.5	No	53%
Taraval	West Portal – Wawona/46th	18.5	No	71%
Ocean	St. Francis Circle – Balboa Park	24.7	No	129%
Church	**Van Ness – Balboa Park**	**7.3**	**Yes**	**N/A**
Muni Metro Extension	Embarcadero – 4th/King	16.3	No	51%
Central Subway	Chinatown – 4th/King	15.0	No	39%
Mission Bay	4th/King – 3rd/20th	18.7	No	73%
Third Street South	3rd/20th – Bayshore/Sunnydale	26.2	No	148%

[1] Based on 555 square feet of usable space per car

4. Forecasting future ridership and crowding

As of 2025, Muni Metro is the fourth-busiest light-rail system in the nation. It is the second busiest transit corridor in the Bay Area after BART's Transbay Tube. Muni Metro ridership has been growing each year since the pandemic. We are starting to see overcrowding again, particularly on the N Judah. The level of ridership growth over the coming decades is uncertain. We do not know how quickly growth will happen or when post-pandemic recovery will stabilize. That's why we looked at low-, medium-, and high-growth scenarios. This helps us to understand what mix of investments we may need to make to ensure there is enough room on Muni Metro for future riders.

Figure 7: Crowding on the N Judah, 2024)

The Muni Metro Capacity Study conducted initial ridership forecasting in 2023, using a ridership forecast developed for the 2022 San Francisco Housing Element Update's Environmental Impact Report. This forecast was developed using the San Francisco County Transportation Authority's (SFCTA's) SF-CHAMP activity-based travel demand model. It assumed a full return to pre-COVID travel behavior and 82,000 new housing units in San Francisco by 2031.

As the study progressed, ridership data showed that Muni was not on track for a quick recovery to pre-COVID ridership levels. Also, recent land use growth did not match the levels assumed in the Housing Element's analysis. We heard from community stakeholders that we should factor in these changing conditions.

In response, we developed new ridership forecasts. These forecasts include multiple scenarios to acknowledge uncertainty. They recognize that the future may unfold in different ways.

The forecast methodology uses two factors:

1. Growth in population and jobs
2. The ratio of ridership to population and jobs, or "ridership ratio"

Both are described in more detail in the following subsections.

Growth in population and jobs

Growth in population and jobs drives more Muni Metro ridership. Our analysis considers population and jobs within a half mile of Muni Metro stops south and west of Van Ness Station (excluding Van Ness Station). Van Ness Station represents the part of the system where trains are most full. This is also called the "maximum load point." Inbound from Van Ness Station, trains are less full as more riders get off the train than get on. The maximum load point is the capacity bottleneck for the system.

Our analysis assumes growth in population and jobs south and west of Van Ness Station would be the main reason for more Muni Metro trips at the maximum load point. This would also be the main cause for capacity needs on Muni Metro as a whole.

The analysis considers four potential population and job growth trends. They are ordered here from highest to lowest growth:

- **SF Housing Element**: This scenario uses the population and job growth estimates from the 2022 San Francisco Housing Element Update. These estimates were created by the San Francisco Planning Department.
- **Updated Forecasts**: This scenario uses newer population and job growth estimates developed by the San Francisco County Transportation Authority (SFCTA) for the San Francisco Transportation Plan 2050+. These estimates match the draft Plan Bay Area 2050+ for the whole nine-county region. For San Francisco, the Planning Department adjusted the distribution of population and job growth within San Francisco. This helps to better reflect current and future building plans. These assumptions are also the latest being used in other long-term transportation planning for the city.
- **Historic High**: This scenario assumes that San Francisco's population and jobs will grow by 1% each year, starting from 2023 data from the American Community Survey. This rate includes both fast growth and slowdowns. It is similar to the city's growth rate from 2000 to 2019 (0.90%) and from 2010 to 2023 (1.07%). Each of those periods included at least one major economic downturn.
- **Historic Moderate**: This scenario assumes a slower growth rate of 0.5% per year, also starting from 2023 data. This rate is based on the city's average growth from 2000 to 2023 (0.49%). That time period included the 2008 recession, the COVID-19 pandemic, and times of fast growth.

The SF Housing Element scenario assumes more-rapid linear growth to 2035 and then less-rapid linear growth from 2035 to 2050. The other three scenarios assume steady linear growth between 2024 and 2050.

Table 2 shows the 2023 base year population and jobs for San Francisco. Table 3 shows the combined population and job growth assumed in each scenario in 2035 and 2050.

Table 2: San Francisco population and jobs, American Community Survey, 2023

Population	Jobs	Population + Jobs
809,000	744,000	1,553,000

Table 3: Assumed increase in population and jobs over 2023 for four land use scenarios

	2035		2050	
	#	%	#	%
SF Housing Element	420,000	27%	629,000	41%
PBA 2050+	246,000	16%	611,000	39%
Historic High	197,000	13%	478,000	31%
Historic Moderate	96,000	6%	224,000	14%

Ridership ratio

The "ridership ratio" compares:

- Weekday Muni Metro boardings by line, to
- The amount of population and jobs near Muni Metro stops, also known as the "service population"

This measurement shows how often people use Muni Metro compared to how many people live or work near a Muni Metro stop. For example, if a Muni Metro line has a ridership ratio of 0.10, it means that for every 100 people and jobs within half a mile of a stop, there are about 10 transit trips taken.

The Study used two different ratios to represent two different ridership recovery scenarios:

- **Full Recovery**: The ridership ratio returns to pre-COVID levels. Ridership ratios in this scenario vary (by line) between 0.09 and 0.34.
- **Half Recovery**: The ridership ratio returns halfway to pre-COVID levels. Ridership ratios in this scenario vary between 0.07 and 0.27.

In both scenarios, we assume the growth in the ridership ratio is linear through 2035. We also assume it is constant from 2035 on.

Ridership forecast results

The combination of four population and job growth scenarios and two ridership ratio scenarios produced twelve potential ridership forecasts. We then used these forecasts to create three ridership "bands," shown in Figure 8: Low, Medium, and High. Table 4 shows the lower and upper bounds for each band. These bounds were chosen to produce similarly sized bands across a range of years.

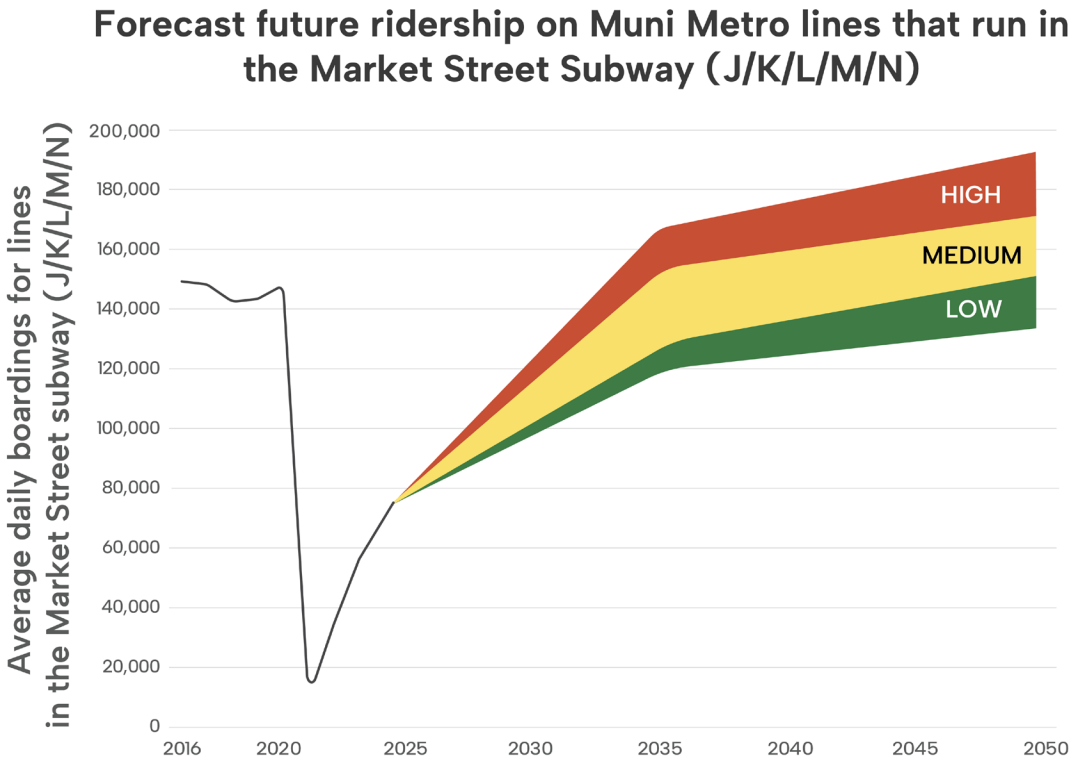


Figure 8: Forecasted future ridership on the Muni Metro lines that run in the Market Street Subway (J, K, L, M, N), showing the high, medium, and low bands.

Table 4: Ridership forecast trend lines for each ridership forecast band

	Lower bound	Upper bound
Low	Historic Moderate Growth and Half Recovery	Historic High Growth and Half Recovery
Medium	Historic High Growth and Half Recovery	Historic Moderate Growth and Full Recovery
High	Historic Moderate Growth and Full Recovery	SF Housing Element and Full Recovery

Future crowding

We then translated ridership forecasts to morning rush hour train loads throughout the Muni Metro system. As shown in
Figure 9, we expect that if Muni Metro frequency remains at today's levels (2025), there would be overcrowding. This would happen in the Market Street Subway, the Twin Peaks Tunnel, and on portions of the N Judah and J Church. This would happen in the next 10 to 15 years, even in our lowest ridership growth scenario.

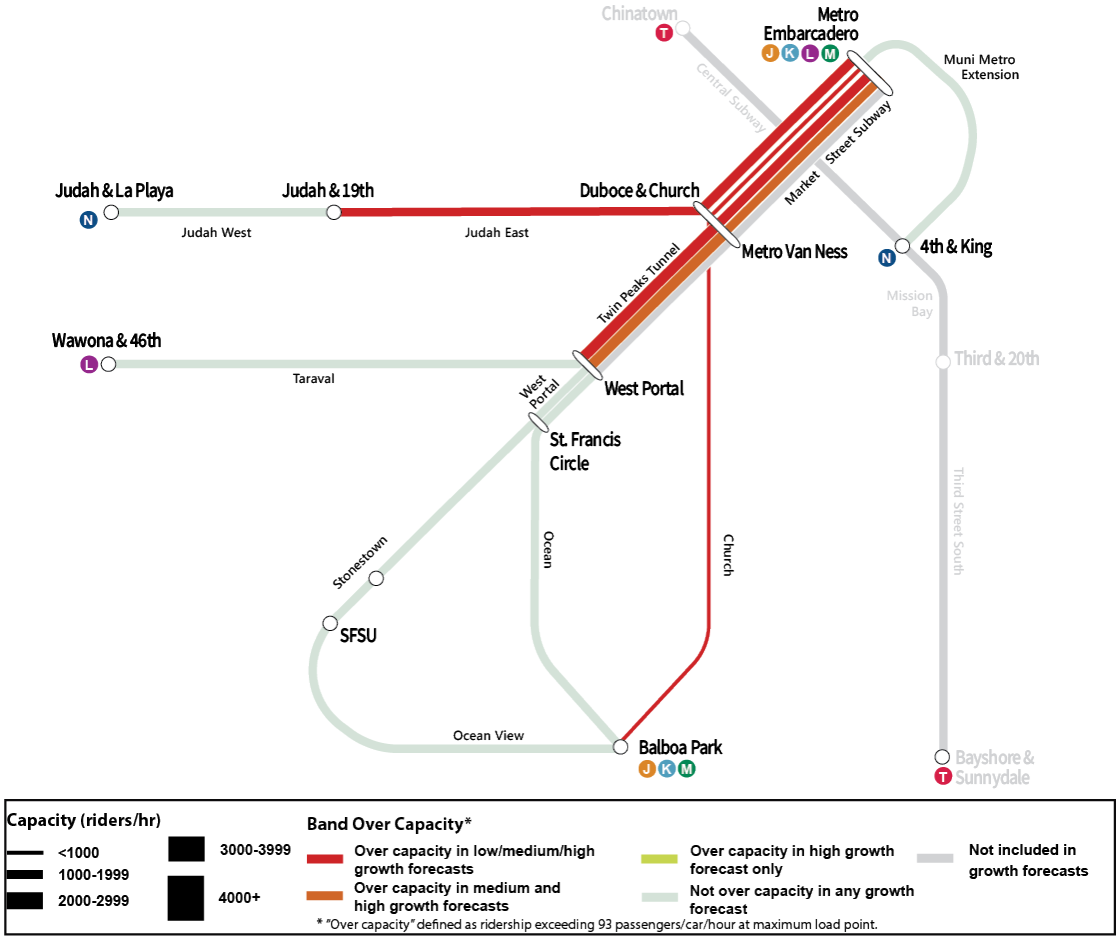


Figure 9: Forecast morning peak period crowding in the next 10-15 years. This analysis assumes a planning capacity of 93 passengers per light-rail car.

5. Technical analysis: showing our work on how recommendations were developed

This chapter describes the technical work that informed the Study recommendations that are presented in the next chapter. It covers three sequential steps:

- Identification and screening of potential strategies
- Feasibility assessments of individual strategies
- Development and evaluation of packages of strategies that provide the needed capacity for the low-, medium-, and high-growth forecasts

This technical work is summarized briefly in this report. More detailed documentation is provided in the Study's technical appendices.

Identification and screening of potential strategies

The Study team generated a list of potential capacity strategies (see Table 5). This list was derived from previous studies including the ConnectSF Transit Strategy (2021), Bay Area Core Capacity Planning Study (2017), Draft Rail Capacity Study (2016) and from professional expertise of team members. We only included strategies that could potentially expand capacity within the existing Muni Metro system. Adding new lines or building new tunnels for existing lines, while proposed by some of the previous studies, was outside the scope of this study.

The Study team identified the strategies that had the greatest potential to provide more capacity as three-car N Judah trains, three-car M Ocean View Short line trains, and service restructuring. The remaining ideas were considered complementary solutions that could potentially accompany these larger capacity investments.

Table 5: List of potential solutions

Strategy	Description
Three-car N Judah trains	Adding a third car to N Judah trains, including longer platforms.
Three-car or four-car M Ocean View Short line trains	Operating an M Ocean View short line between Embarcadero and SF State or Parkmerced with three- or four-car trains, including longer platforms.
Surface-only subfleet	Removing one or more lines from the subway and converting that line(s) to low-floor operations.
Systemwide low-floor vehicle conversion	Transitioning to low-floor operations across the entire light rail system (except for the T-Third), including procuring low-floor

Strategy	Description
	vehicles, lowering subway platforms and associated infrastructure, and lowering raised surface platforms.
Transit preferential streets	Introducing more transit-only streets, transit-only lanes, and protected trackways.
Transit signal priority and preemption	Introducing more traffic signals with transit priority or preemption.
Harrison turnback	Creating a turnback facility on the Embarcadero south of Harrison Street to supplement the Muni Metro Turnback (MMT).
Service restructuring	Changing the termini of routes, with three specific options assessed: • Surface-only J Church: Either operating between Balboa Park and Church/Duboce or continuing to Embarcadero, but on the surface of Market Street. • J/M swap: Terminating the M Ocean View at SF State/Parkmerced and extending the J Church to Stonestown • Surface-only LK (interlining): Merging the surface portions of the K Ingleside and L Taraval into a single, surface-only line.
Grade separation	Separating street traffic and light rail at key intersections with either bridges or tunnels.
Coupling	Coupling pairs of eastbound J/N line trains and K/L/M line trains at portals, so they operate as longer trains in the subway.
Crossing gates	Protective barriers to block the intersection from cross-traffic when trains travel through the area.

Feasibility assessments of individual strategies

The Study Team conducted assessments on the potential improvement strategies, looking at:

- Engineering considerations to assess technical feasibility
- Cost considerations, including capital cost estimates and operating cost estimates, where applicable.
- Other implementation factors:
- Construction impacts
- Neighborhood impacts
- Operational complexity
- Need for interagency coordination
- Potential ability to fund and implement improvements in discrete phases.

Based on these assessments, we eliminated some strategies that were either infeasible and/or had limited benefits and/or significant costs. Strategies that were eliminated in this phase are discussed further in Chapter Six.

Package assessments

Of the strategies that were not eliminated after feasibility assessment, the Study team developed packages for each of three ridership forecasts for the 10-15 year time horizon. We designed the packages of strategies to provide sufficient capacity for projected ridership in the next 10-15 years, without producing excess capacity that might result in higher costs and unnecessary changes to the Muni Metro system. We layered strategies in sequence, from those that would involve less disruption to those that would involve more:

- Increasing frequency of existing service[2]
- Longer trains
- Service restructuring

The Study team created five improvement packages to meet the projected capacity needs in the next 10-15 years, shown in Table 6.

Table 6: Summary of packages evaluated to serve ridership in the next 10-15 years

#	**Ridership growth**	Increases in frequency	3-car N Judah	3-car M Short	2-car M Long	J Church to Stonestown	2-car J Church
1	Low	☑					
2	Medium	☑	☑	☑	☑		
3	Medium	☑	☑	☑	☑	☑	
4	High	☑	☑	☑		☑	
5	High	☑	☑	☑	☑	☑	☑

Packages two through five also assume the following common features:

- Greater signalization with transit signal priority or preemption along the N Judah and M Ocean View corridor between West Portal and SF State.
- High platforms on the M Ocean View at all stops between Downtown and SF State/Parkmerced.
- Mini-high platforms and sidewalk level boarding islands to provide safe boarding and full accessibility at each stop along the N Judah corridor

For each package, the Study team evaluated the following metrics:

- Crowding
- Transfers
- Travel time
- Eligibility for a Core Capacity grant
- Competitiveness for a Core Capacity grant.

For the methodology and results for all metrics, see the Study's technical appendices.

[2] For the purposes of this Study, we assume a maximum of 40 trains per hour per direction as the maximum frequency through the Market Street Subway.

Based on this technical work as well as community feedback, the recommendations presented in Chapter Six are based on Package 3. That's because the medium growth forecast is more likely to reflect reality than either the low or the high. In addition, as compared to Package Two, it enables maintaining frequency in the Oceanview through a combination of M Long and J Church trains, ensuring that an equity neighborhood would not have less frequent service as a result of these changes. As we continue to ready the capital program for entry into the project development pipeline, we will monitor ridership trends and can adjust if we find ourselves in the low or high growth forecast.

6. Recommendations

This chapter describes the Study's recommended capital investment program to address the future overcrowding described in Chapter Four. The program would focus on the Market Street Subway, Twin Peaks Tunnel, the N Judah line, and the M Ocean View line between West Portal and SF State (see Figure 10). While overcrowding was not identified along the M Ocean View corridor, investments along this line would help address overcrowding in the Twin Peaks Tunnel and the Market Street Subway.

To complement these capital investments, we would increase frequency and use other operational strategies to prevent overcrowding throughout the rest of the system. For example, the forecast increase in overcrowding on the J Church could be addressed through increases in frequency. Together, these capital and operational strategies could solve our future capacity needs in all three growth scenarios.

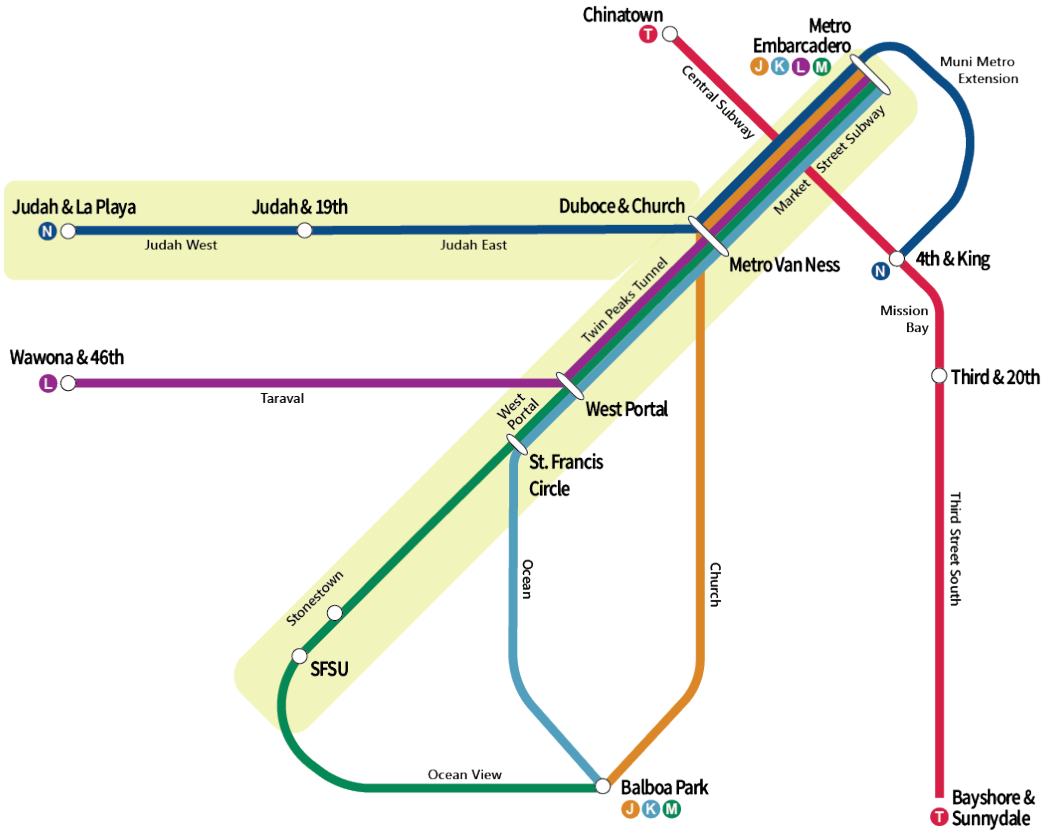


Figure 10: Area of the recommended capital investment program

The recommended capital program includes the following elements:

- **Upgrading old infrastructure to add capacity.** This may include new light rail track, overhead wires, switches, and traction power.
- **Expanding infrastructure that prioritizes transit.** This includes transit lanes, signalizing stop-controlled intersections, expanded signal priority, and signal pre-emption. It also could include crossing gates at select locations.
- **Upgrading infrastructure to accommodate three-car trains** on the N Judah and between SF State and downtown, including
- **Boarding infrastructure for three-car trains**, including upgrades to station accessibility.
- **Infrastructure to provide flexibility for different service patterns in the future.**

Three-car trains may not be needed if ridership is within the lowest future forecast. We recommend conducting additional planning and project development to ready upgrades for three-car trains for future consideration.

The rest of this chapter describes each of these recommendations in more detail. It also describes the key benefits and challenges for each.

Before we explain why we recommend these elements, we want to emphasize that we are just starting to define potential future projects. Completion of this Study does not approve moving forward with implementation of these recommendations. After this Study, the SFMTA would launch separate projects for the N Judah and M Ocean View. Each would include planning and outreach to co-create block-by-block designs. These processes would also provide the opportunity to identify improvements to address broader community priorities.

Upgrade old infrastructure to expand capacity

Both the N Judah and the M Ocean View have old light rail track that is at the end of its useful life. We anticipate installing new rail on the N Judah west of Arguello in the 2030s and along most of the M Ocean View between St. Francis Circle and Balboa Park a few years later.

Projects like these give us a timely opportunity to install modern, capacity-enhancing infrastructure rather than simply replacing the existing, outdated infrastructure.

After the Study, we will need to complete more work to confirm the scope of this work and its eligibility for the Core Capacity grant program before we are ready to enter the Core Capacity pipeline. Capacity-enhancing components could include:

- Modern track embedded in concrete
- New or upgraded traction power substations
- Upgraded switches
- Re-alignment of track

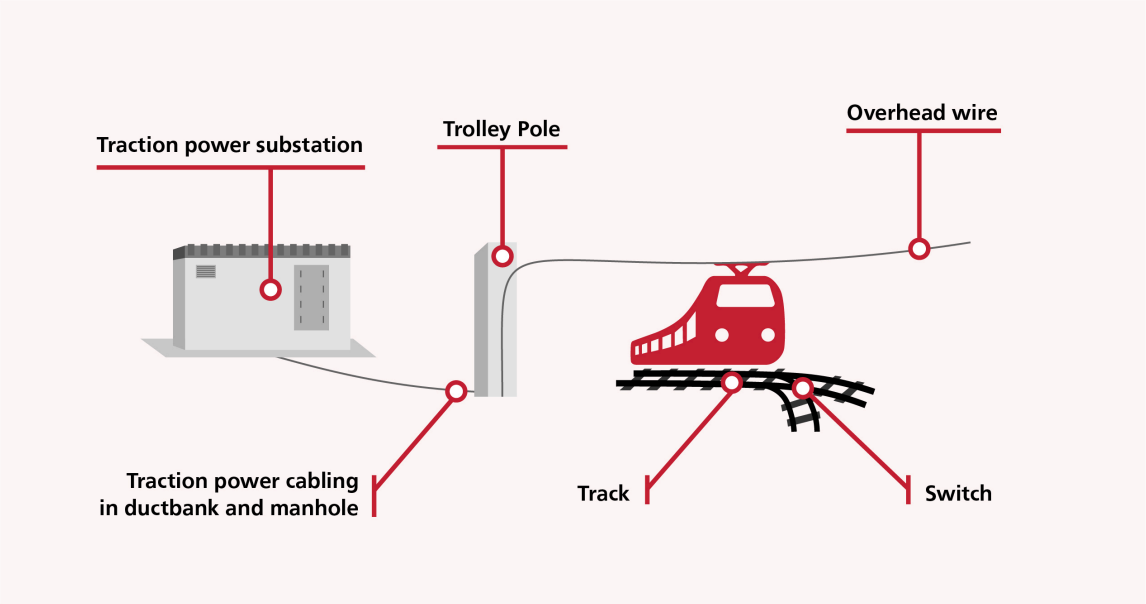


Figure 11: Examples of capacity-enhancing infrastructure for the N Judah and M Ocean View. These could potentially be incorporated into future rail replacement projects.

In addition to potential upgrades along the portions of the N Judah and M Ocean View that are coming due for rail replacement, we also will study potential upgrades along other portions of the Muni Metro system that would replace aging infrastructure and contribute to more capacity in the portions of the system that are forecast to be overcrowded.

Benefits and challenges of upgrading old infrastructure to expand capacity

Benefits: We can attract more funding if we enhance capacity when we replace old infrastructure. This would allow us to address our backlog of infrastructure beyond the end of its useful life. Identifying this funding is critical as it affects our ability to deliver Metro service our riders rely on.

Challenges: Replacing old infrastructure is critical to keep Metro running reliably, but is expensive and disruptive. The L Taraval Improvement Project is a recent example of replacing old infrastructure like rail and overhead lines. The SFMTA's approach to construction mitigation is always evolving to respond to what we learn from past projects.

Expanded infrastructure that prioritizes transit

Transit priority refers to changes to the street that improve transit speed and reliability. Many locations Muni Metro operates on-street already benefit from transit priority. We recommend expanding transit priority at locations that do not yet have these types of treatments.

How do transit priority treatments improve capacity?

Today, Muni Metro's capacity is between 80 and 95% of what might be possible with perfect reliability. That's because transit priority treatments are not already in place in some parts of the system. Muni Metro trains sometimes run late in these locations. As shown in

Figure 12, transit priority investments help keep trains running reliably. They make trains more likely to arrive at tunnel entrances on time. On-time arrivals allow us to use all the available space within the busiest subway portions of the system. We estimate improving rail travel time reliability above ground could provide up to 20% more capacity in the subway.

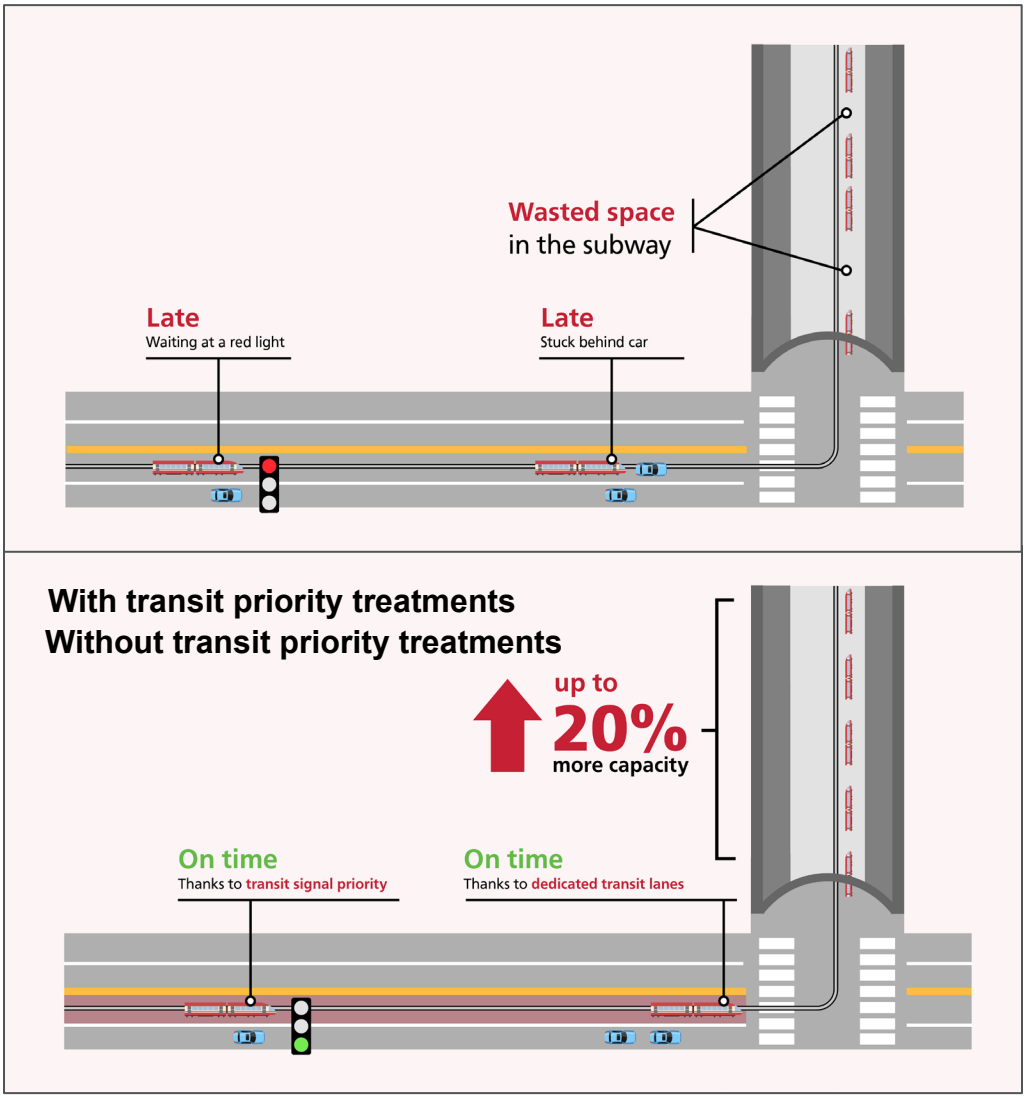


Figure 12: How transit priority treatments improve capacity in the subway

Much of Muni Metro already benefits from some transit priority. At the same time, opportunities exist to expand priority. Figure 13 overviews options for increasing transit priority both at intersections and on the street. While the right transit priority treatments will vary based on location, upgrades like these should be considered at locations that do not yet have them.

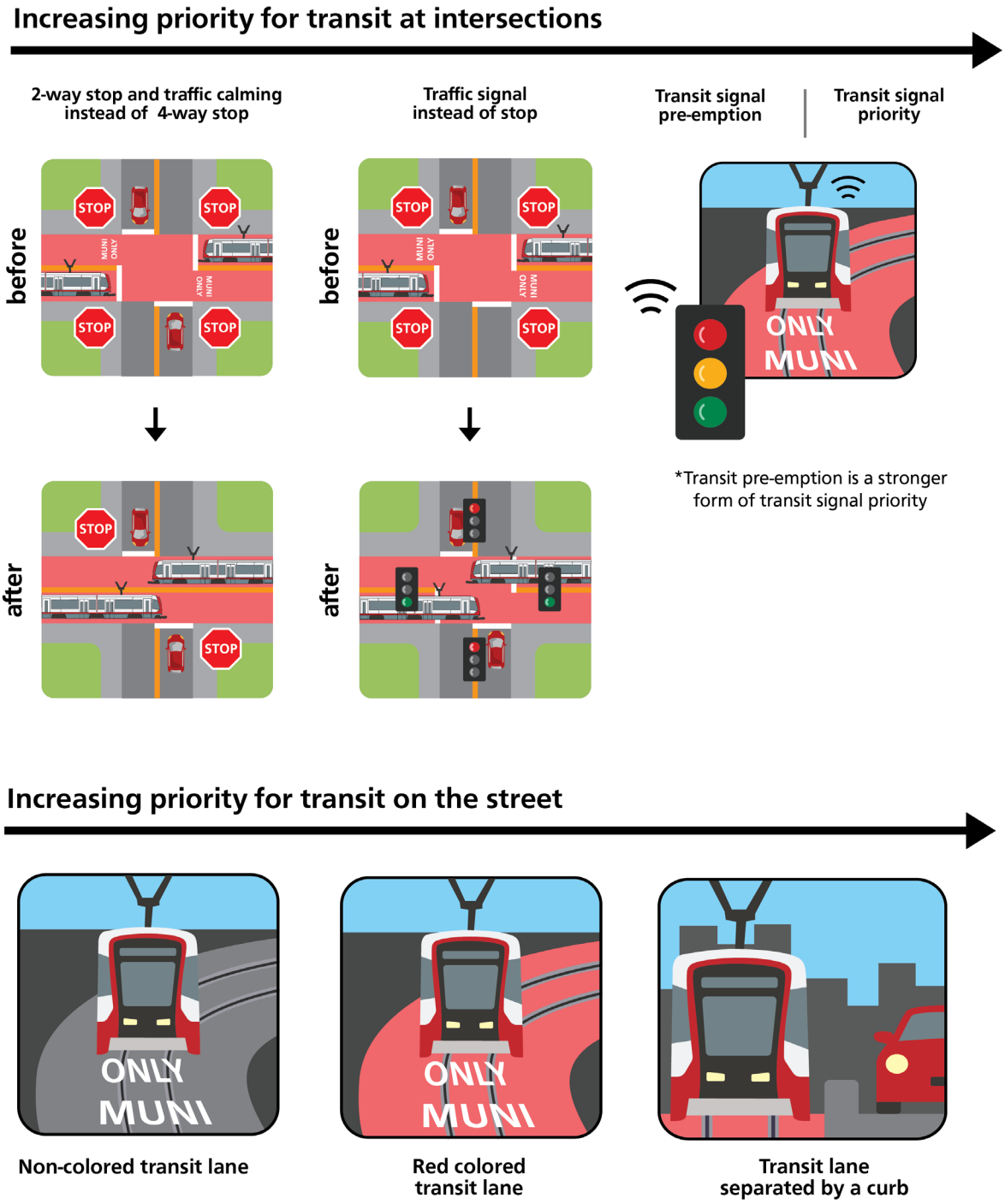


Figure 13: Much of Muni Metro already benefits from some transit priority. At the same time, opportunities exist to expand priority.

Transit priority opportunities at intersections

The time it takes for a train to decelerate to stop at an intersection and then accelerate to proceed through can contribute to slow travel times, particularly when intersections are frequently spaced. That's why it is ideal for rail corridors to not use four-way stop signs to control who has the right-of-way.

Figure *14* indicates existing conditions at intersections along the N Judah and the portion of the M Ocean View where Core Capacity upgrades are recommended.

The Study's recommendations for transit priority at intersections are to upgrade more intersections with signals or two-way stops plus traffic calming measures that allow trains to continue without delay. In addition, for intersections that are signalized, we recommend including "transit signal priority" or "transit signal pre-emption" capabilities. Both priority and preemption are types of technology that make it more likely for trains and buses to get green lights. Pre-emption is a stronger form of priority. The Study recommends expanding these technologies. In the meantime, we continue to work to optimize locations that have this technology today.

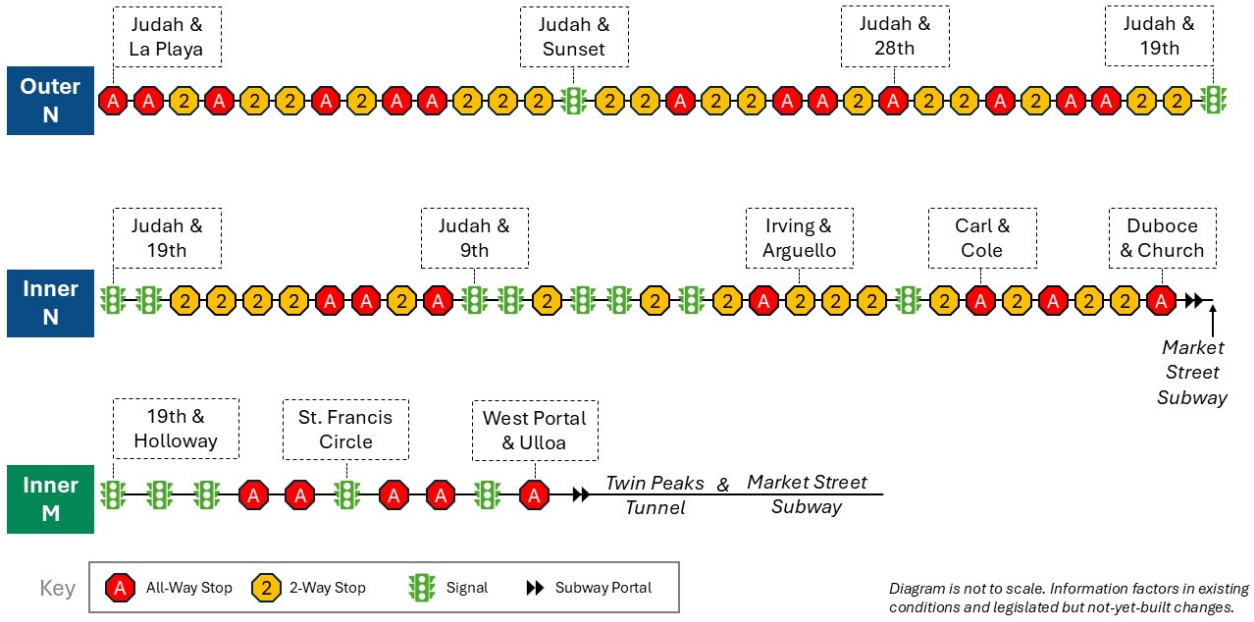


Figure 14: Existing transit priority conditions at intersections.

At select locations where transit signal pre-emption is pursued, crossing gates may help improve its safety. Potential candidate locations for crossing gates are unusual intersections where people driving cars may be surprised by a stop light. A few examples are where the M Ocean View crosses Eucalyptus Drive, Ocean Avenue and 19th Avenue at Rossmoor Drive. Figure 15 illustrates possible upgrades at Ocean Avenue, including crossing gates.

Figure 15: Illustration of possible upgrades at Ocean Avenue (existing conditions at top), including crossing gates.

The specific locations for intersection transit priority treatments would be identified later as a part of a community planning process. Installing one new traffic signal can cost over $1 million dollars, while installing one with signal priority or pre-emption features can approach $2 million. And, installing a new transit signal with pre-emption along with crossing gates can cost over $3 million. There are over 50 intersections with stop signs along the N Judah corridor today as well as a few along the M Ocean View between West Portal and SF State. The cost to move towards more fully signalized corridors could add up quickly. Given Core Capacity grants can be very large, the grant program represents an important funding opportunity for this relatively more expensive form of transit priority.

Transit priority opportunities on-street

The Muni Metro network has a variety of different types of right-of-way. The general types, from greatest to least transit priority, are as follows:

- Exclusive right-of-way, such as in the subways.
- Semi-protected right-of-way such as raised trackway along portions of the N Judah, or curbs along most of the T Third and the portion of the M Ocean View in the median of 19th Avenue
- Transit lanes designated for transit with white striping or red color, but without physical separation such as on segments of Judah, Taraval, and Ocean.
- Mixed traffic, where trains travel in general travel lanes shared with private vehicles.

Figure 16 illustrates existing levels of on-street transit priority throughout the Muni Metro system. On-street transit priority features prevent trains from getting delayed by traffic. They also help trains get to the front of an intersection, which means they can take advantage of transit signal priority and spend less time stuck at red lights even when traffic is lighter. Most of the N Judah and portions of the M Ocean View where Core Capacity upgrades are recommended already have transit lanes. We recommend expanding on-street transit priority or moving to higher forms of priority along these corridors where feasible.

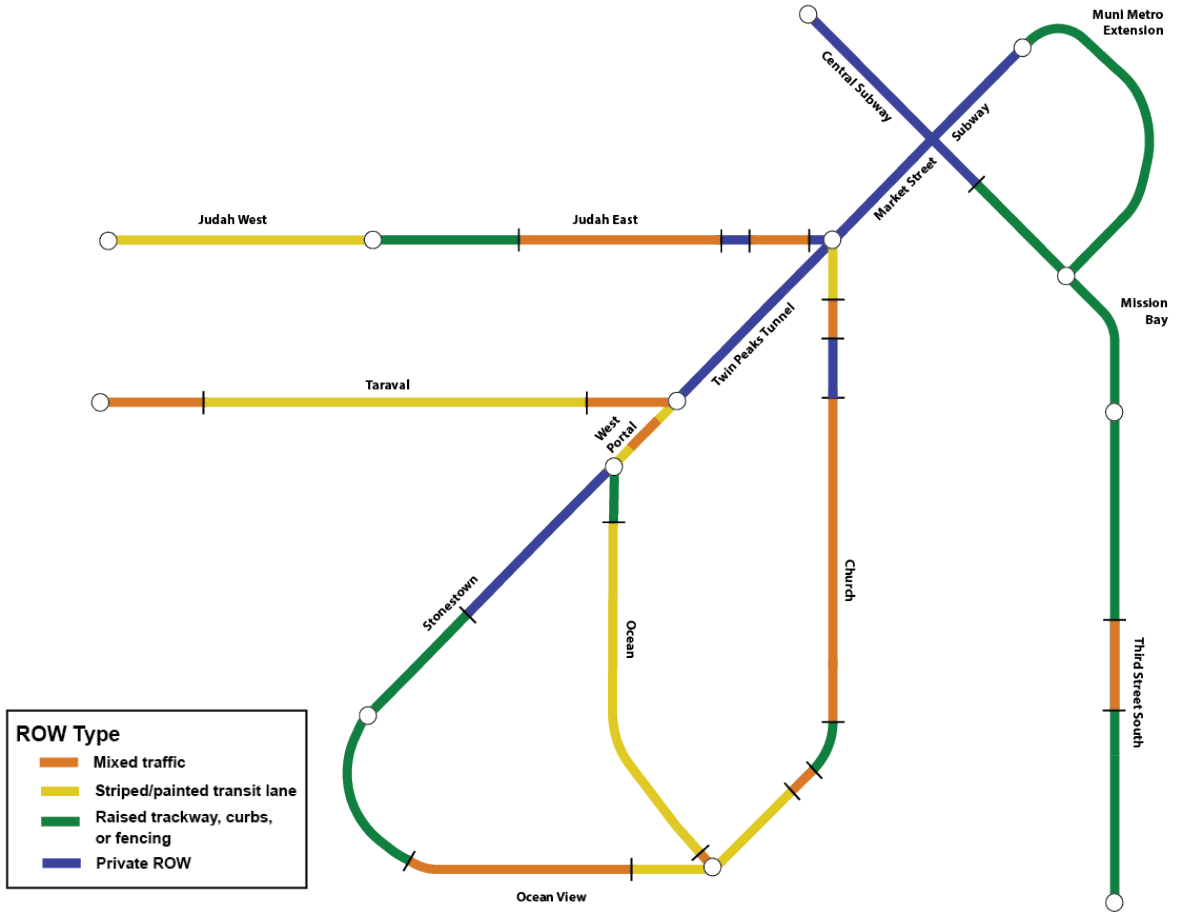


Figure 16: Existing transit right-of-way (ROW) types

Benefits and challenges of expanded infrastructure that prioritizes transit

Benefits: Transit priority investments help keep trains running reliably. They make it more likely for trains to arrive at tunnel entrances on time. On-time arrivals help us use every slot available within the busiest subway portions of the system.

Challenges: Some transit priority infrastructure creates tradeoffs. For example, new transit lanes are created by repurposing other street space uses like general travel lanes or parking.

Some forms of transit priority at intersections keep Muni Metro moving quickly. But people walking, biking and driving may have to wait a bit longer while trains pass. If crossing gates are pursued, they introduce a new equipment type for SFMTA to operate and maintain. These may require lane shifts and capital construction in some locations.

Upgrade infrastructure to accommodate three-car trains

We recommend pursuing upgrades for three-car service on the N Judah, as well as on the M Ocean View between SF State and downtown. As illustrated in Figure 17, each two-car train that is upgraded to a three-car train provides 50% more capacity. This is equivalent to providing room for 93 more riders to get on each train. For a line scheduled to run every 10 minutes, that means room for over 550 more riders per hour to get where they need to go.

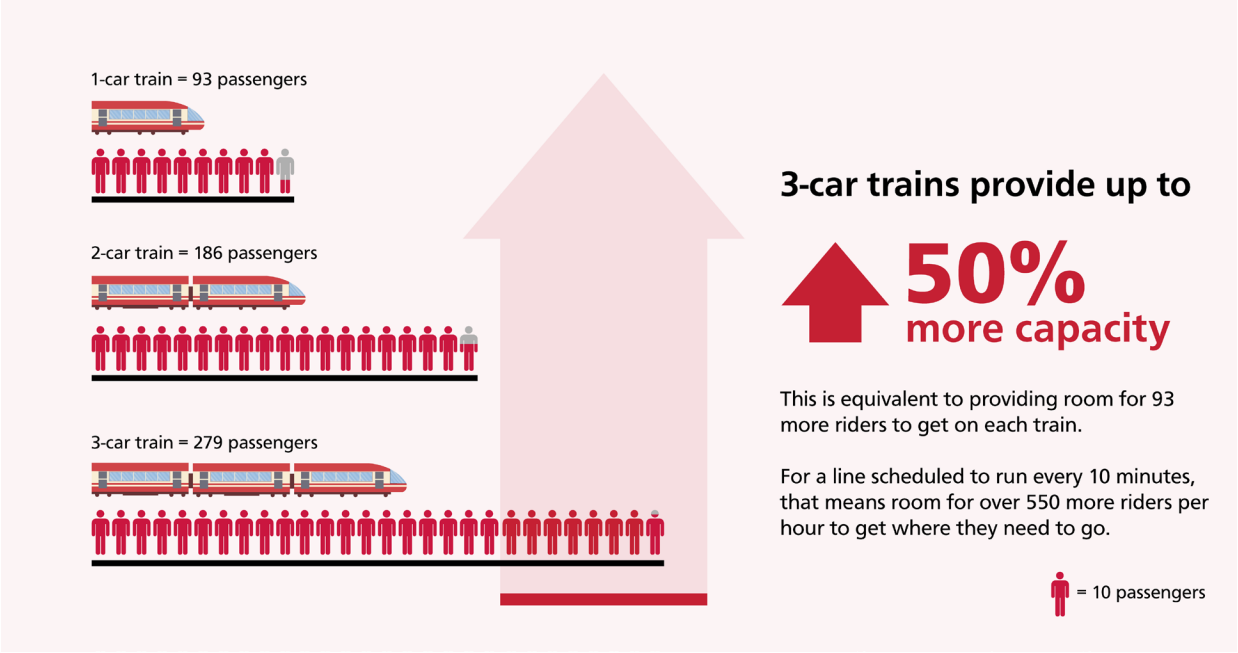


Figure 17: Additional capacity provided by longer trains

If ridership growth is low, this upgrade may not be needed in the next 10-15 years. We recommend conducting additional planning and project development work to ready this strategy for future consideration.

There are two different types of infrastructure that are needed to operate three-car trains: 1) boarding infrastructure; and 2) infrastructure to provide service flexibility. Both are described further in this section. In addition, traction power upgrades may be needed and will require further investigation in the next stages of planning. Finally, there are many other details that we would need to plan for, such as signal timing, yard operations, and stopping locations in the subway. These types of changes do not require capital upgrades and therefore would not need to be incorporated into the Core Capacity grant program, but would need to be addressed before three-car train service could begin operating.

Boarding infrastructure for three-car trains, including upgrades to station accessibility

To provide a safe place for riders to board at each door of the train, some street space would need to be used to extend platforms or boarding islands for all doors of a three-car train. Installing new boarding infrastructure would also provide the opportunity to make more stops accessible. Figure 18 shows which stops are currently accessible along the N Judah and portions of the M Ocean View. There are three different categories:

- Green circles indicate the stop has fully level boarding, meaning riders can enter and exit any door of the train without having to step up or down.
- Yellow circles indicate the stop has a "mini-high" ramp making one door of the train accessible without having to step up or down.
- Red circles indicate the stop is not accessible at any door and riders have to climb up and down stairs to get on and off the train.

Core Capacity upgrades to the N Judah and the portion of the M Ocean View between SF State and Downtown provides an opportunity to make every stop accessible. A different approach is recommended for each line.

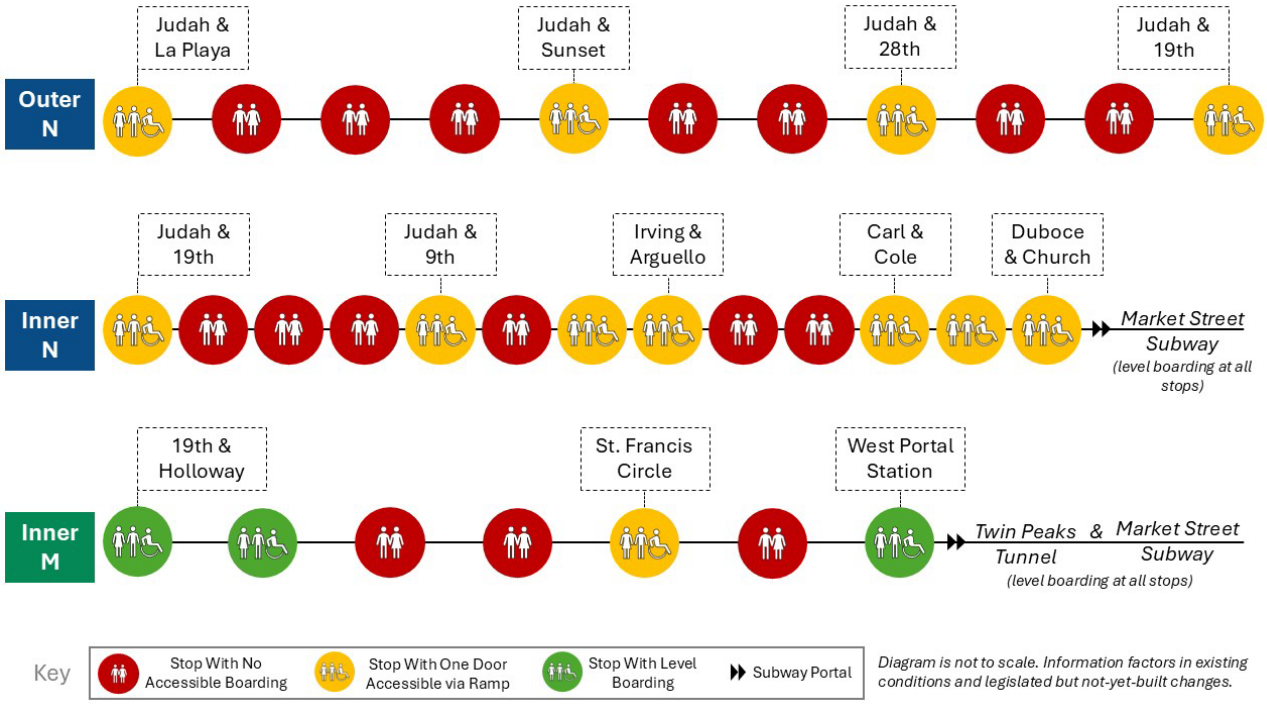


Figure 18: Existing accessibility at surface rail stops.

For the M Ocean View: lengthen existing station platforms and build new level boarding platforms.

To operate three-car trains on the M Ocean View, the existing stops with level boarding at Stonestown and SF State would need to be lengthened. Figure 19 provides a conceptual illustration of lengthening the Stonestown station.

Figure 19: Illustration of the Stonestown Station. Possible upgrades to accommodate three-car trains by lengthening the platforms are shown.

With level boarding, trains can operate without moving the stairs up and down. People who need level boarding can choose to board any door of any train. Only four rail stops between West Portal and SF State do not have level boarding today (14th Avenue, St. Francis Circle, Ocean, and Eucalyptus). We recommend upgrading these so no one needs to use the stairs to get on a train. Figure 20 provides a conceptual illustration of how the St. Francis Circle stop could be upgraded to make all doors accessible with boarding platforms. Similar changes could be made at the 14th Avenue stop.

Figure 20: Photo illustration of possible upgrades to St. Francis Circle to provide level boarding

In most cases, there would be no need to change rail stop locations to accommodate three-car trains. However, to accommodate three-car trains, the very closely spaced stops at Ocean Avenue and Eucalyptus Drive would need to be consolidated. That's because stops have to be on straight track. The location identified below in Figure 21 is the only place that has long enough straight track to do this with three cars. Riders would be able to enter the boarding area from both Ocean Avenue and Eucalyptus Drive. No other stops would have to be consolidated to make three-car service work. Other stop location changes could be considered for block-specific feasibility challenges like hills or driveways.

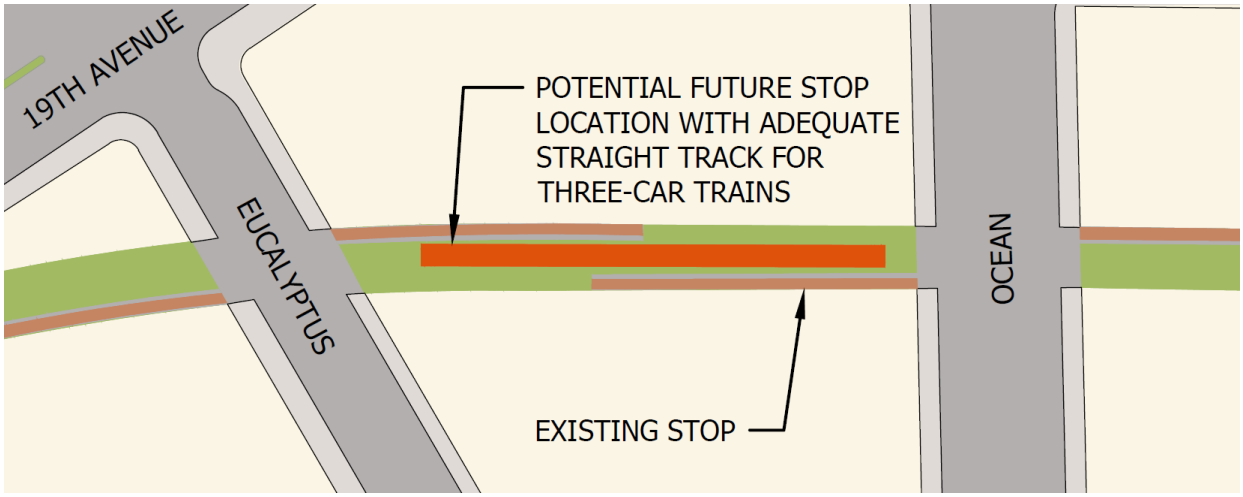


Figure 21: Potential future stop location between Ocean Avenue and Eucalyptus Drive that could accommodate a three-car train length boarding platform

For the N Judah: provide sidewalk-level boarding platforms and mini-high ramps.

We studied what it would take to accommodate level boarding along the N Judah. Level boarding is difficult to fit along narrow streets (like the streets where the N Judah operates through Cole Valley and the Inner Sunset) along with other street functions. We found that there are difficult tradeoffs to fitting these platforms on many streets, particularly for those less than 60 feet in width. We would have to remove parking and possibly impact access to driveways, and it would be more difficult to fit other elements such as transit lanes. That's why we recommend sidewalk-level platforms and mini-high ramps for the N Judah, such as those shown in Figure 22

Figure 22: Photo illustration of possible upgrades to an example N Judah stop to provide level boarding

Benefits and challenges of boarding infrastructure for three-car trains, including upgrades to station accessibility

Benefits: Three-car trains would provide up to 50% more capacity. Boarding accessibility upgrades at street-level Muni Metro stops would make the system easier to use. This benefits people in wheelchairs, with mobility challenges, pushing strollers, rolling luggage and more. Level boarding also lowers wait time and improves travel time.

Challenges: Street space is limited. Using street space for three-car trains and boarding platforms would mean less space for parking or other vehicle traffic. A boarding platform for a three-car train is about a block long. This platform could make it more difficult to access driveways.

Infrastructure to provide flexibility for different service patterns in the future

There is an existing plan to accommodate future three-car M Ocean View service. The San Francisco Board of Supervisors approved this plan in 2011. The existing plan would build a new rail stop in Parkmerced and a new rail terminal as a part of the new development. This would mean the M Ocean View would operate in two forms as shown in Figure 23. Some M Ocean View trains would operate as an M Short between Downtown and Parkmerced. Others would continue to operate the entire line as an M Long between Downtown and Balboa Park. This would likely mean somewhat less frequent service on the M Long.

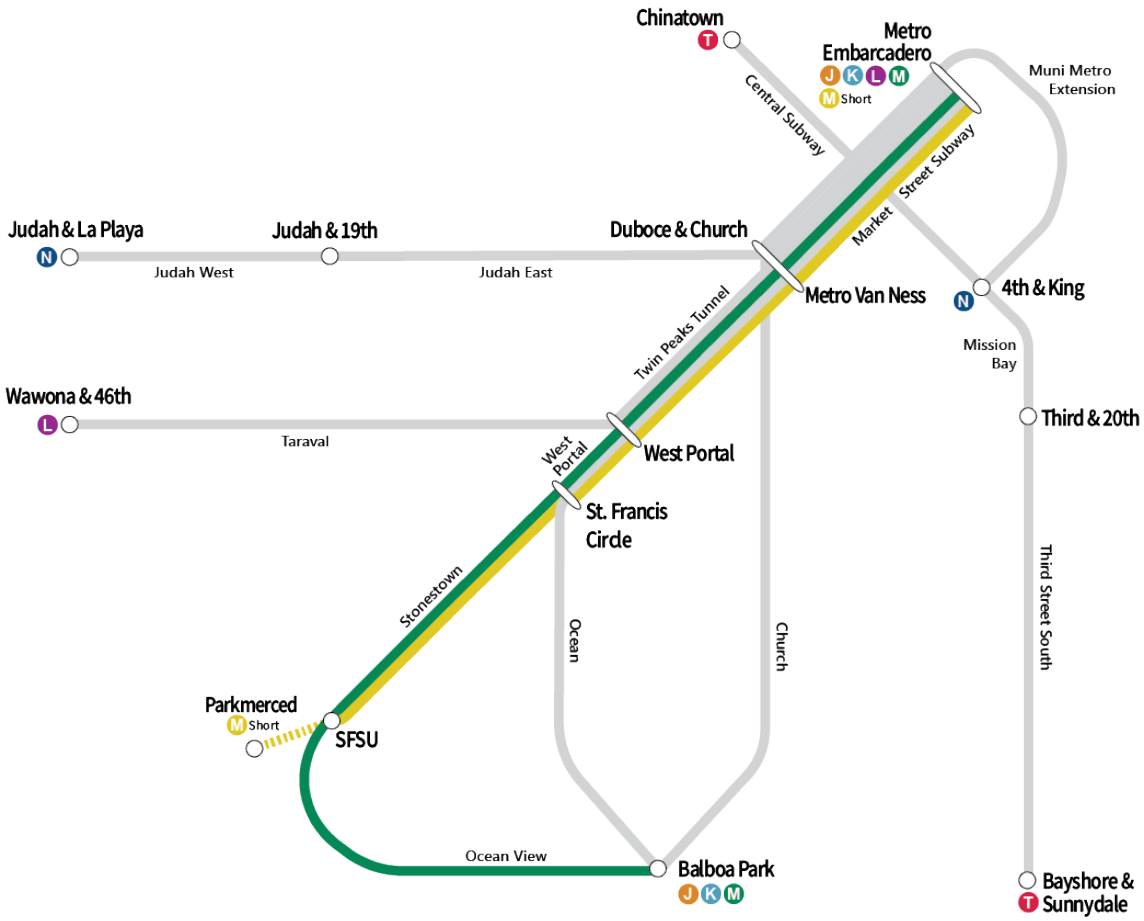


Figure 23: Service diagram showing M Short and M Long services as planned for as a part of the Parkmerced development

The plan was made because it would be difficult to operate three-car trains through the Oceanview for the following reasons:

- There is lower ridership so three-car service is not essential.
- There would be tradeoffs for street space to fit boarding islands for all doors of a three-car train.

Operating short and long versions of a line is common in transit service design. Other local examples that operate a short and long version include the 30 Stockton and the 38 Geary.

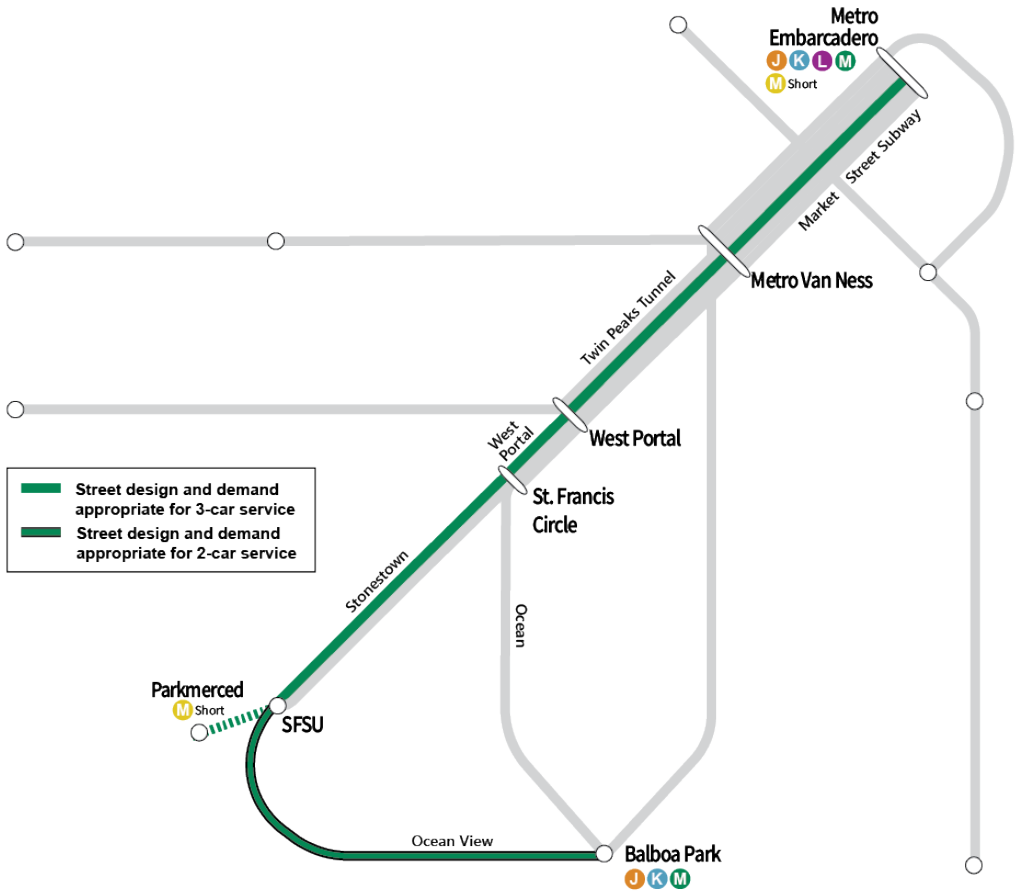


Figure 24: Diagram showing street design and demand conditions along the M Ocean View line

We are recommending new infrastructure to make it possible to extend the J Church to Stonestown. This would allow us to operate both M Long and J Church service through the Oceanview in the future as shown in Figure 25. We would also increase J Church frequency, ensuring room for new riders. The combined frequency of the J Church and M Long could provide similar frequency in the Oceanview as today.

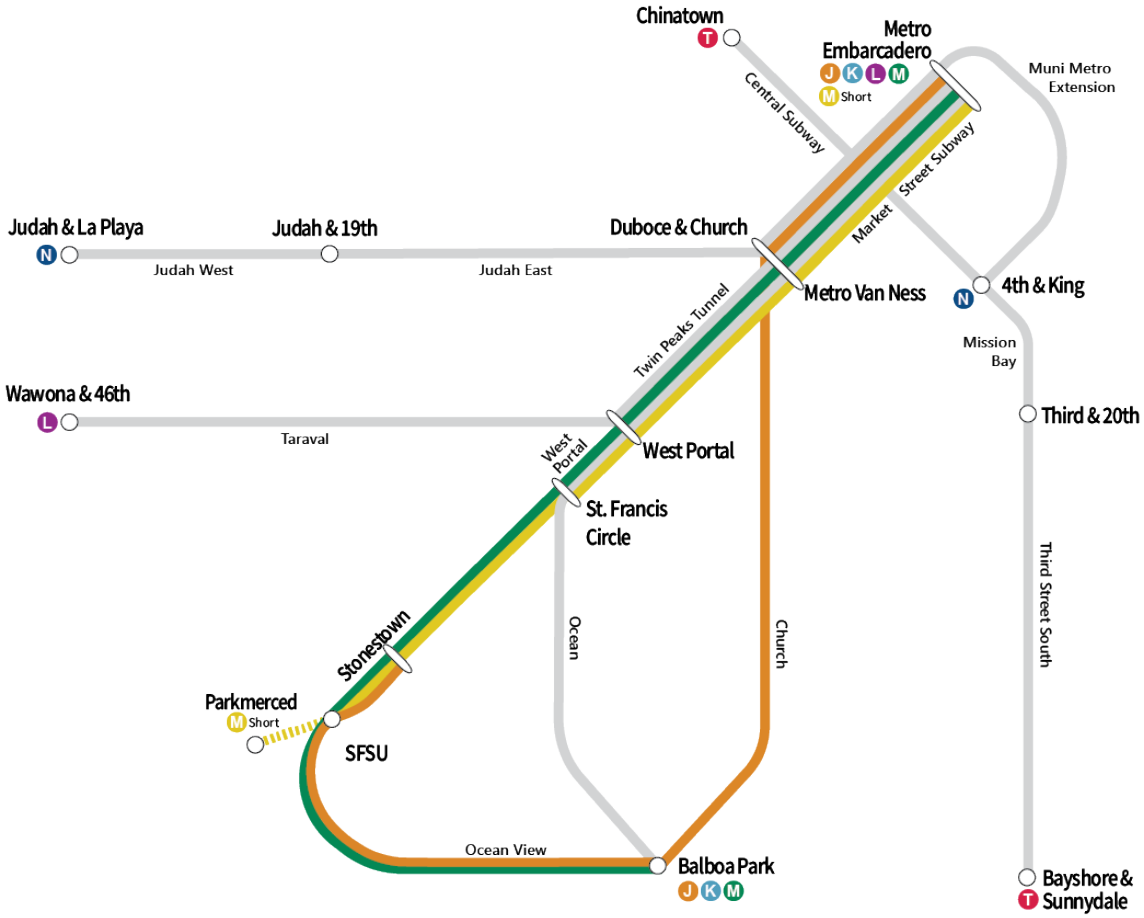
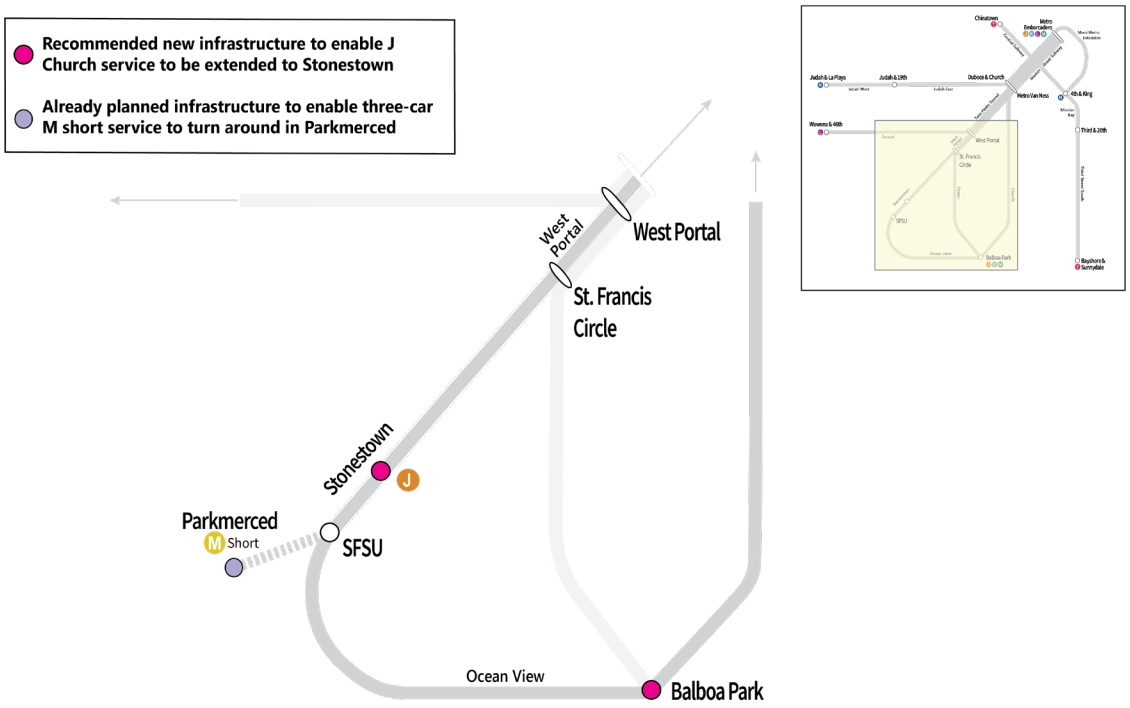


Figure 25: Service diagram showing M Short, M Long, and extended J Church services

Recommended infrastructure to provide operational flexibility for three-car M Ocean View service (see Figure 26) includes:

- Terminal infrastructure for the M Short, including a tail track, crossover, and operator restroom. This would be provided as a part of the Parkmerced development if the development moves forward as planned. If the development does not move forward, this infrastructure could be provided in the median of 19th Avenue, south of SF State.
- Infrastructure to enable the J Church to be extended from Balboa Park to Stonestown. This would include terminal infrastructure at Stonestown including a tail track, crossover, and operator restroom. It also would include new infrastructure like a crossover to allow J Church trains to continue from Balboa Park connecting to the M Ocean View tracks.



* If the Parkmerced Development does not build out as planned, this infrastructure could instead be provided in the median of 19th Avenue south of SF State

Figure 26: Recommended infrastructure for operational flexibility

Altogether, this infrastructure would provide flexibility to operate different service plans in the future.

The future service plan for three-car M Ocean View service would be determined later as a part of a community planning process. ***We recommend that combined service frequency in the Oceanview remain the same as today's frequency (every 10 minutes during weekday daytime hours).*** *Extending the J Church to Stonestown and continuing to operate some M Ocean View service to Balboa Park could accomplish this. Future service planning would also need to consider available operating budget.*

Benefits and challenges of infrastructure to provide flexibility for different service patterns in the future

Benefit: This new infrastructure opens up the potential for new one-seat rides. New one-seat rides could be possible on the J Church to major destinations like San Francisco State and Stonestown. The combined frequency could remain like today if both the J Church and M Long provide service in the Oceanview.

Challenges: There could be less frequent M Long service in the future. A different service plan could be confusing for riders to adjust to.

Other strategies considered but not recommended

Systemwide high-floor platforms

Accessible platforms are an important and necessary part of improving and modernizing Muni. One idea we studied was to build full-length high-level platforms at all stops. This would make the system completely accessible, decrease travel time by reducing dwell time at stops, and eliminate the need for maintenance-intensive moving stairs.

However, we found that there are difficult tradeoffs to fitting these platforms on many streets, particularly for those less than 60 feet (which make up about half of the streets Muni Metro operates along, excluding the T Third which already has fully level boarding) as shown in Figure 27. We would have to remove parking and possibly impact access to driveways, and it would be more difficult to fit other elements such as transit lanes.

As discussed in the prior section, we are recommending full-length high-level platforms along the M Ocean View between SF State and downtown, where only a few stops would need to be upgraded and the street width is adequate. At other locations, we are recommending mini-high platforms which provide accessibility with fewer tradeoffs.

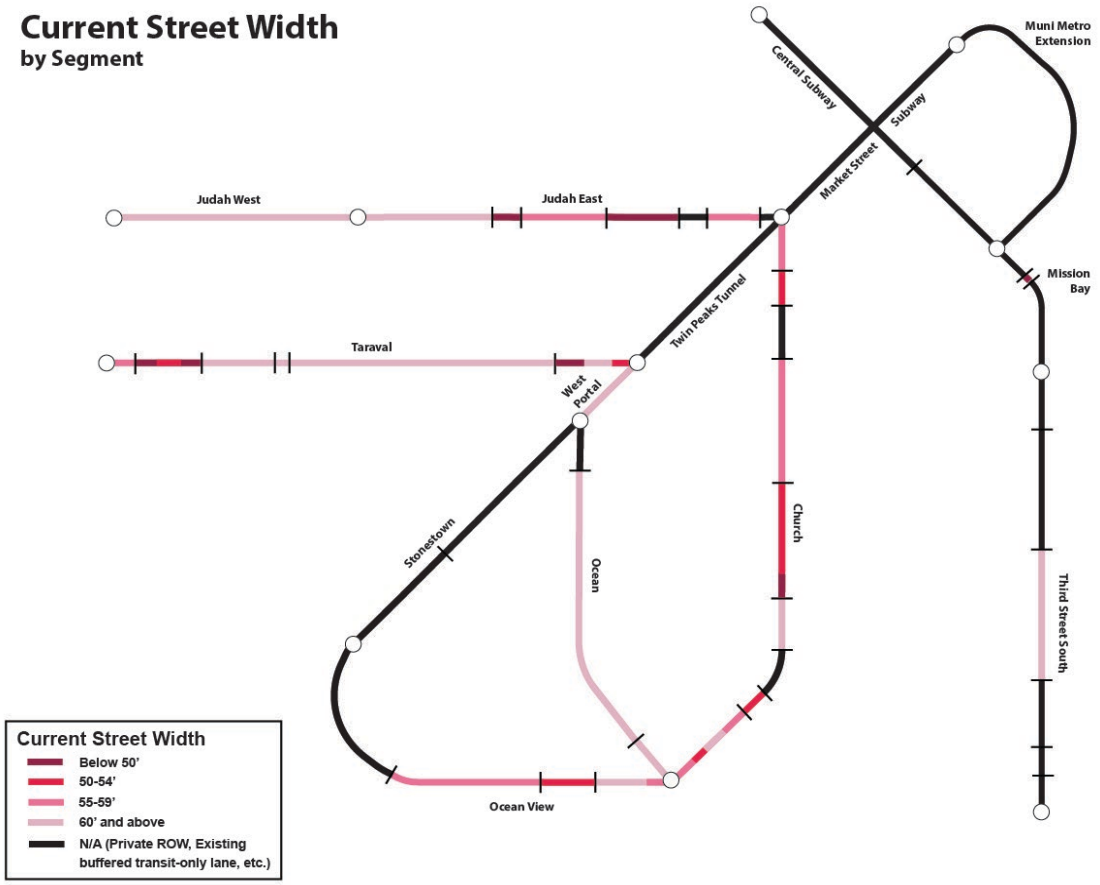


Figure 27: Current street widths (curb to curb) on the Muni Metro system

Systemwide low-floor fleet

Most newer light rail systems in the United States have low-floor vehicles. Riders board from accessible platforms about 14 inches high. This is much lower than Muni Metro high platforms that are 33 inches off the ground, but higher than the six-inch sidewalk-level platforms at some Muni Metro stops now. Low platforms that are 14 inches off the ground require shorter ramps than high platforms and have less visual impact.

The Market Street Subway was built in the 1970s and designed before low-floor light rail vehicles were available.

We studied how to convert the entire Muni Metro system (except the T Third) to low-floor vehicles. We did this to understand if low-floor vehicles would make it easier to build accessible platforms on the street.

We found it might be possible to switch the system to low-floor vehicles, but it would be very expensive and cause a lot of disruption. Also, the benefits wouldn't be very big. Low platforms have shorter ramps than high platforms, but they still need to be the same length and width. That means we'd still face the same problems with limited space on the streets.

To shift to a systemwide low-floor fleet we would have to make several changes to the Twin Peaks Tunnel and Market Street Subway. We would need to:

- Rebuild subway station platforms at a lower level.
- Reroute utilities that currently run through hollow subway platforms.
- Extend or replace stairs, escalators and elevators in subway stations.
- Modify emergency access and exits, platform facilities, passenger amenities and fire, life and safety systems
- Lower emergency walkways between stations to match train heights. This would require extensive retrofitting in some sections.

Construction would likely require station or platform closures. All this work is projected to cost $250 million or more in 2025 dollars.

We would also need to buy a completely new low-floor fleet of light rail vehicles. The current fleet is not due to be replaced during the 10-15-year capital program timeline. We would also need to convert our two rail maintenance facilities for a new low-floor fleet while still operating the current fleet.

If the J Church became a surface-only line, we could consider making it a low-floor line. This could make boarding easier. But we would still need to buy a new low-floor sub-fleet and adapt one of the Muni rail maintenance yards to be able to service low-floor vehicles. These potential benefits and costs would need to be further considered.

Surface-only L Taraval/K Ingleside line (Interlining)

We considered interlining (combining) the L Taraval and K Ingleside as a part of the Study's assessment of route restructuring. This would involve joining the surface portions of the L Taraval and K Ingleside to form a surface-only route between Balboa Park and the Zoo. LK riders would transfer to the subway at West Portal Station and use M Ocean View and subway shuttle trains. The SFMTA has used surface-only L Taraval/K Ingleside service in the past during subway closures. This routing is also used by a few trains in the early morning and late night when the subway is not open.

While it is possible to operate a surface-only LK, we found that it would not help address capacity constraints. Due to limitations at St. Francis Circle, we would not be able to operate the M Ocean View frequently enough to use all the extra subway space. Using the rest of the subway space with subway shuttle trains would require those trains to cross over and reverse at West Portal. This movement temporarily blocks train traffic in both directions, reducing the total number of trains that can use the subway. So, a surface-only LK service would not provide more capacity than running the K and L into the subway.

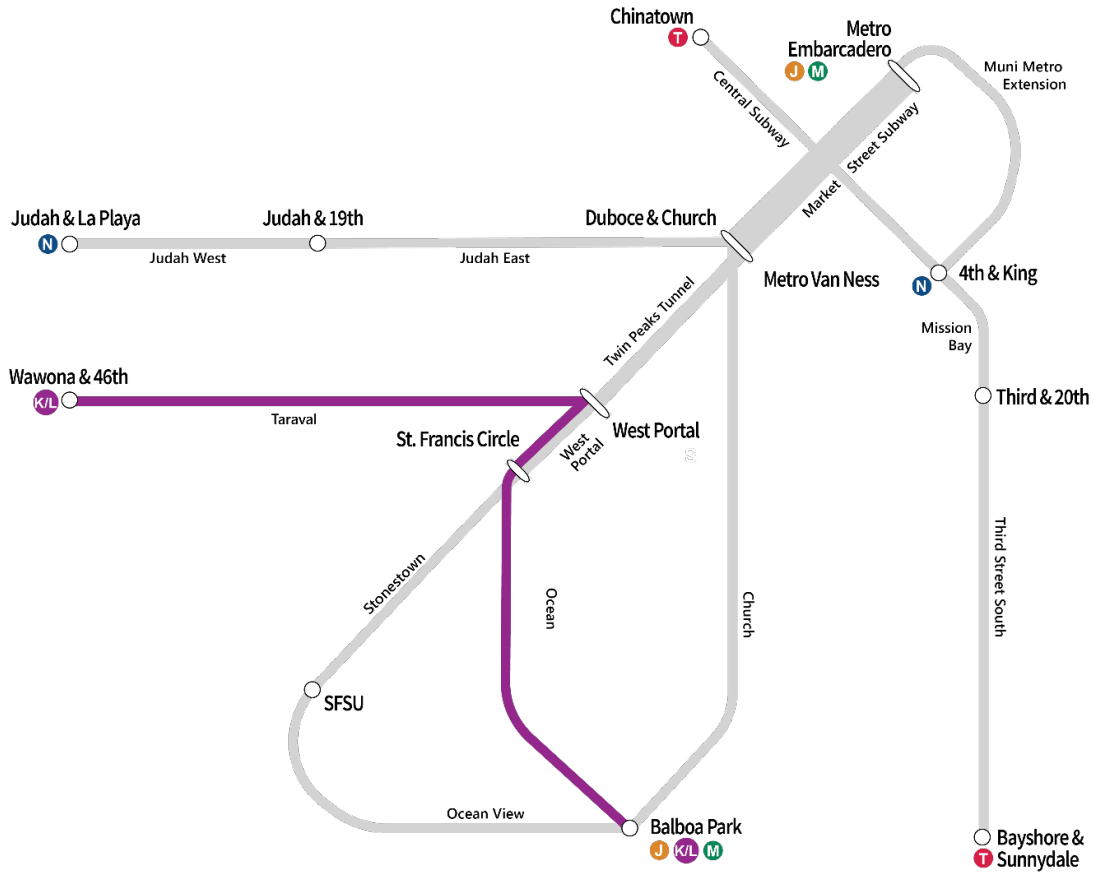


Figure 28: Map of the surface-only LK line concept

Four-car trains

The platforms in the Market Street Subway and on the Embarcadero are long enough to serve four-car trains. Four-car trains could provide double the capacity of two-car trains. But along most of the rest of the Muni Metro lines, the street blocks are not long enough to fit four-car trains. Many intersections would have to be closed to cross traffic. Even at the highest projected demand, three-car trains would be enough to handle ridership for the next 25 years for regular daily service.

Coupling

This would involve coupling inbound trains from multiple lines together at subway portals to form longer subway trains. This strategy was previously used from 1980 to 1998, until the introduction of a new train control system and turnback tracks near Embarcadero Station increased the number of trains that could use the subway. While coupling trains would increase the length of trains using the subway, it is expected to decrease reliability and increase travel time for passengers. It would also reduce the number of trains that could enter the subway and increase operating costs.

Harrison turnback

This strategy was considered as a possibility to facilitate turnaround of three-car trains. However, further technical investigation indicated that using the turnaround facilities at the Embarcadero Station (referred to as the Muni Metro Turnback or MMT) is likely sufficient with minor alterations, so a Harrison turnback is likely not to be needed.

Grade separation

This strategy contemplates separating street traffic and light rail traffic at key intersections with either bridges or tunnels if needed to provide sufficient capacity. At the most complex intersection studied, St. Francis Circle, changes to signalization appear to be sufficient to accommodate the combined frequency of M Ocean View and K Ingleside trains that would be needed to serve future demand here. Signalization changes are much lower cost than grade separation.

Potential ideas for the longer-term future – 2040s and beyond

Our forecast indicates we can meet capacity needs while continuing to serve each Muni Metro line's existing routing for the next 10-15 years. However, even with these medium-term recommendations, if we reach the medium or high growth future ridership levels, we may still run out of capacity by 2050. There are several possibilities, including route restructuring and longer trains, that could add more capacity if needed. **None are recommended at this time, but both could be considered in the future if needed.**

Route restructuring

The Study team explored some possible route restructuring options to understand if they could add more capacity to the Muni Metro system. Route restructuring involves changing one or more lines by

- Combining all or parts of lines
- Shortening lines
- And/or removing lines from the Market Street Subway.

Some forms of route restructuring would improve capacity by allowing space in the subway for longer trains.

Two different route restructuring concepts could help address crowding if ridership is on the higher end of our 2050 forecasts. **Neither are recommended at this time, but both could be considered in the future if needed.**

Surface-only J Church

The J Church could be changed to be a surface-only line. It could either end near Church and Market streets or continue on the surface of Market Street to Downtown as shown in Figure 29. Currently, the one-car J Church takes up the same space in the subway as a longer train. By removing it from the subway we can allow that space to be used by Muni Metro lines with longer trains.

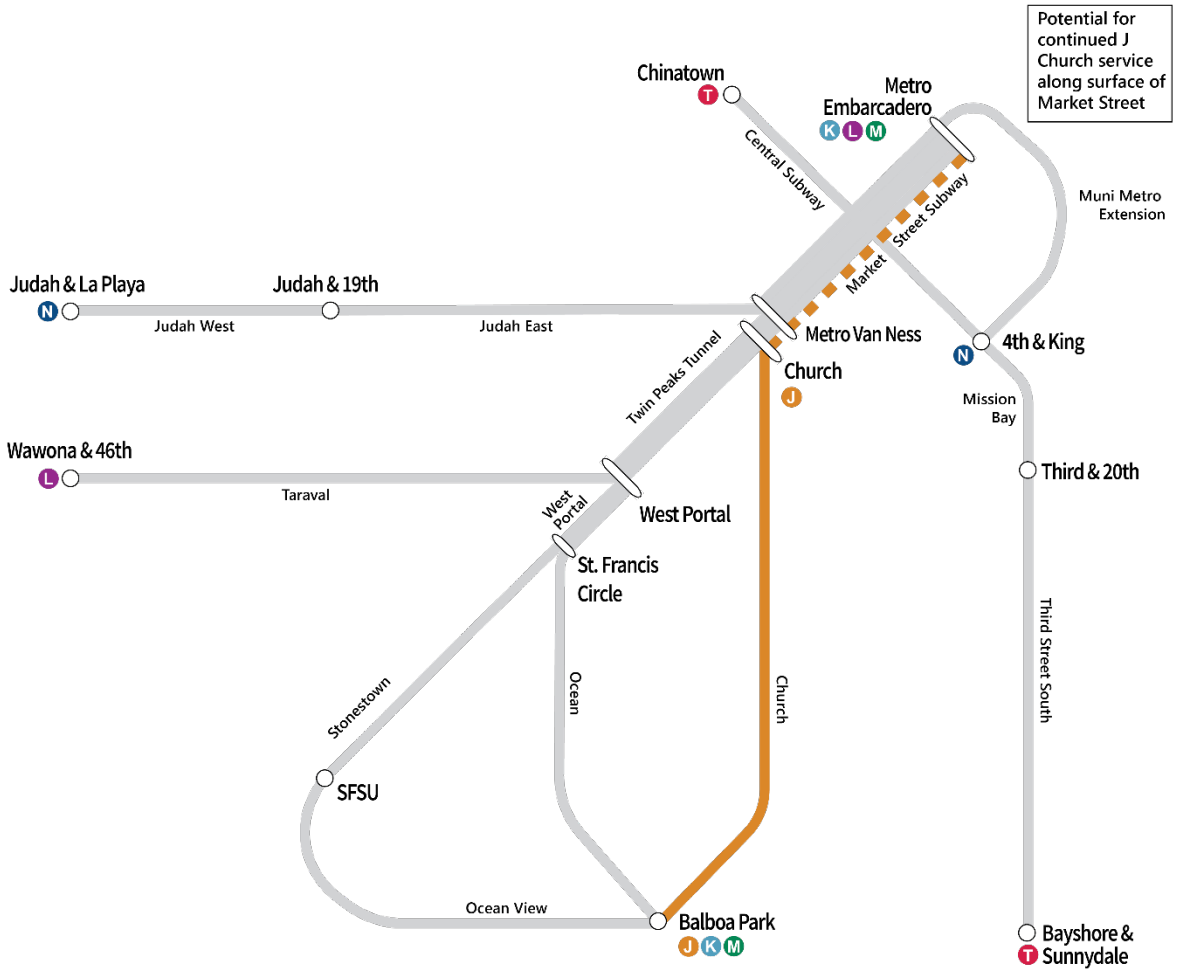


Figure 29: Restructuring concept showing a surface-only J Church with possible continued service along the surface of Market Street.

J Church/M Ocean View Swap

This option would

- Change M Ocean View service to run between Embarcadero and Parkmerced instead of Balboa Park
- Extend J Church service between Embarcadero and Stonestown via Balboa Park (as shown in Figure 30)

We can only run two-car trains between Stonestown and Balboa Park. The J/M Swap would let us run all three-car trains on the M Ocean View between Parkmerced and Downtown.

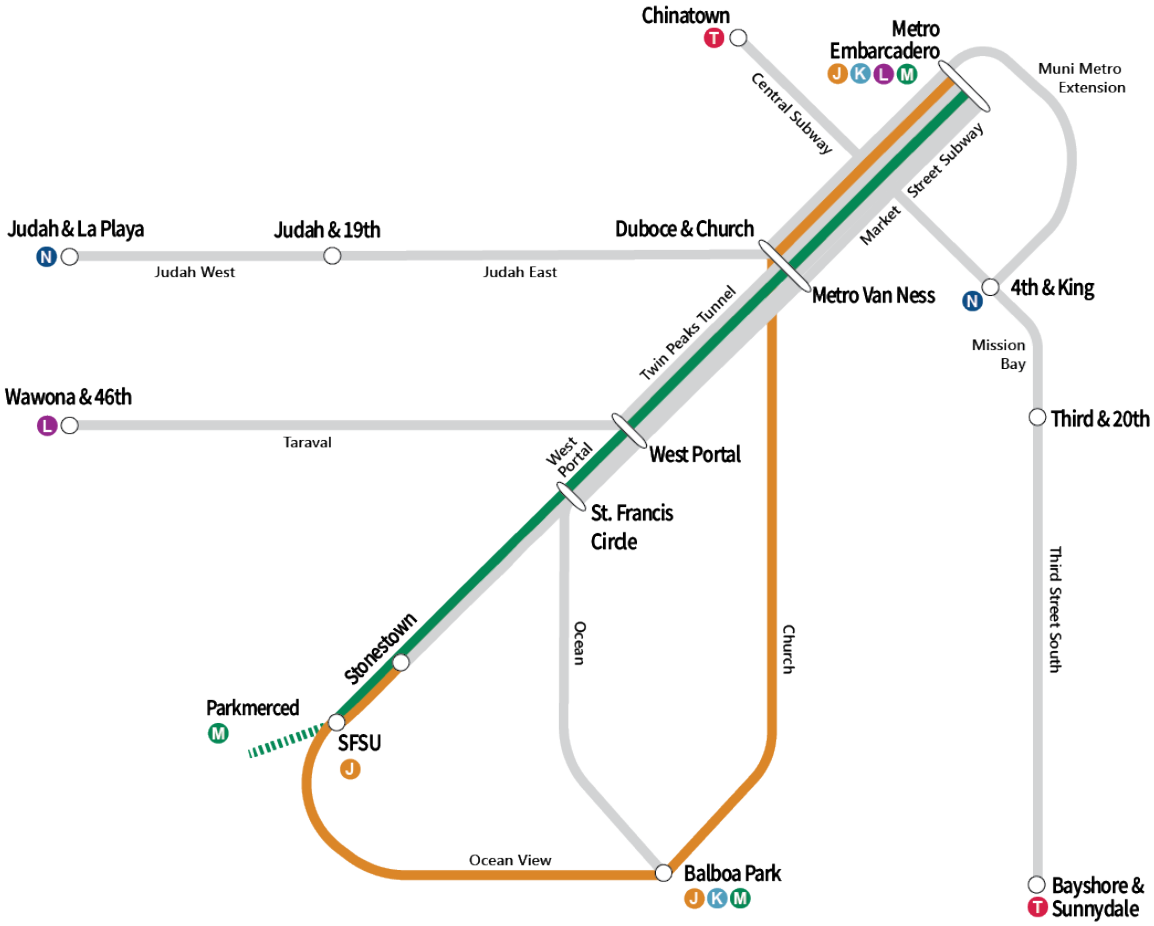


Figure 30: Map of the J/M Swap concept

At this time, we are not recommending any route restructuring. We can keep exploring this strategy as we track ridership increases and subway performance. If we need to consider this strategy further, we will consult with the community before we take any action.

If any potential route restructuring ideas are pursued in the future, they should include transfer improvements, like:

- Frequent enough service at all hours to shorten transfer times
- Operational changes to make connections smoother especially during non-peak hours, like holding trains at transfer locations
- Better transfer facilities like new or upgraded platforms, stairs and/or elevators

Longer trains

We could also consider upgrading another line for longer trains instead of pursuing either of these route restructuring concepts. We did not analyze this in the Study but should consider it if future ridership levels warrant it.

Another possibility for the longer-term future is light rail vehicles longer than the current 75-foot length. This represents a more efficient use of vehicle length, as the additional length is entirely passenger space rather than operator cabs. Peer systems including the MBTA Green Line (Boston) and SEPTA Subway-surface lines (Philadelphia) are currently converting to longer vehicles for this reason. Longer vehicles could make it easier to build high-level platforms in some locations and to provide additional capacity in the Central Subway. However, it will only be possible to acquire longer vehicles when the current fleet is replaced in the 2040s; it is not feasible to retrofit the existing vehicles.

7. Outreach: How consultation with community members has guided the study

The study included multi-faceted engagement with Muni Metro riders, stakeholders, and community groups. The outreach approach was designed for the nature of the study that was long-range and system-wide in focus. Outreach goals were to:

- Get targeted feedback from a diverse cross-section of people who live and or work near Muni Metro, including regular riders of all lines;
- Cultivate support for the process, setting the stage of subsequent project-specific outreach; and
- Seek feedback on draft recommendations before finalizing.

Outreach methods

To accomplish these goals, the team used the following outreach methods.

Community Working Group: Over the course of the Study, the team met eight times with members of a Community Working Group. The Study team administered a public application process and selected members who best met a range of criteria. This included members who were involved in their community and able to speak to broader community priorities, were able to bring a civic-minded perspective to this long-range effort, and were interested in engaging in dialogue with a diverse group of people with different perspectives. Working Group members represented multiple community perspectives including:

- Regular Muni Metro riders of each line
- Small business owners
- Seniors
- People with disabilities
- People who are transit-dependent
- People who also drive, walk and bike
- Institutions along Muni Metro lines

Staff vetted ideas, strategies and study methodology with this group. Group members provided questions, comments and suggestions that helped shape the Study's approach and recommendations. All meeting materials and meeting notes from Community Working Group meetings are publicly available on the Study web page.

Figure 31 Photo of Community Working Group members, meeting observers, and Study team members at final meeting on November, 12 2025

Community group meetings: Staff met with community groups who reached out, including SaveMuni, People of Parkside Sunset (POPS), the Restore J the Working Group, Senior Disability Action, and the Merced Extension Triangle Neighborhood Association.

Muni Metro rider focus groups: Four rider focus groups were held in English, Cantonese and Spanish in October 2024. These focus groups helped the study team understand Muni Metro rider reaction to the potential strategies under consideration. Each focus group consisted of a two-hour moderated conversation with seven to ten Muni Metro riders, including riders of each line. Focus groups are a qualitative research method that provides insights into language, core values, and the "why" behind riders' opinions. They are suggestive of Muni rider attitudes but do not provide statistical precision of how all riders feel. Some key findings from the focus group outreach include:

- ***Transit priority:*** The vast majority of participants were supportive of expanding transit priority, with a few concerns on tradeoffs for people driving. Participants liked that transit priority treatments keep trains on time and make transit more visible.
- ***Boarding infrastructure:*** Most participants supported all-door level boarding and understood the benefits to people with disabilities, luggage, strollers, etc. Some disliked the potential impacts in loss of parking spaces. Most participants recognized the value of "mini-high" boarding ramps, although some people commented that they do not see people using them, that they are unattractive, or that there should be a better solution to providing accessible boarding.

- ***Route restructuring:*** As discussed earlier in the report, the Study is not recommending route restructuring. However, questions about route restructuring were included in the focus groups as a part of consideration of this strategy. Opinions were divided on route restructuring. Those in support understood that effective transit systems around the world include transfers and that it could be a way to optimize the system. Those concerned worried about the downsides of having to transfer. Focus group participants were asked about the three route restructuring concepts discussed in this Study (Surface-only J Church, Surface-only L/K, and J/M Swap). While none of these concepts are recommended at this time, many participants had positive feedback regarding the J/M swap. This feedback was considered in the Study's recommendation to build infrastructure to enable the J Church to be extended from Balboa Park to Stonestown. Focus group participants noted that SF State and Stonestown are major destinations and were supportive of being able to have new one-seat rides to these destinations.

Boards and commissions: The study team provided informational updates to the SFMTA Citizen's Advisory Council, SFMTA Board, SFCTA Citizen's Advisory Committee, SFCTA Board of Commissioners, and SFMTA Multimodal Accessibility Advisory Committee at select milestones.

Inter-agency Technical Advisory Committee: The study team convened a Technical Advisory Committee of city and regional agency partners to provide guidance on the Study. This committee included representatives from BART, Caltrain, Caltrans, the California Public Utilities Commission, the Metropolitan Transportation Commission, San Mateo County Transportation Authority, San Francisco County Transportation Agency, San Francisco Office of Economic and Workforce Development, Port of San Francisco, and the San Francisco Planning Department. The TAC met twice, to review the Study's process and provide feedback on the Study's recommendations, providing guidance on the interconnections between this Study and other relevant planning and policy work.

Project webpage and subscriber updates: The Study team maintains a webpage—SFMTA.com/MetroStudy— that overviews the Study's purpose and status. Occasional project updates were provided to an email and text subscriber list.

Draft recommendations outreach: The study team made draft recommendations available for review and comment via an interactive website available in English, Chinese, Spanish, and Filipino. The team also presented these recommendations to interested groups. Feedback was invited via an online feedback form. The form included questions to gauge how well respondents understood the goals of the study, as well as their feedback on each of the draft recommendations.

Key feedback that informed our Study's draft recommendations

The feedback received from this engagement directly shaped the Study's technical approach and recommendations. Key themes that emerged from the outreach include:

- **Muni Metro's continued success is imperative**. There is broad agreement that it is important that Muni Metro continues to serve San Francisco's mobility needs as the city grows and evolves.
- **Plan for multiple future scenarios.** Initially, the study used a high-growth forecast under which Muni Metro ridership would double from 2019 levels by 2050. However, we received feedback that there was significant uncertainty about ridership growth. In response, the study shifted from using one forecast to multiple forecasts that represent a range of possible growth scenarios. This better shows which strategies are likely needed versus which strategies are only needed at higher growth levels.
- **Focus on rider priorities.** Framing the study around capacity did not resonate with stakeholders. After feedback, study recommendations are framed in terms of how they will impact the Muni rider experience such as ensuring enough room on trains so riders are not passed up.
- **Set up future corridor-based outreach for success.** Some community members felt that planning can seem like a competition between interests, particularly between modes. While tradeoffs are inevitable, future outreach should work to build consensus and reduce the impact of those tradeoffs.
- **Removing a line from the subway should be left as a last resort.** Some stakeholders were very concerned about the negative impacts route restructuring could have for riders of restructured lines who would have to transfer. The study does not recommend removing a line from the subway because the Study's analysis finds that we can serve ridership growth in the next 10-15 years without needing this strategy. Future exploration would only be considered with high ridership growth or if subway performance declines. Any work to consider removing a line from the subway in the future would include extensive community outreach.
- **Maintain service frequency in the Oceanview.** The Study's recommendations include infrastructure to enable extending the J Church to Stonestown. This would enable maintaining service frequency in the Oceanview while introducing 3-car M Oceanview line short lines between SF State and downtown.

Overall feedback received from the draft recommendations outreach was very positive, with the vast majority of respondents understanding and supporting the key goals of the Study. Common themes included:

Strategy-specific

- **Capacity-enhancing upgrades to old infrastructure**: There was strong support for these elements and their importance in ensuring future reliability of trips on Muni Metro. There were some concerns about disruption from construction, especially around lines being replaced with buses for long periods which is required when old track is replaced with new track.

- **Expanded transit priority infrastructure:** Some respondents strongly supported these elements. Others indicated that they do not think they are necessary in all parts of the system or thought that they may not be effective.
- **Three-car trains:** Many respondents were very supportive of the potential of this strategy to alleviate crowding, particularly from N Judah riders who report crowded conditions today and have negative memories of severe overcrowding pre-pandemic.
    - **Boarding infrastructure for three-car trains:** There was strong support for improved accessibility and safety of stops. Specific to the N Judah, some respondents wanted to see high-platforms for all-door level boarding, while others expressed worry that even the recommended less-impactful sidewalk-level platforms would create significant tradeoffs with parking loss for adjacent businesses.
    - **Infrastructure to provide flexibility to operate different service patterns in the future:** Many respondents liked the idea of enabling a future extension of the J Church to Stonestown, opening up new opportunities for one-seat rides. Respondents noted a desire for increased frequency on the J Church, and worried that extending the J Church without more frequency could create longer wait times for riders.

Non-strategy-specific

- There were concerns that the future community outreach process could slow down or water down needed improvements
- There were requests for system expansion and placing lines underground (both of which are outside the scope of this study)

We also received feedback from some stakeholders advocating for the re-introduction of coupling and de-coupling trains at key locations as a strategy to increase Muni Metro capacity. Coupling – linking two trains together while in service – was an operational practice used from 1980 to 1998. As discussed in Chapter Six, our analysis found that coupling is not a promising strategy because it would increase operating costs and decrease reliability. Additionally, use of coupling would not require capital investment, and the Study's main aim is to define a capital program of investments.

The Study does not approve or mandate any projects. It only recommends potential strategies to be advanced in future projects. Any projects that come from the recommendations would be further developed with more extensive community-based corridor-focused outreach.

8. Initial Core Capacity capital program definition

This chapter outlines the capital program for the recommended infrastructure described in Chapter Three. The proposed capital program would be advanced as two or three projects:

- N Judah Core Capacity Project between Church Street and La Playa
- M Ocean View Core Capacity Project, primarily between West Portal and SF State
- Potentially, a third project, depending on the scope and locations of capacity-enhancing upgrades to old infrastructure

These projects would be "bundled", an approach to delivering multiple projects that is an option for federal Capital Investment Grant projects. Proposed elements of the N Judah and M Ocean View projects are shown in Table 7 and Table 8, respectively.

Table 7: Proposed elements of the N Judah Core Capacity project

N Judah project	
Capacity-enhancing upgrades to old infrastructure	• Any upgrades to track, OCS, switches, traction power, that would be taken on as a part of planned re-railing (Arguello to La Playa) and that could be considered capacity-enhancing
Expanded transit priority	• Signalizing up to 50+ stop-controlled intersections and expanding signal priority/pre-emption
Upgrade infrastructure to accommodate 3-car trains	• Boarding platforms for three-car trains with mini-highs at all stops • New La Playa terminal • Any traction power upgrades needed to operate 3-car trains

Table 8: Proposed elements of the M Ocean View project

M Ocean View project	
Capacity-enhancing upgrades to old infrastructure	• Any upgrades to track, OCS, switches, traction power, that would be taken on as a part of planned re-railing (most track between St. Francis Circle and Balboa Park) and that could be considered capacity-enhancing
Expanded transit priority	• Signalizing up to five stop-controlled intersections and expanding signal priority/pre-emption at other signals • Potentially crossing gates at Ocean, Eucalyptus, and Rossmoor

Upgrade infrastructure to accommodate 3-car trains	• New high-level platforms at Ocean/Eucalyptus (consolidated) and St. Francis Circle (or relocated location) • Platform expansion for three-cars at Stonestown and SF State • Stonestown terminal infrastructure for J Church extension • Balboa Park trackwork to facilitate J Church extension • SF State or Parkmerced terminal infrastructure for M Short • Any traction power upgrades needed to operate 3-car trains

The Study team generated Class 5 Rough Order of Magnitude estimates according to the Association for the Advancement of Cost Engineering International (AACEI) estimate classification matrix. The estimated capital construction cost of the recommended set of improvements is at least $230 million in 2024 dollars. This includes $75 million for the M Ocean View and $155 million for the N Judah. Cost estimates are based on historical SFMTA data and findings from similar projects elsewhere. Cost estimates do not reflect the case-by-case realities of construction in different parts of the system.

We escalated capital costs to the potential year of construction and expanded the costs to include soft costs such as the costs to complete planning, preliminary engineering, detailed design, and contracting and construction management using SFMTA's standard cost estimating procedures. The following assumptions were made for escalation:

- 3.5% for the first year and 5% for subsequent years
- Construction begins in 2035
- Construction duration of 10 years (5 for the N Judah and 5 for the M Ocean View)

Finally, since the scope of capacity-enhancing upgrades to old infrastructure is not yet identified, we have included a placeholder range. The upper end of this range assumes we would pursue a $1 billion grant with 20% local match. Therefore, the upper end of the range is $1.2 billion minus the subtotal of the scoped elements, $915 M.

Table 9 shows the resultant estimated capital construction cost for the program, which ranges from $915 million to $1,200 million.

Table 9: Estimated capital costs for the Core Capacity projects

Project	Platforms	Signals and crossing gates	Terminals	Subtotal	Potential for Capacity-Enhancing Upgrades to Old Infrastructure	Total
M line project	$55 M	$55 M	$180 M	$290 M	Split by project to-be-determined	Project total depends on split of capacity-enhancing SOGR costs
N line project	$215 M	$340 M*	$70 M	$625 M		
Potential third project	N/A	N/A	N/A	N/A		
Total	**$270 M**	**$395 M**	**$250 M**	**$915 M**	**$0 - $285 M**	**$915 - 1,200 M**

*Assumes entire N is signalized. Cost could be significantly lower if only intersections with existing 4-way stop signs are signalized.

9. Next steps

Following the completion of this Study, staff will conduct additional implementation planning work to ready the projects to enter the FTA's pipeline for Core Capacity grants. Recommended improvements would advance as two distinct projects that are staggered in their planning, design, and construction:

- N Judah Core Capacity Project
- M Ocean View Core Capacity Project
- Potentially an additional project, depending on the full scope of Recommendation 1: Upgrade old infrastructure to enhance capacity.

Separate projects would be considered a project "bundle" for the purpose of the grant program. Table 10 summarizes each phase and the next steps. The N Judah and M Ocean View projects would proceed separately through these stages, with the N Judah Project first due to the need to replace old track on the N Judah before the M Ocean View.

Table 10: Major requirements of FTA Core Capacity Grant by phase. N Judah and M Ocean View Core Capacity project bundles would proceed through these steps separately

CIG Phase	Requirements	Notes for SFMTA's program
Pre-Project Development (typical duration: two years)	☐ Confirm full scope of project ☐ Include in fiscally constrained metropolitan transportation plan (complete) ☐ Secure funding commitments for next phase ☐ Begin environmental review	Before we are ready to enter the pipeline, we would need to further define the infrastructure included in Recommendation 1: Upgrade old infrastructure to enhance capacity, begin environmental review and begin the project planning and outreach process.
Project Development (typical duration: two years)	☐ Complete environmental review ☐ Obtain partial local funding match commitments ☐ Complete 30% engineering and design ☐ Develop detailed cost estimate	Before completing this phase, the SFMTA Board would need to approve parking and traffic legislation, serving as the project approval action that concludes the environmental phase.
Engineering (typical duration three years)	☐ Complete engineering and design ☐ Obtain full local funding match commitments	
Construction (typical duration varies)	☐ Obtain Full Funding Grant Agreement ☐ Complete construction	Construction would be delivered at the same time as planned replacement of old track along the N Judah and M Ocean View, beginning with the N Judah that may begin construction in the mid-to-late 2030s.