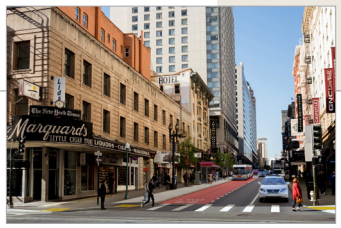
Geary Corridor
Bus Rapid Transit Project

FINAL ENVIRONMENTAL IMPACT STATEMENT (EIS)




SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY

IN PARTNERSHIP WITH

SFMTA

U.S. Department of Transportation
Federal Transit Administration

June 2018

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GEARY CORRIDOR
BUS RAPID TRANSIT PROJECT

City and County of San Francisco, California

FINAL ENVIRONMENTAL IMPACT STATEMENT

PREPARED PURSUANT TO:

National Environmental Policy Act of 1969, § 102 (42 U.S.C. §4432); and Federal Transit Law (49 U.S.C. Chapter 53); Council on Environmental Quality 40 CFR 1500/1508; 23 CFR 771; 23 U.S.C. §139 (FAST Act); 49 U.S.C. § 303 (formally Department of Transportation Act of 1966, §4(f)); National Historic Preservation Act of 1966, §106(54 U.S.C. §300101); Executive Order 11990 (Protection of Wetlands); Executive Order 11988 as amended (Floodplain Management); and Executive Order 12898 (Environmental Justice)

by the

FEDERAL TRANSIT ADMINISTRATION U.S. DEPARTMENT OF TRANSPORTATION

and the

SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY

and the

SAN FRANCISCO MUNICIPAL TRANSPORTATION AGENCY

Edward Carranza, Jr.
Acting Region IX Regional Administrator
Federal Transit Administration

JUN 0 1 2018
Date of Approval

Tilly Chang
Executive Director
San Francisco County Transportation Authority

JUN 0 1 2018
Date of Approval

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JUN 0 1 2018
Date of Approval

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LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

A-	Avoidance measure (when followed by a topical abbreviation and a number, as in A-CUL-1, which would read Cultural Avoidance Measure #1)
ABAG	Association of Bay Area Governments
ACS	American Community Survey
ADA	Americans with Disabilities Act
ADL	Aerially Deposited Lead
ADT	Average Daily Traffic
APE	Area of Potential Effects
APEFZ	Alquist-Priolo Earthquake Fault Zone
APS	Accessible Pedestrian Signals
ASA	Archaeological and Native American Cultural Resources Sensitivity Assessment
AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
ATCM	Airborne Toxic Control Measure
AWSS	Auxiliary Water Supply System
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit
bGS	Below Ground Surface
BMPs	Best Management Practices
BO	Biological Opinion
BRT	Bus rapid transit
BSP	Better Streets Plan
BTUS	British Thermal Units
CAA	Clean Air Act
CAC	Citizens Advisory Committee
CAFE	Corporate Average Fuel Economy
Cal-OSHA	California Division of Occupational Safety and Health Administration

Caltrans	California Department of Transportation
CAMUTCD	California Manual on Uniform Traffic Control Devices
CAP	Clean Air Plan
CARB	California Air Resources Board
CAT	Climate Action Team
CCAA	California Clean Air Act
CCR	California Code of Regulations
CDF	Controlled Density Fill
CDFW	California Department of Fish and Wildlife
CEC	The California Energy Commission
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CGS	California Geological Survey
CHMIRS	California Hazardous Materials Incident Reporting System
CIP	Capital Improvement Program
CMA	Congestion Management Agency
CMAQ	Congestion Mitigation and Air Quality Improvement
CMP	Congestion Management Program
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CO_2	Carbon Dioxide
CPMC	California Pacific Medical Center
CPUC	California Public Utilities Commission
CRHR	California Register of Historic Resources
CRRP	Community Risk Reduction Plan
CSAs	Construction Staging Areas
CSFM	California State Fire Marshal

CSS	Combined Sewer System
CULCOP	Committee for Utility Liaison on Construction and Other Projects
CUPA	Certified Unified Program Agency
CWA	Clean Water Act
CWTP	Countywide Transportation Plan
DAP	Downtown Area Plan
dB	Decibel
DBI	Department of Building Inspection
DOI	Department of the Interior
DPM	Diesel Particulate Matter
DPW	Director of Public Works
DTA	Dynamic Traffic Assignment
DTSC	Department of Toxic Substances Control
DWG	Directors Working Group
EDR	Environmental Data Resources
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act of 2007
EN TRIPS	Eastern Neighborhoods Transportation Implementation Planning Study
EO	Executive Order
ERNS	Emergency Response Notification System
ERO	Environmental Review Officer
ESA	Endangered Species Act
ESER BOND	Earthquake Safety and Emergency Response Bond
ESLs	Environmental Screening Levels
FARR	Final Archaeological Resources Report
FAST	Fixing America's Surface Transportation
FFRMS	Federal Flood Risk Management Standard
FHWA	Federal Highway Administration

FOE	Finding of Effect
FPS	Feet Per Second
FTA	Federal Transit Administration
GGBHTD	Golden Gate Bridge, Highway, and Transportation District
GHGs	Greenhouse Gases
GPRP	Gas Pipeline Replacement Program
HHS	Department of Health and Human Services
HRIER	Historic Resources Inventory and Evaluation Report
HVC	Holy Virgin Cathedral
I-	Improvement measure (when followed by a topical abbreviation and a number, as in I-CUL-2, which would read Cultural Improvement Measure #2)
IAC	Interagency Consultation
IOZs	Infill Opportunity Zones
ISA	Initial Site Assessment
JCHESS	Japantown Cultural Heritage and Economic Sustainability Strategy
KMMS	Kearny-Market-Mason-Sutter
KVP	Key View Point
LCFS	Low-Carbon Fuel Standard
LED	Light Emitting Diodes
LID	Low Impact Design
LOP	Local Oversight Program
LOS	Level-of-Service
LPA	Locally Preferred Alternative
LTP	Lifeline Transportation Program
LUST	Leaking Underground Storage Tank
LWCF	Land and Water Conservation Fund
MBTA	Migratory Bird Treaty Act
MBTUs	One Million British Thermal Units
MIN-	Minimization measure (when followed by a topical abbreviation and a number, as in MIN-CUL-3, which would read Cultural Minimization Measure #3)

MLD	Most Likely Descendant
MM-	Mitigation measure (when followed by a topical abbreviation and a number, as in MM-CUL-4, which would read Cultural Mitigation Measure #4)
MOMA	San Francisco Museum of Modern Art
MPO	Metropolitan Planning Organization
MSAT	Mobile-Source Air Toxics
MSE	Mechanically Stabilized Earth
MTC	Metropolitan Transportation Commission
MUTCD	Manual on Uniform Traffic Control Devices
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NHTSA	National Highway Traffic Safety Administration
NMFS	National Marine Fisheries Service
NOA	Naturally-Occurring Asbestos
NOI	Notice of Intent
NOP	Notice of Preparation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NRHP	National Register of Historic Places
NTSB	National Transportation Safety Board
NWIC	Northwest Information Center
OAP	Ozone Attainment Plan
OCS	Overhead Contact System
OMB	Office of Management and Budget
PAH	Polynuclear Aromatic Hydrocarbons
PAR	Planning Association for the Richmond
PCC	Portland Cement Concrete
PCE	Tetrachloroethylene
PCP	Project Construction Plan

PDAs	Priority Development Areas
PG&E	Pacific Gas & Electric
PHMSA	Office of Pipeline and Hazardous Materials Safety Administration
POAQC	Project of Air Quality Concern
PPV	Peak Particle Velocity
PRC	Public Resources Code
Prop AA	Proposition AA
Prop K	Proposition K
RACM	Regulated Asbestos Containing Material
RACS	Representatives of Russian-American Community Services
RCRA	Resource Conservation and Recovery Act
RECs	Recognized Environmental Conditions
RELs	Reference Exposure Levels
RMS	Root Mean Square
ROD	Record of Decision
ROW	Right-of-Way
RPP	Residential Parking Permit
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Board
SCS	Sustainable Communities Strategy
SER	Standard Environmental Reference (Caltrans)
SFAC	San Francisco Arts Commission
SF-CHAMP	San Francisco Chained Activity Modeling Process
SFCTA	San Francisco County Transportation Authority
SFDPH	San Francisco Department of Public Health
SFFD	San Francisco Fire Department
SFMTA	San Francisco Municipal Transportation Agency
SFPUC	San Francisco Public Utilities Commission
SFPW	San Francisco Public Works
SHPO	State Historic Preservation Officer

SIP	State Implementation Plan
SLIC	Spills, Leaks, Investigations, and Cleanup Site
SMF	Surface Mounted Facilities
SoMa	South of Market
SPUR	San Francisco Planning and Urban Research
SRA	Staff-Recommended Alternative
SRO	Single Room Occupancy
SSIP	San Francisco System Improvement Program
STP	Surface Transportation Program
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
TACs	Toxic Air Contaminants
TAZ	Traffic Analysis Zone
TCP	Traditional Cultural Property
TEP	Transit Effectiveness Project
TIP	Transportation Improvement Plan
TIRCP	Transit and Intercity Rail Capital Program
TJPA	Transbay Joint Powers Authority
TMDL	Total Maximum Daily Load
TMP	Transportation Management Plan
TPH	Total Petroleum Hydrocarbons
TPI	Transit Performance Initiative
TPY	Throughput Yield
TSF	Transportation Sustainability Fee
TSP	Transit Signal Priority
UCSF	University of California, San Francisco
UDE	Urban Design Element
US EPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers

USDOT	United States Department of Transportation
USF	University of San Francisco
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UST	Underground Storage Tank
Vdb	Decibel Notation
VHT	Vehicle Hours Traveled
VMT	Vehicle Miles Traveled
YOE	Year of Expenditure

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EXECUTIVE SUMMARY

S.1 What is this document about?

The San Francisco County Transportation Authority (SFCTA), in cooperation with the Federal Transit Administration (FTA) and the San Francisco Municipal Transportation Agency (SFMTA), proposes to implement physical improvements and modified bus service (bus rapid transit, or BRT) along the 6.5 miles of the Geary corridor. Located entirely within the City and County of San Francisco, California, the Geary corridor comprises all of Geary Boulevard/Geary Street, O'Farrell Street between Gough Street and Market Street, and portions of other nearby streets (described in detail below).

The project proposes construction and operation of a bus rapid transit (BRT) system on the Geary corridor

Simulations of potential future BRT system improvements along the Geary corridor

FTA, SFCTA, and SFMTA have prepared this combined Final Environmental Impact Statement (EIS)/Record of Decision (ROD) pursuant to requirements of the National Environmental Policy Act (NEPA). NEPA requires that a Federal agency considering an action with the potential to result in adverse environmental effects prepare an EIS.

The Final EIS describes four build alternatives that were proposed to meet the identified purpose and need, as well as a No Build Alternative. Each of the build alternatives proposes some form of BRT service and various physical improvements. Chapter 2 (Descriptions of Project Alternatives) and Section S.12.1 describe in greater detail the alternatives considered in this Final EIS. Appendix A includes the proposed design plans for each alternative, including the Locally Preferred Alternative (LPA) as adopted by the SFCTA in January 2017 and by the SFMTA in July 2017.

The Final EIS analyzes each alternative, including the LPA, discloses any adverse environmental effects that would result from the various alternatives and identifies measures to avoid, minimize, and mitigate such effects.

The ROD reflects the lead agency's decision on the project, documents the basis for the decision, and lists the mitigation measures to be incorporated as part of the project.

S.2 Who is leading the environmental review of this project?

FTA is the lead agency pursuant to NEPA. SFMTA as recipient of any FTA grant funding, is the project sponsor, and is the joint lead agency. SFMTA will implement and operate the project. SFCTA served as the local lead agency for environmental review under the California Environmental Quality Act (CEQA), in partnership with SFMTA as a Responsible Agency.

SFMTA Municipal Transportation Agency

U.S. Department of Transportation
Federal Transit Administration

S.3 What is the purpose of this document?

As required by NEPA, this combined Final EIS/ROD informs the public and governmental decision-makers of potential environmental effects associated with the project and describes measures that would be implemented to avoid, lessen, or mitigate for those effects. Also, consistent with NEPA, the Final EIS describes benefits of the project alternatives as relevant.

The purpose of the ROD is to state the lead agency's decision about the project, document the basis for the decision, and summarize the mitigation measures that will be incorporated into the project.

The document includes information about projected costs to construct and operate the proposed project, and it evaluates important considerations such as environmental impacts, need, feasibility, funding, and cost for each project alternative. This process gives decision-makers and the public information so they may consider the likely effects of the project on the environment, together with other important factors such as feasibility, cost, and meeting the identified project purpose and need.

S.4 In general, what kinds of environmental effects could be expected?

Implementing BRT along the Geary corridor would change how travel and parking lanes on the street are allocated. The build alternatives would add bus-only lanes (either side-running or center-running). Where bus-only lanes are added, mixed-flow travel lanes and on-street parking and loading spaces would be adjusted, reduced, or removed.

Implementing center-running bus-only lanes would require the most extensive construction. In many locations where such lanes and new medians would be constructed, existing medians and landscaping would need to be removed. Some alternatives also include major road modifications such as filling the Fillmore underpass or re-configuring the Masonic tunnel area. All build alternatives would require some removal of parking spaces and relocation of loading spaces. All build alternatives would also require removal of some existing trees (in medians and along streets), but all build alternatives would plant new trees at least equal in number to trees removed.

All build alternatives would affect traffic at several intersections along and near the Geary corridor. However, as further discussed below, taking no action (referred to as the "No Build Alternative") would also affect traffic at intersections on and off the corridor. See Section S.15 for a more detailed summary of the environmental effects of the project.

S.5 What are some of the benefits of the project (versus taking no action?)

All of the build alternatives would reduce vehicle miles traveled (VMT) by substantial levels relative to the No Build Alternative. Accordingly, all build alternatives would reduce energy usage relative to the No Build Alternative and would also reduce long-term emissions of air pollutants and greenhouse gases. All of the build alternatives would also improve transit travel time and reliability, reduce crowding, and otherwise improve the passenger experience along the Geary corridor relative to the No Build Alternative. All of the build alternatives would provide substantially greater pedestrian enhancements than the No Build Alternative.

S.6 What steps in the environmental process have occurred since issuance of the Draft EIS/EIR?

The Draft EIS/Environmental Impact Report (EIR) was available for public review and comment from October 2 through November 30, 2015. During the public review period (on November 5, 2015), SFCTA advertised and hosted a corridor-wide public meeting to provide information about the alternatives and the environmental review process, as well as to receive comments.

The Draft EIS/EIR was prepared as a joint document to meet all pertinent requirements of both NEPA and CEQA; however, after publishing the Draft EIS/EIR, the federal and local agencies mutually agreed to prepare separate final environmental documents.

SFCTA released a Final EIR for the Geary BRT project on December 9, 2016. As the CEQA lead agency, SFCTA certified the Final EIR, unanimously approved the project, and identified the Hybrid Alternative with five minor modifications as the LPA on January 5, 2017. SFCTA issued a Notice of Determination (NOD) on January 6, 2017. A sixth minor modification was subsequently added and analyzed in a CEQA addendum; which the SFCTA Board approved on June 27, 2017. Section S.16 below details all of the modifications.

On July 18, 2017, the SFMTA Board unanimously approved the project and concurred with the LPA, including six minor modifications. SFMTA issued a NOD on July 25, 2017.

All six modifications, which are listed in Section S.16 and discussed in detail in Chapter 2 (Descriptions of Project Alternatives), were made in response to written comments on the Draft EIS/EIR and/or the ongoing outreach efforts of SFCTA and SFMTA to create a project that is most responsive to

community concerns. One of the six modifications, as described in Section 2.1.1, was also developed as part of an agency initiative.

After considering public and agency comments on the Draft EIS/EIR and identifying the LPA, the lead agency, in cooperation with SFCTA and SFMTA, prepared this Final EIS, which includes the responses to comments received on the Draft EIS/EIR (Appendix L of this document) and documentation on the LPA.

S.7 What is the difference between the Draft EIS/EIR and this Final EIS/ROD?

The Draft EIS/EIR described and analyzed the No Build Alternative as well as four distinct build alternatives. The Draft EIS/EIR also summarized the process by which the build alternatives were developed, including the screening out of various design options and configurations during the planning process. The Draft EIS/EIR further noted that the Hybrid Alternative was considered the "staff-recommended alternative" by SFCTA.

As noted in S.6 above, the Hybrid Alternative with six minor modifications was identified as the LPA (hence Hybrid Alternative/LPA). As summarized in section S.16 below and described in more detail in Section 2.3 of this Final EIS, the Hybrid Alternative/LPA is also the environmentally preferable alternative and the NEPA preferred alternative.

Text changes between the Draft EIS/EIR and Final EIS primarily reflect documentation of the LPA, including analyses of potential impacts of changes to the Hybrid Alternative since the publication of the Draft EIS/EIR (see Chapter 3 – Transportation and Chapter 4 – Affected Environment, Environmental Consequences, and Avoidance, Minimization and/or Mitigation Measures), and responses to comments received on the Draft EIS/EIR (see Appendix L – Responses to Comments), and staff-initiated changes to correct minor errors or improve/update the presentation of information. This Final EIS is prepared in two formats, a version without any revisions noted, prepared as a published print-version of the document, as well as a version available electronically as an appendix which denotes revisions (including deletions, new text, and moved text) using ~~strikeout~~ for deletions and <u>underline</u> for additions.

Since the October 2015 publication of the Draft EIS/EIR, the lead agencies reviewed all time-sensitive existing conditions to ascertain validity and to determine whether any key conclusions might have changed. The key content that has been revalidated and/or updated within this Final EIS includes:

- Traffic volumes on the Geary corridor (see Section 3.1.2 and 3.4.3)
- The number of on-street parking spaces on the Geary corridor (existing and proposed; see Section 3.6)
- Major planned and reasonably foreseeable projects (see Section 2.8)

- City and County of San Francisco zoning maps (see Section 4.1)
- Left turn existing conditions throughout the Geary corridor (see Section 3.2)
- Data used to identify environmental justice communities (see Section 4.14)
- Bay Area regional population and employment projections (see Appendix D2-2)
- Historic Resources Inventory and Evaluation Report (HRIER; on file with SFCTA)
- Finding of Effect (FOE; on file with SFCTA)
- Archaeological Sensitivity Assessment (addendum on file with SFCTA)

The ROD includes the lead agency's decision on the project and provides explanation about that decision.

S.8 How can I be involved?

As this combined Final EIS/ROD includes the lead agency's decision about the project, and SFCTA previously certified an EIR for this project in January 2017, federal and state environmental review processes are considered complete. However, the federal and local agencies encourage the public to remain involved by reviewing the combined Final EIS/ROD, keeping abreast of further project updates and meetings that will take place throughout the detailed design and construction phases, or potentially serving on an advisory panel.

SFMTA will distribute information about the project via the project website, direct mailings, electronic newsletters, and outreach events. SFMTA will also convene two committees that would play an advisory role during design and construction: a community advisory committee (CAC) and a business advisory committee. The SFMTA Geary CAC was formed in summer 2017 and hosted its first meeting on July 12, 2017.

Visit **www.sfmta.com/geary** to join the project email list and receive periodic updates on the project.

S.9 Where is the project located?

The proposed project would be located along the entire 6.5-mile length of the Geary corridor, a primary east-west arterial and transit spine in the northern half of San Francisco. The project corridor includes Geary Boulevard between 48th Avenue and Gough Street; Geary Street between Gough Street and Market Street; O'Farrell Street between Gough Street and Market Street; and various blocks of Market, Fremont, Beale, Mission, and First streets that comprise the route to and from the Transbay Transit Center.

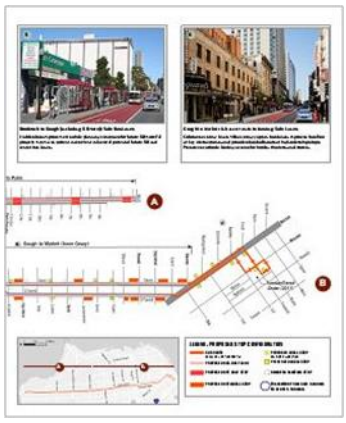
The Geary corridor

Project limits were identified in accordance with the project purpose and need and with the opportunities and constraints of the local environment.

S.10 How did this project come to be?

Bus-only lanes are an integral part of any BRT system, allowing buses to travel without being impeded by other vehicles

Many community meetings were held to engage the residents and community of the Geary corridor



Detail of a project Fact Sheet

Traffic congestion along the Geary corridor in mixed-flow travel lanes and transit overcrowding result in poor transit service reliability and low average bus speeds, which are currently around 7 to 8 miles per hour for Geary corridor Muni routes

For more than a decade, SFCTA and SFMTA have studied potential transit improvements to the Geary corridor. SFCTA's 2007 *Geary Corridor Bus Rapid Transit Study*, also known as the "Feasibility Study", evaluated the feasibility of three different BRT configurations on Geary Boulevard and associated street, as well as two "no build" non-BRT options, for a total of five conceptual design alternatives for the corridor. The Feasibility Study found each of the three BRT configurations to be potentially feasible and to have the potential to result in substantial potential benefits. The Feasibility Study did not eliminate any configurations, including the two "no build" alternatives, but recommended environmental review and further design work to identify a preferred alternative.

In November 2008, SFCTA, in cooperation with the lead agency, issued a federal Notice of Intent (NOI) to prepare an environmental impact statement (EIS) and a state Notice of Preparation (NOP) to prepare an environmental impact report (EIR). SFCTA undertook a comprehensive outreach effort to inform the environmental scope and alternatives development for the project, including three public scoping meetings and meetings with the project's then-active Citizens Advisory Committee (CAC), Technical Advisory Committee (TAC), and numerous stakeholder groups.

After that scoping process, SFCTA conducted two additional screening steps in response to community feedback, including publication of two additional screening reports (in 2009 and 2014) to help refine and eliminate design options, configurations, and alternatives. SFCTA then performed a full evaluation on the remaining, refined set of project alternatives in order to select a staff-recommended alternative.

Chapter 10 (Initial Development and Screening of Alternatives) describes the alternatives initially considered but withdrawn from further analysis, and it discusses various factors SFCTA used in identifying a staff-recommended alternative. Chapter 8 (Public Participation) summarizes all public engagement and participation efforts to date, from the alternative development and screening process through the present.

S.11 What is the purpose and need for this project?

S.11.1 | Project Purpose

The core purpose of the project is to enhance the performance, viability, and comfort level of transit and pedestrian travel along the Geary corridor between the Transbay Transit Center and 48th Avenue. In fulfillment of NEPA requirements, the following statements comprise the project purpose.

- Improve transit performance on the corridor as a key link in the City's rapid transit network to improve the passenger experience and promote high transit use.
- Improve pedestrian conditions and pedestrian access to transit.
- Enhance transit access and the overall passenger experience, while maintaining general vehicular access circulation.

S.11.2 | Project Need

Current transit performance and pedestrian conditions in the Geary corridor are in need of improvement in several key ways. The following transportation needs have been identified in the Geary corridor, serving as the basis for the project purpose:

1) *Existing transit service in the Geary corridor is unreliable, slow, and crowded, and is in need of improvement in order to promote high ridership and competitiveness with other travel modes.*

Less than two-thirds of the Geary 38 (Local) and 38R (Rapid) buses arrive within five minutes of their scheduled arrivals over the course of the day, and in the p.m. peak hour, only about half arrive on time.[1]

The average vehicle speed for all buses over the length of the corridor is 7.3 mph. An average six-mile trip from the Transbay Transit Center to 48th Avenue during the p.m. peak hour takes about 54.5 minutes by the 38 Local bus and 47 minutes by Rapid bus. By car, the trip from Market Street to 48th Avenue takes about 22 minutes, and would be a few minutes longer if starting from the Transbay Transit Center.

The most common sources of delay for buses are those from: boarding and alighting passengers (called dwell time); waiting at traffic lights; private vehicle loading and parking activity in the right-most travel lane; and moving across the mixed-flow travel lanes to access bus stops. In addition, buses spend time waiting at traffic signals and re-entering the mixed-flow travel lanes after passenger boarding and alighting.

These factors slow bus travel, leading to bus bunching, which results in longer gaps between subsequent buses and therefore longer passenger wait times. Given the corridor's high ridership demand, bunching can also lead to overcrowding both on the first bus within a bunch, which adds to further delays as alighting and boarding become more time-consuming, and at bus stops as passengers continue to arrive to wait for a late bus.

At heavily used transit stops, bus loading areas are too narrow and too short to accommodate the volume of passengers

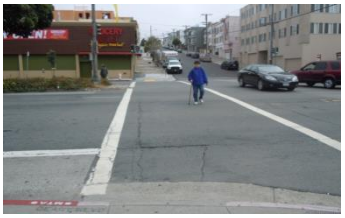
Lack of reliability in bus travel times leads to bus bunching

Lanes reserved exclusively for transit are an integral part of any BRT system, allowing buses to travel without being impeded by other vehicles. Transit delays due to auto congestion, crashes, or by loading and unloading vehicles would be substantially reduced. Similarly, cars would not be impeded by bus operations, such as stops to load and unload passengers

The corridor has been identified as among the highest priority arterials for pedestrian safety improvements due to its collision history

[1] On April 25, 2015, SFMTA changed naming conventions for limited stop bus services. Bus services previously referred to as *limited* and denoted by the letter "L" following the bus line number, e.g. 38L, are now referred to as *rapid* services and are denoted by the letter "R."

2) Geary Boulevard's wide travelway and high vehicle travel speeds create unfavorable pedestrian conditions - especially west of Gough Street and throughout the Richmond District.



Pedestrian access conditions are poor at some locations, including unsignalized crossings and closed crosswalks

The Geary corridor's non-vehicular mode share – the proportion of those traveling via public transit, walking, or bicycling – reaches 50 percent in its Tenderloin segment, 40 percent in its Western Addition/Japantown segment, and over 30 percent in its Richmond District segment. A high percentage of seniors reside in the corridor compared with the rest of San Francisco – a group of people with higher rates of disabilities and other mobility limitations than the overall population. The quality of the pedestrian experience, including safety and comfort, is an important element affecting the corridor's ability to retain existing transit riders and attract new ones.

Current pedestrian conditions in the Geary corridor need improvement. Large segments of the Geary corridor are very wide, and pedestrians routinely face relatively long crossing distances with limited refuge areas. In the Japantown and Fillmore areas, there are closed crosswalks and circuitous pedestrian bridges that are not compliant with accessibility standards for people with disabilities. Near the Fillmore Street underpass, almost 40 percent of vehicles have been measured reaching speeds faster than the 35 mph limit. All of these elements divide the neighborhoods on the north and south sides of the Geary corridor.

Geary bus stop location lacking amenities

The City's WalkFirst study (2012) identified Geary Boulevard as a top-priority corridor for pedestrian safety improvements because of the corridor's very high rate of pedestrian injury and role as a key street for pedestrian activity. Many of its intersections see pedestrian volumes greater than 500 in the p.m. peak hour, with pedestrians numbering as much as 4,000 per day at a few intersections. All segments of the Geary corridor exhibit worse pedestrian safety performance than the citywide average.[2]

3) The Geary corridor's existing street and streetscape environment do not provide a high-quality transit experience, despite the corridor's high transit ridership.

38 Geary buses like this one are often overcrowded

Despite the corridor's high transit use, the existing roadway layout is not designed to provide a high-quality transit experience. The transit experience along the corridor, as defined by the conditions facing transit riders as they walk to transit stops, wait for the bus, board the bus, ride the bus, and finally get off the bus, is unfavorable in multiple ways. As described above, passengers encounter less-than-ideal pedestrian conditions in accessing transit.

Once arriving at bus stops, the passenger experience can still be lacking. Bus stop waiting areas can be overcrowded. Some locations throughout the corridor feature only a bus stop pole, with no shelter, map, or other amenities. Additional space is needed where the bus shelter, waiting passengers, and other features like newspaper boxes compete for sidewalk

[2] San Francisco Department of Public Health Pedestrian Collision Scorecard, 2012.

space and thus hinder pedestrian movement and access to transit facilities. In addition, the current street design makes it challenging for buses to position themselves completely parallel and adjacent to the short curbside bus stops, which in turn creates difficulty and delay for passengers boarding and alighting the buses.

Finally, once boarding the bus, passengers experience a transit ride quality that includes frequent and abrupt side-to-side movement as buses change lanes to pull into and out of bus stops and around vehicles in the right-side curb lane that may be double-parked, stopped for loading, or queuing for a right turn.

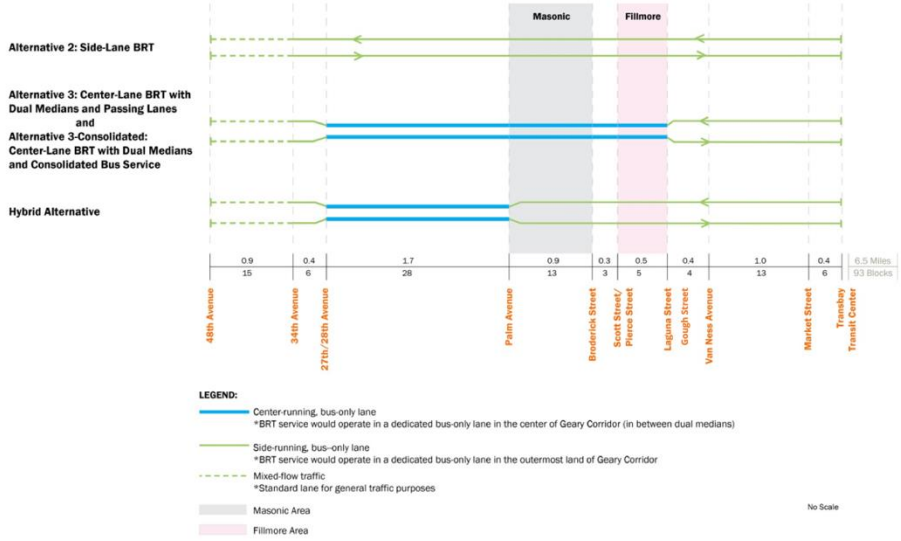
S.12 What is in this project?

S.12.1 | Project Alternatives

Based on the established purpose and need, the project alternatives discussed below consider a range of improvements to San Francisco's Geary corridor, between 48th Avenue to the west and the Transbay Transit Center to the east. The alternatives discussed below include a No Build Alternative and four build alternatives. The build alternatives would implement physical roadway and lane changes between Market Street and 34th Avenue, as well as higher frequency bus service and bus stop amenities/improvements along the entire Geary corridor (between the Transbay Transit Center and 48th Avenue).

Figure S-1 provides a graphical depiction of the build alternatives. Key attributes of all alternatives, including the Hybrid Alternative/LPA are described below.

Figure S-1 Build Alternatives Schematic Diagram



Note: The Fillmore Street and Masonic Avenue areas are highlighted on this figure due to the major engineering constraints for implementing BRT service associated with underpasses in these areas (i.e., steep grades and narrow service roads). See Sections 10.2.5 and 10.2.6 for further details. Figure has been updated since the Draft EIS/EIR with clarified labeling.

Source: Jacobs, 2014

Alternative 2: Side-Lane BRT (At Fillmore Street looking east)

Rapid service is used to describe Muni bus service that operates with less frequent stops than local service.

Proposed BRT service would replace the existing Rapid service for all Build Alternatives and indicates the greater level of transit priority infrastructure that would be in place.

- **No Build Alternative**[3]
  - No new BRT service or related physical infrastructure improvement. Existing local, express, and rapid service would continue to operate. The Geary corridor would be served with previously planned/programmed transit and infrastructure improvements.
- **Alternative 2: Side-Lane BRT**
  - BRT service would replace the existing 38R service. Local and express bus services would continue to operate.
  - From the Transbay Transit Center to 34th Avenue, buses would operate in dedicated side-running bus-only lanes, replacing the existing outside travel lanes of the Geary corridor, next to the existing curbside parking lane that would remain at most locations.
  - Between 34th and 48th avenues, no bus-only lanes would be constructed; all buses would operate in mixed-flow lanes.

[3] Throughout this document, the more descriptive term "No Build Alternative" is used instead of the label "Alternative 1."

- Existing 38 Local service would also operate in the dedicated bus lanes but would pull out of them to service curbside local bus stops, enabling BRT buses to pass.

Alternative 3: Center-Lane BRT with Dual Medians and Passing Lanes

- BRT service would replace the existing 38R service; local and express buses would operate.
- This alternative would be different from Alternative 2 from Laguna Street to 27th Avenue. There, BRT and local service would operate in dedicated bus-only lanes in the center of the Geary corridor. A bus passing lane at local bus stops would enable BRT buses to pass local buses that are stopped to load and unload passengers.
- The center-lane design would include filling in the Fillmore underpass and reconfiguring the Masonic tunnel for a BRT stop.
- In all other locations, this alternative would be similar to Alternative 2.

Alternative 3-Consolidated: Center-Lane BRT with Consolidated Bus Stops, Dual Medians, and No Passing Lanes

- Same as Alternative 3 between Laguna Street and 27th Avenue; however, BRT service would replace both 38R and 38 Local services as a new consolidated service, eliminating the need for bus passing lanes. Express buses would operate.

Alternative 3-Consolidated: Center-lane BRT with no passing lanes (At 17th Avenue looking west)

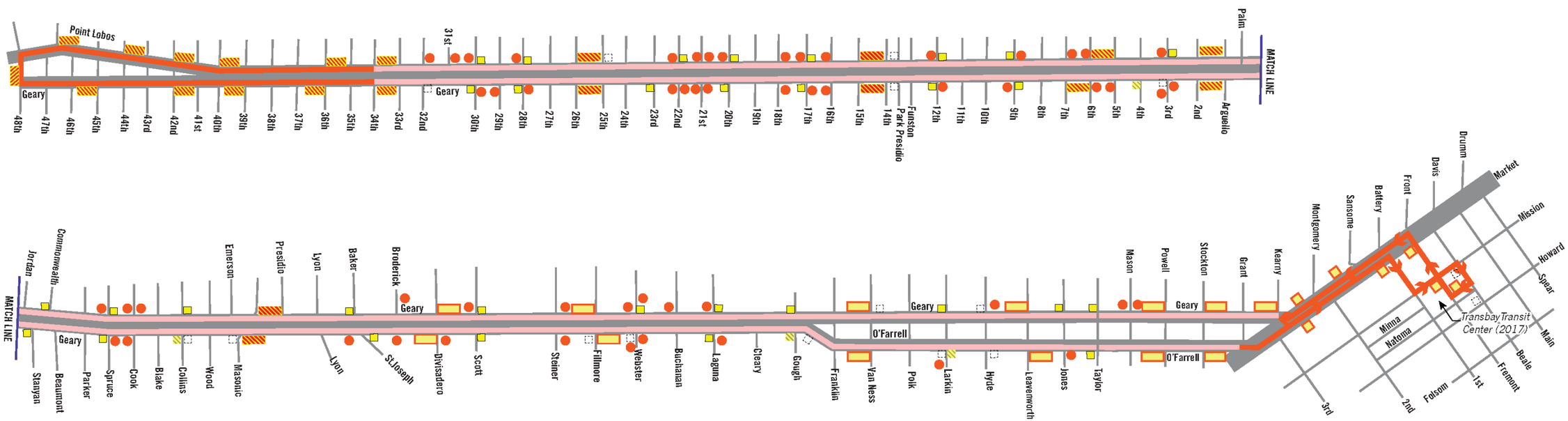
Hybrid Alternative/LPA

- This alternative would incorporate various physical features of Alternatives 2 and 3-Consolidated in different segments, a mix intended to maximize benefits and minimize impacts
- BRT service would replace the existing 38R service; local and express buses would operate:
  - From Transbay Transit Center to Palm Avenue, local and BRT buses would operate in existing or new side-running bus-only lanes.
  - Between Palm Avenue and 27th Avenue (inbound) and 28th Avenue (outbound), local and BRT buses would operate in dedicated bus-only lanes in the center of the Geary corridor, with no bus passing lanes. Every stop would local, BRT and express buses.
  - Between 27th/28th and 34th avenues, all buses would operate in new side-running bus-only lanes.

        - Between 34th and 48th avenues, no bus-only lanes would be constructed; all buses would operate in mixed-flow lanes.
    - In side-running portions of the corridor, BRT buses would have the ability to pass local buses at local stops.

Figures S-2 through S-5 depict each build alternative in detail.

Figure S-2 Alternative 2



(not to scale)

Source: SFCTA, 2017

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Figure S-3 Alternative 3

(not to scale)

Source: SFCTA, 2017

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Figure S-4 Alternative 3-Consolidated

(not to scale)

Source: SFCTA, 2017

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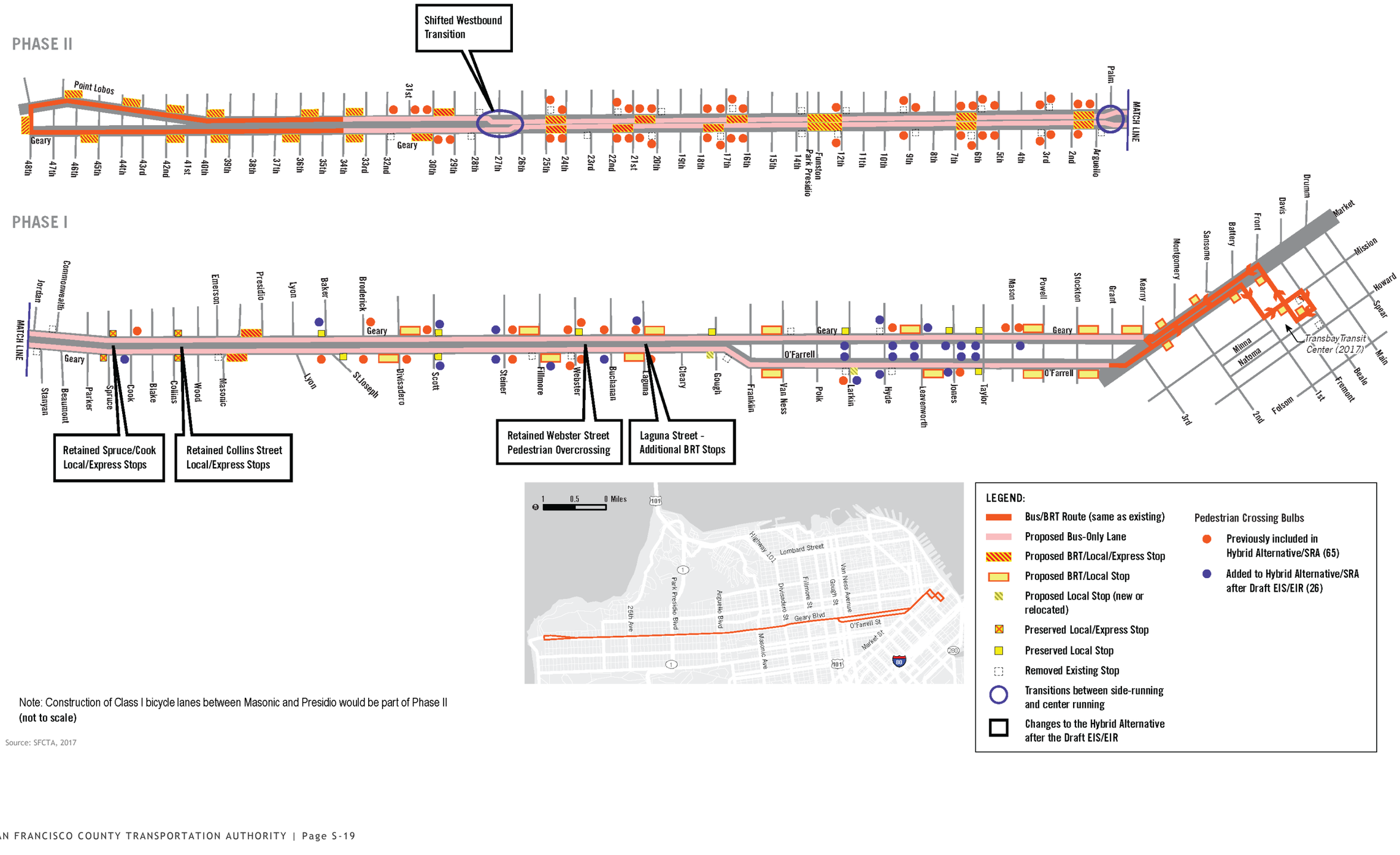
Figure S-5 Hybrid Alternative/Locally Preferred Alternative



Note: Construction of Class I bicycle lanes between Masonic and Presidio would be part of Phase II
(not to scale)

Source: SFCTA, 2017

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S.13 How is this document organized?

This combined Final EIS/ROD evaluates all reasonable alternatives considered, identifies a NEPA preferred alternative (Section 2.3), responds to written comments on the Draft EIS/EIR, describes mitigation measures that would be incorporated into the project, and reflects the lead agency's decision on the project.

This document is organized primarily as a NEPA document – Environmental Impact Statement (EIS)

Chapter 3 (Transportation) and Chapter 4 (Affected Environment, Environmental Consequences, and Avoidance, Minimization and/or Mitigation Measures) evaluate each environmental resource topic area pursuant to NEPA. Several environmental topic areas are related to transportation; thus Chapter 3 of this document is solely devoted to transportation-related topics. Chapter 5 (Cumulative Impacts) analyzes potential cumulative impacts.

To help support decision-making, this Final EIS documents the project alternatives' performance against a number of measures related to the purpose and need detailed in Chapter 1.

Chapter 2 describes in detail each of the project alternatives carried forward through environmental analysis and identifies both the environmentally preferable alternative as well as the NEPA preferred alternative.

Chapter 3's subsections analyze transportation-related effects of each project alternative, including potential effects associated with transit performance, auto traffic, pedestrian and bicycle movement, and parking.

Chapter 4's subsections describe the existing conditions in the vicinity of the Geary corridor and analyze the potential effects of each project alternative on several other environmental resource topic areas.

Chapter 5 assesses the total cumulative impact or the total of all impacts on a particular resource that have occurred, are occurring, and will likely occur as a result of any action or influence, including the direct and indirect effects of a federal activity.

Chapter 6 analyzes each of the project alternatives' potential effects to Section 4(f) and 6(f) properties (i.e., effects on public park and recreational areas, wildlife and waterfowl refuges, and certain historic properties, as required by Section 4(f) of the Department of Transportation Act of 1966 [49 U.S.C. 303] and Section 6(f) of the Land and Water Conservation Act of 1965 [36 CFR Part 59]).

Chapter 7 is no longer necessary as part of this NEPA-only Final EIS because its contents were exclusively relevant to CEQA; the Final EIR for the project was certified in December 2016.

Chapter 8 summarizes the agencies' efforts to engage the public and stakeholder agencies in the development and screening of alternatives and the environmental review process.

Chapter 9 describes the estimated costs of construction, annual operations, and maintenance of the improvements associated with the various project alternatives. This chapter also summarizes committed, planned, and potential additional sources of project funding.

Chapter 10 describes the criteria that SFCTA used to develop and screen alternatives, including a discussion of alternatives considered but rejected from further consideration in the environmental review process.

Each of environmental resource topic subsections discussed in Chapters 3 and 4 are generally organized according to the following structure:

- **Regulatory Setting:** This section, where applicable, describes relevant laws, policies, and regulatory agencies.
- **Affected Environment:** This section includes information about existing conditions for the area affected by all of the alternatives presented in this Final EIS.
- **Methodology:** This section includes discussion of how project effects were evaluated and determined. The environmental baseline/existing conditions for a project is the site at the time the NOP was issued (e.g., existing land uses, visual environment, etc.); however, given the amount of time that has passed since the publication of the NOP in 2008, some of the descriptions of existing conditions have been updated where new, more relevant information is available and/or recent site visits identified altered conditions from the date of NOP issuance.
- **Environmental Consequences:** This section includes a summary of the potential adverse or significant environmental effects of the project on each respective environmental resource area. The discussions are typically divided into *operational* and *construction-period* effects.
- **Avoidance, Minimization, and Mitigation Measures:** This section includes potential measures, if relevant, to avoid, minimize, or mitigate adverse environmental effects of the project. Avoidance measures (abbreviated as "A" in the document) are designed to completely avoid potentially adverse effects; minimization measures (abbreviated as "MIN") would reduce the severity of any potentially adverse effects; and mitigation measures (abbreviated as "MM") compensate for potential adverse effects of the project. Improvement measures (abbreviated as "I") are incorporated for some environmental resource topic areas where opportunities exist to improve conditions, and where no significant/adverse effects have been identified.

Avoidance Measures (A)

Minimization Measures (MIN)

Mitigation Measures (MM)

Improvement Measures (I)

The ROD states the lead agency's decision on the project, and includes explanation of the lead agency's decision-making process.

S.14 How much will this project cost?

The proposed project is estimated to cost between $170 million and $435 million, depending on the build alternative. The Hybrid Alternative/LPA is estimated to cost $300 million. This estimate includes both the capital cost of the project's core components and parallel improvements. Total capital costs are in year of expenditure. Chapter 9 (Financial Analysis) describes project costs in more detail.

As reflected in Chapter 9, the project sponsors have identified a substantial component of anticipated capital funding. Budgeted and planned funding sources for the proposed project include:

- **Small Starts (up to $100 million).** This program, which is administered by FTA, provides competitive grants for new transit projects whose capital costs do not exceed $300 million. SFCTA and SFMTA intend to apply for the maximum grant amount, $100 million, with plans to enter the program in fiscal year 2018/19. For some alternatives including Alternative 2 and the Hybrid Alternative/LPA – the cost of the BRT scope elements is $300 million or less, making those alternatives eligible for funds within the Small Starts program. (For comparison, the capital costs of Alternatives 3 and 3-Consolidated exceed $400 million, which exceeds the $300 million cap for Small Starts eligibility.)
- **Proposition K Sales Tax ($50.9 million).** In November 2003, San Francisco voters approved Proposition K (Prop K), extending the existing half-cent local sales tax for transportation and approving a new 30-year expenditure plan identifying projects and programs to be funded by the sales tax. The Prop K Strategic Plan (2009) prioritized funding within the larger Bus Rapid Transit/Transit Preferential Streets/MTA-Muni Metro Network category for BRT on Geary corridor, designed and built to rail-ready standards. To date, the SFCTA Board has allocated almost $2 million in Prop K funds for the detailed design phase of Geary BRT Phase I and $15.8 million for various phases of Phase II. Going forward, an additional $1.4 million of Prop K funding is programmed for Phase I and $31.7 million is programmed for Phase II. In total, $50.9 million in Prop K funds has been allocated or programmed for the project.

S.15 What are the potential environmental effects of this project?

This combined Final EIS/ROD considers the potential for the project alternatives to result in adverse environmental effects in a wide range of environmental topic areas. The build alternatives would generally improve transit and traffic conditions in the corridor, but as described in S.15.2 and Section 3.4, the project would nonetheless result in increased automobile traffic delays at a number of intersections along and near the Geary corridor.

Environmental topic areas considered include: transportation, land use, community impacts, growth, visual resources, cultural resources, utilities, geology and soils, hazards and hazardous materials, hydrology and water quality, air quality, noise and vibration, energy, biological resources, environmental justice, cumulative impacts, section 4(f) and 6(f) resources, and construction-related impacts

Moreover, construction of the build alternative improvements has the potential to result in temporary effects. The Final EIS identifies all such effects from both construction and operation of the build alternatives. Chapter 3 (Transportation) summarizes potential environmental effects on transit, automobile traffic, parking, and pedestrian/bicycle conditions.

The project's potential effects on traffic circulation would represent its adverse effects under NEPA. In all other topic areas, the project would have no adverse impacts, or avoidance, minimization, and/or mitigation measures would be able to render any impacts non-adverse. As both the primary benefits and most substantial impacts of the project relate to its effects on the transportation system, the findings of Final EIS Chapter 3 (Transportation) are summarized below.

S.15.1 | Transit Conditions

Transit ridership on the Geary corridor is expected to increase in the future. All of the build alternatives would increase transit ridership further. The Hybrid Alternative/LPA and Alternative 3 would increase ridership to about 95,000 daily trips in 2035 (from an existing 50,000). Alternative 3-Consolidated would generate a slightly higher ridership increase (99,000 daily trips), and Alternative 2 would generate the least increase among build alternatives (92,000 daily trips). In contrast, if no action were taken, transit ridership would increase by about 25 percent less than the Hybrid Alternative/LPA (to about 77,000 daily trips).

The average travel time for the 38R is currently 47 minutes from 48th Avenue to the Transbay Transit Center; the 38 Local travel time is 54.5 minutes. All build alternatives are projected to operate at faster speeds and would be more reliable than the No Build Alternative. The Hybrid Alternative/LPA travel times (38 Local and BRT services) would be 21 to 23 percent less than the No Build Alternative. Both Alternative 3 and Alternative 3-Consolidated would have shorter travel times than the Hybrid Alternative/LPA; the Alternative 3 travel time for the 38 BRT would be the fastest among build alternatives. Alternative 2 travel times would be the slowest of the build alternatives.

Bus crowding was projected based on vehicle occupancy at the route's maximum load point, where buses are carrying the greatest number of accumulated passengers. Muni's peak period load factor standard is 85 percent, meaning bus occupancy should not exceed 85 percent of a full (crush) passenger load. In the peak direction during the peak hour, the No Build Alternative and all build alternatives would exceed the standard under future year conditions. During the 2035 a.m. peak period in the eastbound direction, crowding with the Hybrid Alternative/LPA would be comparable to the No Build Alternative, Alternative 3 would be more crowded, Alternative 2 would be less crowded than the No Build Alternative, and Alternative 3-Consolidated would be the least crowded (18 percent less crowded than the No Build Alternative). During the 2035 p.m. peak period in the outbound direction, the Hybrid Alternative/LPA and Alternative 3 would be slightly less crowded than the No Build Alternative, Alternative 2

would have further reduced crowding, and Alternative 3-Consolidated would be the least crowded (25 percent less than the No Build Alternative).

All of the build alternatives would entail the relocation and consolidation of some existing transit stops along the corridor, but to varying degrees. The Hybrid Alternative/LPA would reduce the number of total stops by 18 percent from existing conditions. Alternative 3-Consolidated would consolidate the most bus stops (58 percent reduction), while Alternative 3 and Alternative 2 would retain slightly more bus stops than the Hybrid Alternative/LPA (12 to 16 percent reduction). Existing stop spacing is about 700 feet on average for local stops and 1,500 feet for Rapid stops. The Hybrid Alternative/LPA, Alternative 3, and Alternative 2 would have comparable stop spacing, all slightly greater than existing conditions (less than 20 percent greater). Alternative 3-Consolidated would have stop spacing more than 50 percent greater than current spacing.

S.15.2 | Automobile Conditions

Traffic volumes in the corridor are expected to increase by 2035 in the No Build Alternative due to anticipated growth in San Francisco and the region. The build alternatives are projected to result in less traffic relative to the No Build Alternative due to improved transit service, as well as reduced vehicular capacity along the Geary corridor. The Hybrid Alternative/LPA would result in about 25 percent less traffic on average than the No Build Alternative, depending on roadway location. Due to the proposed changes at the Masonic tunnel and Fillmore underpass areas, Alternative 3 and Alternative 3-Consolidated would result in between 25 and 55 percent less traffic than the No Build Alternative, depending on roadway location. Alternative 2 would result in the least traffic decrease about 20 percent less than the No Build in 2035.

With the projected traffic volume increase under the No Build Alternative, adverse effects would occur at 21 study intersections (17 on-corridor and 4 off-corridor). The Hybrid Alternative/LPA would result in adverse effects at eight study intersections (4 on-corridor and 4 off-corridor). Alternative 3-Consolidated would result in nine study intersections experiencing adverse effects, and Alternative 2 and Alternative 3 would both result in five intersections experiencing adverse effects. Mitigation measures to reduce project impacts at the affected intersections for each build alternative are not considered feasible, or they would negatively affect transit and pedestrian operations. As such, those intersection effects would remain adverse.

S.15.3 | Pedestrian and Bicycle Conditions

Any of the build alternatives would improve pedestrian safety. Alternatives 2, 3, and 3-Consolidated would provide an additional 51 pedestrian crossing bulbs, resulting in a total of 65 new bulbs including 14 that would be built in the No Build Alternative. The Hybrid Alternative/LPA as revised would provide 26 additional pedestrian crossing bulbs, for a total of 91 bulbs including the 65 previously included. Pedestrian safety also would be improved by increases in protected left turns for vehicles (vehicles may only turn left with a left-turn signal (i.e., arrow)), and decreases in permissive left

turns (vehicles may turn left with a green signal if there is no conflicting oncoming traffic and/or pedestrian crossing). All build alternatives also would provide additional median refuges, add two new signalized pedestrian crossings, and add two new crosswalks at existing signalized intersections. All build alternatives include an enhanced bicycle facility on Geary Boulevard on the block between Presidio and Masonic avenues. This location would close an east-west bicycle facility gap where the route transitions from Class II bike lanes south of Geary Boulevard and west of Masonic Avenue, to Class II bike lanes north of Geary and east of Presidio Avenue.

S.15.4 | Parking and Loading Conditions

The Hybrid Alternative/LPA would decrease the overall parking supply within one to two blocks of the Geary corridor by 3 percent (410 spaces); Alternatives 2 and 3 would reduce it by 4 percent (460 and 430 spaces, respectively); and Alternative 3-Consolidated would reduce it by 2 percent (210 spaces).

A detailed parking analysis was undertaken for two areas that would experience the highest levels of parking loss – the Masonic Avenue and Japantown/Fillmore Street study areas.

In the Masonic Avenue study area, Alternative 3-Consolidated would reduce the area's public parking supply by 7 percent; Alternative 2 would reduce it by 8 percent; and Alternative 3 and the Hybrid Alternative/LPA would reduce it by 9 percent.

In the Japantown/Fillmore Street study area, Alternatives 3 and 3-Consolidated would reduce the area's public parking supply by 2 percent; Alternative 2 would reduce it by 3 percent; and the Hybrid Alternative/LPA would reduce it by about 4 percent.

On the Geary corridor, the Hybrid Alternative/LPA, Alternative 3, and Alternative 3-Consolidated would not change parking for people with disabilities. Alternative 2 would move to an adjacent block four parking spaces for people with disabilities.

All build alternatives would result in 5 commercial loading spaces lost and 10 to 15 commercial loading spaces relocated. All build alternatives would result in 1 to 3 passenger loading spaces lost and 7 to 12 spaces relocated.

S.16 The Preferred Alternative

SFCTA and SFMTA staff have studied the performances of the alternatives under consideration, and they have consulted the public during the past several years to understand local issues of concern. Based on performance analysis and public input, the Draft EIS/EIR identified the Hybrid Alternative as the staff-recommended alternative (see Figure S-5)

This Final EIS identifies the LPA as the Hybrid Alternative with the following six minor modifications (collectively referred to as "Hybrid Alternative/LPA"):

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

Three of the above six minor modifications to the Hybrid Alternative rescind previously proposed Hybrid Alternative elements: retention of the Webster Street bridge, removal of the proposed BRT stops between Spruce and Cook streets, and retention of the Collins Street combined local/express stops.

FTA weighed the ability of project alternatives to meet the purpose and need, the economic and technical feasibility of the project alternatives, the environmental effects of the project alternatives, local agency decision-making subsequent to publication of the Draft EIS/EIR, and all comments in identifying the Hybrid Alternative LPA as the Preferred Alternative for the Project.

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CHAPTER 1.0 PROJECT PURPOSE AND NEED

1.1 Introduction

The Federal Transit Administration (FTA), San Francisco County Transportation Authority (SFCTA), and San Francisco Municipal Transportation Agency (SFMTA) have prepared this Final Environmental Impact Statement (EIS)/Record of Decision (ROD) to address the environmental effects of the proposed Geary Corridor Bus Rapid Transit (BRT) Project and respond to the comments received on the Draft EIS/Environmental Impact Report (EIR). These agencies have prepared this combined Final EIS/ROD in accordance with the National Environmental Policy Act (NEPA) of 1969, 42 United States Code Section 4321 et seq. FTA is the federal lead agency (hereinafter, "lead agency") pursuant to NEPA.

SFMTA, a project sponsor along with SFCTA, would be the recipient of any grant funds, and is the joint lead agency under NEPA.

SFCTA, in cooperation with FTA and SFMTA, proposes to implement BRT improvements along the City's Geary corridor. The Geary corridor encompasses all of Geary Boulevard/Geary Street, O'Farrell Street from Gough Street to Market Street, as well as blocks of several others streets that provide connections to and from the Transbay Transit Center (see Figure 1-1).

In 2004, SFCTA initiated a Geary Corridor BRT Study (Feasibility Study). Published in 2007, the study evaluated the feasibility of three different BRT configurations on Geary Boulevard and associated streets, as well as two "no build" non-BRT options, for a total of five conceptual design alternatives for the corridor. The Feasibility Study found each of the three BRT configurations to be potentially feasible and to have the potential to result in substantial benefits. The Feasibility Study did not eliminate any configurations, but recommended environmental review and further design work to identify a preferred alternative.

KEY AGENCIES

SFCTA: Transportation planning and funding agency for San Francisco

SFMTA: Owner and operator of San Francisco's streets and Municipal Railway ("Muni") transit system

FTA: Federal agency responsible for providing technical and financial assistance to local and regional transit agencies

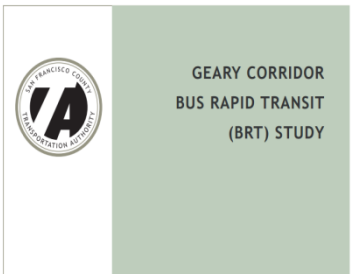
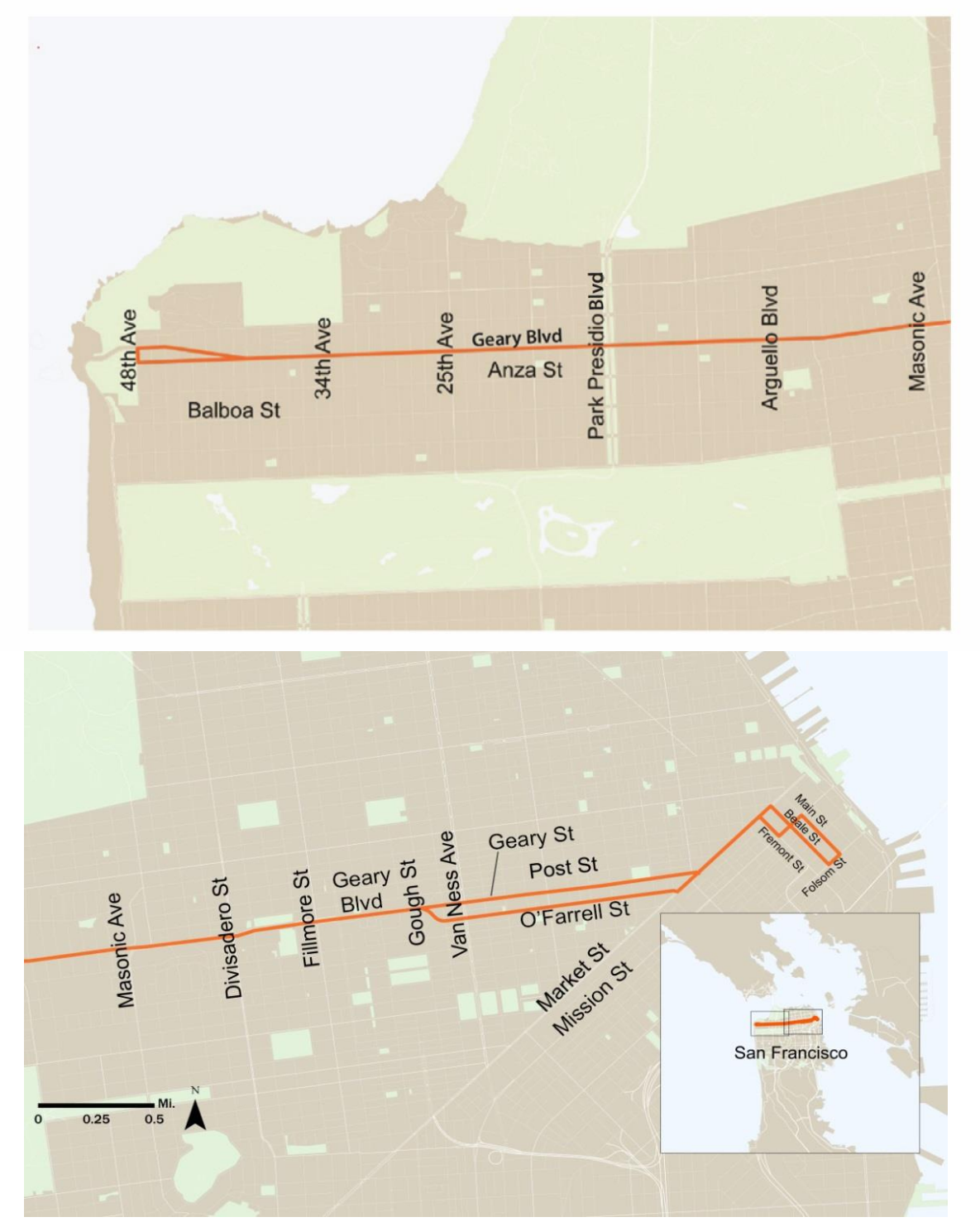


Figure 1-1 The Geary Corridor between 48th Avenue and the Transbay Transit Center



Source: SFCTA, 2014

Following adoption of the Feasibility Study, SFCTA and SFMTA called for the next phase of project development – preliminary engineering and environmental analysis. After the environmental scoping process that developed and facilitated community input on potential project alternatives and included two additional screening steps,[1] five alternatives were defined and carried forward for evaluation in the Draft EIS/EIR, including one No Build Alternative and four build alternatives – Alternatives 2, 3, 3-Consolidated, and the Hybrid Alternative, which was a variation that combined parts of other build alternatives. Chapter 2 (Descriptions of Project Alternatives) details each project alternative.

The Draft EIS/EIR was published on October 2, 2015, and was available for a 59-day public review period through November 30, 2015.

1.2 Final EIS/Record of Decision

The lead agency, in cooperation with SFCTA and SFMTA, have prepared this combined Final EIS/ROD to address the environmental effects of the proposed Geary Corridor BRT Project and respond to the comments received on the Draft EIS/EIR.

1.2.1 | Modifications to the Hybrid Alternative after Publication of the Draft EIS/EIR

A total of six minor modifications have been made to the Hybrid Alternative. Five of the six modifications were developed in direct response to public comments on the Draft EIS/EIR; the sixth was developed both in response to comments as well as in association with an agency initiative. See Sections 2.1.1 and 2.2.7 for further detail on these modifications.

SFCTA released the Final EIR for the Geary BRT project on December 9, 2016. As the California Environmental Quality Act (CEQA) lead agency, SFCTA certified the Final EIR, approved the project, and identified the Hybrid Alternative with five minor modifications as the LPA on January 5, 2017. All of these actions were on unanimous votes of the SFCTA Board. SFCTA issued a Notice of Determination (NOD) on January 6, 2017. The sixth minor modification was subsequently added and analyzed in a CEQA addendum; the SFCTA Board took an approval action on June 27, 2017, as further discussed in Section 2.2.7.6.6.

On July 18, 2017, the SFMTA Board unanimously approved the project and concurred with the LPA, including all six minor modifications noted above. SFMTA issued a NOD on July 25, 2017.

[1] See Chapter 10 of this Final EIS (Initial Development and Screening of Alternatives) for more information on the various design options and configurations that SFCTA considered in formulating project alternatives.

1.2.2 | Final EIS

After considering public and agency comments on the Draft EIS/EIR and identifying the LPA, the lead agency, SFCTA, and SFMTA cooperatively prepared this Final EIS, which includes responses to comments on the Draft EIS/EIR. Text changes between the Draft EIS/EIR and Final EIS primarily reflect documentation of the LPA, responses to comments received on the Draft EIS/EIR, and staff-initiated changes to correct minor errors or improve/update the presentation of information. This Final EIS is prepared in two formats, a version without any revisions noted, prepared as a published print-version of the document, as well as a version available electronically as an appendix which denotes revisions (including deletions, new text, and moved text) using ~~strikeout~~ for deletions and underline for additions.

Material that is new or has been revised since publication of the Draft EIS/EIR is indicated by a vertical bar in the margin; text deletions are shown in ~~strikethrough~~ and insertions are underlined.

The analytical chapters of the Final EIS (Chapters 3 through 6) reflect revisions and expansions of the text and analysis of the Draft EIS/EIR to include consideration of each of the six minor modifications to the Hybrid Alternative/LPA described above. These added subsections provide analysis and reasoning demonstrating that the six minor modifications do not change any of the environmental conclusions for any resource area. In other words, the modifications would not result in any new or more severe environmental impacts nor would they result in more severe cumulative effects beyond what the Draft EIS/EIR described.

1.2.3 | Environmentally Preferable Alternative

Based on analysis in the Draft EIS/EIR and as updated throughout the revised and expanded analytical sections of this Final EIS, this document identifies the environmentally preferable alternative, as required by federal regulations.[2] Sections 2.3.8 and 2.3.8.1 describe considerations in determining the environmentally preferable alternative; these considerations draw on the analysis summarized in Chapters 3 through 6 of this Final EIS. Based on this analysis, the Hybrid Alternative/LPA is the environmentally preferable alternative.

As noted in Section 2.3.8.1, the six modifications applied to the Hybrid Alternative/LPA did not result in any new or more severe environmental impacts from those described in the Draft EIS/EIR.

1.2.4 | Preferred Alternative

KEY CONCEPT

This document informs the public and governmental decision makers of the environmental effects of the project and describes the measures that would be undertaken to mitigate them

As detailed in Section 2.3.8.2, the LPA is also considered the preferred alternative pursuant to federal regulations.[3] This is because the Hybrid Alternative/LPA would balance improvements to transit performance and pedestrian safety in the corridor with reduced impacts in key areas of community concern, and would meet the project purpose and need. The

[2] Code of Federal Regulations, Title 40, Section 1505.2

[3] Code of Federal Regulations, Title 23, Part 771.125; Code of Federal Regulations, Title 40, Part 1502.14(e); and Questions 4a and 4b of the Council on Environmental Quality's *40 Questions*

lead agency (FTA) also recognizes that SFCTA designated the Hybrid Alternative as the LPA, and that SFMTA concurred with this designation.

1.2.5 | Uses of the Final EIS

Pursuant to requirements of NEPA, this document informs the public and governmental decision-makers about potential environmental impacts of the project alternatives during both construction and operational phases. Where warranted, this document identifies avoidance, minimization, and/or mitigation measures to avoid, lessen, or compensate for adverse environmental effects. Federal, state, regional, and local agencies will use this document as may be required or necessary to assess the environmental impacts of the build alternatives on resources under their jurisdictions, to make discretionary decisions regarding the project, and to exercise review and permit authority over the project.

See Table 2-11 for a list of other anticipated approvals and permits.

1.3 Project Location

The proposed project would be located along the entire 6.5-mile length of the Geary corridor, a primary east-west roadway and transit spine across the northern neighborhoods of San Francisco. The corridor is comprised of: Geary Boulevard, a two-way arterial between 48th Avenue and Gough Street and the pair of one-way streets between Gough and Market streets including Geary Street, which runs westbound, and its companion, O'Farrell Street, which runs eastbound one block south of Geary Street. The corridor also includes Geary bus line routing between Market Street and the Transbay Transit Center. The project does not propose roadway infrastructure changes south of Market Street or west of 34th Avenue.

A west to east view of the Geary corridor.

The east and west project limits constitute logical termini as they include the full length of SFMTA's current 38 Geary bus services. The project limits were identified in accordance with the project purpose and need, described in the following sections, and in accordance with the opportunities and constraints of the local environment.

Four SFMTA Muni bus routes currently provide public transit service in the Geary corridor: 38 Geary Local (38), 38 Geary Rapid (38R[4]), 38 Geary B Express (38BX), and 38 Geary A Express (38AX). Golden Gate Transit, based in Marin County, also operates commuter service into San Francisco via a portion of Geary Boulevard between Park Presidio Boulevard and Webster Street.

[4] On April 25, 2015, SFMTA changed naming conventions for limited stop bus services. Bus services previously referred to as *limited* and denoted by the letter "L" following the bus line number, e.g. 38L, are now referred to as *rapid* services and are denoted by the letter "R."

A number of major north-south transit routes cross the Geary corridor and generate major transfers to and from Geary services, including but not limited to Muni bus lines 22 Fillmore, 47 Van Ness, 49 Van Ness, and 30 Stockton, and the Powell Street cable car line. Major regional transit lines also connect to Geary, including the Bay Area Rapid Transit (BART) lines along Market Street, several Golden Gate Transit routes that cross the Geary corridor at Van Ness Avenue, and several other regional bus lines at the Transbay Transit Center. Muni light rail lines also operate beneath the Geary corridor on Market Street, and the T-Third Central Subway extension currently under construction will cross below Geary Street near Union Square.

In addition to the routes on the Geary corridor, several routes operate within a few blocks, including the 1 California, 2 Clement, 3 Jackson, 5 Fulton, and 31 Balboa. Several Muni routes provide regional transit connections to BART trains, Caltrain, and bus services of Alameda-Contra Costa Transit District (AC Transit), Golden Gate Transit, and SamTrans. A number of private shuttles also operate on or near the Geary corridor.

1.4 Planning Context

The San Francisco Transportation Plan (2040) includes the Geary corridor in the SFTP Investment Vision.

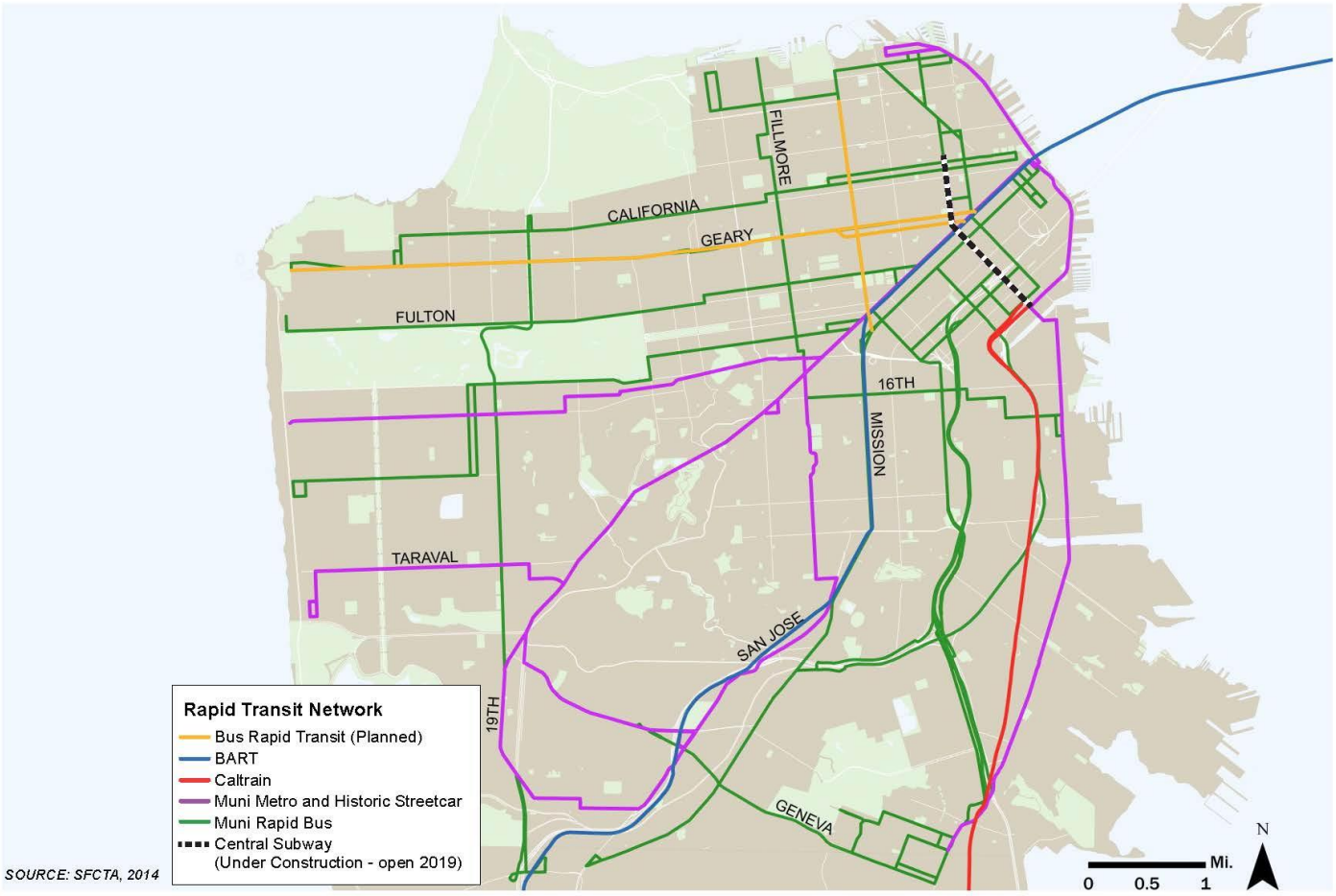
Several planning studies and funding actions within San Francisco have documented a vision for the Geary corridor as part of San Francisco's rapid transit network.

- SFCTA's *Four Corridors Plan* (1995)
- SFMTA's *Vision for Rapid Transit* (2000)
- SFCTA's 2004 Countywide Transportation Plan (CWTP)
- SFMTA's Transit Effectiveness Project (2008)
- SFCTA's 2013 and 2017 San Francisco Transportation Plans (SFTP)

Each of these plans identified Geary as high-priority corridor for improvements within the City's rapid transit network. In 2014, the City's WalkFirst pedestrian safety effort identified portions of Geary Boulevard and Geary Street as part of the City's pedestrian high-injury network.

The CWTP evaluated alternative approaches to meeting the City's rapid transit system needs and recommended a preferred scenario that called for development of a citywide BRT network. Figure 1-2 shows the CWTP's identified rapid transit network. The Proposition K Expenditure Plan, the investment component of the 2004 CWTP approved by voters reauthorizing the City/County's half-cent transportation sales tax measure, featured Geary BRT as one of the named projects to be funded.

Figure 1-2 San Francisco Rapid Transit Network Map



In 2013, SFCTA adopted a new version of the long-range, countywide transportation plan, called the San Francisco Transportation Plan (SFTP). It identified four core goal areas, including *Livability*, *Economic Competitiveness*, *World Class Infrastructure*, and *Healthy Environment*, and reaffirming the importance of the Geary corridor in meeting them by including it in the SFTP Investment Vision.

Under the *Livability* goal, the SFTP proposed to lift the non-auto travel mode share from its current 48 percent in 2013 to above 50 percent, noting that safety concerns prevented more walking, and transit reliability concerns prevented more transit use.

Within *Economic Competitiveness*, the plan identified increased transit capacity as necessary to support new planned growth in Civic Center, Downtown and the Eastern Neighborhoods.

In *World-Class Infrastructure*, the plan noted transit operating costs growing faster than revenues, caused in part by declining transit speed performance – a 10 percent decrease from 1997 to 2008. Lower speeds mean the same driver and vehicle complete fewer route runs in a day, resulting in less service for the same price.

Improved transit and pedestrian conditions on Geary would constitute a major contribution toward those goal areas.

In 2017, SFCTA adopted SFTP 2040, an update to the 2013 SFTP. The updated SFTP reaffirmed the 2013 plan's goals, investment plan, and supporting policy recommendations. SFTP 2040 provided an update on existing and future conditions impacting the San Francisco transportation system, revised transportation funding revenue forecasts, updated project costs, and reassessed projects previously identified for funding in the 2013 plan. The new plan confirmed the importance of Geary BRT to achieving the plan's goals by including the project in the SFTP 2040 Investment Plan.

Lastly, several previous planning efforts have described a vision for light rail treatments on the Geary corridor, including SFMTA's System Planning Study (1995). As a way to move toward that ultimate vision, the 2004 Proposition K Expenditure Plan included language requiring the Geary corridor BRT improvements to be rail-ready, such that the improvements facilitate an eventual implementation of light rail on the Geary corridor.

1.4.1 | Regional Planning Context

1.4.1.1 | METROPOLITAN TRANSPORTATION COMMISSION

The Metropolitan Transportation Commission (MTC) serves as the transportation planning, coordinating, and financing agency for the nine-county San Francisco Bay Area. MTC functions as both a regional transportation planning agency for state purposes, and for federal purposes as the region's metropolitan planning organization (MPO). As such, MTC is responsible for regularly updating the Regional Transportation Plan (RTP), which is a comprehensive blueprint for the development of mass transit, highway, railroad, bicycle, and pedestrian facilities. The most recent RTP, adopted together with the region's second Sustainable Communities Strategy in 2017 as *Plan Bay Area 2040,* specifies how $303 billion in anticipated federal, state, and local transportation funds will be spent in the Bay Area in coming decades. The plan includes anticipated improvements to local and rapid bus services, with committed and discretionary funds for Geary BRT specifically identified in the plan.

1.5 Project Purpose and Need

1.5.1 | Project Purpose

The core purpose of the project is to improve the performance, viability, and comfort of transit and pedestrian travel along the Geary corridor. In fulfillment of NEPA requirements, the following statements comprise the project purpose.

- Improve transit performance on the corridor as a key link in the City's rapid transit network to improve the passenger experience and promote high transit use.
- Improve pedestrian conditions and pedestrian access to transit.
- Enhance transit access and the overall passenger experience, while maintaining general vehicular access circulation.

The remainder of this document, as summarized in Section S.6, helps the lead agencies and public understand the potential environmental effects of each alternative and evaluate how well each alternative meets the project purpose and need (or project objectives).

1.5.2 | Project Need

As recognized by the planning efforts for the Geary corridor and San Francisco overall cited above, the Geary corridor serves as an important vehicular and transit corridor, serving high-density commercial and residential areas along its entire length.

The major streets of the corridor – Geary Boulevard west of Gough Street and the one-way couplet streets of Geary Street and O'Farrell Street east of Gough Street – together serve as a major thoroughfare for local and through traffic. According to SFMTA, each day the corridor sees more than 50,000 person-trips via public transit, and it serves automobile volumes that vary between about 16,000 to 20,000 in the outlying neighborhoods west of Park Presidio to about 44,000 at the highest-demand locations. The corridor also sees tens of thousands of daily pedestrian trips.[5] Unlike many public transit routes that can have disproportionate usage patterns related to commute direction and period, transit ridership on the Geary corridor is consistently high throughout the day, on weekdays and weekends, and in both the eastbound and westbound directions.

DEFINITION

SOIL LIQUIFACTION: When saturated, cohesionless soils lose their strength due to the build-up of excess pore water pressure, especially during cyclic loadings (i.e., shaking) such as those induced by earthquakes.

While the Geary corridor serves thousands of multimodal trips per day, current transit performance and pedestrian conditions in the Geary corridor are in need of improvement in several key ways. The following transportation needs have been identified in the Geary corridor, serving as the basis for the project purpose.

[5] SFCTA, 2009-2012.

1) Existing transit service in the Geary corridor is unreliable, slow, and crowded, and is in need of improvement in order to promote high ridership and competitiveness with other travel modes.

Less than two-thirds of the 38 Local and 38R buses arrive within five minutes of their scheduled arrivals over the course of the day, and in the p.m. peak hour, only about half arrive on time.[6]

The average vehicle speed for all buses over the length of the corridor is 7.3 mph, with slightly higher speeds prevailing west of Divisadero Street and lower east of Webster Street.[7] An average six-mile trip from the Transbay Transit Center to 48th Avenue during the p.m. peak hour takes about 54.5 minutes by 38 Local bus and 47 minutes by 38R bus; by car, the trip from Market Street to 48th Avenue takes about 22 minutes, and would be a few minutes longer if starting from the Transbay Transit Center.[8]

The most common sources of delay for buses are those from loading and unloading passengers (or "dwell time"); waiting at traffic lights; private vehicle loading and parking in the right-most travel lane; and moving across the mixed-flow travel lanes to access bus stops. Factors contributing to long dwell times include the need for people to walk up the three steps required to board buses that are not low-floor buses, which is particularly challenging for people with disabilities or mobility impairments; and the distance from the bus to the curb caused by the difficulty buses have when attempting to pull completely parallel to the bus stops (see Figure 1-3). In addition, buses spend time waiting at traffic signals and re-entering the mixed-flow travel lanes after passenger loading and unloading.

Congestion, demand, and transit inefficiencies have resulted in higher transit operating costs and crowding

These factors slow bus travel and make travel times less reliable, leading to bus bunching. As many as 30 percent of the vehicles arrive less than one minute apart (see Figure 1-4 for an example). This bus bunching results in longer gaps between subsequent buses and therefore longer passenger wait times.[9] Given the corridor's high ridership demand, bunching can also cause overcrowding on the first bus within a bunch, which adds to further delays as alighting and boarding become more time-consuming, and at bus stops, as passengers continue to arrive to wait for a late bus (see Figure 1-5).

2) *Geary Boulevard's wide travelway and high vehicle travel speeds create unfavorable pedestrian conditions – especially west of Gough Street and throughout the Richmond District.*

The Geary corridor's non-vehicular mode share – the proportion of those traveling via transit, walking or bicycling – reaches 50 percent in its Tenderloin segment, 40 percent in its Western Addition/Japantown segment, and over 30 percent in its Richmond segment. As a key pedestrian street with high pedestrian volumes, the Geary corridor features conditions that affect a large number of those who walk to or from work, school, or home. A concentration of residences and service centers for seniors are

[6] SFCTA & SFMTA, 2012.
[7] SFCTA & SFMTA, 2011.
[8] SFCTA & SFMTA, 2011 & 2013.
[9] SFCTA & SFMTA, 2012 & 2013.

located within the corridor, and a high percentage of seniors reside in the corridor relative to the rest of San Francisco – a group of people with higher rates of disabilities and other mobility limitations than the overall population. Because most transit riders access the Geary corridor transit stops by walking from adjacent neighborhoods, the quality of the pedestrian experience, including safety and comfort, affects the corridor's ability to retain existing riders and attract new ones.

Current pedestrian conditions in the Geary corridor need improvement. Large portions of the Geary corridor, particularly Geary Boulevard, are very wide, ranging in width from 125 feet to 168 feet including medians, travel lanes, parking lanes, and sidewalks. Consequently, pedestrians face relatively long crossing distances with limited refuge areas and minimally marked crosswalks.

In the Japantown area, as depicted in Figure 1-6, narrow medians and circuitous pedestrian bridges that intimidate some and do not comply with accessibility standards for people with disabilities discourage pedestrian movement and activity. Near the Fillmore Street underpass, nearly 40 percent of vehicles have been gauged reaching speeds faster than the 35 mph limit. Lastly, the wide vehicular right of way, high-speed vehicular traffic, and lack of pedestrian-crossing facilities at some locations divide the neighborhoods on the north and south sides of the street.

In the segment of the corridor that includes Masonic Avenue and the Richmond District, several uncontrolled pedestrian crosswalks cross six or more lanes of Geary Boulevard. Here, the speed limit is 25 mph, but as many as 75 percent of vehicles have been gauged going faster than that.

The City's WalkFirst study (2012) identified Geary Boulevard as a top-priority corridor for pedestrian safety improvements because of its very high rate of pedestrian injury and its role as a key street for pedestrian activity. Many of its intersections see pedestrian volumes greater than 500 in the p.m. peak hour, with pedestrians numbering as many as 4,000 at a few intersections.[10] All segments of the Geary corridor have worse pedestrian safety performance than the citywide average, seeing 30 to 110 severity-weighted pedestrian injuries per mile from 2005 to 2011, compared with less than 10 per mile citywide.[11] The Geary corridor's areas of highest pedestrian injury rates are Market Street to Laguna Street, and the section from Cook Street to 22nd Avenue.

3) The Geary corridor's existing street and streetscape environment do not provide a high-quality transit passenger experience, despite the corridor's high transit ridership.

Despite the corridor's high transit use, the existing roadway layout is not designed to provide a high-quality transit experience. The corridor's ample width provides room for multiple travel lanes, with between four and eight lanes in the stretches west of Van Ness Avenue.

[10] SFCTA, 2009-2012.
[11] San Francisco Department of Public Health Pedestrian Collision Scorecard, 2012.

In contrast, multiple conditions are unfavorable for transit riders as they walk to transit stops, wait for the bus, board the bus, ride the bus, and finally get off the bus.

First, the unfavorable crossing conditions described above affect all transit passengers as they access bus stops.

Second, once arriving at bus stops, the passenger experience can still be lacking. As shown in Figure 1-5, exiting bus stop waiting areas can be overcrowded. Once passengers board the bus, further crowding can occur creating unfavorable riding conditions. As shown in Figure 1-7, some locations throughout the corridor feature only a bus stop pole, with no shelter from the elements, no map of bus system routes, and no other amenities, such as "next bus" arrival signs. Elsewhere, at heavily used transit stops near Market Street and in the Japantown area, bus loading areas are too narrow and too short to accommodate typical passenger volumes. As depicted in Figure 1-8, additional space is needed where the bus shelter, waiting passengers, and other features like newspaper boxes compete for sidewalk space, hindering pedestrian movement and limiting the perceived viability of transit use.

Third, the current street design makes it challenging for buses attempting to position themselves completely parallel and adjacent to the short curbside bus stops, which in turn creates difficulty and delay for those boarding and alighting the buses.

Finally, after boarding, bus passengers experience frequent and abrupt side-to-side movements as buses change lanes to pull into and out of bus stops and around vehicles that may be double-parked in the right-side curb lane, stopped for loading, or queuing for a right turn.

Figure 1-3 Curbside Bus Stop

Short, curbside bus stops like this one in the Richmond District make it difficult for buses to position themselves completely parallel and adjacent to bus stops, making the passenger loading process more onerous and time-consuming.

Figure 1-4 Bus Bunching

Lack of reliability in Geary bus travel times leads to bus bunching, in which buses have been so delayed that they arrive together at a bus stop, such as this one in the Japantown area, instead of at even time intervals, contributing to bus crowding and further delays.

Figure 1-5 Bus Delays and Crowding

Bus delays combine with high ridership demand to result in crowding at Geary corridor bus stops, like this one in the Richmond District, and on buses, as more people arrive to wait for and board a delayed bus.

Figure 1-6 Pedestrian Access Conditions

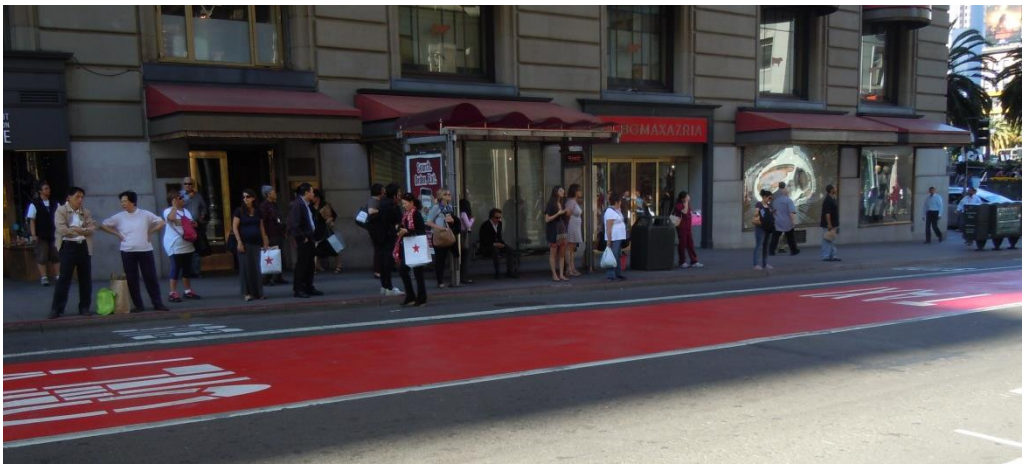
Pedestrian access conditions are poor at some locations, including 28th Avenue below, which lacks a pedestrian countdown signal, which can be challenging for people with disabilities and senior citizens. Unsignalized crossings, such as at Cook Street (not shown) and closed crosswalks, such as at Webster and Steiner streets (below), create challenging pedestrian access conditions.

Figure 1-7 Existing Bus Stop Amenities at Various Locations

Some stop locations throughout the corridor, like this location in the Tenderloin, feature only a bus stop pole, with no shelter, map, or other amenities.

Figure 1-8 Bus Loading Areas

At heavily used transit stops in the downtown area near Market Street and in the Japantown area, bus loading areas are too narrow and too short to accommodate the volume of passengers, and additional space is needed where the bus shelter, waiting passengers, and other amenities like newspaper boxes compete for sidewalk space, hindering pedestrian movement and access to transit use.



CHAPTER 2.0 DESCRIPTIONS OF PROJECT ALTERNATIVES

2.1 Introduction

This Final Environmental Impact Statement (EIS) considers five project alternatives:

- **No Build Alternative**
- Four build alternatives:
    - **Alternative 2:** Side-Lane Bus Rapid Transit (BRT)
    - **Alternative 3:** Center-Lane BRT with Dual Medians and Passing Lanes
    - **Alternative 3-Consolidated:** Center-Lane BRT with Consolidated Bus Stops, Dual Medians, and No Passing Lanes
    - **Hybrid Alternative/Locally Preferred Alternative (LPA):** Incorporates elements of Alternatives 2, 3, and 3-Consolidated; side-lane BRT between Market Street and Palm and Jordan avenues; center-lane BRT between Palm and Jordan avenues to 27th and 28th avenues; side-lane BRT between 27th and 28th avenues to 34th Avenue

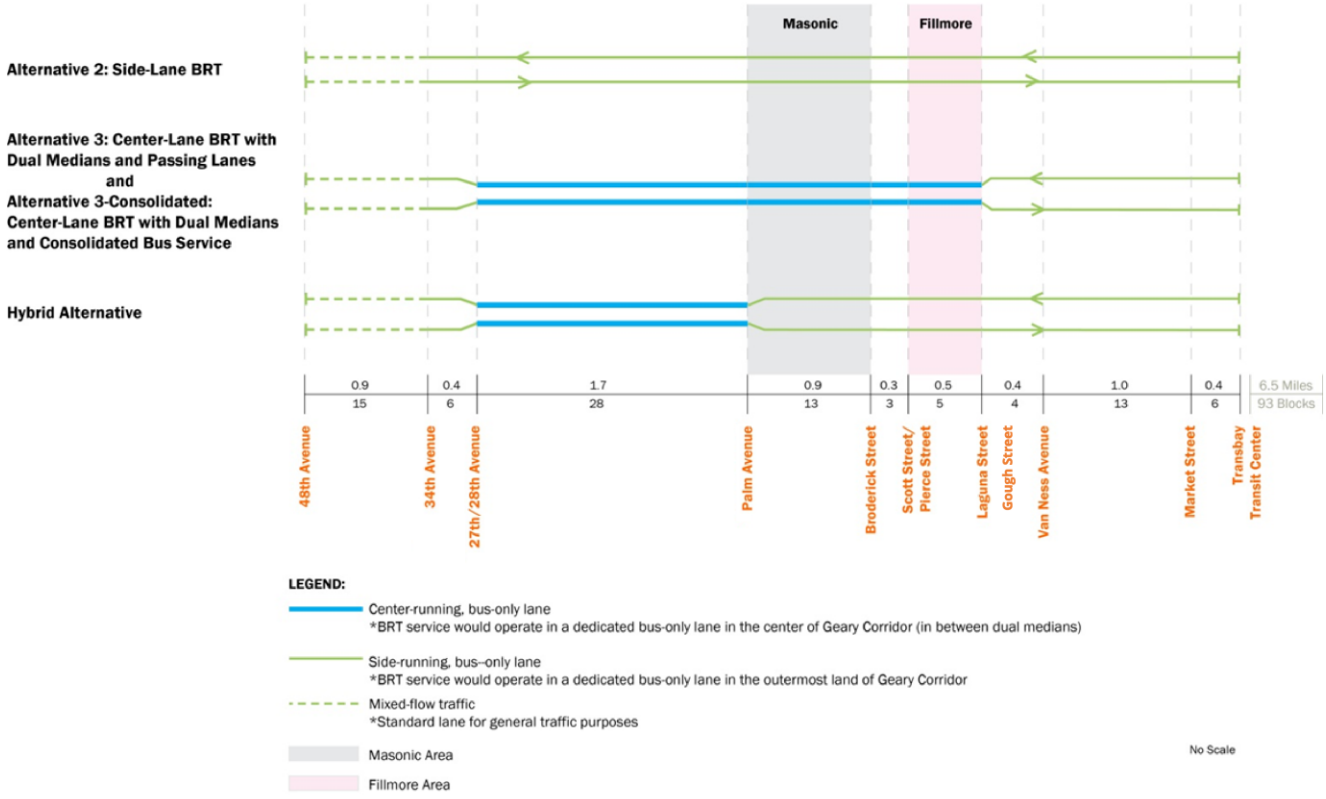
Each of the four build alternatives proposes some form of BRT service and associated physical infrastructure improvements along the Geary corridor. The build alternatives would implement physical roadway and lane changes between Market and 34th streets, but they would also implement bus service amenities and improvements between the Transbay Transit Center and 48th Avenue. Figure 2-1 provides a schematic diagram of the four build alternatives.

2.1.1 | Selection of the Locally Preferred Alternative

SFCTA released the Final EIR for the Geary BRT project on December 9, 2016. As the California Environmental Quality Act (CEQA) lead agency, SFCTA certified the Final EIR, approved the project, and identified the Hybrid Alternative with five minor modifications as the LPA on January 5, 2017. SFCTA issued a Notice of Determination (NOD) on January 6, 2017. A sixth minor modification was subsequently added and analyzed in a CEQA addendum; which the SFCTA Board approved on June 27, 2017, as further discussed in Section 2.2.7.6.6.

On July 18, 2017, the SFMTA Board unanimously approved the project and concurred with the LPA, including six minor modifications. SFMTA issued a NOD on July 25, 2017.

Figure 2-1 Schematic Diagram of the Build Alternatives



Note: The Masonic Avenue and Fillmore Street areas are highlighted on this figure due to the major engineering constraints for implementing BRT service associated with underpasses in these areas (i.e., steep grades and narrow service roads). See Sections 10.2.5 and 10.2.6 for further details. Figure has been updated since Draft EIS/EIR with clarified labeling.

Source: Jacobs, 2014

The six minor modifications to the Hybrid Alternative since publication of the Draft EIS/EIR are as follows and shown in Figure 2-2.

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues[1]

Section 2.2.7.6 provides further detail on each of these six minor modifications. Five of the six modifications were developed in direct response to public comments on the Draft EIS/EIR. One modification – the additional pedestrian improvements – was in part a response to another agency initiative (Vision Zero; described in Section 2.8.1 below) as well as in response to public comments on the Draft EIS/EIR related to concerns regarding the level of pedestrian facilities on the Geary corridor.

Section 2.3 provides an evaluation of all project alternatives in terms of selecting an environmentally preferable alternative and a preferred alternative.

[1] This change to the Hybrid Alternative was not included in the LPA that was approved in January 2017 but rather was added and approved in June 2017. The SFCTA prepared an addendum to the Final EIR associated with this change.

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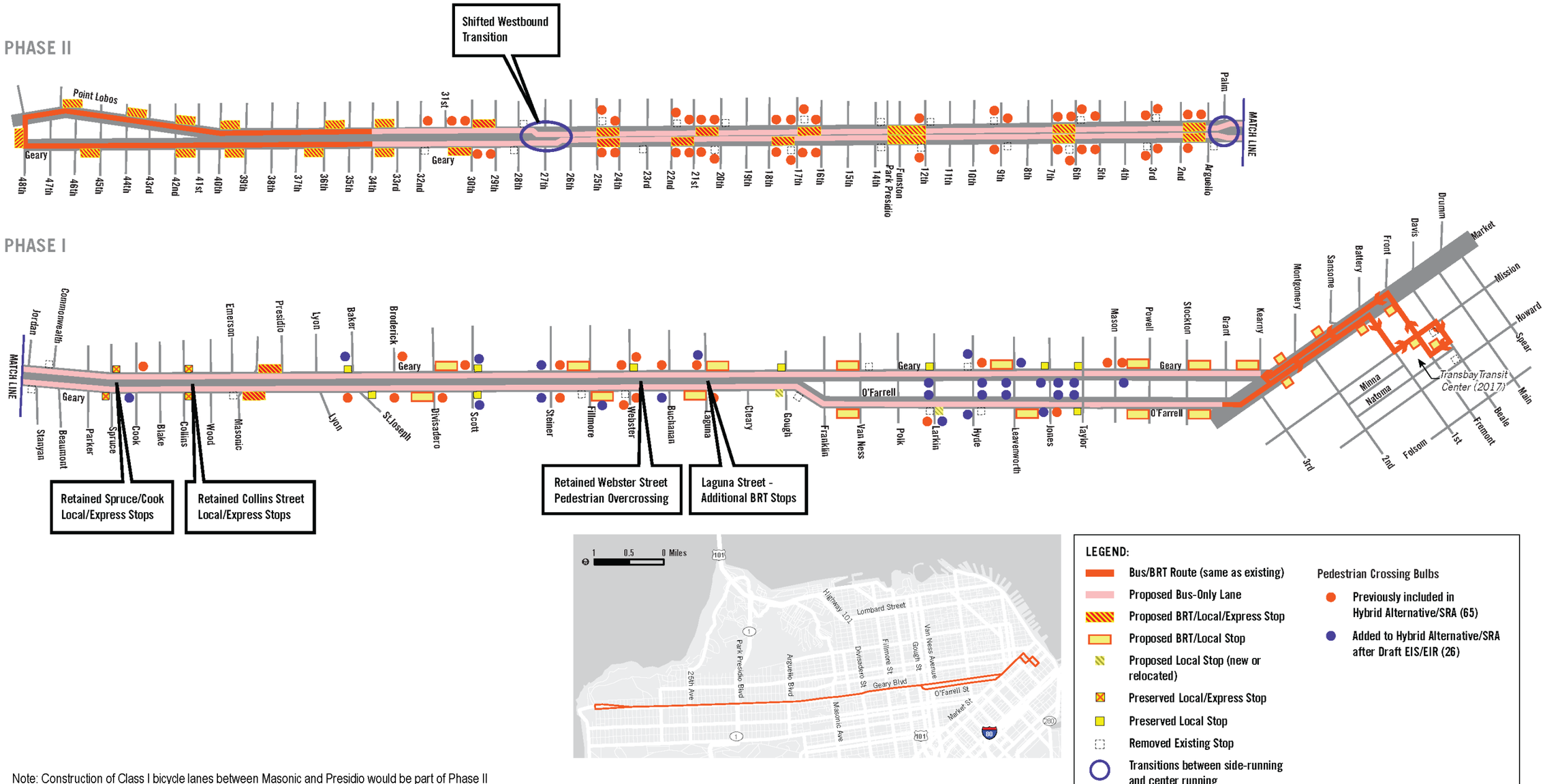
Figure 2-2 Hybrid Alternative/Locally Preferred Alternative



Note: Construction of Class I bicycle lanes between Masonic and Presidio would be part of Phase II **(not to scale)**

Source: SFCTA, 2017

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2.1.2 | Project Setting

Geary is called *Geary Boulevard* between 48th and Van Ness avenues and *Geary Street* between Van Ness Avenue and Market Street. This document uses the term *Geary corridor* to describe the study area, including the additional streets noted below.

As shown in Figure 2-3, Geary is a major east-west arterial originating in downtown San Francisco at Market Street. Geary traverses a broad swath of neighborhoods and districts between the Financial District and the Outer Richmond.

The study area for the proposed project includes the full length of Geary Boulevard/Street from 48th Avenue to Market Street. The study area also includes other streets used by buses that primarily serve the Geary corridor. These additional streets include:

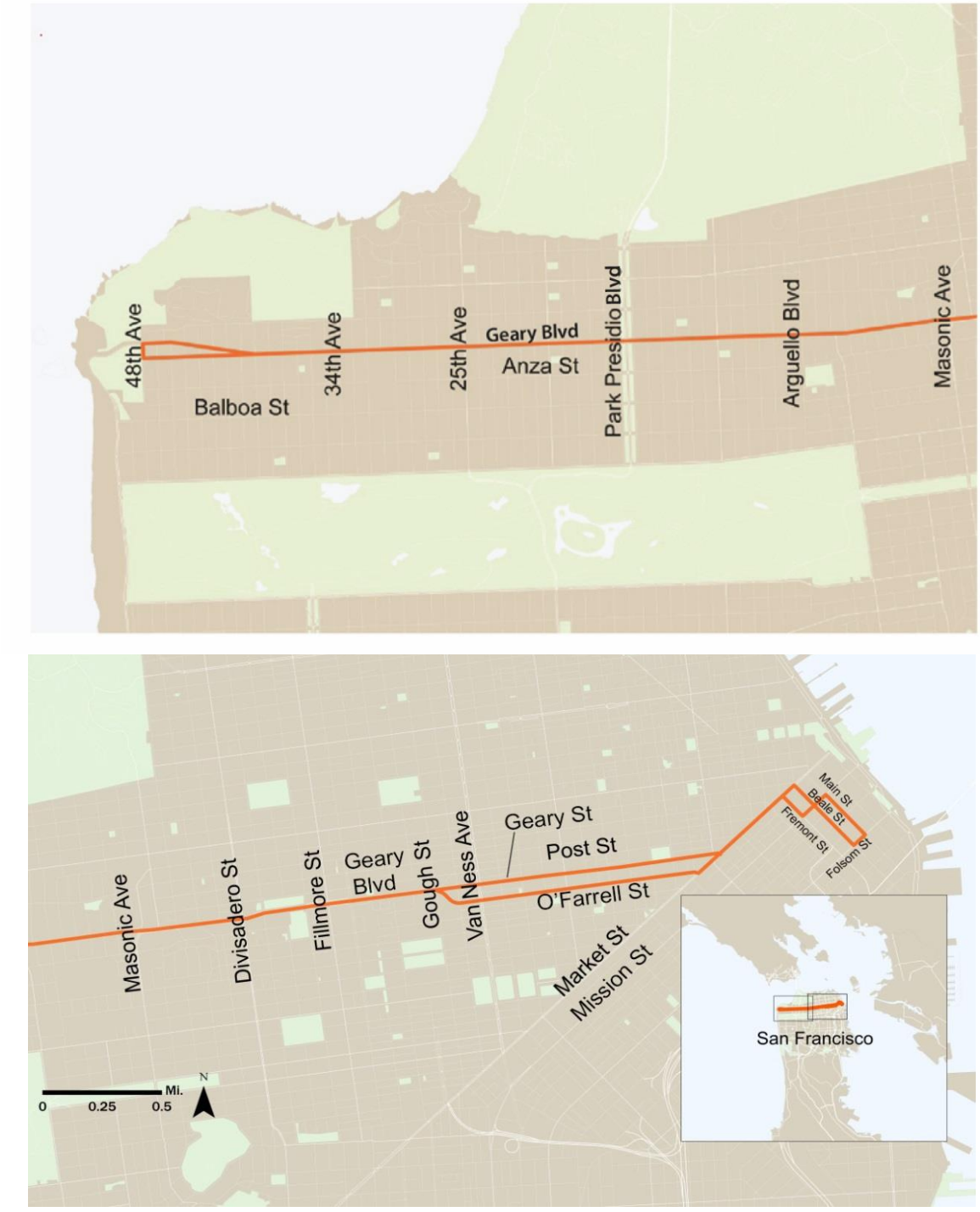
- O'Farrell Street from Gough Street to Market Street[2]
- Market, First, and Fremont streets, which link to the Transbay Transit Center

Befitting its status as a major east-west linkage, the Geary corridor sees some of the highest levels of transportation use of all City roadways. According to the San Francisco Municipal Transportation Agency (SFMTA), the Geary corridor sees a range of between 20,000 to about 44,000 daily auto trips (higher numbers on weekdays[3]) and about 50,000 daily transit trips. Transit usage is high in both eastbound and westbound[4] directions at most times of day and most days of the week. The Geary corridor also hosts thousands of daily pedestrian trips. A number of public transit routes serve the Geary corridor, which are described in Section 1.1.2.

Existing land uses along the Geary corridor vary considerably. Along western and central portions, primary land uses are neighborhood-scale residential and commercial areas punctuated by major medical, cultural, entertainment, and shopping activity centers. Central and eastern portions of the corridor see similar uses but at greater concentrations that reach their peaks near the eastern end of the Geary corridor in the Financial District.

[2] In addition, one eastbound block of O'Farrell Street between Gough and Franklin Streets is technically named "Starr King Way" instead of O'Farrell Street.
[3] Traffic volumes are for the central and eastern portions of the Geary corridor. West of 34th Avenue, average daily traffic volumes are somewhat lower (16,000 vehicles per day).
[4] The Geary corridor travels in an east-west orientation. Eastbound buses are also considered 'inbound' lines whereas westbound buses are considered 'outbound' lines. As such, the terms eastbound/inbound and westbound/outbound are used interchangeably throughout this EIS/EIR.

Figure 2-3 Geary Corridor



Source: SFCTA, 2014

Two Geary corridor underpasses in the Fillmore Street and Masonic Avenue areas represent major engineering constraints on potential configurations for BRT service in the corridor. In both instances, multiple through-travel lanes are separated from the adjoining land uses in a below-grade trench and tunnel, with side service roads connecting to intersecting streets at the surface. These side service roads accommodate one mixed-flow travel lane and one parking lane. Buses on the Geary corridor currently operate in the mixed-flow travel lane.

Four SFMTA Muni bus routes currently serve the Geary corridor: 38 Geary Local (38), 38 Geary Rapid (38R), 38 Geary B Express (38BX), and 38 Geary A Express (38AX). Each of these routes is served by biodiesel motorcoaches.[5]

The 38 provides local service along Geary Boulevard, Geary Street, and O'Farrell Street from 48th Avenue to the Transbay Transit Center 24 hours a day. The 38 Geary route also includes variations west of 34th Avenue. From this point, westbound buses loop northerly to Fort Miley and the Veterans Administration (VA) Hospital, travel westerly along Point Lobos Avenue, or continue on Geary Boulevard. Eastbound buses also offer these service splits. The focus, however, of this environmental document, is on the buses that stay on Geary Boulevard.

The 38 Rapid travels the same route (with noted variations) but with fewer stops for a faster ride. The 38 Rapid operates during the day, seven days a week, but not in the late evening and early morning.

Geary's current express routes – the 38AX and 38BX only operate weekdays during the peak period in the peak direction (eastbound during the a.m. peak and westbound during the p.m. peak). These routes alleviate crowding on both the local and Rapid routes. The express routes travel on Pine and Bush streets east of Masonic Avenue. The express routes do not follow the routing variations.

The Geary corridor is also used by regional bus services and private shuttle services. In particular, Golden Gate Transit Route 92, which provides inter-regional connections to the Geary corridor from the North Bay, makes nine stops on Geary Boulevard between Park Presidio Boulevard and Webster Street. Several other Golden Gate Transit bus routes cross the Geary corridor at Van Ness Avenue.

High pedestrian volumes prevail, especially during peak commute hours. Geary has been identified by the Mayor's Pedestrian Strategy and WalkFirst Study as a high-pedestrian-injury corridor. There are several factors that degrade the pedestrian environment along the corridor, including but not limited to:

[5] For a list of all bus routes operating within or across the Geary corridor, refer to Tables 3.3-1 and 3.3-2 in Chapter 3.3.

- Large portions of Geary Boulevard are very wide, ranging from 125 feet to 168 feet in width including medians, travel lanes, parking lanes, and sidewalks. Consequently, pedestrians face relatively long crossing distances with limited refuge areas and minimally marked crosswalks.
- In the segment of the corridor including Masonic Avenue and the Richmond District, several uncontrolled pedestrian crosswalks cross six or more lanes of Geary Boulevard. Here, the speed limit is 25 mph, but as many as 75 percent of vehicles have been observed reaching speeds faster than that.[6]
- Two pedestrian bridges at the Webster Street and Steiner Street intersections with Geary Boulevard, where lengthy or closed crosswalks limit pedestrians' ability to cross Geary Boulevard at ground level, are several decades old. Although they provide separation from traffic, the bridges are often perceived as an inconvenient and/or unsafe way of crossing Geary Boulevard due to their long and indirect ramps, change in elevation required, and some users' sense of insecurity. Additionally, the pedestrian overcrossings are not compliant with the Americans with Disabilities Act (ADA), hindering the mobility of people with disabilities.
- Left-hand turns on the corridor currently have permissive signal phasing, which allows vehicles to turn when there is no oncoming through traffic and when pedestrians are not crossing. As discussed in Section 3.5, permissive left-turn signals have a higher rate of injury than protected left turn-signals, as pedestrians may not be fully visible to turning vehicles because drivers may be distracted by other factors on the roadway, such as oncoming traffic and queuing vehicles behind them.

Several segments of the Geary corridor have disproportionately high numbers of pedestrian collisions involving seniors. Approximately 40 senior centers are located within a quarter mile of the Geary corridor. The corridor is also heavily used by people with disabilities such as wheelchair users and people with vision and hearing impairments.

The Geary corridor does not have a dedicated bicycle lane or other facility, and few bicyclists currently travel along the corridor. Geary carries the fewest bicyclists of all nearby parallel east-west streets. Counts conducted in 2008 found fewer than five bicyclists per hour in the morning and afternoon peak periods.[7] In SFMTA's 2015 Annual Bicycle Survey, which reported counts from the 2014 afternoon peak period (4:30 – 6:30 p.m.), a total of 15 bicycles were counted at the Geary Boulevard/Park Presidio Boulevard intersection, which is about one bicycle every eight minutes.[8] The Geary corridor currently has no separated right of way for bicycle facilities, so cyclists must share travel lanes with automobile and bus traffic. However, east-west travel by bicycle is accommodated by on-street bicycle lanes ("Class II") on several parallel streets including:

[6] SFMTA, 2007.
[7] SFCTA & SFMTA, 2008. Geary Boulevard Bicycle Demand Study.
[8] SFMTA, 2015. Annual Bicycle Count Survey.

- Lake Street: 28th Avenue to Arguello Boulevard
- Post Street: Presidio Avenue to Steiner Street
- Turk Street: Arguello Boulevard to Masonic Avenue
- Golden Gate Avenue: Parker Avenue to Divisadero Street
- Cabrillo Street: La Playa Street to Arguello Boulevard
- Fulton Street: Baker Street to Octavia Street
- Grove Street: Baker Street to Scott Street and Van Ness Avenue to Hyde Street

2.1.3 | Terminology

This chapter and document as a whole describe and analyze a number of build alternatives intended to meet the purpose and need of the proposed action as expressed in Chapter 1 (Purpose and Need). Several specialized terms and concepts are used in this description and analysis, which are summarized below.

Bus rapid transit or BRT is a bus transit system implemented to improve the speed and capacity of service for riders. BRT systems often include dedicated bus-only lanes (further described below) as well as certain physical infrastructure and technological enhancements (also further described below). BRT can use **articulated** buses, sometimes referred to as "double" or "bending" buses.

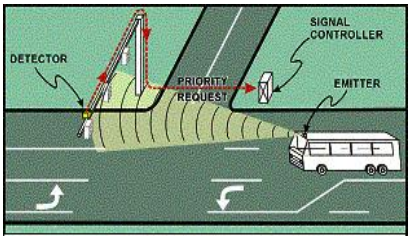
Mixed-flow lanes are general purpose travel lanes shared by automobiles, trucks, buses, and bicycles.

Bus-only lanes are designated lanes of travel – sometimes with a color distinct from other pavement – intended primarily for bus use. Certain bus-only lanes may also be used by emergency vehicles and taxis. When bus-only lanes are proposed to run within existing public right of way like the Geary corridor, bus-only lanes can be oriented to run either in the center of the street or along the outside edges. Accordingly, build alternatives considered here contemplate the use of **side-running** and **center-running** bus-only lanes at various points along the Geary corridor.

Lanes reserved exclusively for transit are an integral part of any BRT system, allowing buses to travel without being impeded by other vehicles. Transit delays due to auto congestion, crashes, or by loading and unloading vehicles would be substantially reduced. Similarly, cars would not be impeded by bus operations such as stops to load and unload passengers.

Center-running bus-only lanes are flanked by passenger **platforms** and narrow landscaped **median** areas that separate them from mixed-flow travel lanes.

Side-running bus-only lanes would run adjacent to sidewalks and would not have physical separation from adjacent, mixed-flow travel lanes.



The transit priority signal (TSP) would be programmed to prioritize green lights for approaching buses
Image credit: Kittelson & Associates

Transit signal priority (TSP) is a way to utilize the traffic signals to provide bus travel time and reliability improvements. At a traffic signal, TSP is programmed to prioritize green lights for approaching buses and minimize the amount of time buses wait at red lights. As such, TSP gives buses a competitive advantage at congested intersections. At key locations where buses need to shift lanes, a **queue jump** may also be used to allow buses to move through the intersection on a separate signal phase prior to mixed-flow traffic. As further discussed in Section 2.2.3.1, there are various types of TSP technology, including wireless TSP and fiber-based TSP. Wireless and fiber-based TSP have similar operational benefits; fiber-based TSP is considered more durable and to have a longer useful life.

New **BRT Stations** would be constructed or modified from existing stations to offer improved amenities for riders, including bus shelters, landscaping, and lighting. In areas with center-running bus-only lanes, BRT stations would be located on center-running platforms immediately adjacent.

For locations with side-running bus-only lanes, BRT stations would be constructed on new **bus bulbs**, sidewalk extensions that would serve as bus passenger loading platforms.

2.2 Description of Alternatives

2.2.1 | Overview

This Final EIS considers five alternatives:

- No Build Alternative
- Alternative 2: Side-Lane BRT
- Alternative 3: Center-Lane BRT with Dual Medians and Passing Lanes
- Alternative 3-Consolidated: Center-Lane BRT with Dual Medians and Consolidated Bus Service
- Hybrid Alternative/LPA

This section begins with a comparative overview of the alternatives, followed by detailed descriptions of each alternative. Each subsection below describes an alternative in the same format, with a discussion of the alternative's transit improvements and operations first, followed by a description of the roadway and multimodal features, then any major underground utility work involved with the alternative. To minimize repetition, this section includes Subsection 2.2.3 describing features common to all build alternatives, before discussing each alternative individually.

NEPA assumes that any proposed action can be achieved through a variety of different means. To this end, NEPA requires that an EIS evaluate the environmental effects of a "reasonable range" of project alternatives.[9] One alternative NEPA requires is a "No Action" alternative – referred to in this document as the "No Build Alternative." However, selection and construction of the No Build Alternative does not automatically mean "no environmental effects." Therefore, this document describes anticipated environmental effects from the No Build Alternative and four build alternatives.

[9] Council on Environmental Quality, "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Recommendations," 46 Fed. Reg. 18026 (March 1981).

Figure 2-1 (above) and Table 2-1 (below) summarize key features of each alternative. Table 2-1 further summarizes bus service headways (the estimated time between buses) and service hours associated with each alternative for each type of bus service (Local, BRT/Rapid, and Express).

Table 2-1 Proposed Bus-Only Lane Configurations and Frequencies by Alternative

	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/LPA
Bus Only Lane Configurations by Segment					
Transbay Transit Center to Market Street	Side-running (within existing or previously approved bus-only lanes)				
Market Street to Gough Street	Side-running (within existing bus-only lanes)				
Gough Street to 27th/28th Avenue	None	Side-running	Side-running (Gough Street to Laguna Street) Center-running (Laguna Street to 27th Avenue)	Side-running (Gough Street to Laguna Street) Center-running (Laguna Street to 27th Avenue)	Side-running (Gough Street to Palm Avenue) Center-running (Eastbound between 27th Avenue and Palm Avenue; Westbound, between Palm Avenue and 28th Avenue)
27th/28th Avenue to 34th Avenue	None	Side-running (all build alternatives)			
34th Avenue to 48th Avenue	None (all alternatives)				
Proposed A.M./P.M. Peak Period Bus Service Headways by Service Type (minutes between buses)					
Local	6.0/7.5	5.5/6.0	5.5/6.0	n/a	5.5/6.0
BRT/Rapid	5.0/6.0	2.8/2.8	2.8/2.8	2.0/2.1	2.8/2.8
Express	5.0/5.0	5.5/6.0	5.5/6.0	4.5/4.5	5.5/6.0
Proposed Service Hours					
Local	24 hours	24 hours	24 hours	n/a	24 hours
BRT/Rapid	Approx. 6:00 A.M. to 9:30 P.M.	Approx. 6:00 A.M. to 9:30 P.M.	Approx. 6:00 A.M. to 9:30 P.M.	24 hours	Approx. 6:00 A.M. to 9:30 P.M.
Express	A.M. and P.M. peak periods (all alternatives)				

Notes: Headways for each service type represent combined headways east of 25th Avenue. In the No Build Alternative, approximately half of all local buses would turn back at 33rd Avenue to provide more service to the eastern portion of the corridor, while the remaining local buses and all Rapid buses would continue to the western end of the corridor. Similarly, in all Build Alternatives, approximately half of all BRT buses would turn back at 25th Avenue while the remaining BRT buses and all local buses (if applicable) would continue to the end of the corridor. This means that headways west of the turnaround would be approximately two times what is shown in the table (e.g. Local morning service in the No Build west of 33rd Avenue is 12 minutes). SFMTA periodically rebalances local and Rapid service in the Geary corridor to minimize crowding. As a result, existing local and Rapid service frequencies as shown in Table 3.3-1 differ slightly from assumed No Build frequencies; however, the total amount of service on the corridor across all routes is expected to remain similar to existing conditions in the No Build scenario. The No Build Alternative would continue to operate the 38 AX and BX Express routes, while the Build Alternatives would combine these services into a new 38 Express route. In the above, the No Build Alternative Express Bus headways show the combined headways for the 38 AX and BX.

- **No Build Alternative**[10]
    - No new BRT service or related physical infrastructure improvement. The Geary corridor would be served with previously planned/programmed transit and infrastructure improvements.

[10] Throughout this document, the more descriptive term "No Build Alternative" is used instead of the label "Alternative 1."

- **Alternative 2: Side-Lane BRT**
    - BRT service would replace the existing 38 Rapid service; local and express bus service would operate.
    - From the Transbay Transit Center to 34th Avenue, BRT buses would operate in dedicated side-running bus-only lanes, replacing the existing outside travel lanes of the Geary corridor, next to the existing curbside parking lane that would remain at most locations.
    - Between 34th and 48th avenues, no bus-only lanes would be constructed; all buses would operate in mixed-flow lanes.
    - Existing 38 Local service would also operate in the dedicated bus lanes but would pull out of them to service curbside local bus stops, enabling BRT buses to pass.
- **Alternative 3: Center-Lane BRT with Dual Medians and Passing Lanes**
    - BRT service would replace the existing 38 Rapid service; local and express buses would operate.
    - This alternative would be different from Alternative 2 from Laguna Street to 27th Avenue. There, BRT and local service would operate in dedicated bus-only lanes in the center of the Geary corridor. A bus passing lane at local bus stops would enable BRT buses to pass local buses that are stopped to load and unload passengers.
    - The center-lane design would necessitate filling in the Fillmore underpass and reconfiguring the Masonic tunnel for a BRT stop.
    - In all other locations, this alternative would be similar to Alternative 2.
- **Alternative 3-Consolidated**: **Center-Lane BRT with Consolidated Bus Stops, Dual Medians, and No Passing Lanes**
    - Same as Alternative 3 between Laguna Street and 27th Avenue; however, BRT service would replace both 38 Rapid and 38 Local services as a new consolidated service, eliminating the need for bus passing lanes. Express buses would still operate and would use bus-only lanes.
- **Hybrid Alternative/LPA**
    - This alternative would incorporate various physical features of Alternatives 2 and 3-Consolidated in different segments, a mix intended to maximize benefits and minimize impacts.
    - BRT service would replace the existing 38 Rapid service; local and express buses would operate.

- From Transbay Transit Center to Palm Avenue, local and BRT buses would operate in existing or new side-running bus-only lanes.
- Between Palm and 27th avenues (inbound) and 28th Avenue (outbound), local and BRT buses would operate in dedicated bus-only lanes in the center of the Geary corridor, with no bus passing lanes. Every stop would serve local, BRT, and express buses.
- Between 27th/28th and 34th avenues, all buses would operate in new side-running bus-only lanes.
- Between 34th and 48th avenues, no bus-only lanes would be constructed; all buses would operate in mixed-flow lanes.
- In side-running portions of the corridor, BRT buses would have the ability to pass local buses at local stops.

2.2.2 | No Build Alternative

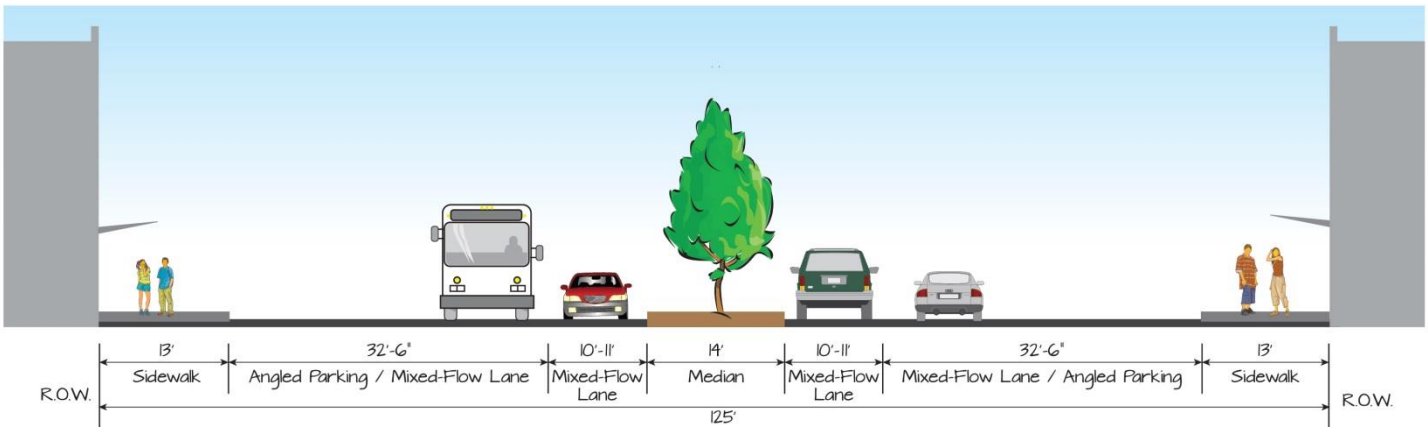
The No Build Alternative represents the baseline scenario if none of the proposed build alternatives were implemented. Under the No Build Alternative, physical infrastructure and transit service in the Geary corridor would remain unaltered except for changes associated with other City projects described below that are either planned or programmed to be implemented in the Geary corridor by the year 2020. The year 2020 is considered the opening year for all alternatives because it is the earliest year by which any of the build alternatives could be expected to be fully operational; therefore, it is also the most reasonable year for the No Build Alternative as a basis of comparison.

The No Build Alternative assumes no changes to existing median configurations, movement of existing through-traffic, or on-street parallel parking. Figure 2-4 depicts the cross section of the No Build Alternative west and east of Gough Street.

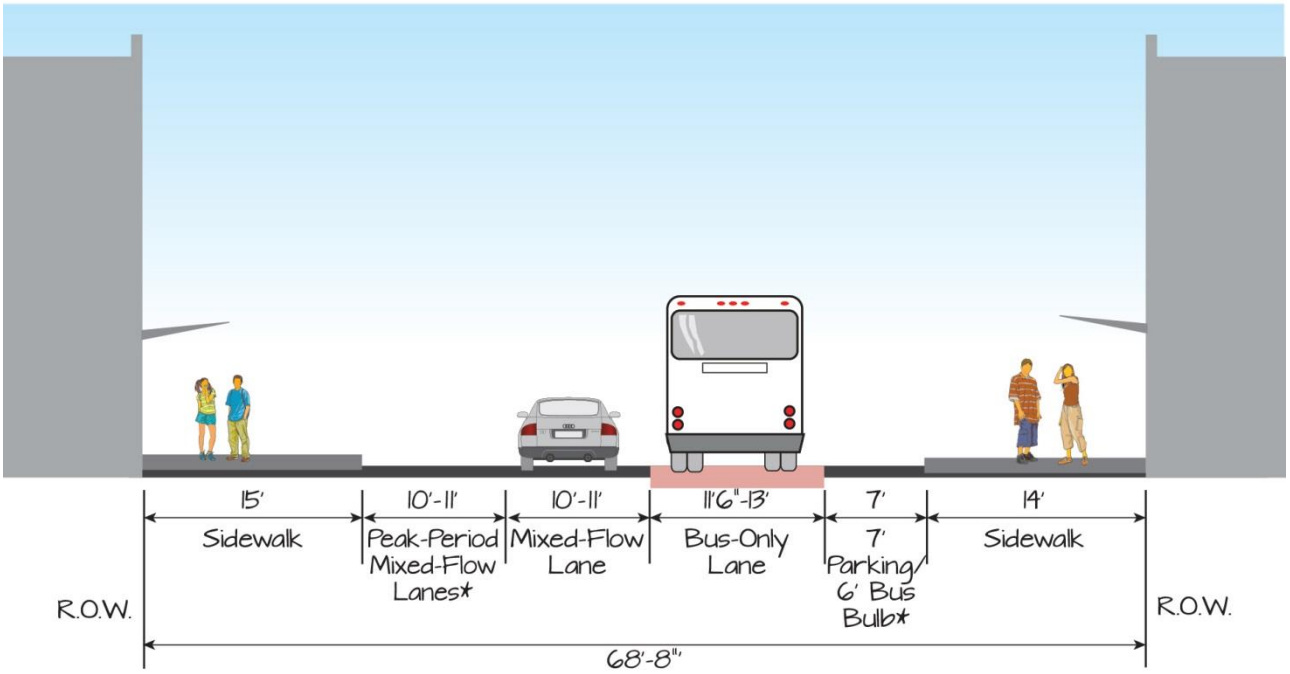
2.2.2.1 | NO BUILD ALTERNATIVE – PREVIOUSLY PLANNED/PROGRAMMED TRANSIT IMPROVEMENTS

- **Bus service:** Bus service in the corridor is provided 24 hours per day, with shorter headways during peak periods than during off-peak periods. In April 2015 SFMTA implemented increases to 38 Rapid transit service frequency and new Sunday 38 Rapid service as planned in the Transit Effectiveness Project (TEP) and implemented as a part of the Muni Forward program. As a result of the recent Muni Forward service changes all 38 Rapid buses currently travel the full length of the Geary corridor. In the No Build Alternative, the Rapid service would operate at five-minute headways during the morning peak hours and at six-minute headways during the evening peak hours, as shown in Table 2-1.

Figure 2-4 Typical Cross-Sections: No Build Alternative (No Change from Existing)



a) Typical Section West of Gough Street



b) Typical Section East of Gough Street

Source: Jacobs, 2014

Some 38 Local buses would continue to short-turn, providing more frequent service in the highest-demand portions of the corridor, while others would travel the full corridor length. The local short line and full-length services would both operate at 12-minute headways during the morning peak period and at 15-minute headways during the evening peak period, resulting in combined headways of 6 minutes and 7.5 minutes, respectively, in locations east of 33rd Avenue.

The 38AX and 38BX services would both operate in the peak direction during peak periods with frequencies ranging between nine and 11 minutes, resulting in combined headways of five minutes.

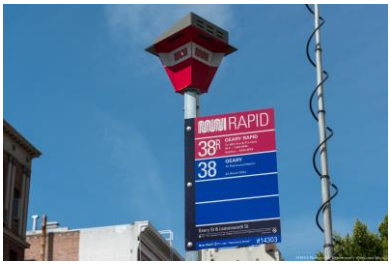
Combined headways for all bus services in the Geary corridor would continue to be about two minutes during peak periods. The No Build Alternative assumes that future combined service frequencies would remain constant front existing conditions because more frequent peak-period service would have limited effectiveness in attracting ridership if the infrastructure to ensure competitive transit travel time and reliability is not present.[11]

  - **Transbay Transit Center to Gough Street:** SFMTA Muni buses would use the existing bus-only lanes on Geary Street in the westbound direction and O'Farrell Street in the eastbound direction. The only changes related to bus service would be service increases by SFMTA's Transit Effectiveness Project (TEP/Muni Forward) and the opening of the new Transbay Transit Center. The expected opening in 2018 of the new Transbay Transit Center will modify the current routes of 38 Rapid and 38 Local buses south of Market Street, consistent with the routing shown in the build alternatives.
  - **Gough Street to 48th Avenue:** SFMTA Muni and Golden Gate Transit buses will continue to operate in the outside mixed-flow travel lanes and serve curbside bus stations as in the existing condition.

- **Bus-only lanes in the Transbay Transit Center to Gough Street areas:** Under other previously approved projects, two portions of the Geary corridor have bus-only lanes as of 2017, or they are expected to have such lanes by 2020. Bus-only lanes are colored red to identify them as bus-only lanes, discouraging use by mixed-flow traffic. San Francisco's Transit Center District Plan (2009) proposes colored bus-only lanes within its plan boundaries. Buses will operate within the Transit Center District Plan's proposed bus-only lanes on Beale, Fremont, and Mission streets. In a separate effort in 2014, SFMTA colored the existing bus-only lanes on most of Geary and O'Farrell streets between Gough and Market streets.

[11] SFMTA periodically rebalances local and Rapid service in the Geary corridor to minimize crowding. As a result, existing local and Rapid service frequencies differ slightly from assumed No Build frequencies; however, the total amount of service on the corridor across all routes is expected to remain similar to existing conditions in the No Build scenario.

New Muni Rapid Network bike racks (above) and flag signs on transit poles with solar lanterns (below).



Buses with low floors speed up boarding time by reducing the number of steps required to board the bus.

- **Transit Signal Priority (TSP):** SFMTA installed wireless next-generation TSP at signalized intersections along the Geary corridor. TSP technology allows buses to spend less time stopped at red lights. Buses are equipped with TSP transponders, which send signals to traffic lights to either extend the green light to allow approaching buses to pass through or trigger a change from red to green when it would not unduly affect crossing traffic.
- **Bus Stop Amenity Enhancements:** SFMTA is in process of upgrading bus stop amenities and legibility system-wide, beginning with stops serving the Muni Rapid Network, the name for the routes that form the backbone of the Muni network and carry nearly 70 percent of customers. Bus stops serving Muni Rapid Network routes will receive shelter enhancements including bike racks, decals, redesigned flag signs and new transit poles outfitted with solar powered lanterns. These enhancements make finding and navigating the Muni Rapid Network easier. The solar powered lanterns are intended to be installed at all stops throughout the City, with the completion of the new Muni Rapid stops expected by the end of 2018. Solar powered lanterns at local stops will be implemented starting in 2018.
- **New, low-floor buses:** SFMTA is in the process of replacing its entire fleet of 60-foot, articulated, diesel motorcoach buses with low-floor, diesel hybrid buses with three doors on the right-hand side of the vehicles, including all vehicles currently operating in the Geary corridor. These buses do not have steps as older traditional buses do. Low-floor buses thus improve accessibility for all riders and also reduce time boarding and alighting.
- **Pavement maintenance, rehabilitation, and/or resurfacing projects (selected locations):** Previously planned/programmed repair, replacement, maintenance, or other modifications to the road surface, curbs, or utilities along the corridor will occur in the No Build Alternative. San Francisco Public Works (SFPW) would resurface pavement in mixed flow lanes between 10th and 28th avenues as well as between Van Ness and Masonic avenues, as the pavement condition is below SFPW's threshold for acceptable condition.
- **New traffic signals:** New signals are planned for installation along Geary Boulevard at its currently unsignalized intersections with the following cross streets: Presidio Avenue, Cook Street, Beaumont Avenue/Commonwealth Avenue, and Palm, 22nd, and 26th avenues.
- **Replacement of traffic signal infrastructure (selected locations):** In various locations along the Geary corridor, SFMTA will replace or upgrade some traffic light controllers and traffic signal heads. SFMTA will also install mast-arm poles, which hang over travel lanes for better traffic light visibility.

- **Pedestrian countdown signals (selected locations)**: These traffic signals are located at crosswalks and display both the standard symbols for walk/don't walk as well as provide a flashing numerical countdown that indicates how many seconds remain to finish crossing. By 2020, SFMTA will install pedestrian countdown signals where they do not already exist at selected signalized intersections along the Geary corridor.
- **Curb ramps:** These pavement depressions facilitate access for people who use wheelchairs and pedestrians toting strollers, carts and luggage. By 2020, SFPW will install curb ramps at some intersections along the Geary corridor that do not meet current City standards and/or ADA requirements. SFPW will prioritize locations with large populations of people who have mobility impairments.
- **Pedestrian crossing bulbs:** These pavement features, located at corners or midblock crossings, are physical extensions of the sidewalk into the travel lane nearest the curb. Pedestrian crossing bulbs increase pedestrian visibility, reduce crossing distances, slow turning vehicles, and visually narrow the roadway. The Draft EIS/EIR described SFPW's plans to implement bulbs at 14 locations along the Geary corridor including Arguello Boulevard, Palm Avenue, and Stanyan Street. Since publication of the Draft EIS/EIR in 2015, SFPW has installed some of these pedestrian crossing bulbs.
- **Bus bulbs at California Pacific Medical Center (CPMC):** Construction of this new facility at Geary Street and Van Ness Avenue is under way. Plans call for an existing (westbound) bus bulb – at Polk and Geary streets to the west side of Van Ness Avenue – to be relocated immediately alongside the new medical facility. The bus bulb that CPMC proposes to construct would be smaller than bus bulbs that would serve BRT stops. Accordingly, all build alternatives would require expansion and modification of the proposed stop here to ultimately serve as a Signature BRT stop.
- **High-Visibility Crosswalk Striping:** Crosswalks at most intersections in the Geary corridor have been upgraded with new crosswalk striping of the high-visibility "Continental" type. SFMTA will continue to upgrade crosswalks with high-visibility striping at the remaining corridor intersections.

Bulbs maximize pedestrian space and minimize crossing distances.

2.2.3 | Features Common to All Build Alternatives

In addition to the roadway infrastructure and transit system improvements associated with the No Build Alternative (see Section 2.2.2.1), this section describes the transit, roadway, and multimodal improvements, including bus-only lanes and BRT service, proposed under all build alternatives.

2.2.3.1 | TRANSIT IMPROVEMENTS AND OPERATIONS COMMON TO ALL BUILD ALTERNATIVES

Bus-only lane configurations would be identical for all alternatives from the Transbay Transit Center to Gough Street

The time interval between the arrivals of successive buses on the same line would be reduced, thereby increasing frequency with BRT Service. Additionally, BRT Service would include longer hours of service.

- **Bus-only lanes:** All build alternatives would feature new bus-only lanes between Gough Street and 34th Avenue, but the configuration of the lanes (i.e., side versus center lanes) in some portions of the corridor differs for each alternative. descriptions for each respective alternative in the sections that follow as well as Figure 2-1.
- **Higher-frequency bus service:** The build alternatives would replace the current 38 Rapid service with BRT service between the Transbay Transit Center and 48th Avenue. The BRT service would have reduced headways, or time in between one bus and the next, compared to existing Rapid service headways and those assumed for the No Build Alternative.
    - Alternatives 2, 3, and the Hybrid Alternative/LPA would retain the 38 Local bus service.
    - Alternative 3-Consolidated would provide consolidated bus service rather than providing both a BRT service and a separate local service.
    - All build alternatives would replace existing 38AX and 38BX express service with a new 38 Express (38X) service. Like the 38AX and 38BX services it would replace, the 38X would be a weekday peak-period, peak-direction service – only eastbound during morning peak periods and only westbound during evening peak periods. The 38X would stop at limited stations between 48th and Masonic avenues. East of Masonic Avenue, like the 38AX and 38BX, the 38X would leave Geary and run express on Bush Street (inbound) or Pine Street (outbound) to and from downtown, but with an added stop at Van Ness, per the TEP/Muni Forward recommendations. For more information on the new 38X service, see Section 3.3.3.4. Some express bus stop locations would be re-located or removed.
- **TSP:** All build alternatives would include the installation of fiber-based TSP on all signalized intersections between 25th Avenue and Gough Street. This type of TSP technology differs from the wireless TSP that was installed (see section 2.2.2.1 regarding TSP as an element of the No Build Alternative). Fiber-based TSP requires placement of cables in underground trenches along the corridor. Wireless and fiber-based TSP have similar operational benefits; fiber-based TSP is considered more durable and to have a longer useful life.

- **Additional vehicles with low-floor design:** All build alternatives would deliver BRT service via vehicles similar to the new low-floor buses included as part of the No Build Alternative, which have recently been put into service. Each build alternative would increase the frequency of the headways assumed for the No Build Alternative; thus, the build alternatives would require additional low-floor buses above what would be required under the No Build Alternative.
- **New BRT stations:** The build alternatives would include enhanced stations with amenities at selected stop locations. Table 2-2 shows the proposed list of amenities to be included in the various types of BRT stations proposed. This table is color-coded; the colors are used in subsequent Tables 2-3 and 2-4 to denote planned stop types at locations across the Geary corridor. In addition, any curbside stations would feature bus bulbs (see Section 2.2.3.2).
    - **Market Street to Gough Street:** In this area, for all build alternatives, BRT stops would expand up to one block in length and be located on new BRT bus bulbs that would extend into parking lanes (and thereby remove parking spaces). BRT bus bulbs eliminate the need for buses to pull into and out of the curb lane at bus stops, subsequently reducing transit vehicle delay. The additional space created by the bus bulbs would allow for the inclusion of passenger amenities, such as seating or bike parking.
    - **34th Avenue to 48th Avenue:** All build alternatives propose minor added bus stop amenities at various locations. Station types, amenities, and locations are described in more detail in Tables 2-2 to 2-4.

Table 2-2 summarizes the different levels of bus stop amenities that would be provided in all build alternatives as compared to existing conditions. Both "Branded Flag" and "Signature BRT" stops refer to the amenities that would be provided at future BRT stops in addition to "Existing" amenities. Generally, "Signature BRT" refers to the amenities that would be provided within the limits of where physical infrastructure improvements are proposed (Market to 34th Avenue), while "Branded Flag" refers to way-finding improvements that would be provided at stops outside these limits (south of Market Street or west of 34th Avenue) but that are still a part of the Geary corridor. Some amenities labeled as "Existing" such as shelters and real-time information are only present at some bus stops; amenities repeated from "Existing" in other categories means they would be systematically added at each stop in the corridor with the project. In addition, all build alternatives would also include "Local-only" shelters at bus stops that BRT would not service between Market Street and 34th Avenue.

Table 2-2 Bus Stop Types and Amenity Levels

STOP TYPE	SERVICES PROVIDED	APPLICABLE ALTERNATIVE(S)	PROPOSED AMENITIES*
Existing	Local, Rapid, Express[1]	No Build	• Existing amenities (includes shelters and system maps in some locations) • No Build Alternative amenities, including bike racks, shelter decals, redesigned flag signs, and transit poles outfitted with solar-powered lanterns as further described in Section 2.2.2.1 • System map
Branded Flag	BRT, Local, Express	2, Hybrid/LPA	• Existing amenities (includes shelters and system maps in some locations) • BRT-branded flag sign • System map
Local-only Shelter	Local, Express	2, 3, 3-Consolidated, Hybrid/LPA	• Shelter • Shelter power feed
Signature BRT	BRT, Local, Express	2, 3, 3-Consolidated, Hybrid/LPA	• Shelter • Shelter power feed*** • Communications including real-time information (i.e. NextMuni), WiFi, and system map • BRT-branded flag sign • Trash receptacle • Pedestrian-scale light fixtures**** • Railing along back of platform** • Custom sidewalk paving at BRT median stations** • Station landscaping (trees) • Bus bulbs for new curbside stations with new bike racks and seating

1 For the build alternatives, BRT service would replace existing Rapid service. Express service does not serve every bus stop. Some amenities labeled as "Existing" such as shelters and real-time information are only present at some bus stops; amenities repeated from "Existing" in other categories means they would be systematically added at each stop in the corridor with the project.

* Exact amenities may vary depending on location; some stops already feature some of these amenities. Amenities

** For center-running stations only.

*** Provides power to shelter to enable lighting and real-time information (signs, audio).

**** Transit poles outfitted with solar lanterns call attention to the signage for easy passenger identification but is distinct from pedestrian-scale lighting which illuminates the passenger waiting area.

STOP TYPE LEGEND[1]

Existing

Branded-Flag: BRT and Local

Local-Only

Signature BRT: BRT + Local

[1] Alternative 3-Consolidated would not have local service.

BUS SERVICE DEFINITIONS

38 Local (38) buses run 24 hours and make all stops on the Geary corridor.

38 Express (38AX, 38BX, 38X) buses run only during commute hours and in commute directions (i.e., west to east in the a.m. and east to west in the p.m.).

38 Rapid (38R) buses run from early morning to the evening and make limited stops on the Geary corridor.

Table 2-3 Proposed Eastbound Stop Locations

CROSS STREETS	NO BUILD ALTERNATIVE (EXISTING STOPS)	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/LPA
48th / Point Lobos	38, 38R, 38AX (N)	BRT, 38, 38X (N)	BRT, 38, 38X (N)	BRT, 38X (N)	BRT, 38, 38X (N)
45th	38, 38R, 38AX (N)	BRT, 38, 38X (N)	BRT, 38, 38X (N)	BRT, 38X (N)	BRT, 38, 38X (N)
42nd	38, 38R, 38AX (F)	BRT, 38, 38X (F)	BRT, 38, 38X (F)	BRT, 38X (F)	BRT, 38, 38X (F)
39th	38, 38R, 38AX (N)	BRT, 38, 38X (N)	BRT, 38, 38X (N)	BRT, 38X (N)	BRT, 38, 38X (N)
36th	38, 38R, 38AX (N)	BRT, 38, 38X (N)	BRT, 38, 38X (N)	BRT, 38X (N)	BRT, 38, 38X (N)
33rd	38, 38R, 38AX (N)	BRT, 38, 38X (NB)	BRT, 38, 38X (NB)	BRT, 38X (NB)	BRT, 38, 38X (NB)
32nd	38, 38AX (F)	—	38 (F)	—	—
30th	38, 38AX (N)	38 (N)	38 (N)	BRT, 38X (NB)	BRT, 38, 38X (NB)
28th	38, 38AX (N)	38 (N)	38 (N)	—	—
25th	38, 38R, 38AX, 38BX (N)	BRT, 38, 38X (NB)	BRT, 38, 38X (FB)	BRT, 38X (FB)	BRT, 38, 38X (FB)
23rd	38, 38BX (N)	38 (N)	—	—	—
22nd	—	—	38 (F)	—	—
21st	—	—	—	BRT, 38X (NB)	BRT, 38, 38X (NB)
20th	38, 38R, 38BX (N)	38 (N)	—	—	—
19th	—	—	38 (F)	—	—
17th	38, 38BX (N)	38 (N)	—	BRT, 38X (NB)	BRT, 38, 38X (NB)
15th	—	—	38 (F)	—	—
14th	—	BRT, 38, 38X (NB)	—	—	—
Park Presidio	38, 38R, 38BX (N)	—	—	—	—
12th	38, 38BX (N)	38 (N)	BRT, 38, 38X (NB)	BRT, 38X (NB)	BRT, 38, 38X (NB)
9th	38, 38BX (F)	38 (F)	38 (F)	—	—
6th	38, 38R, 38BX (N)	BRT, 38, 38X (NB)	BRT, 38, 38X (FB)	BRT, 38X (NB)	BRT, 38, 38X (NB)
4th	—	38 (N)	—	—	—
3rd	38, 38BX (N)	—	—	—	—
Arguello	38, 38R, 38BX (F)	BRT, 38, 38X (NB)	BRT, 38, 38X (NB)	BRT,38X (NB)	BRT, 38, 38X (NB)
Stanyan	38, 38BX (N)	38 (N)	—	—	—
Spruce	38, 38R, 38BX (N)	38 (N)	38 (F)	BRT, 38X (FB)	38, 38X (N)
Collins	38, 38BX (F)	38 (N)	38 (NB)	—	38, 38X (F)
Masonic	38, 38BX (N)	BRT, 38, 38X (F)	BRT, 38, 38X (F)	BRT, 38X (F)	BRT, 38, 38X (F)
Presidio	38, 38R (N)	—	—	—	—
St. Josephs / Baker	38 (F)	38 (F)	38 (N)	BRT (F)	38 (F)
Divisadero	38, 38R (N)	BRT, 38 (N)	BRT, 38 (N)	BRT (F)	BRT, 38 (N)
Scott	38 (F)	38 (F)	38 (F)	—	38 (F)
Fillmore	38, 38R (N)	BRT, 38 (F)	BRT, 38 (FB)	BRT (FB)	BRT, 38 (F)
Webster	38 (N)	—	—	—	—
Laguna	38, 38R (N)	38 (N)	38 (N)	BRT (F)	BRT, 38 (N)
Gough	38 (F)	38 (N)	38 (N)	—	38 (N)
Van Ness / O'Farrell	38, 38R (N)	BRT, 38 (N)	BRT, 38 (N)	BRT (N)	BRT, 38 (N)
O'Farrell / Larkin	38 (N)	38 (F)	38 (F)	BRT (N)	38 (F)
O'Farrell / Hyde	38 (F)	—	—	—	—
O'Farrell / Leavenworth	38 (F)	BRT, 38 (F)	BRT, 38 (F)	BRT (F)	BRT, 38 (F)
O'Farrell / Taylor	38, 38R (N)	38 (N)	38 (N)	BRT (N)	38 (N)
O'Farrell / Powell	38, 38R (N)	BRT, 38 (N)	BRT, 38 (N)	BRT (N)	BRT, 38 (N)
O'Farrell / Grant	38, 38R (N)	BRT, 38 (N)	BRT, 38 (N)	BRT (N)	BRT, 38 (N)
Market / 3rd	38, 38R (N)	BRT, 38 (N)	BRT, 38 (N)	BRT (N)	BRT, 38 (N)
Market / 1st	38, 38R (N)	BRT, 38 (N)	BRT, 38 (N)	BRT (N)	BRT, 38 (N)
Beale / Mission	38, 38R (N)	—	—	—	—
Beale / Howard	38, 38R (F)	—	—	—	—
Transbay Transit Center	38, 38R	BRT, 38	BRT, 38	BRT	BRT, 38

38: 38 Local bus service and stop (serves 97 stops along Geary corridor daily); 38R: 38 Rapid bus service and stop (serves 48 stops along Geary corridor daily); 38AX: Geary A Express (serves 25 stops during weekday peak periods only) 38BX: Geary B Express (serves 34 stops during weekday peak periods only); BRT: BRT service and stop; 38X: Proposed New 38 Express Service; —: No bus stop

Table 2-4 Proposed Westbound Stop Locations

CROSS STREETS	NO BUILD ALTERNATIVE (EXISTING STOPS)	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/LPA
48th / Point Lobos	38, 38R, 38AX (F)	BRT, 38, 38X (F)	BRT, 38, 38X (F)	BRT, 38X (F)	BRT, 38, 38X (F)
46th / Point Lobos	38, 38R, 38AX (F)	BRT, 38, 38X (F)	BRT, 38, 38X (F)	BRT, 38X (F)	BRT, 38, 38X (F)
44th / Point Lobos	38, 38R, 38AX (N)	BRT, 38, 38X (N)	BRT, 38, 38X (N)	BRT, 38X (N)	BRT, 38, 38X (N)
42nd / Point Lobos	38, 38R, 38AX (N)	BRT, 38, 38X (N)	BRT, 38, 38X (N)	BRT, 38X (N)	BRT, 38, 38X (N)
40th	38, 38R (N)	BRT, 38, 38X (N)	BRT, 38, 38X (N)	BRT, 38X (N)	BRT, 38, 38X (N)
36th	38, 38R, 38AX (N)	BRT, 38, 38X (N)	BRT, 38, 38X (N)	BRT, 38X (N)	BRT, 38, 38X (N)
33rd	38, 38R, 38AX (N)	BRT, 38, 38X (FB)	BRT, 38, 38X (FB)	BRT, 38X (FB)	BRT, 38, 38X (FB)
30th	38, 38AX (N)	38 (N)	38 (N)	BRT, 38X (NB)	BRT, 38, 38X (NB)
28th	38, 38AX (N)	38 (N)	38 (N)	—	—
25th	38, 38R, 38AX, 38BX (N)	BRT, 38, 38X (FB)	BRT, 38, 38X (NB)	BRT, 38X (NB)	BRT, 38, 38X (NB)
22nd	38, 38BX (N)	38 (N)	38 (F)	—	—
21st	—	—	—	BRT, 38X (NB)	BRT, 38, 38X (NB)
20th	38, 38R, 38BX (N)	38 (N)	—	—	—
19th	—	—	38 (F)	—	—
17th	38, 38BX (N)	38 (N)	—	BRT, 38X (NB)	BRT, 38, 38X (NB)
15th	—	—	38 (F)	—	—
14th	—	BRT, 38, 38X (FB)	—	—	—
Park Presidio	38, 38R, 38BX (F)	—	—	—	—
12th	38, 38BX (N)	38 (N)	BRT, 38, 38X (FB)	BRT 38X (FB)	BRT, 38, 38X (FB)
9th	38, 38BX (F)	38 (F)	38 (F)	—	—
6th	38, 38R, 38BX (N)	BRT, 38, 38X (NB)	BRT, 38, 38X (NB)	BRT, 38X (FB)	BRT, 38, 38X (FB)
3rd	38, 38BX (N)	38 (N)	—	—	—
Arguello	38, 38R, 38BX (N)	BRT, 38, 38X (FB)	BRT, 38, 38X (FB)	BRT, 38X (FB)	BRT, 38, 38X (FB)
Commonwealth	38, 38BX (F)	38 (F)			
Spruce	38, 38R, 38BX (N)	38 (N)	38 (F)	BRT, 38X (NB)	38, 38X (N)
Collins	38, 38BX (N)	38 (N)	38 (F)	—	38, 38X (N)
Presidio Ave	38, 38R, 38BX (F)	BRT, 38, 38X (F)	BRT, 38, 38X (F)	BRT, 38X (F)	BRT, 38, 38X (F)
St. Josephs / Baker	38 (F)	38 (F)	38 (N)	BRT (N)	38 (F)
Divisadero	38, 38R (N)	BRT, 38 (N)	BRT, 38 (F)	BRT (N)	BRT, 38 (N)
Scott	38 (N)	38 (N)	38 (N)	—	38 (N)
Fillmore	38, 38R (F)	BRT, 38 (F)	BRT, 38 (NB)	BRT (NB)	BRT, 38 (F)
Webster	38 (N)	38 (N)	—	—	38 (N)
Laguna	38, 38R (N)	38 (N)	38 (N)	—	BRT, 38 (N)
Gough	38 (F)	38 (F)	38 (F)	BRT (F)	38 (F)
Van Ness / Geary	38, 38R (N)	BRT, 38 (F)	BRT, 38 (F)	BRT (F)	BRT, 38 (F)
Geary / Larkin	38 (F)	38 (F)	38 (F)	BRT (F)	38 (F)
Geary / Hyde	38 (F)	—	—	—	—
Geary / Leavenworth	38, 38R (F)	BRT, 38 (F)	BRT, 38 (F)	BRT (F)	BRT, 38 (F)
Geary / Jones	38 (F)	38 (F)	38 (F)	—	38 (F)
Geary / Taylor	38 (F)	38 (F)	38 (F)	BRT (F)	38 (F)
Geary / Powell	38, 38R (F)	BRT, 38 (F)	BRT, 38 (F)	BRT (F)	BRT, 38 (F)
Geary / Stockton	38, 38R (N)	BRT, 38 (N)	BRT, 38 (N)	BRT (N)	BRT, 38 (N)
Geary / Kearny	38, 38R (F)	BRT, 38 (F)	BRT, 38 (F)	BRT (F)	BRT, 38 (F)
Market / Montgomery	38, 38R (F)	BRT, 38 (F)	BRT, 38 (F)	BRT (F)	BRT, 38 (F)
Market / Sansome	38, 38R (F)	BRT, 38 (F)	BRT, 38 (F)	BRT (F)	BRT, 38 (F)
Fremont / Market	38, 38R (N)	BRT, 38 (N)	BRT, 38 (N)	BRT (N)	BRT, 38 (N)
Mission / Beale	38 (F)	—	—	—	—
Transbay Transit Center	38, 38R	BRT, 38	BRT, 38	BRT	BRT, 38

38: 38 Local bus service and stop (serves 97 stops along Geary corridor daily); 38R: 38 Rapid bus service and stop (serves 48 stops along Geary corridor daily); 38AX: Geary A Express (serves 25 stops during weekday peak periods only) 38BX: Geary B Express (serves 34 stops during weekday peak periods only); BRT: BRT service and stop; 38X: Proposed New 38 Express Service; —: No bus stop

STOP TYPE LEGEND[1]

Existing

Branded-Flag; BRT and Local

Local-Only

Signature BRT; BRT + Local

[1] Alternative 3-Consolidated would not have local service.

N = Near Side Stop

F = Far Side Stop

NB = Near Side Full Block Stop

FB = Far Side Full Block Stop

BUS SERVICE DEFINITIONS

38 Local (38) buses run 24 hours and make all stops on the Geary corridor.

38 Express (38AX, 38BX, 38X) buses run only during commute hours and in commute directions (i.e., west to east in the a.m. and east to west in the p.m.).

38 Rapid (38R) buses run from early morning to the evening and make limited stops on the Geary corridor.

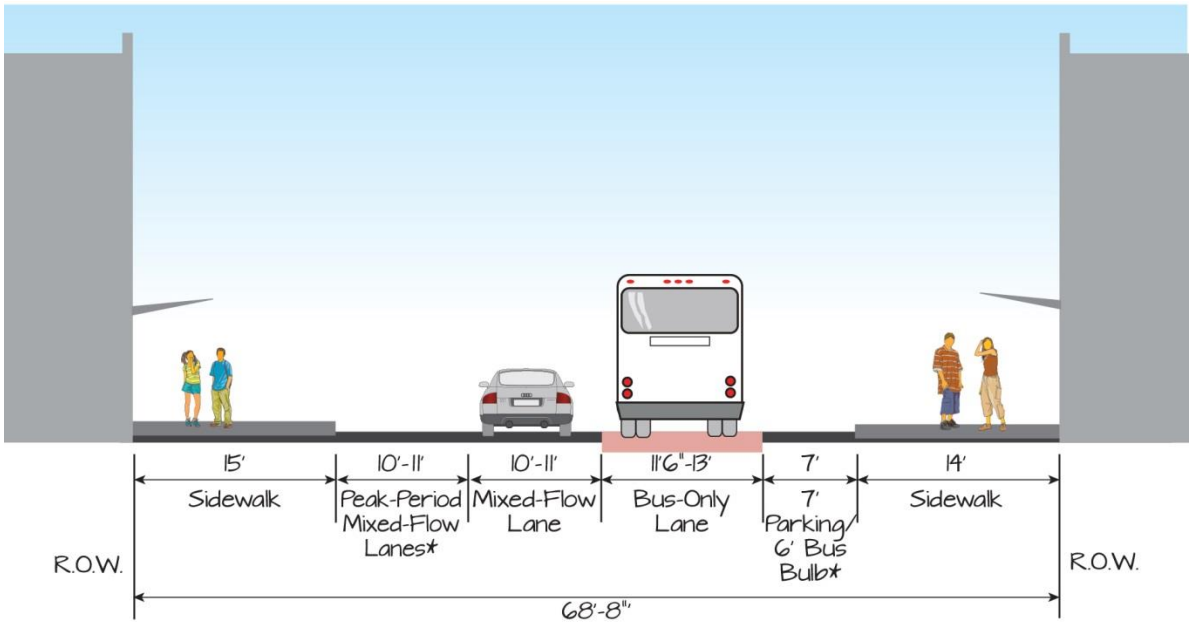
2.2.3.2 | ROADWAY AND MULTIMODAL CHANGES COMMON TO ALL BUILD ALTERNATIVES

- **Pavement Rehabilitation:** New bus-only lanes are proposed to be a red color.[12] The red color could be achieved through the use of paint, thermoplastic coatings, and/or "color-integrated" paving material such as concrete or asphalt. Different colorization methods would likely be used in different locations.
    - In median locations where construction of new center-running bus-only lanes is required, the process would consist of creation of a new travel lane from subsurface to top pavement.
    - In the course of constructing side-running bus-only lanes, the project may need to rehabilitate the lane surface. This work would be coordinated with the rehabilitation efforts of SFPW to minimize disruption to the communities along the corridor.
    - The actual composition of the final roadway pavement and color treatment and level of roadway rehabilitation would be determined during the design process.
- **Mixed-Flow Travel Lanes and On-Street Parking Changes:**
    - **Market Street to Gough Street:** Minor changes to lane configurations and signal operations on Geary and O'Farrell streets at the Powell Street and Stockton Street intersections would shift the buses away from right-turning vehicles at these heavy-turn locations.

      Gough Street to 34th Avenue: Mixed-flow traffic would be two lanes in each direction. From Gough Street to Scott Street, the change to two lanes would be a reduction from the current four lanes in each direction. From Scott Street to Park Presidio Boulevard, the change to two lanes would be a reduction of one lane from three lanes. Figure 2-5 depicts a typical cross-section view of the Geary corridor east of Gough Street. A lane of parallel on-street parking would generally be provided on the north and south sides of the Geary corridor. Existing diagonal parking between 33rd and 15th avenues would be replaced with parallel parking to provide enough space to create a bus-only lane in each direction.

[12] As part of a separate SFMTA program, existing bus-only lanes east of Van Ness Avenue were red-colorized in 2014. These would be incorporated into the build alternatives and would be assumed to continue operation as part of the No Build Alternative.

Figure 2-5 Proposed Cross-Section – East of Gough Street



Source: Jacobs, 2014

- **34th Avenue to 48th Avenue:** No changes proposed to mixed-flow travel lanes or on-street parking. Due to relatively less transit ridership and lower traffic volumes in this portion of the Geary corridor, none of the build alternatives propose any new bus-only lanes for this segment; however, the branding of the service including BRT bus stops would continue in this part of the corridor. BRT vehicles would operate in existing mixed-flow travel lanes. See Table 2-4.

- **Loading Spaces**: Each of the build alternatives would require the relocation or removal of some commercial and passenger loading zones in the Geary corridor. Where feasible, removed loading spaces would be replaced in close proximity to their current locations. Appendix A (Plan Drawings of the Build Alternatives and Hybrid Alternative/LPA) includes specific details.
- **Pedestrian Improvements:**
  - **Bus Bulbs:** Bus bulbs would be constructed along existing sidewalks to extend curb lines to the new side running bus lane to simplify bus positioning for patron boarding and alighting. The width of these bulbs would vary along the corridor – generally 4 feet to 8 feet, depending on local constraints.

- **Pedestrian Crossing Bulbs:** The No Build Alternative reflects 14 pedestrian crossing bulbs at corners along the Geary corridor, several of which were built since publication of the Draft EIS/EIR in 2015. The build alternatives would each construct at least an additional 51 pedestrian crossing bulbs at high-priority locations in the Geary corridor. Therefore, with construction of any of the build alternatives, a minimum of 65 new pedestrian crossing bulbs would be provided along the Geary corridor.[13] Pedestrian crossing bulbs would be constructed at various locations selected to improve transit access and pedestrian safety. Locations would differ by alternative. Most locations would be at corners, but some would be associated with midblock crossings. Some bulb locations were selected to improve safety for pedestrians accessing transit stops; others were selected to address intersections with high injury rates.
- **Other Improvements**, such as pedestrian countdown signals, curb ramps,[14] and enhanced intersection lighting, would be installed at some locations under the No Build Alternative conditions and at more locations under the build alternatives. Specifics for each build alternative are discussed in subsequent subsections.
- **Tree Removal/Replacement**: The streetscape modifications proposed as part of each build alternative require some tree removal from both center median areas and sidewalk areas. The build alternatives would require the removal of between 156 and 268 trees along the Geary corridor. For each build alternative, a new tree would be planted for each tree removed. See Section 4.13.4 for additional information regarding tree removal/replacement.

- **Left Turns:** To reduce conflicts with the bus-only lanes and increase pedestrian safety,[15] left turns by mixed-flow traffic would be restricted at various locations, while some build alternatives would add new, protected left turns in different locations. The left-turn locations would vary by alternative and proposed bus stop locations (see Figures 2-9, 2-13, 2-17, and 2-20).

New Muni Rapid Network flag signs on transit poles with solar lanterns (above) and bike racks (below)

New Muni Rapid Network shelter with shelter decals and map

[13] Refinements to the Hybrid Alternative/LPA would result in construction of 77 crossing bulbs, which is 26 more than the other build alternatives. With the implementation of the Hybrid Alternative/LPA (77 crossing bulbs) and the No Build (14 crossing bulbs), a total of 91 bulbs would be built under the Hybrid/LPA.

[14] Curb ramps that do not currently meet the requirements set forth in the ADA Standards for Accessible Design would be upgraded.

[15] Pedestrian collisions involving turning vehicles, and particularly left-turning vehicles, happen disproportionately on the Geary corridor, when compared with the rest of San Francisco. This is especially true from 22nd Avenue to Cook Street, where the majority of pedestrian collisions involve a left-turning vehicle. (Source: SFCTA, 2013, Pedestrian Safety Analysis and Recommendations for Geary Corridor BRT.)

- **Pedestrian Bridge at Steiner Street:** This pedestrian overcrossing would be removed to eliminate conflicts between this structure's piers and the proposed bus lanes, and to provide new street-grade pedestrian crossings.
- **New Signalized Crossings at Buchanan and Broderick Streets:** The build alternatives would implement a new, signalized pedestrian crossing at Buchanan Street, which intersects only the south side of the Geary corridor, to decrease the out-of-direction walking distance required to cross the Geary corridor on this long block. A new signalized crossing is also proposed at Broderick Street to address high pedestrian demand associated with medical facilities at that location.
- **Bicycle Lane between Masonic and Presidio Avenues:** All build alternatives include construction of a new Class II bicycle lane on Geary Boulevard between Masonic and Presidio avenues. This new lane would be a continuation of the proposed bicycle lane/cycle track to be constructed as part of SFMTA's Masonic Avenue Streetscape Improvements Project (separate and independent from the Geary Corridor BRT Project; see Section 2.8.1.1). That project proposes a cycle track/bicycle lane on each side of Masonic Avenue between Geary Boulevard and Fell Street. The new bicycle lane on Geary would be facilitated by the, –redesign of the Masonic-Presidio block of Geary Boulevard associated with each of the build alternatives. Moreover, the new bicycle lane would help close a gap in the City's bicycle network across Geary Boulevard connecting two key bicycle routes. The bicycle lane would be colored green to increase its visibility.

2.2.4 | Detailed Discussion of Features for Alternative 2: Side-Lane BRT

The following subsections describe improvements unique to Alternative 2 in more detail. Features common to all build alternatives are not listed in this section and instead are discussed in Section 2.2.3. Figure 2-6 depicts Alternative 2 in detail.

Alternative 2 includes new side-running bus-only lanes throughout much of the Geary corridor. These bus-only lanes would exist in the rightmost travel lane next to the existing curbside parking lane

2.2.4.1 | ALTERNATIVE 2 TRANSIT IMPROVEMENTS AND OPERATIONS

- **Bus-Only Lanes:** As described below, depicted in Figure 2-7, and summarized in Table 2-5:
    - **Market Street to Gough Street:** Alternative 2 would retain the existing bus-only lanes on Geary Street in the westbound direction and O'Farrell Street in the eastbound direction.

- **Gough Street to 34th Avenue:** Alternative 2 would create a colorized bus-only lane in each direction of Geary Boulevard. The new bus-only lanes would be designated in the rightmost travel lane next to the existing curbside parking lane. The bus-only lane would be traversable by other vehicular traffic, i.e., cars would be able to enter the bus-only lane to make right turns, park, or enter or exit driveways.
- **34th Avenue to 48th Avenue:** None. Due to relatively lower levels of transit ridership and traffic volumes in this portion of the Geary corridor, Alternative 2 does not include any new bus-only lanes for this segment; however, the branding of the service including BRT bus stops would continue in this part of the corridor. BRT vehicles would thus operate in existing mixed-flow travel lanes.

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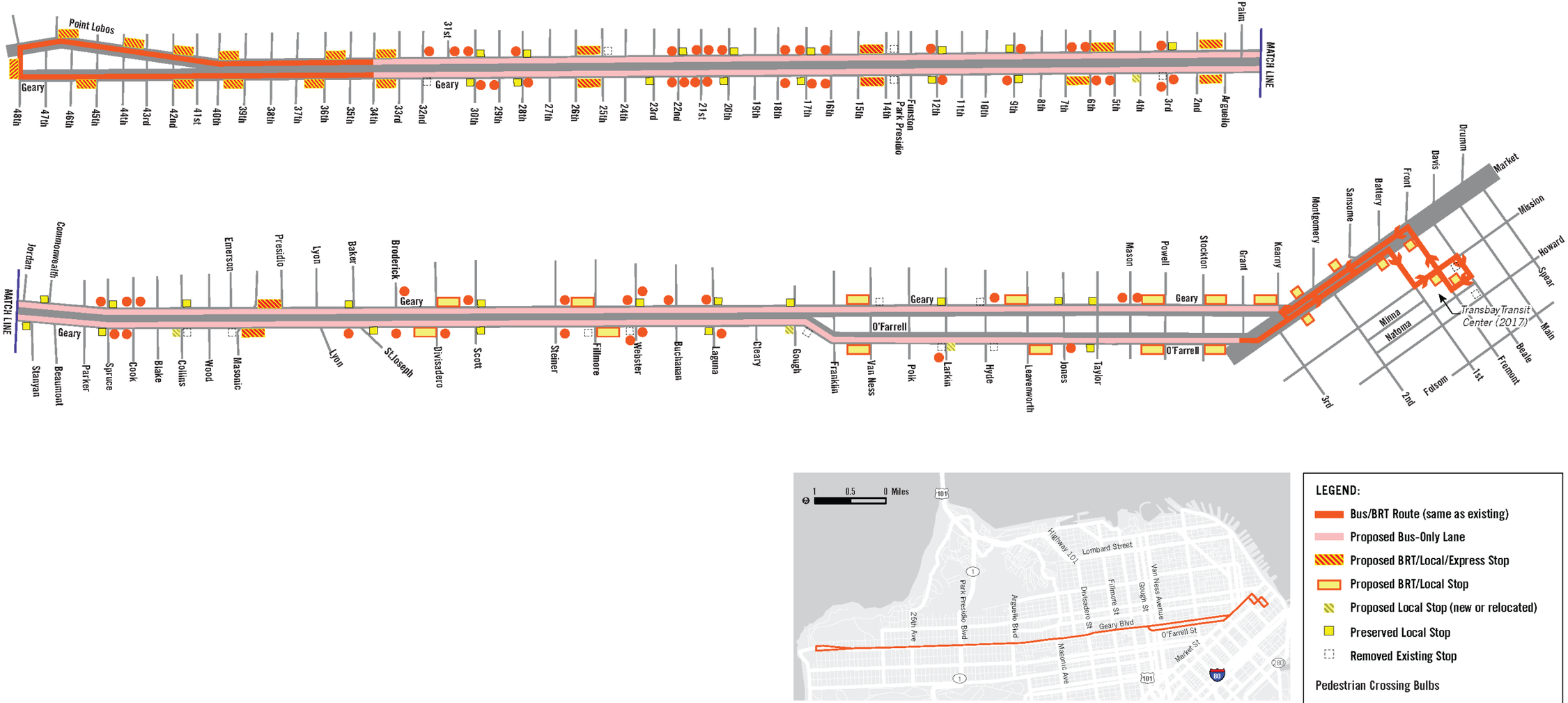
Figure 2-6 Alternative 2



(not to scale)

Source: SFCTA, 2017

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- **Bus Operations:** Under Alternative 2, both BRT and non-BRT bus services (38 Local, 38X, and Golden Gate Transit Route 92) would operate in the side-running bus-only lanes. Local service would be provided 24 hours per day, with shorter headways during peak periods than during off-peak periods. All local buses would travel the full length of the corridor. Some BRT service buses would short-turn, providing more frequent service in the highest-demand portions of the corridor, while others would travel the full corridor length. The local service would operate at headways of 5.5 minutes during the morning peak period and at 6-minute headways during the evening peak period. The BRT short line and full-length services would both operate at 5.5-minute headways during both peak periods (resulting in effective headways of about 2.8 minutes for locations east of 25th Avenue). The 38X would operate every 5.5 minutes inbound in the morning peak and outbound every 6 minutes in the evening peak.

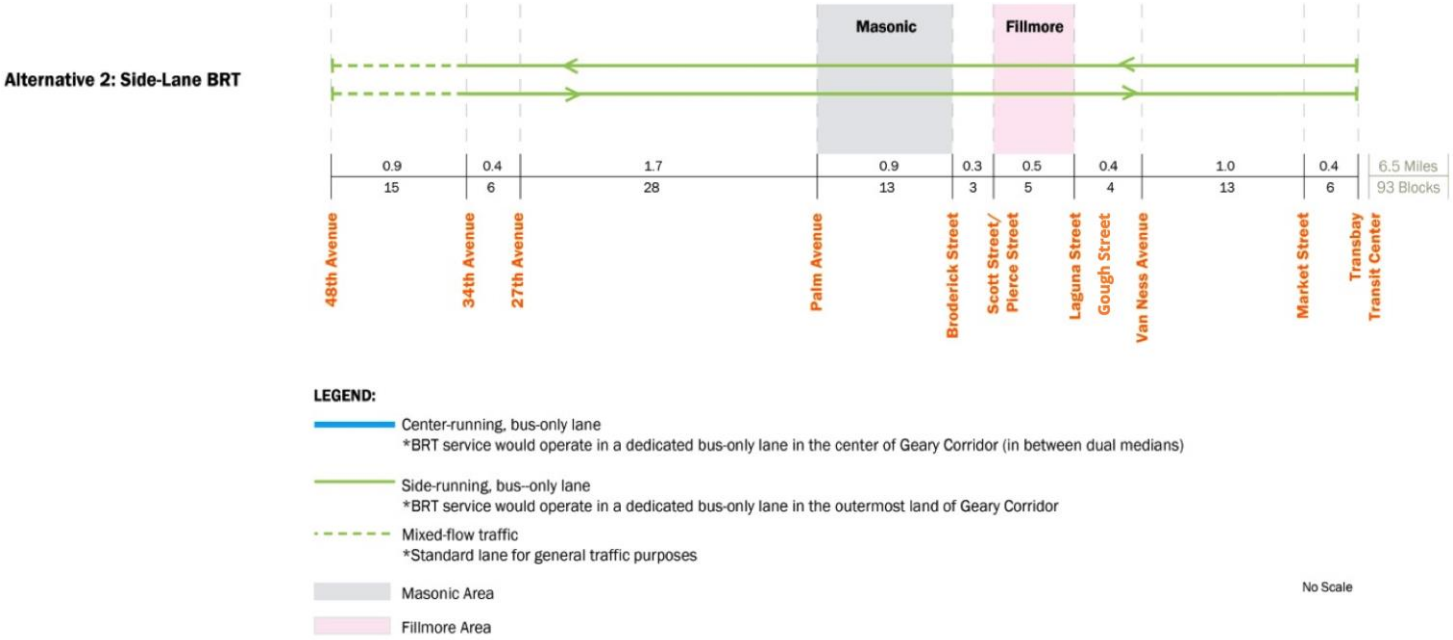
  BRT buses would stop only at BRT stops, while local buses would stop at all stops. At local stops, local buses would operate the same way they do today, pulling out of the bus-only lane to pick up and drop off passengers at the local curbside stop. In this way, BRT buses would be able to pass the local buses. Additional detail at key locations is provided below.

  - **Fillmore Street:** In the westbound direction, the side service road would be reconfigured to accommodate one mixed-flow travel lane and one bus-only lane. In the eastbound direction, to preserve existing loading spaces on the service road, both BRT and local buses would operate in mixed-flow lanes on the existing service road.
  - **Masonic Avenue:** West of Masonic Avenue, westbound buses would operate on the existing service road in a mixed-flow travel lane, which would be located adjacent to the parking lane between Emerson Street and Collins Street. Westbound buses would need to shift to the left side of the service road at Masonic Avenue in order to avoid right-turning vehicles. Alternative 2 would install a signal queue-jump at Masonic Avenue to facilitate these bus operations. East of Masonic Avenue, eastbound BRT buses would be traveling in bus-only lanes adjacent to the curb, except for an approximately 275-foot stretch between Lyon Street and Baker Street.

- **Stations and stop locations:** Please refer to Tables 2-2 through 2-4 for detail about proposed station types and locations. In general, new BRT stops (up to one block in length) would be located on new bus bulbs that would extend into parking lanes. Bus bulbs eliminate the need for buses to pull into and out of the curb lane at bus stops, subsequently reducing vehicle delay. The additional space created by the bus bulbs would allow for the inclusion of passenger amenities such as seating or bike parking.

Side-running bus-only lanes would be "permeable" for cars that need to turn right, park, or enter/exit driveways

Figure 2-7 Alternative 2 Schematic Diagram



Source: Jacobs 2014. Figure has been updated since Draft EIS/EIR with clarified labeling.

Table 2-5 Alternative 2 Bus-Only Lane Configuration

SEGMENT	SEGMENT LENGTH	BUS-ONLY LANE CONFIGURATION
Transbay Transit Center to Gough Street	1.5 miles | 21 blocks	Side-running (within existing bus-only lanes)
Gough Street to 34th Avenue	4.1 miles | 58 blocks	Side-running
34th Avenue to 48th Avenue	0.8 miles | 15 blocks	None

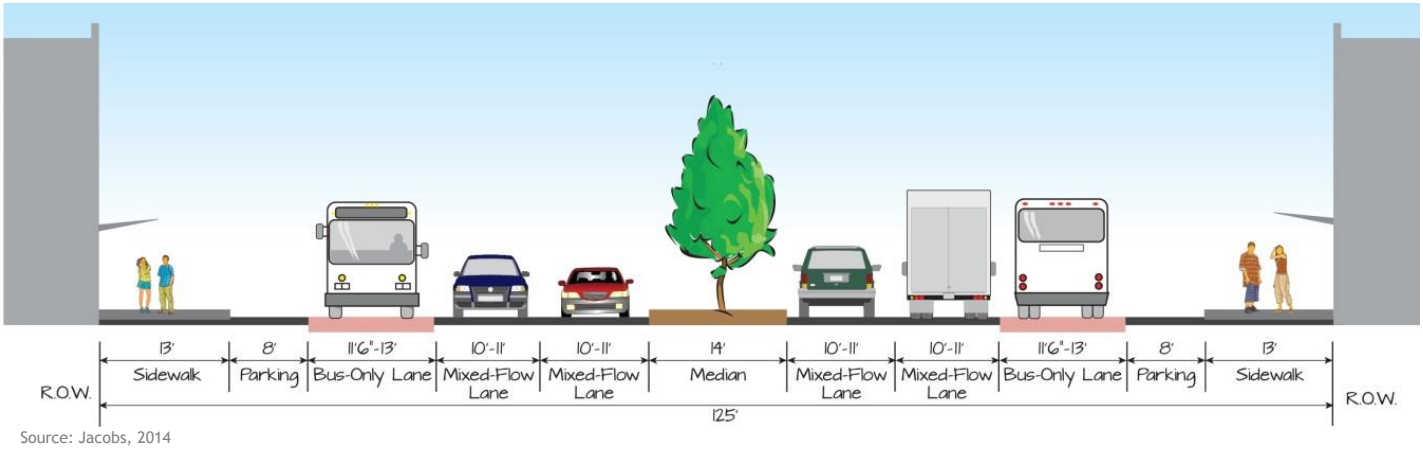
Source: Jacobs, 2014

2.2.4.2 | ALTERNATIVE 2 ROADWAY AND MULTIMODAL IMPROVEMENTS

- **Mixed-Flow Travel Lanes and On-Street Parking Changes**: Figure 2-8 depicts a typical cross section for Alternative 2 west of Gough Street. The street design would generally provide, in each direction, two mixed-flow travel lanes, a new bus-only lane as the rightmost travel lane, and a parking lane, retaining the raised center median. In most of the corridor, the street currently features three mixed-flow travel lanes, so this design would convert one of those lanes to bus-only use. Details for selected areas are addressed below:

- In the stretch from Gough Street to Scott Street, the existing configuration is four mixed-flow travel lanes in each direction; there, Alternative 2 would reduce the number of lanes by two in each direction.
- Near the Fillmore Street underpass, the side service roads between Webster and Steiner streets would be reconfigured to accommodate one travel lane and one bus-only lane where feasible; the existing parking on these two blocks would be removed. In the underpass itself, Alternative 2 would reduce the number of lanes by one in each direction, resulting in two mixed-flow travel lanes in each direction.
- In the vicinity of the Geary underpass at Masonic Avenue, the side service roads would be reconfigured to accommodate one travel lane and one bus-only lane where feasible. Some of the existing parking along these six blocks would be removed.
- From Park Presidio Boulevard to 27th Avenue, Geary features only two existing lanes in each direction, so the number of mixed-flow travel lanes in that segment would be unchanged.
- Between 34th Avenue and Market Street, proposed streetscape modifications included as part of Alternative 2 would require conversion of on-street parking spaces to other non-parking uses. Of the existing approximately 1,680 on-street parking spaces between 34th Avenue and Market Street, Alternative 2 would result in the removal of about 460 on-street parking spaces.

Figure 2-8 Proposed Cross-Section of Alternative 2 - Typical Section West of Gough Street



Source: Jacobs, 2014

- **Left Turns:** Alternative 2 would eliminate some existing left turns for mixed-flow traffic, as shown in Figure 2-9, to reduce conflicts with BRT operations and turning vehicles.
- **Pedestrian Crossing Improvements at Webster, Steiner, and Buchanan Streets:** In association with the reduction in Geary corridor travel lanes and removal of the pedestrian bridges at Webster and Steiner streets, Alternative 2 would implement at-grade pedestrian crossings at those streets, with new pedestrian refuges and pedestrian crossing bulbs. Alternative 2 would adjust signal timing to provide sufficient time to for pedestrians to cross Geary corridor at Webster and Steiner streets. It would also include a new signalized pedestrian crossing at Buchanan Street.
- **Pedestrian Crossing Improvements at Broderick Street:** Alternative 2 would install a new signalized pedestrian crossing and bulbs at Broderick Street, a high-demand location associated with the Kaiser Permanente medical facilities there.
- **Driveway and Access Modification near Divisadero Street:** To accommodate a longer westbound bus stop at Divisadero, Alternative 2 proposes a change to existing access to the adjacent medical buildings east of the intersection by relocating an existing driveway.

Figure 2-9 Proposed Left-Turn Locations for Alternative 2

Note: This figure has been revised to reflect changes to permitted/protected left-turn conditions at Third and Seventh avenues since publication of the Draft EIS/EIR.
Source: SFMTA, 2017

2.2.5 | Detailed Discussion of Features for Alternative 3: Center-Lane BRT with Dual Medians and Passing Lanes

The following subsections describe Alternative 3 improvements in more detail. Features common to all build alternatives are not listed in this section and instead are discussed in Section 2.2.3. Figure 2-10 depicts Alternative 3 in detail.

Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA include new center-running bus-only lanes throughout much of the Geary Corridor, creating a two-way busway in the middle of the street. New landscaped medians would be provided immediately adjacent of the busway on either side. At bus stations, these dual medians would serve as passenger loading platforms

2.2.5.1 | ALTERNATIVE 3 TRANSIT IMPROVEMENTS AND OPERATIONS

- **Bus-Only Lanes:** The text, Table 2-6, and Figure 2-11 below summarize where bus-only lanes would be implemented under Alternative 3.
    - **Market Street to Laguna Street:** Between Market and Gough streets, Alternative 3 would retain the existing bus-only lanes on Geary Street in the westbound direction and O'Farrell Street in the eastbound direction. Alternative 3 would extend these side-running bus-only lanes to Laguna Street;
    - **Laguna Street to 27th Avenue:** In each direction, a new center-running bus-only lane would be constructed, creating a two-way busway in the middle of the street. New dual landscaped medians would be provided immediately adjacent to the busway on either side. At bus stations, these dual medians would serve as passenger-loading platforms, to be accessed by crossing from the sidewalk at the nearest intersection. At local bus stations, Alternative 3 would provide bus passing lanes for BRT buses to bypass other buses. More detail about key locations is as follows:
        - **Fillmore Street:** Alternative 3 would replace the existing Fillmore Street underpass with a surface street, with bus lanes located in the center of the new surface street. Subsection 2.2.4.2 further describes the roadway design and operational characteristics of each of these areas.
        - **Masonic Avenue:** Alternative 3 would replace three of four existing mixed-flow travel lanes in the Masonic Avenue tunnel with two bus-only lanes and a median station. Other traffic would be redirected to an existing service road.

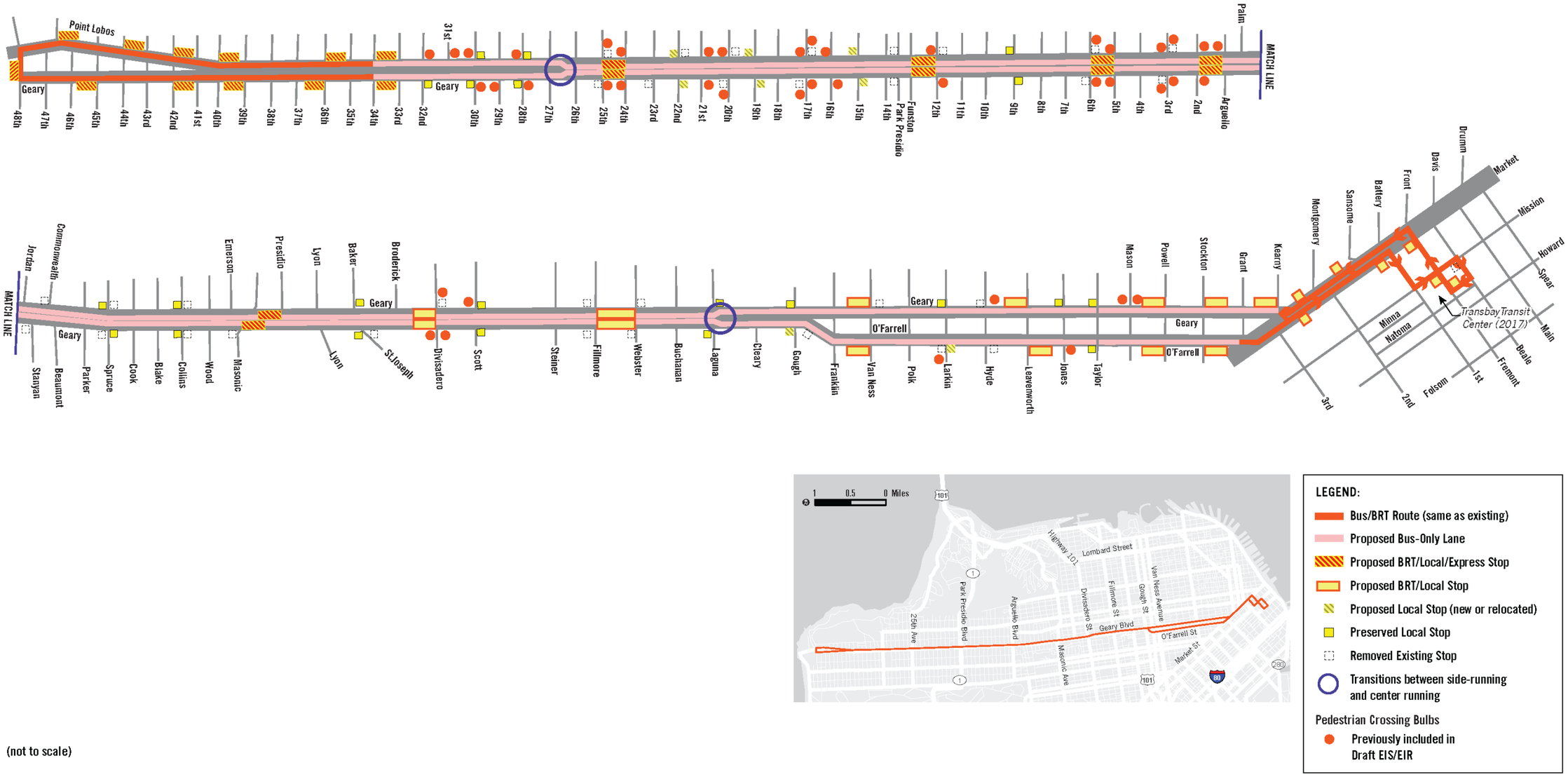
Alternative 3 would include transition areas between Gough and Laguna streets and between 26th and 27th avenues that would move buses between side-running and center-running bus-only lanes.

- **Bus Operations:** Bus service patterns and headways would be similar to Alternative 2. Alternative 3 would replace the existing 38 Rapid service with the new BRT service, retain the existing 38 Local service, and provide 38X service. The Local service would operate at headways of 5.5 minutes during the morning peak period and at six-

minute headways during the evening peak period. BRT short line and full-length services would both operate at 5.5-minute headways in both peak periods (resulting in effective headways of about 2.8 minutes for locations east of 25th Avenue). The 38X would operate every 5.5 minutes inbound in the morning peak and outbound every six minutes in the evening peak.

- **Laguna Street to 27th Avenue:** All buses would operate in the new center-running bus-only lanes. At local bus stops, the 38 Local bus would pull into a bus bay to pick up and drop off passengers. Next to this bus bay would be the bus-only lane, creating a passing zone which the BRT bus could use to bypass the stopped 38 Local bus.
- **Fillmore Street:** Buses would operate in new center-running bus-only lanes on a new surface street that would replace the current underpass.
- **Masonic Avenue:** Buses would operate in new center-running bus-only lanes in the underpass trench and tunnel, servicing a station in the trench part of the underpass.
- **All Other Locations:** Buses would operate in side-running bus-only lanes similar to Alternative 2.
- **Transitions:** Between Laguna and Gough streets, and again between 26th and 27th avenues, buses would transition to and from new center-running bus-only lanes and the new side-running bus-only lanes. Queue-jump traffic signals would use a bus-only signal phase to create gaps in traffic, allowing buses to shift across the mixed-flow travel lanes.
- **Stations and Stop Locations:** Tables 2-2 through 2-4 include details about proposed station types and locations.

Figure 2-10 Alternative 3



(not to scale)

Source: SFCTA, 2017

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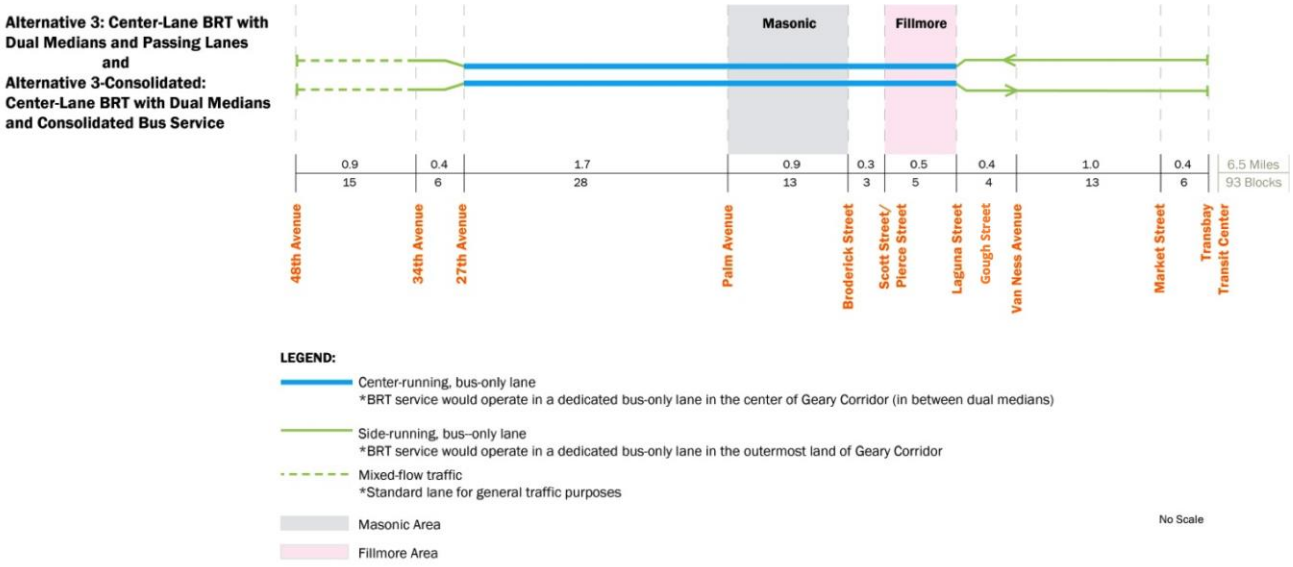
Table 2-6 Alternative 3 Bus-Only Lane Configuration

SEGMENT	SEGMENT LENGTH	BUS-ONLY LANE CONFIGURATION
Transbay Transit Center to Gough Street	1.5 miles | 21 blocks	Side-running (within existing bus-only lanes)
Gough Street to 27th Avenue	3.5 miles | 51 blocks	Side-running (Gough Street to Laguna Street; 2 blocks) Center-running (Laguna Street to 27th Avenue; 49 blocks)
27th Avenue to 34th Avenue	0.4 miles | 6 blocks	Side-running
34th Avenue to 48th Avenue	0.8 miles | 15 blocks	None

Figure 2-11 Alternative 3 Schematic Diagram



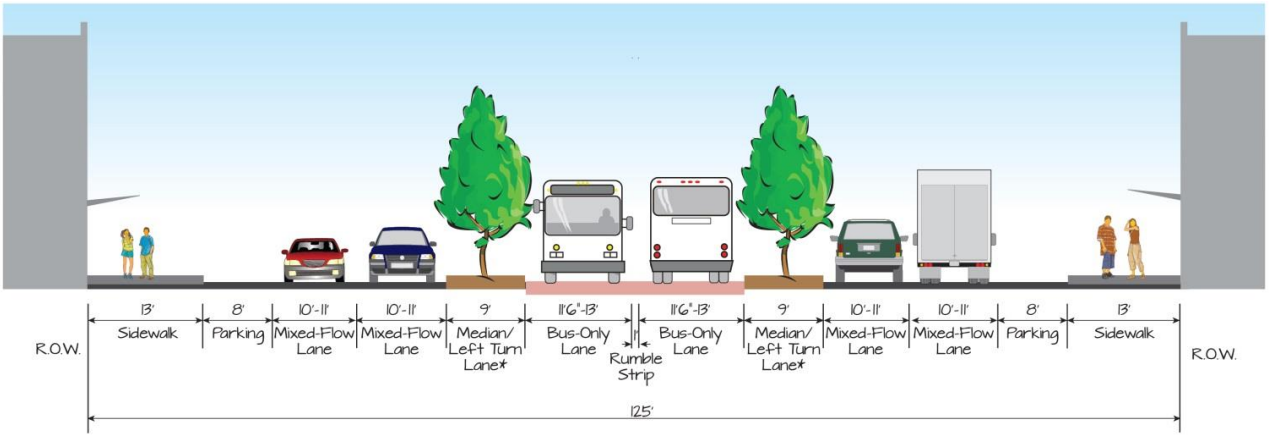
Source: Jacobs, 2014. Figure has been updated since Draft EIS/EIR with clarified labeling.

2.2.5.2 | ALTERNATIVE 3 ROADWAY AND MULTIMODAL IMPROVEMENTS

- **Mixed-Flow Travel Lanes and On-Street Parking Changes:** Alternative 3 would remove the existing center median and create center-running bus-only lanes separated from mixed-flow traffic by new medians from Gough Street to 27th Avenue. The redesigned street in this segment would feature, in each direction, a bus-only lane, a median/station platform, and two mixed-flow travel lanes. Alternative 3 would provide on-street parking where it would fit into the existing street width. Figure 2-12 depicts a typical cross section of Alternative 3 in this portion of the Geary corridor. Detail about selected locations is provided below.

- **Masonic Avenue:** Alternative 3 would retain the tunnel/underpass but would convert three of its four mixed-flow travel lanes to transit use. One westbound mixed-flow travel lane would be retained in the underpass. Outside the underpass, at-grade service roads would continue to serve mixed-flow traffic. Buses would no longer use the at-grade service roads.

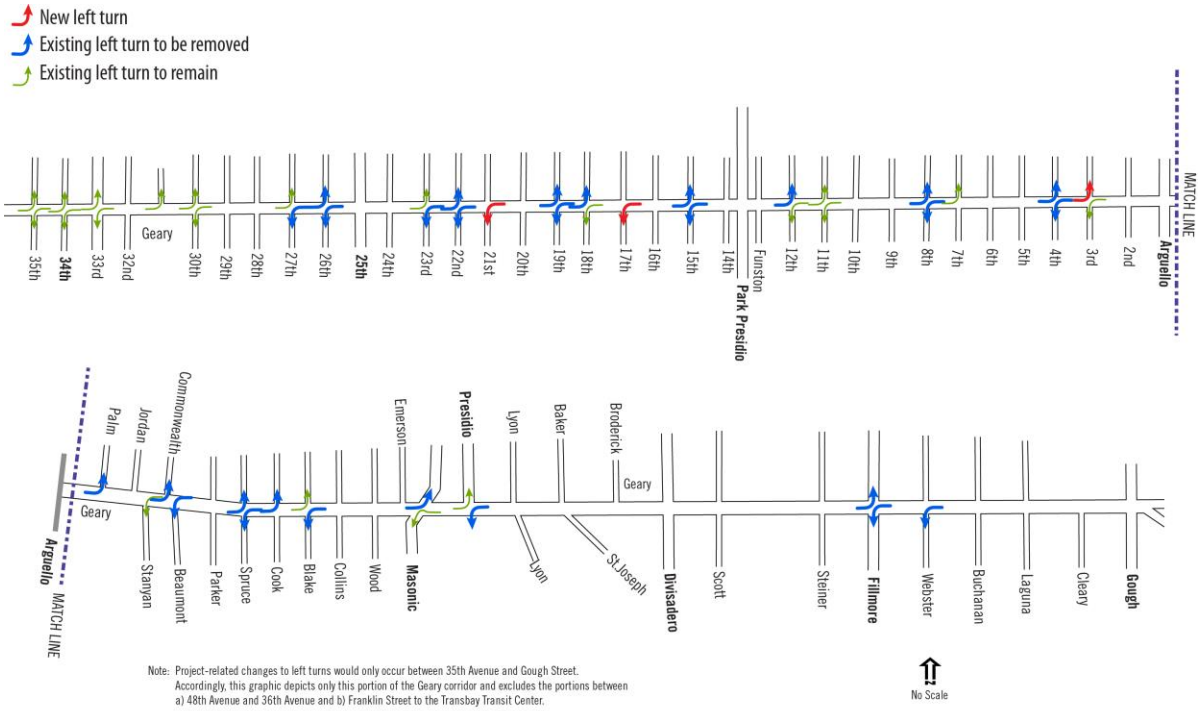
Figure 2-12 Proposed Typical Cross-Section of Alternative 3



Source: Jacobs, 2014

- **Median Removal; Tree Replacement:** To construct new center-lane bus-only lanes and associated platforms and medians, Alternative 3 would remove existing medians, plantings, and some center-lane areas. Landscaping with tree plantings would be placed in the new dual medians. The number of new trees planted would be at least equal to the number removed.
- **On-Street Parking:** Between 34th Avenue and Market Street, proposed streetscape modifications included as part of Alternative 3 would require conversion of on-street parking spaces to other non-parking uses. Of an existing approximately 1,680 on-street parking spaces between 34th Avenue and Market Street, Alternative 3 would result in the removal of about 430 on-street parking spaces.
- **Left Turns and Traffic Signal Modifications:** As shown in Figure 2-13, some existing left turns for mixed-flow traffic would be eliminated to provide safer and more efficient operations by reducing bus conflicts with left-turning vehicles.

Figure 2-13 Proposed Left-Turn Locations for Alternative 3



Note: This figure has been revised to reflect changes to permitted/protected left-turn conditions at Third and Seventh avenues since publication of the Draft EIS/EIR.

Source: SFMTA, 2017

Where new left-turn lanes are created, traffic signals would be programmed so that these turns would have protected signal phases (i.e., left-turn arrows) to improve safety for motorists as well as pedestrians crossing side streets. All left turns in the portion of the corridor with center-running bus-only lanes would be converted to protected left-turn arrows.

- **Major Underground Utility Work**
  - **Sewer Reconstruction or Relocation**: Coordination with the San Francisco Public Utilities Commission (SFPUC) has identified two areas where existing sewer lines would need to be reconstructed or relocated as a result of the construction of new facilities:
    - **Geary Boulevard Median Area between 4th and 14th Avenues:** This sewer would be reconstructed in place with the same depth and capacity as the existing facility. Excavation for this work would reach depths of about 16 feet.

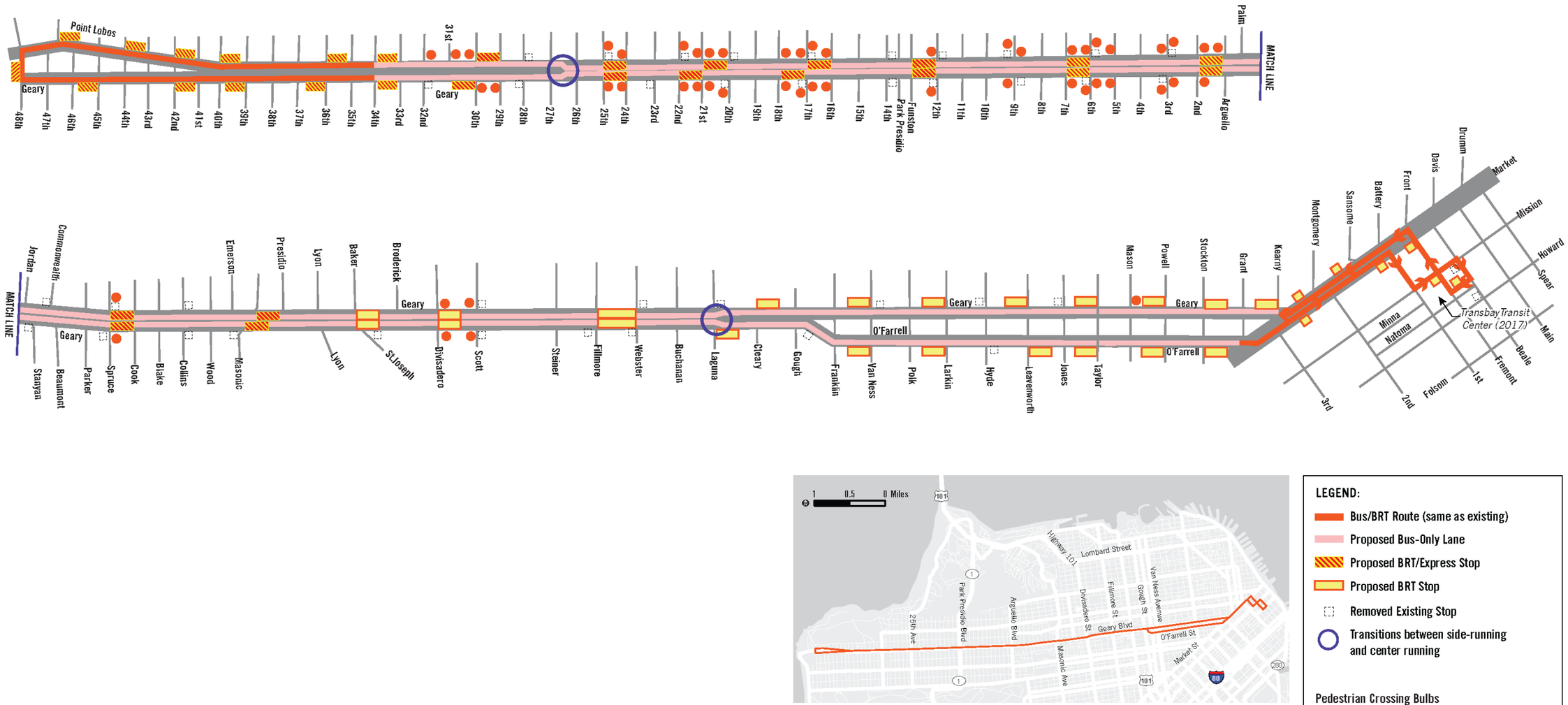
- **Geary Boulevard between Funston and 12th Avenues:** The existing sewer along the side of the street aligns with an area designated for a proposed bus stop. Locating a station atop an existing sewer would limit the ability to access or perform maintenance on the sewer without disrupting the proposed bus stop. To address this conflict, the sewer may need to be relocated to the eastbound #1 (i.e., left-most) lane of Geary Boulevard. Construction would occur between 11th and 14th streets across all of Park Presidio Boulevard.

- **Fillmore Street:** Filling the Fillmore Street underpass would require removing part of the retaining walls, relocating existing utilities, and decommissioning an existing below-grade pump station, including removal of a portion of its structure.

2.2.6 | Detailed Discussion of Features for Alternative 3-Consolidated: Center-Lane BRT with Dual Medians and Consolidated Bus Service

Alternative 3-Consolidated would create a bus-only lane configuration generally identical to Alternative 3, but would have different transit operations. Key features are summarized in the subsections below. Improvements and features common to all build alternatives are not listed in this section and instead are discussed in Section 2.2.3. Figure 2-14 depicts Alternative 3-Consolidated in detail.

Figure 2-14 Alternative 3-Consolidated



(not to scale)

Source: SFCTA, 2017

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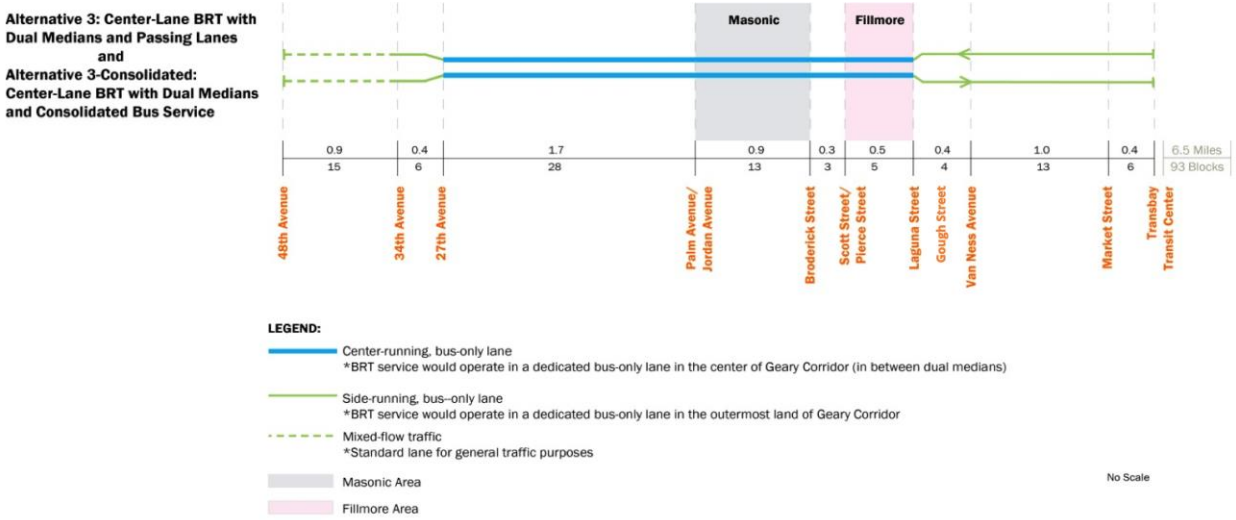
2.2.6.1 | ALTERNATIVE 3-CONSOLIDATED TRANSIT IMPROVEMENTS AND OPERATIONS

- **Bus-Only Lanes:** Table 2-7 summarizes where Alternative 3-Consolidated would implement bus-only lanes. Implementation would be the same as in Alternative 3; however, Alternative 3-Consolidated would not include bus bays at local stops for BRT buses to pass stopped local buses, which would provide space to retain existing on-street parking.
- **Bus Operations:** Alternative 3-Consolidated would consolidate existing 38 Local and 38 Rapid lines into one BRT line, which would operate as visually summarized in Figure 2-15. The buses would utilize the bus-only lanes similar to Alternative 3. However, all buses would stop at the same stops – no local-only stops – which would eliminate the need for bus passing. This alternative would also provide the 38X service. BRT service would operate 24 hours per day with more frequent headways during peak periods than during off-peak periods. Some BRT buses would short-turn, providing more frequent service in the highest-demand portions of the corridor, while others would travel the full corridor length. The short-turn and full-length services would both operate at four-minute headways in the morning peak period, providing combined headways of 2 minutes east of 25th Avenue. In the evening peak period, full-length buses would operate at 4.5-minute headways, with the short-turn buses operating every four minutes, providing combined headways of approximately 2.1 minutes east of 25th Avenue. The 38X would operate weekdays every 4.5 minutes inbound in the morning peak and outbound every 4.5 minutes in the evening peak.
- **Stations and Stop Locations:** Please refer to Tables 2-2 through 2-4 for detail on proposed station types and stop locations. Alternative 3-Consolidated would largely replicate Alternative 3's station types and locations, with some exceptions:
    - **Market Street to Gough Street:** Several local-only stops proposed as part of Alternative 3 would be upgraded to BRT stops under Alternative 3-Consolidated.
    - **Gough Street to 27th Avenue:** This alternative would remove several local stops that would be included as part of Alternative 3; the remaining stops would be combined BRT and local stops.
    - **27th Avenue to 34th Avenue:** Same as Gough to 27th, except that new BRT stops would be at curbside locations here, consistent with proposed side-running bus-only lanes through this area.
    - **34th Avenue to 48th Avenue:** Same as proposed for Alternative 2, this area would retain existing curbside stops.

Table 2-7 Alternative 3-Consolidated Bus-Only Lane Configuration

SEGMENT	SEGMENT LENGTH	BUS-ONLY LANE CONFIGURATION
Transbay Transit Center to Gough Street	1.5 miles | 21 blocks	Side-running (within existing bus-only lanes)
Gough Street to 27th Avenue	3.5 miles | 51 blocks	Side-running (Gough Street to Laguna Street; 2 blocks) Center-running (Laguna Street to 27th Avenue; 49 blocks)
27th Avenue to 34th Avenue	0.4 miles | 6 blocks	Side-running
34th Avenue to 48th Avenue	0.8 miles | 15 blocks	None

Figure 2-15 Alternative 3-Consolidated Schematic Diagram

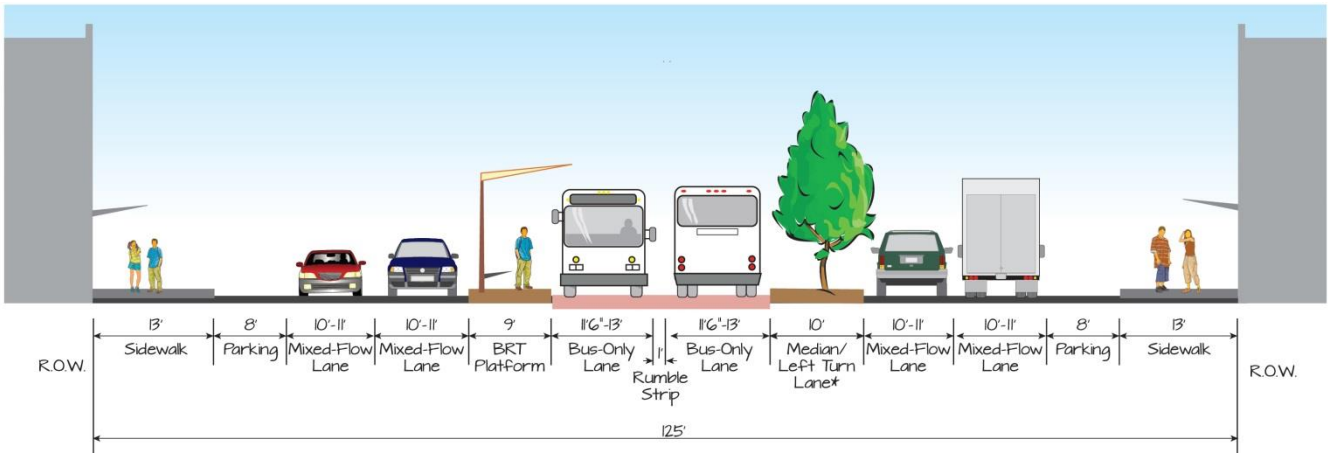


Source: Jacobs, 2014. Figure has been updated since Draft EIS/EIR with clarified labeling.

2.2.6.2 | ALTERNATIVE 3-CONSOLIDATED ROADWAY AND MULTIMODAL IMPROVEMENTS

- **Mixed-Flow Travel Lanes and On-Street Parking Changes:** Figure 2-16 depicts a typical cross section of Alternative 3-Consolidated in the portion of the Geary corridor west of Gough Street. The street configuration for this alternative is similar to that for Alternative 3, but with no need for bus passing lanes at local stops, there would generally be sufficient space to include parking lanes. At Fillmore Street and Masonic Avenue, this alternative would provide the same treatments as in Alternative 3.

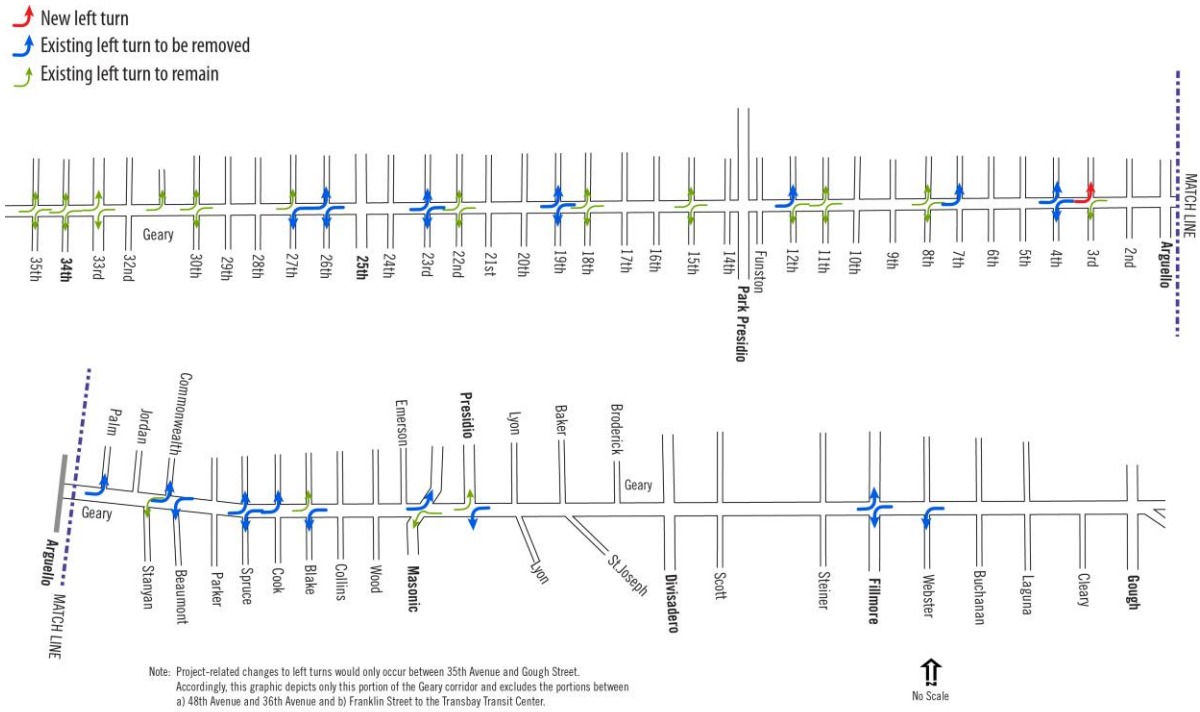
Figure 2-16 Proposed Cross-Section of Alternative 3-Consolidated



Source: Jacobs, 2014

- **Median Removal; Tree Replacement:** Same as proposed for Alternative 3.
- **On-Street Parking:** Between 34th Avenue and Market Street, proposed streetscape modifications included as part of Alternative 3-Consolidated would require conversion of existing on-street parking spaces to non-parking uses. Of an existing approximately 1,680 on-street parking spaces between 34th Avenue and Market Street, Alternative 3-Consolidated would result in the removal of about 210 on-street parking spaces.
- **Left Turns and Traffic Signal Modifications:** As shown in Figure 2-17, some existing left turns for mixed-flow traffic would be eliminated to provide safer and more efficient operations by reducing conflicts with left-turning vehicles. Where new left-turn lanes are created, traffic signals would be programmed so that these turns would have protected signal phases (i.e., left-turn arrows) to improve safety for motorists as well as pedestrians crossing side streets. All left turns in the portion of the corridor with center-running bus-only lanes would be converted to protected left-turn arrows.
- **Major Underground Utility Work:** Same as proposed for Alternative 3.

Figure 2-17 Proposed Left-Turn Locations for Alternative 3-Consolidated



Source: Jacobs, 2014

Note: This figure has been revised to reflect changes to permitted/protected left-turn conditions at Third and Seventh avenues since publication of the Draft EIS/EIR.

Source: SFMTA, 2017

2.2.7 | Detailed Discussion of Features for the Hybrid Alternative/LPA

The Hybrid Alternative/LPA combines various attributes of Alternatives 2 and 3-Consolidated

The Hybrid Alternative/LPA initially resulted from a robust alternatives evaluation process that preceded the Draft EIS/EIR. This process is documented in Chapter 10 (Initial Development and Screening of Alternatives). The Hybrid Alternative/LPA combines various attributes of Alternatives 2 and 3-Consolidated in different segments throughout the corridor to produce a build alternative that meets the project's purpose and need, minimizes environmental impacts, and is customized for key segments of the diverse study corridor. The intent of the Hybrid Alternative/LPA is to provide the bus lane configurations best suited to each segment's constraints and opportunities. As described in Chapter 10, the Hybrid Alternative was initially derived through a robust evaluation of several metrics, including:

- **Transit Performance**: Vehicle travel time; total travel time including walking and waiting times; reliability, and ridership; passenger experience;
- **System Performance**: Average person-delay for both transit users and car drivers;
- **Environmental Effects**: Anticipated parking opportunities and tree and landscaping provided; pedestrian safety and access to bus stops;
- **Cost**: Construction cost estimates, and operations and maintenance cost estimates; and
- **Construction Impacts**: Access to businesses during construction.

The project's Citizens Advisory Committee (CAC) and Technical Advisory Committee (TAC) reviewed the analysis process for the Hybrid Alternative, and it was presented at open houses and stakeholder meetings with local agencies, merchant associations and businesses, community groups, and advocacy organizations.

Largely in response to public comments, a total of six minor modifications have been made to the Hybrid Alternative, including design changes that enhance safety and address community concerns.

Given its selection, SFMTA advanced construction phasing planning for the Hybrid Alternative/LPA. Section 2.2.7.5.7 details proposed phasing activities. The section below describes the improvements associated with the Hybrid Alternative/LPA, and Figure 2-18 depicts the Hybrid Alternative/LPA in detail.

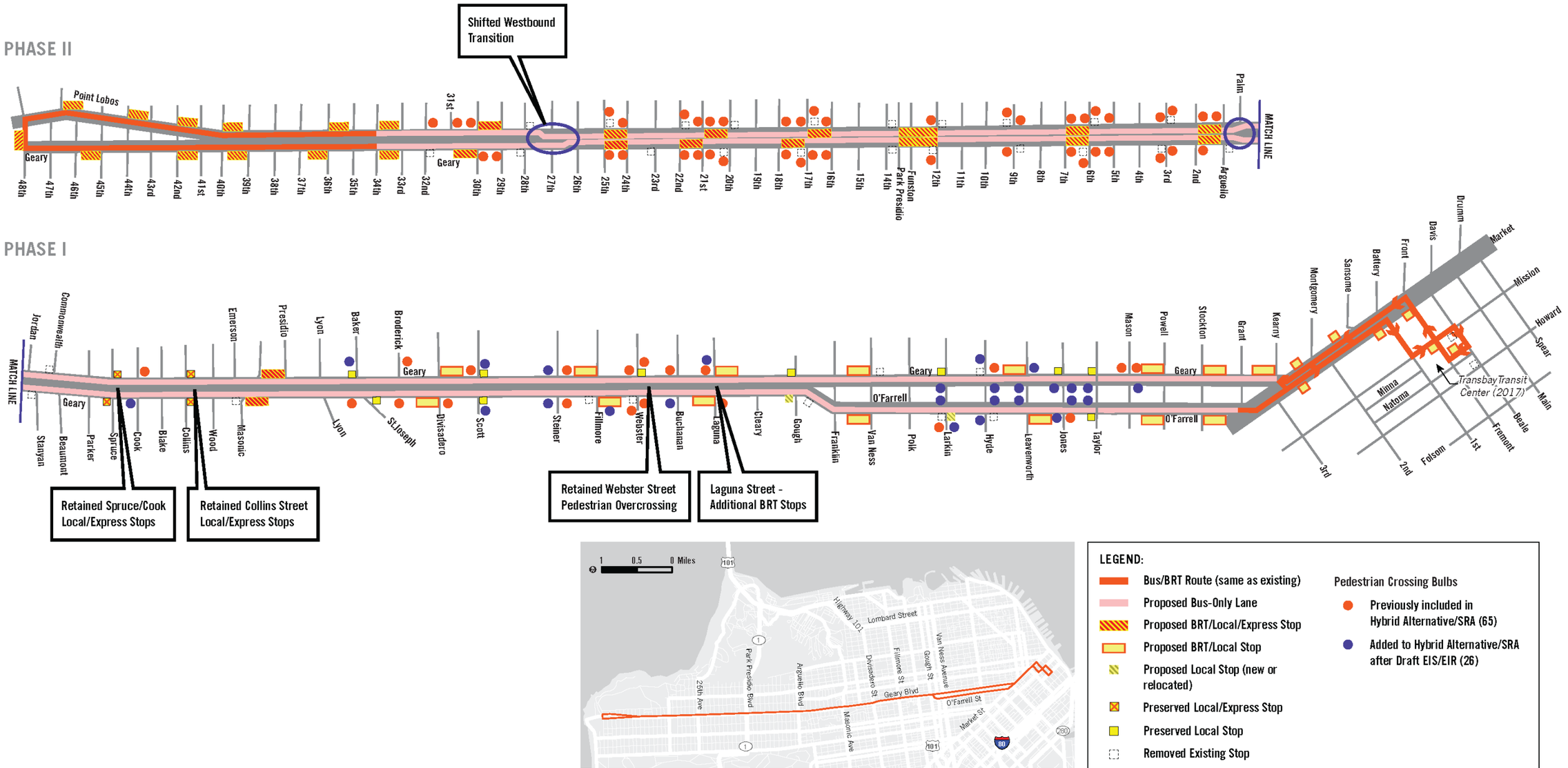
2.2.7.1 | INCORPORATION OF NO BUILD ALTERNATIVE PROJECT FEATURES AND OPERATIONAL CHANGES

The Hybrid Alternative/LPA, like all other build alternatives, assumes the implementation of the following service and operational changes in the Geary corridor and elsewhere in the City, all of which were described above as part of the No Build Alternative. The Hybrid Alternative/LPA would provide additional improvements beyond what is assumed as part of the No Build Alternative. For example, the Hybrid Alternative/LPA would include installation of fiber-based TSP along the Geary corridor, whereas the No Build Alternative assumes installation of wireless TSP along the Geary corridor and elsewhere in the City.

- Bus service improvements consistent with the TEP/Muni Forward in the Geary corridor and elsewhere throughout the City.
- Installation of new traffic signals at several currently unsignalized intersections in the Geary corridor (including Presidio Avenue, Cook Street, and Beaumont/Commonwealth, Palm, 22nd, and 26th avenues).
- Replacement of traffic signal infrastructure at various locations throughout the Geary corridor.
- Installation of pedestrian countdown signals so that by 2020, all signalized intersections along the Geary corridor will include these safety features.

Installation of 14 pedestrian crossing bulbs and curb ramps at various locations along the Geary corridor. The Hybrid Alternative/LPA would also install 77 additional bulbs for a total of 91 pedestrian crossing bulbs, as described in Section 2.2.7.6.3.

Figure 2-18 Hybrid Alternative/Locally Preferred Alternative



Note: Construction of Class I bicycle lanes between Masonic and Presidio would be part of Phase II **(not to scale)**

Source: SFCTA, 2017

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2.2.7.2 | HYBRID ALTERNATIVE/LPA – FEATURES COMMON TO ALL BUILD ALTERNATIVES

As discussed in Section 2.2.3, several features are common to all build alternatives. This section provides greater detail about the Hybrid Alternative/LPA's incorporation of these features:

- **Bus-Only Lanes; Higher-Frequency Bus Service; Changes to Mixed-Flow Travel Lanes, including Permissible Left Turns and Parking and Loading Spaces; Pavement Rehabilitation; Pedestrian Improvements; Bus Bulbs:** Section 2.2.7.3 provides details.
- **TSP:** The Hybrid Alternative/LPA would include the installation of fiber-based TSP on all signalized intersections between 25th Avenue and Gough Street. This type of TSP technology differs from the wireless TSP that would be installed under the No Build Alternative in terms of long-term maintenance and operating costs, but is similar in terms of ability to improve performance at intersections.
- **Additional Vehicles with Low-Floor Design:** The Hybrid Alternative/LPA would deliver BRT service via vehicles similar to the new low-floor buses which have recently been put into service. The Hybrid Alternative/LPA would increase frequency of the headways assumed for the No Build Alternative; thus the Hybrid Alternative/LPA would require additional vehicles above what would be required under the No Build Alternative.
- **New BRT Stations:** Tables 2-2 through 2-4 include details on proposed station locations and types under the Hybrid Alternative/LPA.
- **New Signalized Crossings at Buchanan and Broderick Streets:** The Hybrid Alternative/LPA would implement new, signalized pedestrian crossings at Buchanan and Broderick streets.
- **Bicycle Lane Between Masonic and Presidio Avenues:** The Hybrid Alternative/LPA would include bicycle lanes on the one block of Geary Boulevard between Masonic and Presidio avenues, providing a critical linkage in the City's bicycle network.

New Muni Rapid Network flag signs on transit poles with solar lanterns (above) and bike racks (below)

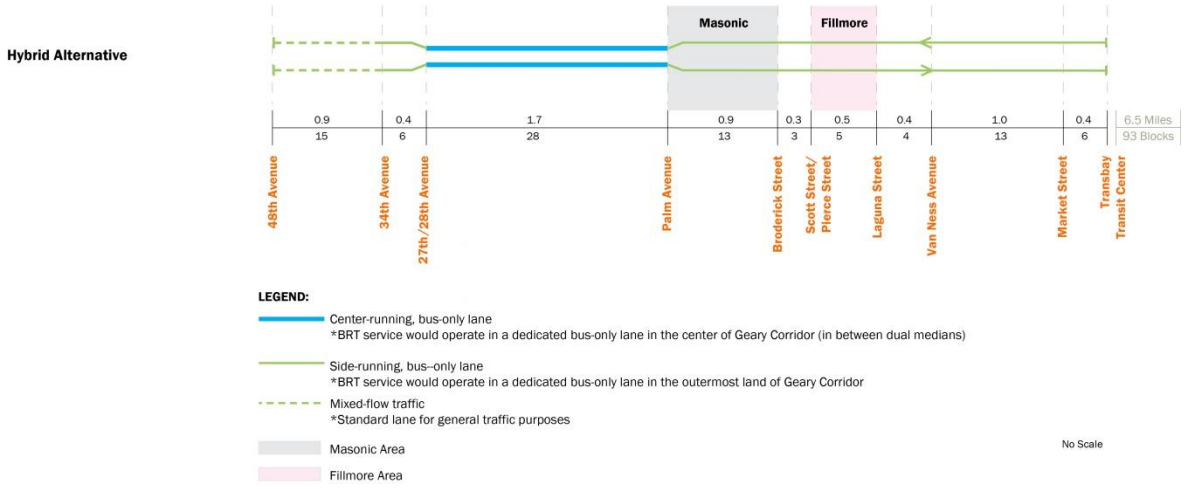
2.2.7.3 | HYBRID ALTERNATIVE/LPA TRANSIT IMPROVEMENTS AND OPERATIONS

- **Bus-Only Lanes:** Table 2-8 and Figure 2-19 below summarize where bus-only lanes would be implemented under the Hybrid Alternative/LPA.
    - **Market Street to Gough Street:** Same as proposed for Alternative 2, the Hybrid Alternative/LPA would retain the existing bus-only lanes on Geary Street in the westbound direction and O'Farrell Street in the eastbound direction.

Table 2-8 Hybrid Alternative/LPA Bus-Only Lane Configuration

SEGMENT	SEGMENT LENGTH	BUS-ONLY LANE CONFIGURATION
Transbay Transit Center to Gough Street	1.5 miles | 21 blocks	Side-running (within existing bus-only lanes)
Gough Street to 27th Avenue (eastbound)	3.45 miles | 51 blocks	Side-running (Gough Street to Palm Avenue; 23 blocks) Center-running (Palm Avenue to 27th Avenue; 28 blocks)
Gough Street to 28th Avenue (westbound)	3.5 miles | 52 blocks	Side-running (Gough Street to Palm Avenue; 23 blocks) Center-running (Palm Avenue to 28th Avenue; 29 blocks)
27th Avenue to 34th Avenue (eastbound)	0.4 miles | 6 blocks	Side-running
28th Avenue to 34th Avenue (westbound)	0.35 miles | 5 blocks	Side-running
34th Avenue to 48th Avenue	0.8 miles | 15 blocks	None

Figure 2-19 Hybrid Alternative/LPA Schematic Diagram



Source: Jacobs, 2014. Figure has been updated since Draft EIS/EIR with clarified labeling.

- **Gough Street to Palm Avenue:** Same as proposed for Alternative 2, the Hybrid Alternative/LPA would create a colorized bus-only lane in each direction of Geary Boulevard, designated in the rightmost travel lane next to the existing curbside parking lane.
- **Palm Avenue to 27th and 28th Avenues:** The Hybrid Alternative/LPA would create new center-running bus-only lanes. In the eastbound direction, center-running bus-only lanes would be between Palm and 27th avenues; in the westbound direction, center-running bus-only lanes would be between Palm and 28th avenues. As with Alternative 3-Consolidated, no bus passing lanes would be provided.

  - **27th and 28th Avenues to 34th Avenue:** The Hybrid Alternative/LPA would create side-running bus-only lanes from 27th Avenue to 34th Avenue in the eastbound direction and from 28th Avenue to 34th Avenue in the westbound direction.
  - **34th Avenue to 48th Avenue:** None, same as proposed for all build alternatives; BRT buses would operate in mixed-flow lanes.
  - **Transition Areas:** The Hybrid Alternative/LPA would create transition areas to shift the buses between the side-running and center-running bus-only lanes. There would be three transition areas: at Palm Avenue, at 27th Avenue (eastbound only), and at 28th Avenue (westbound only).

- **Bus operations:** BRT, local, and 38X bus service under the Hybrid Alternative/LPA would generally be similar to Alternative 2, as follows:
  - In locations with side-running bus-only lanes, there would be two tiers of service consisting of a Local line and a BRT line. In these locations, the Local bus line would serve all Local and BRT stops, while the BRT line would serve only the BRT stops.
  - In locations with center-running bus-only lanes – Palm Avenue to 27th and 28th avenues – the local and BRT lines would serve all stops, with fewer stops than existing. This operation eliminates the need for bus passing lanes.
  - Like Alternative 2, the Local service would operate at headways of 5.5 minutes during the morning peak period and at six-minute headways during the evening peak period. BRT short line and full-length services would each operate at 5.5-minute headways in both peak periods (resulting in effective headways of about 2.8 minutes for locations east of 25th Avenue). The 38X would operate every 5.5 minutes inbound in the morning peak and outbound every six minutes in the evening peak. Local service would operate 24 hours per day.

- **Stations and Stop Locations:** The Hybrid Alternative/LPA would have a combination of stops located on bus bulbs adjacent to the sidewalk where there are side-running bus-only lanes and stops located in the median where there are center-running bus-only lanes. Tables 2-2 through 2-4 include details about proposed station types and locations.

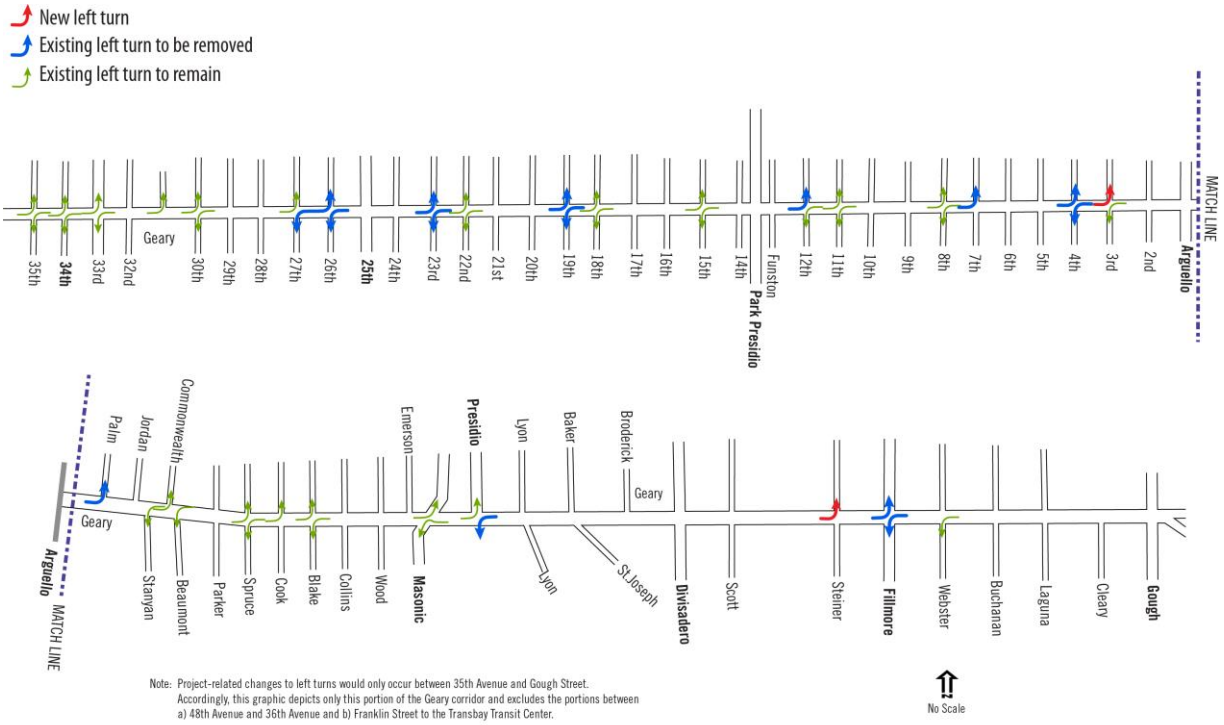
2.2.7.4 | HYBRID ALTERNATIVE/LPA ROADWAY AND MULTIMODAL IMPROVEMENTS

- **Mixed-Flow Travel Lanes and On-Street Parking Changes:** The street design would generally provide, in each direction, two mixed-flow travel lanes, a new bus-only lane, and a parking lane. Details by segment resemble other build alternatives, as described below:
    - **Market Street to Gough Street:** Same as proposed for all build alternatives – minor bus and mixed-flow travel lane shifts and signal operations at Geary and Stockton streets, Geary and Powell streets, O'Farrell and Powell streets, and O'Farrell and Stockton streets, to move the buses out of right-turning auto traffic at these high-turning-demand locations.
    - **Gough Street to Palm Avenue, including Fillmore Street and Masonic Avenue underpasses and Side Service Roads:** Generally the same as proposed for Alternative 2 – in each direction, the Hybrid Alternative/LPA would provide a side-running bus-only lane, two mixed-flow travel lanes, and a parking lane. At Fillmore Street and Masonic Avenue, the side service roads would be reconfigured to carry one bus-only lane and one mixed-flow travel lane where feasible.
    - **Palm Avenue to 27th and 28th Avenues:** In each direction, the Hybrid Alternative/LPA would provide a center-running bus-only lane (between Palm and 27th avenues for the eastbound lane, and Palm and 28th avenues for the westbound lane), two mixed-flow travel lanes, and a parking lane.
    - **27th and 28th Avenues to 34th Avenue:** The Hybrid Alternative/LPA would provide a side-running bus-only lane (between 27th and 34th avenues for the eastbound lane, and 28th and 34th avenues for the westbound lane), two mixed-flow travel lanes, and a parking lane.
    - **34th Avenue to 48th Avenue:** As for all build alternatives, no changes to mixed-flow travel lanes are proposed.
    - **On-Street Parking:** Between 34th Avenue and Market Street, proposed streetscape modifications included as part of the Hybrid Alternative/LPA would require conversion of existing on-street parking spaces to non-parking uses. Of an existing approximately 1,680 on-street parking spaces between 34th Avenue and Market Street, the Hybrid Alternative/LPA would result in the removal of about 410 on-street parking spaces.

- **Left turns and traffic signal modifications:** As Figure 2-20 shows, some existing left turns for mixed-flow traffic would be eliminated to improve safe and efficient operations by reducing conflicts with left-turning vehicles.

  Traffic signals would include protected signal phases where new left-turn lanes are created to improve motorist and pedestrian safety. All left turns in the portion of the corridor with center-running bus-only lanes would be converted to protected left turns.
- **Pedestrian Crossing Improvements at Webster, Steiner, and Buchanan Streets:** In association with the reduced Geary corridor travel lanes and the removal of the pedestrian bridge at Steiner Street, the Hybrid Alternative/LPA would implement at-grade pedestrian crossings at those streets, with new pedestrian refuges and pedestrian crossing bulbs to facilitate the crossing. The Hybrid Alternative/LPA would adjust signal timing to provide sufficient time to cross Geary corridor at Webster and Steiner streets. It would also include a new signalized pedestrian crossing at Buchanan Street.
- **Pedestrian Crossing Improvements at Broderick Street:** The Hybrid Alternative/LPA would install a new signalized pedestrian crossing and bulbs at Broderick Street, a high-demand location associated with the Kaiser Permanente medical facilities there.

Figure 2-20 Proposed Left-Turn Locations for the Hybrid Alternative/LPA



Note: This figure has been revised to reflect changes to permitted/protected left-turn conditions at 3rd and 7th avenues since publication of the Draft EIS/EIR

Source: SFMTA, 2017

Similar to Alternatives 3 and 3-Consolidated, the Hybrid Alternative/LPA would relocate existing sewer lines in the median between 14th and 4th avenues and between 12th and Funston avenues

- **Median Removal; Tree Replacement:** Same as proposed for Alternative 3 and 3-Consolidated, where there are center-running bus-only lanes (Palm Avenue to 27th Avenue), the Hybrid Alternative/LPA would remove the existing medians and plantings to construct the bus-only lane and its side platforms. Landscaping with tree plantings would be placed in the new dual medians, including planting of a number of new trees equal to or greater than those that would be removed during construction.
- **Major Underground Utility Work:**
    - **Sewer Reconstruction or Relocation:** Coordination with the SFPUC has identified two areas where existing sewer lines would need to be reconstructed or relocated as a result of the construction of BRT facilities:
        - **Geary Boulevard median area between Fourth and 14th avenues:** This sewer would be reconstructed in place with the same depth and capacity as the existing facility. Excavation for this work would reach depths of about 16 feet.
        - **Geary Boulevard between Funston and 12th avenues:** The sewer along the side of the street aligns with an area designated for a proposed bus stop. Locating a station atop a sewer would limit the ability to access and maintain the sewer without disrupting the proposed bus stop. To address this conflict, the sewer may need to be relocated to the eastbound leftmost lane of Geary corridor. Construction would occur between 11th and 14th avenues– across all of Park Presidio Boulevard.

2.2.7.5 | SUMMARY OF CHANGES TO THE HYBRID ALTERNATIVE SINCE THE DRAFT EIS/EIR

As discussed in Section 2.1.1, a total of six minor modifications have been made to the Hybrid Alternative, including design changes that enhance safety and address community concerns.

2.2.7.5.1 | RETENTION OF THE WEBSTER STREET PEDESTRIAN BRIDGE

In the Draft EIS/EIR, the Hybrid Alternative included demolition of the pedestrian bridge at Webster Street to allow for uninterrupted side-running bus-only lanes through this intersection with the Geary corridor. The Draft EIS/EIR noted that the existing pedestrian bridge did not conform to ADA requirements because of the steep grade of its access ramps. The Draft EIS/EIR proposed new ground-level crosswalks on the west and east sides of the intersection.

Comments on the Draft EIS/EIR from agencies, organizations, and individuals expressed substantial concern about removing this bridge. Many commenters questioned the safety of the proposed ground-level crossings, particularly for groups of children attending nearby schools. Appendix L (Responses to Comments) includes more information.

After publishing the Draft EIS/EIR, SFCTA and SFMTA met with stakeholder groups who submitted comments on this particular issue. In studying the issue more closely, SFCTA and SFMTA found that retaining the Webster Street bridge would impact bus service by just one second. This would have a negligible effect on transit and auto travel times throughout the corridor.

Therefore, the Hybrid Alternative/LPA would retain the Webster Street pedestrian bridge, and it also includes the following two pedestrian surface crossings on either side of the intersection:

- A straight crossing on the west side of the intersection incorporating pedestrian refuge areas; and
- A staggered crossing on the east side that would improve pedestrian sight distance at the westbound frontage road, where pedestrians would cross in front of existing bridge piers so they would not be obscured when crossing. Signal timing design would allow pedestrians to cross in one cycle, with multiple wide medians providing pedestrian refuge areas across the Geary corridor. A pedestrian barrier would be installed on the center median of the staggered crossing to guide pedestrians to the second crossing.

In the westbound direction, the Webster Street approach would not have a dedicated bus lane. Buses could either share the outside lane with right-turning vehicles, or share the through lane with frontage road traffic. A westbound side-running bus-only lane would begin after crossing the Geary Boulevard/Webster Street intersection.

2.2.7.5.2 | REMOVAL OF PROPOSED BRT STOPS BETWEEN SPRUCE AND COOK STREETS

The Hybrid Alternative in the Draft EIS/EIR proposed to add BRT stops on the north and south sides of the block of Geary Boulevard between Spruce and Cook streets (see Tables 2-3 and 2-4). Several commenters opposed the proposed BRT stops, citing concerns over the loss of the on-street parking spaces on this block. Numerous commenters cited such parking loss as detrimental to businesses.

After publishing the Draft EIS/EIR, SFCTA and SFMTA consulted extensively with stakeholders in this area about potential project changes. The local agencies ultimately proposed to modify the Hybrid Alternative to drop the two BRT stops proposed for this area. Instead, the Hybrid Alternative would incorporate the existing bus stops (westbound, on the near side of Spruce Street; eastbound, also on the near side of Spruce Street) as local and express stops. These two stops would retain their existing physical configurations under the Hybrid Alternative/LPA and retain existing local and express services.

2.2.7.5.3 | ADDITION OF MORE PEDESTRIAN CROSSING AND SAFETY IMPROVEMENTS

In the Draft EIS/EIR, the Hybrid Alternative proposed a total of 65 new pedestrian crossing bulbs along the Geary corridor. This total included 14 that were associated with the No Build Alternative, plus 51 more associated with the Hybrid Alternative, as well as all other build alternatives. These features addressed a key aspect of the established need for the project, namely improving unfavorable pedestrian conditions in the Geary corridor.

As noted in Section 2.1.1, a combination of an agency initiative focused on improving pedestrian safety (Vision Zero) along with responses to comments on the Draft EIS/EIR about pedestrian safety, led SFCTA and SFMTA to add the following several enhancements to the Hybrid Alternative: 26 additional pedestrian crossing bulbs (for a total of 91), a painted safety zone at Taylor and O'Farrell streets, and implementation of "daylighting" at strategic intersection locations along the Geary corridor.[16] The additional pedestrian crossing bulbs were added for safer travel to transit stops and to address areas where pedestrian injury rates are high.

The complete list of additional pedestrian improvements added to the Hybrid Alternative is as follows.

- **Pedestrian Crossing Bulbs:** Twenty-six additional pedestrian crossing bulbs as described below.
  - **Mason Street/Geary Intersection:** A pedestrian crossing bulb along Mason Street at the southeast corner.
  - **Taylor Street/Geary Intersection:** A pedestrian crossing bulb along Taylor Street at the southwest corner.
  - **Jones Street/Geary Intersection:** Pedestrian crossing bulbs along Jones Street at the southwest and southeast corners.
  - **Jones Street/O'Farrell Intersection:** Pedestrian crossing bulbs along Jones Street at the northeast and southwest corners.
  - **Leavenworth Street/Geary Intersection:** Pedestrian crossing bulbs along Leavenworth Street at the northeast and southwest corners.
  - **Leavenworth Street/O'Farrell Street Intersection:** A pedestrian crossing bulb along Leavenworth Street at the northwest corner.
  - **Hyde Street/Geary Intersection:** Pedestrian crossing bulbs along Hyde Street and Geary at the northwest corner, and a pedestrian crossing bulb along Hyde Street at the southeast corner.
  - **Hyde Street/O'Farrell Street Intersection:** Pedestrian crossing bulbs along Hyde Street at the northeast and southwest corners.

[16] "Daylighting" is achieved by removing parking spaces adjacent to curbs around an intersection, increasing visibility for pedestrians and drivers and minimizing conflicts.

- » **Larkin Street/Geary Intersection:** A pedestrian crossing bulb along Larkin Street at the southwest corner.
- » **Larkin Street/O'Farrell Street Intersection:** Pedestrian crossing bulbs along Larkin Street at the northwest and southeast corners.
- » **Laguna Street/Geary Intersection:** A pedestrian crossing bulb along Laguna Street at the northwest corner.
- » **Buchanan Street/Geary Intersection:** A midblock pedestrian crossing bulb along the south side.
- » **Fillmore Street/Geary Intersection:** A pedestrian crossing bulb along Fillmore Street at the southeast corner.
- » **Steiner Street/Geary Intersection:** Pedestrian crossing bulbs along Steiner Street at the northwest and southwest corners.
- » **Scott Street/Geary Intersection**: Pedestrian crossing bulbs along Scott Street at the northeast and southeast corners.
- » **Baker Street/Geary Intersection:** A pedestrian crossing bulb along Baker Street at the northwest corner.
- » **Cook Street/Geary Intersection:** A pedestrian crossing bulb along Geary at the southwest corner.

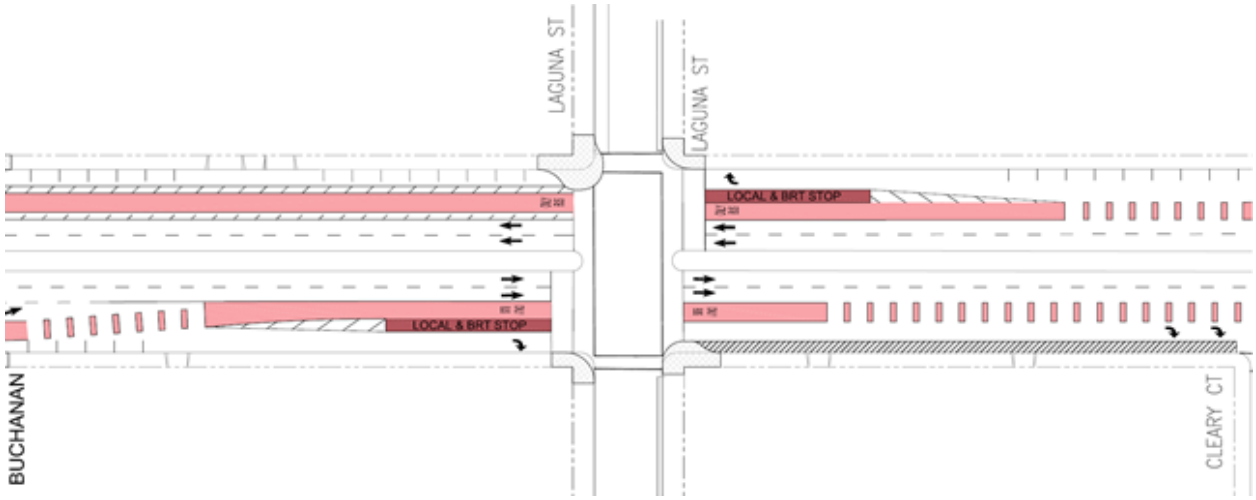
- **Painted Safety Zone**
  - » **Taylor Street/O'Farrell Street Intersection:** A painted safety zone along Taylor Street at the northwest corner.
- **Daylighting**
  - » All approaches on the Geary corridor would have advanced limit lines painted and between 10 feet to 30 feet of daylighting to increase visibility of pedestrians by drivers.
  - » All side streets intersecting with the Geary corridor within the project site would have advanced limit lines painted and 5 feet to 20 feet of daylighting to increase visibility of pedestrians by drivers.

2.2.7.5.4 | ADDITION OF BRT STOPS AT LAGUNA STREET

The Hybrid Alternative in the Draft EIS/EIR proposed to designate the existing curbside bus stops at Laguna Street as being served only by local buses. The change at this location would instead designate Laguna Street as a stop on the BRT line in the form of combined local/BRT stops in each direction located on new transit islands, as shown in Figure 2-21.[17] In the revised design, passengers would board from transit islands that would separate right-turning vehicles from the bus lane to minimize transit delay and improve traffic safety. SFCTA and SFMTA proposed this change in response to numerous comments on the Draft EIS/EIR from area residents (see Appendix L, Master Response 1b).

[17] San Francisco Municipal Transportation Agency and San Francisco County Transportation Authority. *Analysis of Geary Corridor Stop Options at Laguna Street*. September 14, 2016. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market St., 22nd Floor, San Francisco, CA 94103.

Figure 2-21 Combined Local/BRT Bus Stop Design at Laguna Street



Source: SFMTA and SFCTA, 2016

2.2.7.5.5 | RETENTION OF EXISTING LOCAL AND EXPRESS STOPS AT COLLINS STREET

The Hybrid Alternative in the Draft EIS/EIR had proposed to remove the existing local and express bus stops at Collins Street. Modifications to the Hybrid Alternative/LPA would retain the existing bus stops in their curbside configurations. This change was made in response to comments from the community (see Appendix L, Master Response 1b).

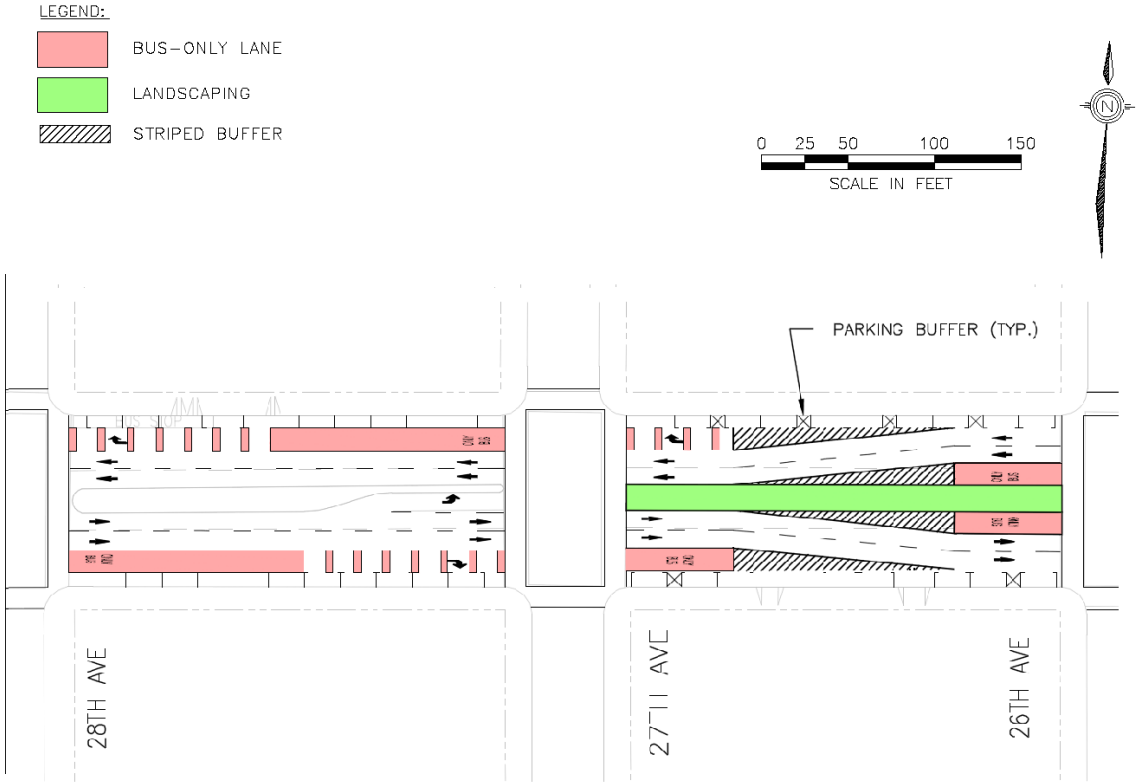
2.2.7.5.6 | RELOCATION OF THE WESTBOUND CENTER- TO SIDE-RUNNING BUS LANE TRANSITION

After publication of the Draft EIS/EIR, certification of the Final EIR, and selection of the LPA, SFCTA and SFMTA proposed a sixth minor change to the Hybrid Alternative regarding the transition from center- to side-running bus-only lanes in the western portion of the Geary corridor in the Outer Richmond. SFCTA approved this change in June 2017.

Figure 2-22 shows the Hybrid Alternative analyzed in the Draft EIS/EIR and Final EIR. The transition from center- to side-running bus-only lanes was placed between 26th and 27th avenues for both the eastbound and westbound bus lanes.

This transition area is on the block including Holy Virgin Cathedral (6210 Geary Boulevard), a religious and community facility.

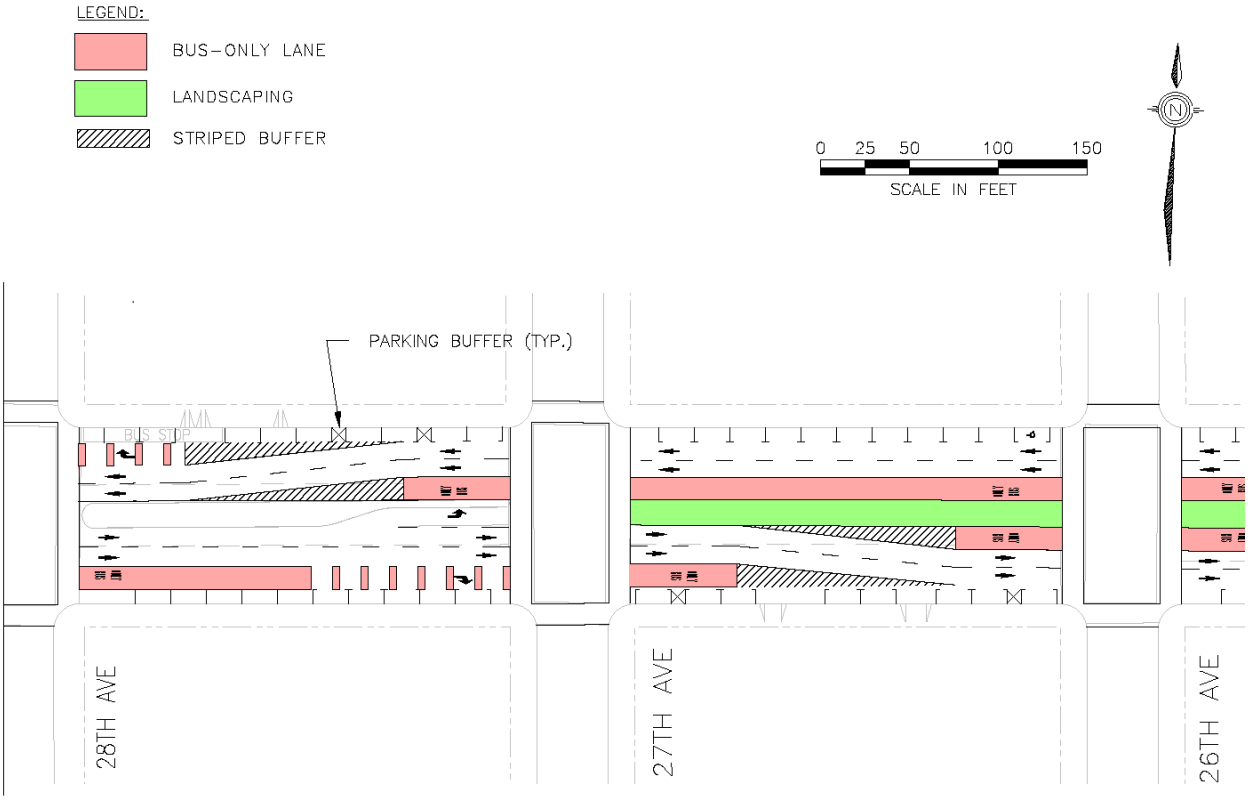
Figure 2-22 Hybrid Alternative Bus Lane Configuration between 26th and 28th Avenues Proposed in the Draft EIS/EIR and Final EIR



Source: SFMTA, 2017

In response to concerns from representatives of Holy Virgin Cathedral that the transition area would result in access concerns along the westbound lanes of Geary Boulevard, including on-street parking and loading areas, SFCTA and SFMTA modified the transition as follows: The westbound transition would shift one block to the west, to the block between 27th and 28th avenues; the eastbound transition would remain between 26th and 27th avenues on the south side of Geary Boulevard, opposite Holy Virgin Cathedral. Figure 2-23 depicts this change.

Figure 2-23 Hybrid Alternative/LPA Bus Lane Configuration Change between 26th and 28th Avenues



Source: SFMTA, 2017

2.2.7.5.7 | HYBRID ALTERNATIVE/LPA PROPOSED CONSTRUCTION PHASING

Since publication of the Draft EIS/EIR, certification of the Final EIR, and SFCTA's selection of the Hybrid Alternative as the LPA, SFCTA and SFMTA have advanced their plans for project implementation and divided the project into two primary construction phases. SFCTA addressed this refinement in a June 2017 CEQA addendum that included the following:

- **Phase I** would generally entail work east of Stanyan Street where BRT would operate in side-running bus-only lanes.
- **Phase II** would include work west of Stanyan Street, where BRT operations would be in predominantly center-running bus-only lanes.

Phase I would extend the existing side-running bus-only lanes from Downtown west to Stanyan Street. Bus stops on this segment of the Geary corridor (Stanyan Street to Market Street) would also change, in accordance with project plans.[18] Other improvements included in Phase I would entail traffic signal work, pedestrian improvements, and new bus bulbs between Stanyan and Market streets. Signal work would include installation of new signals, queue-jump signals, new pedestrian countdown signals, and other

[18] All work south of Market Street will be constructed separately, as part of the Transbay Transit Center District Plan; see Section 2.8.1.2 for further details.

general modifications. Traffic signal retiming and installation of fiber TSP would be included. New pedestrian crossing bulbs and/or medians, as well as bus bulbs, would be added at various intersections. Upon completion, all intersections between Stanyan and Market streets would have continental crosswalks, advanced limit lines, and red zone intersection daylighting for improved pedestrian visibility.

The Steiner Street pedestrian overcrossing would also be removed in Phase I and replaced with at-grade, high-visibility crosswalks and pedestrian refuges. Fiber optic conduit would be installed between Stanyan and Gough streets to make the existing corridor's TSP more reliable. Utility modifications by SFPUC and SFPW coordinated with the project are likely to include water main replacements from Stanyan Street to Market Street, and sewer replacements between Van Ness and Masonic avenues.

The bicycle facility improvements on the Geary corridor between Masonic and Presidio avenues would be one exception to the geographic limits that separate Phase I and Phase II. These improvements include reconfiguring the center median island to accommodate a new dedicated bicycle facility. Due to the longer design schedule for these improvements, they would be implemented through the contracting mechanism used to deliver the Phase II improvements west of Stanyan Street. All transit improvements in this area, including bus-only lanes, bus stop consolidation, and a queue-jump traffic signal, would still be part of Phase I.

In the planned Phase II, center-running bus-only lanes would be created from 28th Avenue to Palm Avenue in the eastbound direction and between Palm to 27th avenues in the westbound direction. In center-running areas, existing medians and plantings would be removed and replaced with bus-only lanes with new dual medians and new landscaping. Phase II would also include the installation of side-running bus-only lanes from 27th and 28th avenues to 34th Avenue.

Traffic signal modifications, pedestrian improvements, bus stop changes, and construction of bus bulbs, similar to Phase I, would occur in Phase II on the segment of the Geary corridor between 34th Avenue and Stanyan Street. Fiber optic conduit would be installed between 25th Avenue and Stanyan Street to accommodate fiber TSP. Project-related sewer relocation would occur in the area between Funston and 12th avenues. In addition, coordinated sewer replacement work would likely occur between Fourth and 14th avenues.

Construction for planned Phase I improvements construction would begin after appropriate federal project approvals are received and the project design is finalized. The preliminary and detailed design for the improvements planned in Phase II would take longer to complete. No temporal or geographic overlap (except for the bicycle facility improvements described above) is anticipated in construction between Phases I and II.

Chapter 9 (Financial Analysis) includes additional details about proposed funding by phase.

2.3 Evaluation of Alternatives

Although the Draft EIS/EIR identified the Hybrid Alternative as the SFCTA's and SFMTA's staff-recommended alternative, and the Hybrid Alternative was subsequently adopted as the LPA, the Draft EIS/EIR did not identify the lead agency's preferred alternative under NEPA.

This section documents the lead agency's evaluation of alternatives and identification of both an environmentally preferable alternative and a preferred alternative.

In the Council on Environmental Quality's guidance document, *40 Questions*, the response to Question 4a provides the following guidance on the nature of the preferred alternative:

> *The "agency's preferred alternative" is the alternative which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors. The concept of the "agency's preferred alternative" is different from the "environmentally preferable alternative," although in some cases one alternative may be both.*

In considering a preferred alternative, the lead agency considered many factors including:

- The ability of project alternatives to meet the purpose and need established for the project (defined in Section 1.5).
- The economic feasibility of the project alternatives.
- Environmental effects of the project alternatives.
- Local agency decision-making subsequent to publication of the Draft EIS/EIR.

Consistent with all of the above factors, as well as input received during public outreach, SFCTA and SFMTA developed a set of evaluation criteria to identify an LPA. These criteria also serve as a basis for the lead agency to identify a preferred alternative. These criteria are listed and further discussed below.

- **Transit Performance**
  - Vehicle travel time – Bus p.m. peak travel time, local and BRT service.
  - Reliability – Difference between average and 95th percentile bus travel time.
  - Ridership – Daily boardings for all Geary corridor services.
- **System Performance**
  - Person-delay (auto and transit) – Delay per person per intersection during p.m. peak along the Geary corridor.
  - Diversions – Increase in p.m. peak hour traffic on nearby parallel streets.

- **Environmental Effects**
    - Parking opportunities – Change in number of all types of curb spaces.
    - Trees and landscaping provided – Percent of existing trees retained, and the median area available for landscaping opportunities.
- **Pedestrian Access and Safety**
    - Ease of access to bus stops – Average maximum walk to closest local bus stop, and average maximum walk to closest BRT stop.
    - Pedestrian safety improvements – Opportunity for pedestrian crossing bulbs in optimal locations, and the elimination of permissive-phase left-turn signals or conversion to protected-phase signals.
- **Rail-Readiness**
    - Ease of conversion to rail – Extent of future construction to accommodate rail service.
- **Cost**
    - Construction cost – Total construction cost.
    - Operations and maintenance costs – Annual operating cost, and annual maintenance cost.
- **Construction Impacts**
    - Access to businesses during construction – Length of construction duration.

2.3.1 | Transit Performance

Vehicle travel time. As described in Section 3.3.4.5, throughout the corridor, all build alternatives would reduce BRT bus travel times by about 15 to 35 percent in 2035 compared with Rapid bus travel time in the No Build Alternative. The Hybrid Alternative/LPA would be slightly faster than Alternative 2, although slightly slower than Alternatives 3 and 3-Consolidated.

Reliability. Transit reliability is measured using the difference between the average bus travel time in each alternative and the 95th percentile travel time, which for a weekday round-trip commuter would correspond roughly to the worst travel time experienced on any one commute journey over a two-week period.

As described in Section 3.3.4.8, by 2035, the build alternatives would reduce 95th percentile additional travel time for the Rapid service (associated with the No Build Alternative) by approximately 2-3 minutes. (In other words, the BRT service associated with the build alternatives would outperform the Rapid service associated with the No Build Alternative). This represents a 20-percent or better reliability improvement. Differences among build alternatives would be relatively small.

Ridership. As described in Section 3.3.4.2, in scenarios evaluated for opening and buildout years, the No Build Alternative would attract the lowest ridership – 77,000 daily trips in 2035. Of the build alternatives, Alternative 2 would attract the lowest ridership (92,000 daily trips in 2035). Alternative 3-Consolidated would attract the highest ridership (99,000 daily trips in 2035). Alternative 3 and the Hybrid Alternative/LPA would attract ridership levels of about 95,000 daily trips in 2035.

2.3.2 | System Performance

Person-delay. The build alternatives would reduce person-delay hours during the p.m. peak hour by 12 to 16 percent relative to the No Build Alternative. Alternative 2 would reduce person-delay by 16 percent; Alternative 3 by 12 to 16 percent; and the Hybrid Alternative/LPA by 12 percent (see Sections 3.3.4.6 and 3.3.4.7).

Diversions. All of the build alternatives would convert one mixed-flow travel lane in each direction to bus-only lanes. The environmental analysis considered the potential for each alternative to divert traffic that would otherwise have used the Geary corridor to nearby parallel streets as a result of implementing a build alternative. Tables 3.4-7 and 3.4-8 show how Alternatives 3 and 3-Consolidated would result in the most diverted traffic during the p.m. peak hour. The Hybrid Alternative/LPA would divert somewhat fewer vehicles than Alternatives 3 and 3-Consolidated, but more than Alternative 2. The No Build Alternative would result in negligible diversions because no lane changes are anticipated.

2.3.3 | Environmental Effects

Parking opportunities. The No Build Alternative would result in minimal changes to parking in the Geary corridor. The build alternatives would result in elimination of on-street parking spaces in at least some portions of the corridor. Alternative 2 would remove about 460 on-street parking spaces (27 percent) on the Geary corridor, or about 4 percent of the total public parking supply within one to two blocks of the corridor.

In comparison, the Hybrid Alternative/LPA would remove 24 percent of spaces (about 410 of the 1,680 on-street spaces), or about 3 percent of the total nearby public parking supply.

While Alternative 2 would result in parking losses distributed throughout the corridor, the Hybrid Alternative/LPA would minimize the number of spaces lost in the Richmond District between Arguello Boulevard and 25th Avenue, the core of a retail district with very limited off-street parking.

Alternative 3-Consolidated would have the lowest removal of parking spaces – about 210 spaces, or 13 percent, of the 1,680 on-street spaces, or 2 percent of the total nearby public parking supply owing to the proposed center-lane (with no bus passing lane) operations west of Gough Street.

Alternative 3 would result in the loss of about 430 on-street spaces (26 percent of on-street parking spaces in the corridor or about 4 percent of the

total nearby public parking supply), somewhat worse than the Hybrid Alternative/LPA (about 3 percent of the total nearby public parking supply). Alternative 3 would require removal of more parking spaces on account of its inclusion of bus passing lanes at various points along the Geary corridor west of Gough Street.

Trees and landscaping provided. The No Build Alternative would result in minimal changes to trees in the Geary corridor. The build alternatives would retain most of the existing trees corridor-wide, but some would need to be removed and replaced to accommodate street reconfigurations.

Alternative 2 would result in the removal and replacement of up to 156 trees, while the Hybrid Alternative/LPA would remove and replace up to 182 existing trees.

These stand in contrast to Alternatives 3 and 3-Consolidated, each of which would remove and replace more trees (253 and 268, respectively) owing to the longer length of center-lane construction (and related removal of planted medians).

The Hybrid Alternative/LPA would increase the amount of landscaped median area in the corridor from 3.1 acres to 3.5 acres, a 13 percent increase, by replacing the existing single median with two new medians between approximately Palm and 27th/28th avenues.

Alternative 2 would provide about the same amount of median area as the No Build Alternative (3.1 acres).

Alternatives 3 and 3-Consolidated would provide the greatest amount of median landscaping area (3.6 acres) due to the greatest extent of new dual median construction to accommodate center-running bus-only lanes, but would also require the most tree removal.

2.3.4 | Pedestrian Access and Safety

Ease of access to stops. The build alternatives include fewer bus stops than currently exist and would remain with the No Build Alternative. Most notably, the Hybrid Alternative/LPA would consolidate local and BRT stops between Arguello Boulevard and 34th Avenue. As a result, it would increase the average spacing between local stops from 720 feet to 1,090 feet, while the average spacing between Rapid/BRT) stops would increase from 1,540 feet to 1,740 feet. Alternatives 2 and 3 would have the greatest average spacing between BRT stops – 2,180 feet – while spacing between local stops would be 840 feet for Alternative 2, and 960 feet for Alternative 3. Alternative 3-Consolidated would have an average of 1,310 feet between BRT stops.

Pedestrian safety improvements. The build alternatives would include additional pedestrian safety improvements beyond those included in the No Build Alternative. Alternatives 2, 3, and 3-Consolidated would include construction of 51 additional crossing bulbs. A total of 65 new pedestrian crossing bulbs would exist in the Geary corridor, including the 51 from

these build alternatives plus the 14 crossing bulbs included in the No Build Alternative. The Hybrid Alternative/LPA would include construction of 77 additional crossing bulbs, which is 26 more than the other build alternatives. With the implementation of the Hybrid Alternative/LPA (77 crossing bulbs) and the No Build (14 crossing bulbs), a total of 91 new pedestrian crossing bulbs would be located along the Geary corridor.

2.3.5 | Rail-Readiness

Rail-readiness. None of the build alternatives would preclude the possibility of future conversion to rail, nor would the No Build Alternative preclude future rail construction.

2.3.6 | Cost

Construction cost. In terms of capital construction costs, the No Build Alternative and Alternative 2 would be the least expensive options. The No Build Alternative would add no BRT features and would add only previously planned or programmed improvements to the Geary corridor.

Alternative 2 would utilize much of the existing pavement and reuse or repurpose most of the existing median.

The Hybrid Alternative/LPA would require replacement of the existing single median in the Geary corridor from Palm Avenue to 27th/28th Avenues with new bus lanes and dual medians.

Alternatives 3 and 3-Consolidated would have by far the highest costs of the alternatives considered because of extensive construction of center lanes, including through the Fillmore Street underpass area and the Masonic Avenue tunnel.

Operations and maintenance costs. The annual cost to operate bus service on the Geary corridor is expected to increase over time due to anticipated increases in traffic congestion and anticipated higher ridership.

Under 2020 No Build Alternative conditions, operations/maintenance are expected to cost $36.7 million annually.

The build alternatives would improve bus travel time and reliability, attracting additional riders and necessitating further increases in service frequency to accommodate them. Annual operating and maintenance costs for Alternative 2 and the Hybrid Alternative/LPA are expected to be about $50 million, and costs for Alternatives 3 and 3-Consolidated are estimated to be about $46 million and $44 million, respectively.

2.3.7 | Construction Impacts

Access to businesses during construction. All build alternatives would involve significantly more construction than the No Build Alternative. The recommended construction approach would involve construction on multiple work zones of several blocks each to minimize the length of

disruption on any one block. Thus, construction in any individual work zone would be shorter than the length of time required to construct the entire project. Moreover, all build alternatives would incorporate measures to ensure access to businesses during construction.

Of the build alternatives, Alternative 2 would require the least amount of time for construction because it would have the fewest changes to the existing roadway configuration.

In contrast, Alternatives 3 and 3-Consolidated would require the longest construction time due to proposed activities such as filling the Fillmore Street underpass and constructing bus lanes and a passenger platform in the Masonic Avenue tunnel.

The Hybrid Alternative/LPA would be in the middle of the build alternatives in terms of construction duration. Proposed construction phasing for the Hybrid Alternative/LPA is detailed above in Section 2.2.7.6.7.

2.3.8 | Summary

In considering all the alternatives against the above selection criteria and project purpose and need, the No Build Alternative is notable for performing worst on several key indicators.

With regard to transit performance (including vehicle travel time, reliability and ridership), the No Build Alternative would be at least nine minutes slower than any build alternative and would be at least 20 percent less reliable than any build alternative. Travel time and reliability measures for the No Build Alternative are worse than those of the build alternatives because the No Build Alternative does not include infrastructure improvements like dedicated bus-only lanes. Consequently, the No Build Alternative would result in the highest amount of person-delay of all alternatives considered; ridership associated with the No Build Alternative would also be the lowest of all alternatives considered.

In addition, the No Build Alternative would provide the least degree of improvement to pedestrian safety in the Geary corridor. It would result in only 14 new pedestrian crossing bulbs, while the build alternatives would result in construction of an additional 51 to 77 new bulbs. The No Build Alternative also would not include signal upgrades and protected left-turn signals between Palm Avenue and 27th Avenue.

While the No Build Alternative would require substantially less construction than any of the build alternatives and would result in the removal of fewer existing parking spaces in the Geary corridor, the No Build Alternative would result in the lowest transit ridership over the long term, which translates to the least ability among alternatives to reduce long-term greenhouse gas and air pollutant emissions.

The project purpose, as defined in Chapter 1, includes improving transit performance and improving pedestrian safety and access to transit. As

summarized above and noted throughout this Final EIS, the No Build Alternative would perform worst of all alternatives considered in achieving these provisions of the project purpose.

Among build alternatives, as demonstrated above, between the Hybrid Alternative/LPA and Alternatives 2, 3 and 3-Consolidated, the Hybrid Alternative/LPA would meet the purpose and need by improving transit performance and pedestrian safety in the corridor while also reducing impacts in key areas of community concern. These key areas are highlighted below.

- The Hybrid Alternative/LPA would result in more adverse intersection impacts in 2035 (eight) than Alternative 2 (five), but it would result in fewer affected intersections than Alternatives 3 and 3-Consolidated (nine), and far fewer affected intersections than with the No Build Alternative (21).
- While Alternative 3-Consolidated would remove the least amount of existing parking spaces (12.5 percent on-street or 2 percent areawide relative to the No Build Alternative), the Hybrid Alternative/LPA would remove less parking (24 percent on-street or 3 percent areawide relative to the No Build) than Alternative 2 (27 percent on-street or 4 percent areawide relative to the No Build) and Alternative 3 (26 percent of on-street or 4 percent areawide relative to the No Build Alternative), particularly in the neighborhoods along the corridor where merchants have expressed concerns about on-street parking loss.
- While the Hybrid Alternative/LPA would result in more loss of existing trees (182) than Alternative 2 (156), it would provide more area and opportunities for new median landscaping than Alternative 2. Alternatives 3 and 3-Consolidated would result in greater losses of existing trees – 253 and 268, respectively. The No Build Alternative would not remove any trees.
- In terms of rail readiness, none of the project alternatives would preclude the possibility of future conversion to rail.

2.3.8.1 | ENVIRONMENTALLY PREFERABLE ALTERNATIVE

As demonstrated in Chapter 3 (Transportation) and Chapter 4 (Affected Environment, Environmental Consequences, and Avoidance, Minimization and/or Mitigation Measures), the alternatives have notably different construction and/or operational effects in the key areas of traffic, air quality, and noise.

Air Quality and Noise: The Hybrid Alternative/LPA (with or without the six modifications) would result in the greatest reduction in operational greenhouse gas emissions relative to the No Build Alternative.

Air pollutant emissions and noise/vibration effects, while not adverse for any of the build alternatives, would generally be less perceptible to sensitive receptors for the Hybrid Alternative/LPA (either with or without the six modifications) relative to Alternative 2. This is because the Hybrid

Alternative/LPA would include a substantial center-running bus-only segment; pollutant and noise/vibration associated with bus operations would be located further away from sensitive receptors than in a side-running bus-only lane configuration. Alternatives 3 and 3-Consolidated would perform similarly to the center-running portions of the Hybrid Alternative/LPA. However, both Alternatives 3 and 3-Consolidated would require intensive construction activities required to fill the Fillmore Street underpass and reconfigure the roadway through the Masonic Avenue tunnel. These activities would generate substantially more air pollutants, noise, and other disruptive impacts during construction than any of the other alternatives.

Traffic: The Hybrid Alternative/LPA would result in fewer (eight) intersections with adverse effects in 2035 compared with the No Build Alternative (21). Alternatives 3 and 3-Consolidated would each result in nine adversely affected intersections in 2035, and Alternative 2 would result in five.

While the Hybrid Alternative/LPA would have more adversely affected intersections than Alternative 2, the Hybrid Alternative/LPA would introduce substantially more long-term benefits not anticipated with Alternative 2. The Hybrid Alternative/LPA would also balance longer term impact reduction with less intensive short-term construction relative to Alternatives 3 and 3-Consolidated.

Conclusion: Based on all of these factors, pursuant to 40 CFR 1505.2, the Hybrid Alternative/LPA is the environmentally preferable alternative. Further, since the six modifications applied to the Hybrid Alternative/LPA did not result in any new or more severe environmental impacts from those described in the Draft EIS/EIR, the Hybrid Alternative/LPA would still have been identified as the environmentally preferable alternative if the six modifications had not been added.

Similarly, had the six modifications been added to any of the other build alternatives, the Hybrid Alternative/LPA would have remained the environmentally preferable alternative, as the modifications are minor in nature and would neither substantially alter any of the key differentiating impacts or benefits of the other build alternatives from what was described in the Draft EIS/EIR.

See Chapters 3 and 4 of this document for detailed analyses of impacts of the build alternatives, including the Hybrid Alternative/LPA with the six modifications.

2.3.8.2 | PREFERRED ALTERNATIVE

Consistent with Code of Federal Regulations, Title 23, Part 771.125; Code of Federal Regulations, Title 40, Part 1502.14(e); and Questions 4a and 4b of the Council on Environmental Quality's *40 Questions*, this Final EIS identifies the preferred alternative.

In considering all the alternatives against the above selection criteria and project purpose and need, the Hybrid Alternative/LPA is notable for

performing well in many key factors (without including the six minor modifications added after publication of the Draft EIS/EIR).

With regard to transit performance (including vehicle travel time, reliability, and ridership), the Hybrid Alternative/LPA would substantially improve vehicle travel time and reliability over existing conditions in comparison with the No Build Alternative. In terms of ridership, the three build alternatives that incorporate center-running bus lanes each would result in markedly stronger ridership over Alternative 2 (which would feature just side-running bus-only lanes) and stronger still over the No Build Alternative. For each of these transit performance factors, the six minor modifications do not substantially alter the performance of the Hybrid Alternative/LPA (see analyses presented in Chapters 3 through 6). Therefore, the minor modifications do not affect these considerations of identifying the preferred alternative.

While Alternatives 3 and 3-Consolidated would be stronger than the Hybrid Alternative/LPA in terms of reducing transit vehicle travel time, improving reliability, and increasing ridership, these alternatives would have capital costs about 43 to 45 percent greater than the Hybrid Alternative/LPA. These higher costs are associated primarily with implementing center running bus lanes through the Fillmore Street underpass (and raising the entire Geary corridor from the existing depressed section) and the Masonic Avenue tunnel. Because of the extensive construction associated with creating at-grade travel lanes (for buses and all vehicles) through the Fillmore Street area, Alternatives 3 and 3-Consolidated would have the greatest degree of construction-period impacts, particularly in terms of air pollutant emissions and noise/vibration. These construction-period effects would be offset in part by the longer-term increases in ridership that Alternatives 3 and 3-Consolidated could achieve over all other alternatives, but the cost increment associated with these two alternatives is substantial relative to the long-term benefits. As discussed in Chapters 3 and 4, the six minor modifications do not substantially change construction related effects of the Hybrid Alternative/LPA; Alternatives 3 and 3-Consolidated would still have much more extensive construction period effects. Therefore, the six minor modifications do not affect considerations of construction impacts. Further, as noted in Chapter 9, the six minor modifications do not change the cost estimate for the Hybrid Alternative/LPA. Therefore, the six minor modifications do not affect cost considerations in selecting a preferred alternative.

Overall, the analyses in Chapters 3 through 6 demonstrate that the Hybrid Alternative/LPA, inclusive of all six minor modifications, would not result in any new adverse effects or increase the severity of any such effects that were described for the Hybrid Alternative in the Draft EIS/EIR. Moreover, these modifications still enable the Hybrid Alternative/LPA to meet the project purpose and need to enhance the performance, viability, and comfort level of transit and pedestrian travel along the Geary corridor. Moreover, all modifications were developed at least in part in response to input from the public to enhance the overall experience for passengers and pedestrians along the corridor. One modification, the additional pedestrian

improvements, was in part a response to another agency initiative (Vision Zero) as well as in response to public comments on the Draft EIS/EIR related to concerns regarding the level of pedestrian facilities on the Geary corridor. Finally, the lead agency recognizes also that local agency SFCTA, in cooperation with SFMTA, identified the Hybrid Alternative as the LPA after unanimous selections by both the SFCTA and SFMTA Boards.

Based on all of the above facts, the lead agency identifies the Hybrid Alternative/LPA as the preferred alternative.

2.4 Construction Plan

Each of the build alternatives would require substantial construction activities to install bus-only lanes, construct bus and pedestrian crossing bulbs, complete necessary demolitions, install station facilities, and where applicable, protect or relocate utilities.

The Geary corridor is a major thoroughfare that cannot realistically be fully closed for any extended period. To generally allow through travel during construction, the overall construction method is proposed to follow what is known as a "Staggered Multiple Block Segment Approach." In this approach, there would be multiple active work zones, each about 5 blocks in length, each separated by about 5 blocks.

The duration of construction would differ by build alternative. Construction activities are projected to be completed in 90 to 130 weeks (about 21 to 30 months) if completed all at once for the entire corridor. The build alternatives involving the most extensive construction of center-running, bus-only lanes (Alternatives 3 and 3-Consolidated) generally have a longer duration than those with no or limited center-running bus only lanes (Alternatives 2 and the Hybrid Alternative/LPA). Section 2.2.7.5.7 includes more details about anticipated construction phasing of the Hybrid Alternative/LPA. The analytical sections of this Final EIS also include analysis of construction period effects for each alternative. Section 4.15 of the Final EIS provides further detail on construction and summarizes construction-related effects.

2.5 Capital Costs of Project Alternatives

As Chapter 9 (Financial Analysis) discusses in greater detail, all build alternatives have associated capital cost estimates based on conceptual, 10 percent level engineering design plans, and they are expected to be refined as the detail of design progresses toward 100-percent engineering design. The estimates, shown in Table 2-9, provide a preliminary tool to understand the relative cost of each alternative.

These costs include all the scope elements described in this chapter and analyzed in this document. Some of these scope elements are not strictly needed to provide and operate a BRT facility, but they otherwise benefit the

community in other ways or are needed to facilitate the continued management and stewardship of the City's street, streetscape, and utility systems as changes are made to the Geary corridor to accommodate BRT. These related improvements are therefore important to coordinate closely with the BRT components for construction. Examples of each type of scope element are as follows:

- **BRT Elements**: Includes new road surface and base for bus lanes where no surface exists, such as for center-running alternatives; new road surface for bus lanes where pavement condition is poor; new landscaped medians to accommodate bus lanes for center-running alternatives and segments; new bus bulbs; station platforms where none currently exist (such as for center-running bus-only lanes); station and stop passenger amenities; bus vehicles for increased service; right-turn pockets to improve bus flows; traffic signal modifications to improve bus flows and accommodate center-running bus-only lanes; and removal of the pedestrian bridges at Steiner Street (all build alternatives) and Webster Street (Alternatives 2, 3, and 3-Consolidated only) to provide bus lanes and accommodate improved street-level crossings and smoother traffic flows. In addition, elements such as underground sewer and water line relocations and replacements are needed to accommodate bus lanes, stations, and bus bulbs but represent opportunities for cost-sharing.
- **Related Improvements**: Includes new street lights; roadway base and surface repair for mixed-flow travel lanes; traffic signal modifications for pedestrian crossing enhancements; traffic signal underground communications; pedestrian crossing bulb-outs; new landscaping on existing medians; sidewalk and streetscape improvements; a street redesign between Masonic and Presidio avenues to accommodate bike lanes; and a street redesign between Gough and Scott Streets to accommodate a road diet to remove mixed-flow travel lanes.

Table 2-9 presents capital costs for the core and related improvements included in the four build alternatives, in Year of Expenditure (YOE) dollars. The total cost range of the alternatives is $170 million to $435 million. As Chapter 9 (Financial Analysis) describes further, the costs shown include hard construction costs, other costs such as soft costs for design engineering services, and contingencies to account for existing uncertainties that may impact project cost.

For federal funding purposes, the project cost estimate has been developed with separate costs for each scope element, and for some alternatives, including Alternative 2 and the Hybrid Alternative/LPA, the cost of the BRT scope elements is less than $300 million, making those alternatives eligible to compete for funds from the Federal Transit Administration's Small Starts program.

For BRT elements and the related improvements, there are also opportunities for cost-sharing with other city efforts, such as for re-surfacing and utility replacements, which the project will pursue.

Any potential cost-sharing would not change the capital costs shown in Table 2-9; it would only affect which agency (SFMTA or other local agencies) would provide funding.

Table 2-9 Capital Cost Estimates for Build Alternatives

BUILD ALTERNATIVE	DESCRIPTION	CAPITAL COST OF BRT ELEMENTS AND RELATED IMPROVEMENTS (YOE IN MILLION $)
Alternative 2	Side-Lane BRT	$170
Alternative 3	Center-Lane BRT with Dual Median and Passing Lanes	$430
Alternative 3-Consolidated	Center-Lane BRT with Dual Medians and Consolidated Bus Service	$435
Hybrid Alternative/LPA	27th/28th Avenue to Palm Avenue – Center-Lane BRT with Consolidated Service East of Palm Avenue – Side-Lane BRT	$300 Phase I: $65 Phase II: $235

Note: Phase I cost estimates include utility upgrades coordinated with the project (separate environmental clearance).
Source: SFCTA & SFMTA, 2017

2.6 Operating and Maintenance Costs of Project Alternatives

Table 2-10 illustrates the annual costs for SFMTA to run vehicles and provide revenue service for the No Build and the build alternatives. These estimates include the annualized vehicle operating costs in addition to the roadway maintenance costs. The operation cost of Alternative 2 and the Hybrid Alternative/LPA are the highest, and about 30 percent higher than the No Build Alternative. Alternatives 3 and 3-Consolidated have slightly lower operation costs – 27 percent and 20 percent higher than the No Build Alternative, respectively.

The build alternatives represent increases in transit service in anticipation of higher demand resulting from improved transit performance, and the service increases are intended to address crowding issues and accommodate more passengers. If service levels were to remain the same for every alternative, then, because of their improved bus travel times (see Section 3.3.4.5), the build alternatives would reflect lower vehicle operating costs than the No Build Alternative, with operating costs decreasing from No-Build to Alternative 2, further lower for the Hybrid Alternative/LPA, and lowest for Alternatives 3 and 3-Consolidated.

Note that these service plans and resulting operating costs are intended for analysis and comparison purposes only; ultimately, SFMTA will make service decisions based on the analysis of empirical ridership data and available resources, so actual service plans may vary.

Table 2-10 Annual Operating and Maintenance Costs for Proposed Service

COST TYPE	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE /LPA
Annualized Revenue Hour Vehicle Operating Cost*	$36,471,000	$48,409,000	$45,586,000	$43,322,000	$48,340,000
Other Incremental Annualized Operating and Maintenance Costs**	$251,000	$1,091,000	$596,000	$596,000	$858,000
Total Cost	$36,722,000	$49,500,000	$46,182,000	$43,918,000	$49,198,000

Note: Operating and vehicle maintenance costs based on National Transit Database (NTD); other roadway maintenance accounts for paving, pothole, red lane, and landscape costs.

* Vehicle cost type includes costs for operating the service and maintaining the vehicles.

** Other cost type includes busway surface maintenance and landscaping maintenance.

Source: SFMTA, 201

Table 2-10 also shows the total annual operating and maintenance costs for each alternative of the street infrastructure improvements. The build alternatives represent an increase in maintenance cost above the No Build Alternative. Increased maintenance costs include repairs to potholes and patches to the busway for the center-running alternatives; maintenance to the colorization treatment in the side-running bus-only segments; and additional landscaping and tree maintenance costs for the medians. The Hybrid Alternative/LPA maintenance costs would be higher than those of Alternatives 3 and 3-Consolidated due to the additional cost to maintain the colorization in the side-running bus-only segments. Furthermore, although not a major component of the busway maintenance costs, paving and pothole treatments cost less for the Hybrid Alternative/LPA than Alternatives 3 and 3-Consolidated due to its shorter center-running bus-only segment, which extends from 27th Avenue to Palm Avenue.

In summary, the estimated annual operations cost for the No Build Alternative is about $36.7 million. As shown in Table 2-10 above, annualized operations and maintenance costs for the build alternatives range from $43.9 million for Alternative 3-Consolidated (20 percent higher compared with the No Build Alternative), to $49.5 million for Alternative 2 (35 percent higher compared with the No Build Alternative). For the Hybrid Alternative/LPA, annualized operations and maintenance would cost $49.2 million, about 34 percent higher compared with the No Build Alternative.

2.7 Alternatives Development and Screening Process

SFCTA's Geary Corridor BRT Feasibility Study evaluated the feasibility of five conceptual design alternatives for the Geary corridor between 33rd Avenue and Van Ness Avenue. Completed in 2007, the Feasibility study found that BRT would be feasible in the Geary corridor and recommended environmental review and further design work to identify a preferred alternative.

In November 2008, the lead agency and SFCTA jointly issued federal and state required notices – Notice of Intent (NOI) and Notice of Preparation – announcing the agencies' intention to prepare a joint NEPA/CEQA environmental document (EIS/EIR).

Appendix B includes the Notice of Intent (NOI) and the Notice of Preparation (NOP)

SFCTA undertook a comprehensive outreach effort to inform the environmental scope and alternatives development, including three public scoping meetings and meetings with a project-specific Citizens Advisory Committee (CAC), Technical Advisory Committee (TAC), and numerous stakeholder groups.

After that scoping process, SFCTA conducted two additional screening steps in response to community feedback, then conducted a full evaluation of the remaining, refined set of build alternatives. Chapter 8 of this document (Public Participation) describes these public engagement and participation efforts.

Chapter 10 (Initial Development and Screening of Alternatives) describes several alternatives and configurations initially considered but withdrawn from further analysis. Chapter 10 also summarizes the selection of a staff-recommended alternative, as required by NEPA.

2.7.1 | Other Alternatives Considered

Many alternatives were considered during project development that occurred from 2009 to 2013, and they were documented in the SFCTA's 2007 Geary Corridor Bus Rapid Transit Study ("Feasibility Study"), its 2009 Alternatives Screening Report and the 2013 Design Options Screening Report.

Given the corridor's two distinct street configurations (i.e. two narrower one-way streets east of Gough, and one much wider two-way street west of Gough) numerous design options were examined for "typical cross-sections" of the Geary corridor. Chapter 10 (Initial Development and Screening of Alternatives) contains a complete description of the alternatives development and screening process for the Geary BRT project as well as further discussion of alternatives considered and withdrawn. These include numerous design options, service options, and roadway configuration options that were considered but rejected from further consideration as part of the alternatives development and screening process.

Additional options for Geary bus service were proposed by commenters on the Draft EIS/EIR. These commenters asserted that the build alternatives (all of which feature some configuration of bus-only lanes) were too costly to construct and that many project objectives could be achieved through a more "minimal" concept, without adding any new bus-only lanes beyond those already existing east of Gough Street. The commenters stated that increasing bus service frequency within stricter bus schedules, greater synchronization of traffic signals, roadway repaving, and minor upgrades to existing bus stops would provide similar if not greater benefits than the build alternatives, particularly in the area west of Masonic Avenue.

With a few exceptions, the concept described above has similarities to the No Build Alternative that was analyzed in the Draft EIS/EIR and the Final EIS. One key exception is that the No Build Alternative would not substantially increase bus service/frequency, but would instead reflect more modest changes in bus service/frequency consistent with the TEP/Muni Forward Program. In contrast, all build alternatives feature substantially higher bus service frequency than the No Build Alternative. The No Build Alternative does not feature substantially increased bus service/frequency because the No Build Alternative would not include the infrastructure necessary to support higher service frequencies and extended service hours. Without dedicated bus-only lanes in place to ensure competitive transit travel time and reliability, over time, simply adding more buses to an increasingly congested corridor would face increasingly longer run times, which would not support the project purpose of improving transit performance and reliability. In other words, adding more buses without infrastructure improvements (dedicated bus-only lanes) would not effectively address the travel time and reliability concerns, but would instead result in increased operating costs (more labor and fuel costs needed to operate more buses) with diminishing returns in service improvement. Moreover, this concept would not substantially address another key aspect of the project purpose – improving pedestrian conditions and pedestrian access to transit in the Geary corridor. As this "more buses" concept would not improve reliability, pedestrian conditions, or the transit passenger experience, it would not meet many of the project purposes and thus was not considered further.

2.8 Related and Planned Projects

In addition to the projects integrated in the No Build Alternative, several projects are planned within or near the Geary corridor that could overlap with the proposed project's construction schedule. A discussion of these other planned projects follows.[19]

[19] These locally planned projects are also used in the cumulative impact analysis (Chapter 5) and are considered reasonably foreseeable.

2.8.1 | Local Projects

2.8.1.1 | LOCAL TRANSPORTATION PROJECTS

Several local transportation projects are planned that traverse or overlap the proposed project or are in the project vicinity. Projects expected to be implemented by the time construction begins for the Geary Corridor BRT project are described below.

Van Ness Avenue BRT. SFCTA and SFMTA propose to implement BRT improvements along Van Ness Avenue from Lombard Street in the north to Mission Street in the south. SFCTA completed a feasibility study for BRT for Van Ness Avenue in 2006 and concluded environmental studies in 2012. SFMTA and SFCTA Boards certified the EIR in September 2013, and the lead agency issued a Record of Decision (ROD) for the EIS in December 2013. Final design activities were completed in 2016 and construction began in November 2016. Revenue service is projected to begin in 2020.

Central Subway Project. The Central Subway Project is the second phase of San Francisco's Third Street Light Rail Project. The project consists of a 1.7-mile extension of the Muni Metro T line from the Caltrain Station (Fourth and King streets) to Chinatown. The portion of the alignment between Bryant Street and Chinatown would be in a new subway. Project construction began in 2010 and is expected to be completed in 2018.

Masonic Avenue Streetscape Improvements Project. This SFMTA project proposes a series of improvements on Masonic Avenue between Geary Boulevard and Fell Street to more safely and efficiently accommodate the needs of all users. Major improvements include the addition of a landscaped median, raised cycle tracks, bus bulbs, and creation of a public plaza at the southwest corner of the Geary Boulevard/Masonic Avenue intersection. Construction began in July 2016 and is anticipated to end in January 2018.

Octavia Boulevard Enhancement Project. Guided by the Market-Octavia Area Plan, the Octavia Boulevard Enhancement Project is a series of capital projects to make the boulevard and surrounding streets safer, more pedestrian-friendly, and better at balancing competing demands. These include pedestrian crossing bulbs on Hayes Street at its intersections with Laguna and Buchanan streets (construction phase, estimated completion spring 2018); a pedestrian crossing bulb, extended center medians, and landscaping at the Oak Street/Octavia Boulevard intersection (construction phase; estimated completion spring 2018); traffic safety and streetscape upgrades from Webster Street to Market Street (concept design phase, estimated construction start in 2019); Market Street/Octavia Boulevard intersection improvements and potential circulation changes (concept design phase, estimation construction start in 2019); and sustainable streetscape upgrades along the northbound local lane of Octavia Boulevard from Page Street to Patricia's Green (concept design phase, estimated construction start in 2019). Areawide crosswalk upgrades and other spot improvements were completed in 2015 and 2016.

RESOURCE

Other projects are planned within or near the Geary corridor, including:

- Van Ness BRT
- Central Subway Project
- Red-colored Bus-only lanes from Market to Gough Streets
- Masonic Avenue Streetscape Improvement Project
- Octavia Boulevard Enhancement Project
- Polk Street Improvement Project
- TEP/Muni Forward
- WalkFirst
- SFgo

Polk Street Improvement Project. As identified in the San Francisco Bicycle Plan, the Polk Street Bicycle Lane project would involve improving the existing bicycle facilities on Polk Street between McAllister and Union streets and implementing aesthetic and safety improvements. Proposed changes near Geary and O'Farrell streets include the installation of a green-painted, road-level bicycle lane with plastic safe-hit posts and a painted buffer zone to separate it from the travel lanes in the northbound direction, and a green-painted bicycle lane in the southbound direction. The project underwent alternatives development and public outreach from 2012-2014. SFMTA Board approved the project in 2015, and detailed design was completed from 2015-2016. Construction began in 2016, and it is anticipated to end in 2018.

TEP/Muni Forward. Initiated in 2005, the TEP was SFMTA's comprehensive operations analysis of its transit system. The TEP's central goal was to identify transit service improvements to improve efficiency and meet emerging travel demand patterns. The proposed improvements identified included route restructuring, frequency improvements, vehicle type changes, and bus stop and roadway changes. In 2009, SFMTA finalized its recommended improvements, which included the Geary corridor in its citywide rapid network and identified it as a high-priority route for BRT treatments. The TEP's Draft EIR was released in 2013, and the Final EIR was certified in March 2014. After completion of environmental review, TEP improvements have been implemented under a brand of SFMTA improvements called Muni Forward. Muni Forward improvements on Geary including increased midday and peak-period transit service, as well as expansion of Rapid stop service to Sundays, have since been implemented. Other changes that would affect the Geary corridor include: the addition of a stop at Van Ness Avenue for the 38AX and 38BX lines;[20] and installation of transit priority improvements at the following locations:

- 32nd Avenue from California Street to Geary Boulevard;
- Geary Boulevard from 32nd Avenue to 34th Avenue;
- 34th Avenue from Geary Boulevard to Clement Street.

San Francisco Pedestrian Safety Capital Improvement Programs: WalkFirst and Vision Zero. WalkFirst is a five-year plan that will implement pedestrian safety upgrades at 170 priority intersections, including 25 located in this project's study area, starting in 2014. The WalkFirst plan targets the 6 percent of streets on which 60 percent of the City's pedestrian injuries occur. Proposed improvements at these locations include adding new bulb-outs, signal timing changes, high-visibility crosswalks, and roadway striping changes. WalkFirst is part of the City's larger Vision Zero program, a goal to eliminate serious traffic injuries and fatalities by all modes by 2024.

SFgo. SFMTA operates traffic signals citywide, including along the Geary corridor. SFMTA is implementing an advanced traffic signal management program called SFgo that operates all of SFMTA's traffic signals. Some

[20] As the 38AX and 38BX lines use Bush Street and Pine Street east of Masonic Avenue, any new stops associated with the TEP would be at Van Ness Avenue and Bush Street/Pine Street, not at Van Ness Avenue and Geary Street.

traffic signals are proposed for upgrade/replacement in order to provide needed functionality for the SFgo program. The SFgo program would implement the signal priority operation needed for Geary BRT. The installation would be done in conjunction with the Geary BRT project.

Pavement Rehabilitation. SFPW is responsible for the maintenance of all local streets, including the Geary corridor's pavement, with the exception of State-owned and operated facilities Park Presidio Boulevard and Van Ness Avenue, which fall under the jurisdiction of Caltrans. Planned improvement projects would be coordinated with construction of the proposed BRT project and the aforementioned utility projects.

Road Repaving and Street Safety Bond Projects. A $248 million Road Repaving and Street Safety Bond (Proposition B) was approved by voters in November 2011, and it was recommended as part of the citywide Ten-Year Capital Plan to improve and invest in the City's infrastructure. The bond will repave streets, make repairs to deteriorating street structures, improve streetscapes for pedestrian and bicyclist safety, improve traffic flow on local streets, and install sidewalk and curb ramps to conform to ADA requirements.

2.8.1.2 | LOCAL PLANNING PROJECTS

RESOURCE

For more information on Better Market Street, visit http://bettermarketstreetsf.org

Better Market Street. This project proposes to build improvements on Market Street to improve mobility between Octavia Boulevard and Steuart Street through reliable and efficient transit service and improved conditions for pedestrians and bicyclists. The initial stages of this project included preliminary studies, outreach, concept development, and identification of options to be evaluated in environmental studies (2011-2013). The project is currently undergoing environmental review, which is anticipated to be completed in 2019, with the design phase and the announcement of contract bids to follow. Construction is anticipated to begin in 2020.

CPMC Cathedral Hill Campus. As a component of CPMC's Long-Range Development Plan Project, the medical facility proposes to establish a new medical campus that would include a new *hospital* and new *medical office building* at the intersection of Geary Street and Van Ness Avenue. The new hospital would replace the existing Cathedral Hill Hotel and the 1255 Post Street Office Building, which comprise the entire block bounded by Geary Street, Van Ness Avenue, and Post and Franklin Streets.

The proposed *hospital* would be located on the northwest intersection of Geary Street and Van Ness Avenue. This new facility would be an about 225-foot-tall, 730,000-gross square foot, 274-bed, acute-care hospital with an underground parking garage. The entry and exit to the hospital's parking garage would be on Geary Street between Franklin Street and Van Ness Avenue. Emergency vehicles would enter and exit via Franklin Street.

The proposed *medical office building* would be located on the northeast intersection of Geary Street and Van Ness Avenue. This building would be 9 stories, about 130 feet tall, and would contain about 262,000 gross square feet of floor area along with an underground parking garage. The building's main entrance would be on Van Ness Avenue, with a dedicated passenger

drop-off location on Cedar Street. The entry to the building's parking area would be on Geary Street between Van Ness Avenue and Polk Street, and the exit would be on Cedar Street between Van Ness Avenue and Polk Street.

Van Ness Avenue would provide the main pedestrian entrances for both the proposed hospital and medical office building. An underground tunnel would provide a connection between the medical office building and hospital. Demolition of the existing hotel was completed in 2014, with construction of the hospital, medical office building, and tunnel projected to continue through 2019.

Central SoMa Plan (Draft). The Central SoMa Plan (draft plan released April 2013 and revised plan released August 2016) encompasses the area bounded by Market, Townsend, Second, and Sixth streets. The plan seeks to encourage and accommodate both housing and employment growth in this transit-rich area. The Draft EIR was released in December 2016. Hearings on the plan have continued through 2017.

Japantown Cultural Heritage and Economic Sustainability Strategy. Building off its Draft Japantown Better Neighborhood Plan (2009), the San Francisco Planning Department initiated a process in 2013 to support economic development in this area, preserve and enhance its historic and cultural uses and buildings, and make physical enhancements within the project area. Focused on the neighborhood's cultural heritage, strategies being explored include creating a community development corporation, land trust, or community benefits district; implementing physical improvements to Peace Plaza and Buchanan Mall; and others.

Market Street Hub Project. The Hub neighborhood was included within the boundaries of the Market Street and Octavia Area Plan, adopted in 2008. The Hub Project seeks to increase affordable housing, support transit enhancements, improve the urban form, enhance the public realm, and encourage the arts. Environmental review began in October 2016 and is expected to be completed in October 2018, with project adoption hearings expected in November 2018.

Powell Streetscape Project. The Powell Streetscape project will design and construct a new streetscape layout for Powell Street between Geary and Ellis streets to enhance the quality and use of the public realm, improve safety for all street users, improve cable car safety and performance, and renew transportation infrastructure. Building on the Powell Promenade parklets implemented in 2011 and the Powell Street Safety and Sidewalk Improvement Pilot implemented in 2015, the project, if approved, will implement a permanent streetscape design including wider sidewalks, reduced vehicle volumes, and improved loading for businesses and hotels. The project is expected to complete engineering and design work in 2020, and begin construction in 2021.

Transbay Transit Center District Plan. The San Francisco Planning Department developed this plan in 2012 with the Transbay Joint Powers Authority and the former SF Redevelopment Agency to develop San Francisco's downtown neighborhood with residential, office, and retail uses. The plan includes mechanisms to direct any increased development value to help pay for the construction of the Transbay Transit Center and other public improvements (e.g., affordable housing, public facilities, and circulation improvements). The plan builds on San Francisco's 1985 Downtown Plan that envisioned the area around the Transbay Transit Center as the heart of the new, more intensively developed downtown. All 38 Geary lines would originate/terminate at the new Transbay Transit Center once completed (as of 2014, these lines originate/terminate at the temporary Transbay Terminal at Howard and Main streets).

Earthquake Safety and Emergency Response Bond (ESER BOND). The improvements covered within the ESER BOND are divided into two bond measures, 2010-ESER and 2014-ESER.

2010 ESER Bond work is currently under way and includes construction of a new cistern on Funston Avenue just north of Geary Boulevard. The work involves sewer relocation on Funston Avenue from Geary Boulevard to Clement Street.

In June 2014, San Francisco voters approved the 2014 ESER Bond. This bond will include a range of improvements to the system including an extension of the AWSS pipeline in the Richmond District. The extension is planned to run beneath Geary Boulevard from 26th Avenue to 43rd Avenue.

Sewer System Improvement Program: Since 2012, SFPUC has been implementing a 20-year, citywide program to upgrade aging sewer infrastructure. The program is intended to improve seismic safety and improve the quality of water discharged. SFPUC's program includes replacement of sewer mains along and near the Geary corridor.

Westside Recycled Water Project (2017–2020). The Westside Recycled Water Project would be constructed at the SFPUC's existing Oceanside Water Pollution Control Plant (WPCP). The project would produce and deliver up to 2 million gallons per day on average of recycled water that is suitable for state-approved recycled water uses. Construction of the project began in September 2017 and is expected to be complete in spring 2020.

The WPCP planning study indicates that the pipeline is planned to cross Geary Boulevard at 39th Avenue.[21] Depending on the construction schedule, work associated with the WPCP may need to be coordinated with implementation of any of the build alternatives.

[21] San Francisco Westside Recycled Water Project - Project Alternatives Workshop Series, Evaluation of Alternatives Prepared for SFPUC by Kennedy/Jenks Consultants, 11 February 2011.

Eastside Recycled Water Project (2026-2029). The Eastside Recycled Water Project would deliver recycled water to a variety of customers on the east side of the City for non-potable uses such as irrigation and toilet flushing. The project aims to save an average of 2 million gallons per day of drinking water that would otherwise be used for non-drinking purposes.

As of 2017, the project has been paused to allow for better coordination with the City's Sewer System Improvement Program. The Southeast Wastewater Treatment Plant has been preliminarily identified as a potential site and water source for the eastside recycled water facility.[22]

Gas Pipeline Replacement Program. PG&E is responsible for the improvement of the overall safety and reliability of the natural gas distribution system. Since 1985, the Gas Pipeline Replacement Program continues to work to replace aging and leak-prone sections of distribution and transmission pipelines within the San Francisco Bay Area considered vulnerable to earthquake damage, including on the Geary corridor. The focus of this effort is to replace old cast-iron pipe with modern pipe. In the City of San Francisco, 26 miles of cast-iron pipe were replaced. PG&E completed this work in December 2014.

Water Department Projects. The water supply infrastructure underneath the Geary corridor is aging and in need of replacement. Accordingly, the SFPUC Water Enterprises Division has projects planned to replace approximately eight lane-miles of water mains in the Geary corridor area. As of 2017, these are understood to include Geary Street from Kearny to Van Ness, Van Ness to Stanyan, and Geary Boulevard from 10th to 36th Avenues. Water main replacement within the Geary corridor would be timed to coincide with construction of the preferred alternative, consistent with the City and County of San Francisco's coordination requirements (further discussed in Section 4.6.1.2).

2.8.2 | Regional Projects

Planned projects of regional importance located in the study area or otherwise affecting the proposed project are discussed below.

2.8.2.1 REGIONAL TRANSPORTATION PROJECTS

Doyle Drive Replacement/Presidio Parkway Project. SFCTA, in partnership with SFMTA, Caltrans, and the Golden Gate Bridge, Highway and Transportation District, is replacing the Doyle Drive approach to the Golden Gate Bridge, which serves as a parallel route to Geary Boulevard. The Doyle Drive approach was built in 1937 as part of the Golden Gate Bridge and is part of US 101. The Doyle Drive Replacement Project, also known as the Presidio Parkway Project, would provide seismic and operational safety with widened travel lanes and provision of shoulders and a median. The project would also include landscaping to better blend into its surroundings in the adjacent Presidio National Park. Initiated in 2010, the

[22] SFPUC. San Francisco Eastside Recycled Water Project. Available at: http://sfwater.org/bids/projectDetail.aspx?prj_id=311. Accessed 4/19/2017.

project's Phase I consisted of the construction of the southbound high viaduct, the southbound battery tunnel, and a temporary bypass. These elements comprise a roadway for vehicular travel until the project's completion.

Phase II included construction of the northbound high viaduct, northbound battery tunnel, main post tunnels, low viaduct, and an interchange at Girard Road. This phase of construction began in 2012 and was completed in 2015. Final project landscaping and overall project completion are expected by late 2017.

Transbay Transit Center/Caltrain Downtown Redevelopment Project. The Transbay Joint Powers Authority (TJPA) is replacing the existing Transbay Terminal located in downtown San Francisco with a new 5-story transit center with one above-grade bus level, ground floor, concourse, and two below-grade rail levels serving Caltrain and future high-speed rail. A Redevelopment Area Plan has been established for transit-oriented development in the vicinity of the Transbay Transit Center, including residential, office, and general commercial uses. The project is intended to revitalize the surrounding area and accommodate future transit projects including the Caltrain Extension Project and the California high-speed rail project. The Transbay Transit Center would provide a train depot for future high-speed rail. As part of Phase II, Caltrain commuter rail service would be extended from its current terminus outside the downtown area (at Fourth Avenue and King Street) to the Transbay Transit Center. Construction of the Transbay Transit Center is under way, and it is expected to be completed in 2018.

2.9 Required Permits and Approvals

In addition to its own approval of the project, SFMTA as project proponent would need permits and approvals from various outside agencies prior to the start of construction. Table 2-11 shows the anticipated permits and approvals that SFMTA would be expected to obtain from outside agencies.

Table 2-11 Anticipated Permits and Approvals

AGENCY	APPROVAL OR PERMIT
STATE	
California Department of Transportation (Caltrans)	Encroachment permit(s) for work in State right-of-way areas
REGIONAL	
SF Bay Area Regional Water Quality Control Board (RWQCB)	General Construction Activity Stormwater Permit. A Notice of Intent to construct, which includes the Storm Water Pollution Prevention Program, must be filed with the RWQCB at least 30 days prior to any soil-disturbing activities
Metropolitan Transportation Commission	Air Quality Conformity Determination (Air Quality Conformity Task Force) –see Appendix G of this Final EIS
LOCAL	
SFDPH	Maher Ordinance Certification
SFPW	Tree removal permits will be required for each tree that would be potentially impacted or removed that is protected by City Ordinance 0017-06
	Night-time construction permit
	A demolition permit and Waste Diversion Plan approval
	Streetscape plan approval
SF Planning Department - Citywide	General Plan Referral -required for any proposed changes in curb-to-curb width of public right-of-way. Review by Citywide Planning; ratification by Board of Supervisors.
	General Plan Amendment - potentially required; contingent on review of design of selected/preferred alternative.
SF Planning Department/Historic Preservation Committee	The Historic Preservation Committee must issue a Certificate of Appropriateness for project design located within a landmark site
	Permitting under Article 11 of San Francisco Planning Code contingent on any required relocation of or modification to "Golden Triangle" Light Standards
SF Fire Department	Coordination regarding the Auxiliary Water Supply System
SFPUC, PG&E, and Telecommunication Companies	Coordination with utility providers regarding temporary or permanent relocation of utilities (including sewer line) through NOI and other filings with the San Francisco Street Construction Coordination Center and participation in the Committee for Utility Liaison on Construction and Other Projects (CULCOP)
	National Pollutant Discharge Elimination System Permit for construction activities, including preparation of a Stormwater Pollution Prevention Plan (SWPPP) and street flow analysis

2.10 Next Steps in the Environmental Process

Section 2.1.1 summarizes the earlier approval actions of both SFCTA and SFMTA regarding the project, the LPA, and the EIR.

Following publication of this combined Final EIS/ROD, SFMTA is expected to take several actions including adoption of legislation under Section 201 of the San Francisco Transportation Code to implement project-related changes to the public right of way (bus-only lanes, changes to mixed-flow lanes, changes in on-street parking, etc.).

CHAPTER 3.0 TRANSPORTATION

3.1 Introduction

This chapter presents the process and findings of the transportation analysis conducted for the project alternatives, including the No Build Alternative and four build alternatives. This chapter also includes analyses of the potential impacts of the Hybrid Alternative/Locally Preferred Alternative (LPA) as modified following publication of the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) and Final EIR. Section 2.2.7 includes a detailed description of the Hybrid Alternative/LPA as modified.

Assessments of existing Geary corridor transportation conditions, both in terms of facilities and performance, are presented for public transit, vehicular traffic, non-motorized transportation, and vehicle parking/loading. Existing and future conditions are assessed within the regulatory framework(s) applicable to each travel mode.

3.1.1 | Transportation Chapter Organization

Each of this chapter's subsections addresses key issues associated with the potential adverse effects of the project, including:

- Corridor Travel Patterns
- Transit Conditions
- Automobile Traffic
- Pedestrian and Bicycle Transportation
- Parking and Loading Conditions

Each of these subsections, excluding the one addressing Corridor Travel Patterns, is generally organized according to the following structure:

- **Regulatory Setting:** This section, where applicable, describes relevant laws, policies and regulatory agencies.
- **Affected Environment:** This section includes information about existing travel conditions.
- **Methodology:** This section includes discussion of how impacts were evaluated and determined.
- **Environmental Consequences:** This section includes a summary of the potential significant environmental impacts of the project on each respective travel mode.
- **Avoidance, Minimization, and Mitigation Measures:** This section includes potential measures, if relevant, to avoid, minimize, or mitigate environmental impacts of the project.

The transportation chapter evaluates travel patterns that may be affected by the No Build and build alternatives. Based on the results of the analysis, an assessment is made about whether any of the build alternatives would adversely affect travel conditions in the study area.

3.1.2 | Transportation Analysis Process

The transportation analysis used data from a variety of sources. The analysis was based on a detailed multimodal evaluation consisting of several key steps, including:

Existing Conditions: Through an extensive data collection process, a detailed understanding of existing travel patterns on the corridor was developed. This served as the basis for the analytical tools used to evaluate how the project would affect future travel patterns. Unless specified otherwise, all data represents existing transportation conditions in 2012, when the bulk of the transportation data was collected. As further discussed in Section 3.4.2.2, automobile traffic data from 2012 was validated in early 2015, before the Draft EIS/EIR was published, and again in spring 2017 in association with preparation of the Final EIS. As noted in Section 3.4.2.2, these validation efforts found that traffic volumes on the Geary corridor decreased relative to the 2012 counts, so the future year operations conclusions based upon the 2012 counts would remain valid.

Future Travel Forecasting: Future travel patterns were estimated using transportation forecasting models, including the San Francisco Chained Activity Modeling Process (SF-CHAMP). SF-CHAMP is a regional travel demand model used to assess the impacts of socioeconomic, land use, and transportation system changes on the performance of the local transportation system. Year 2020 No Build conditions were used as the environmental baseline against which future conditions were compared. Year 2020 was used as the baseline so as to more accurately compare the build alternatives taking into account future traffic conditions given the length of time between issuing the Notice of Preparation (2008) and the anticipated opening year of the project (2020). Travel behavior in SF-CHAMP is calibrated based on observed behavior from the California Household Travel Survey (CHTS). As of spring 2017, 2010-2012 CHTS data is the latest travel survey available so its data are still used to calibrate the SF-CHAMP model.

Transportation Operations: Projections of future conditions for the project opening year (2020) and the project horizon year (2035) for all No Build and build alternatives were then modeled using a mix of specialized transportation analysis tools, including multimodal simulation software, traffic analysis software, and assessments of pedestrian and bicycle safety. Appendices D-1 (Modeling Methodology Approach) and D2-1 (Land Use Inputs) describe these tools in greater detail.

Multiple traffic counts were conducted along the Geary corridor to determine when the maximum use of the transportation system occurs. The results indicated that the Geary corridor experiences the highest volumes during the p.m. peak period. Accordingly, the analysis in this Final EIS focuses on the p.m. peak period. This is consistent with the approach suggested in the San Francisco Planning Department's *Transportation Impact Analysis Guidelines*, the document which guides CEQA-level analysis in the City of San Francisco.

3.2 Corridor Travel Patterns

The Geary corridor is a key east-west travel corridor in San Francisco's street network. It functions as a major transit spine in the local San Francisco Municipal Transportation Agency (SFMTA) bus network as well as a key east-west automobile traffic connector. It is also used by regional bus routes such as Golden Gate Transit and by various employer shuttle services. This section provides an overview of existing and future travel patterns on the Geary corridor as well as in surrounding neighborhoods.

3.2.1 | Affected Environment

3.2.1.1 | GEARY TRANSPORTATION STUDY AREA

Figure 3.2-1 displays the Geary Transportation Study Area ("study area"). The overall boundaries of this study area are Pacific Street and Presidio Avenue on the north, Fulton Street on the south, the Pacific Ocean on the west, and Market Street on the east. None of the build alternatives propose physical improvements south of Market Street. Therefore, the study area focuses on points north and west of Market Street.

Multiple transit routes operate on the Geary corridor, including local, rapid, and express service

Similar to the whole of this document, this chapter uses "Geary corridor" to describe Geary Boulevard from 48th Avenue to Van Ness Avenue and the one-way pair of Geary and O'Farrell streets from Van Ness Avenue to Market Street (see Section 2.1.2 for a complete discussion of the project setting). Geary Boulevard is used to describe the area west of Gough Street; Geary Street is used to reference the area east of Gough Street.

References to the "Bay Area" refer to the nine-county San Francisco Bay Area, which encompasses San Francisco, Marin, Napa, Sonoma, Solano, Contra Costa, Alameda, Santa Clara, and San Mateo counties.

3.2.1.2 | GEARY CORRIDOR

As defined in Section 2.1.2, the Geary corridor is an east-west oriented thoroughfare located in the northern portion of San Francisco. The Geary corridor serves the majority of the northern half of San Francisco, connecting residents and businesses to numerous neighborhoods and employment centers, including the Financial District.

Note: On April 25, 2015, SFMTA changed naming conventions for limited bus services. Bus services previously referred to as limited and denoted by the letter "L" following the bus line number, e.g. 38L, are now referred to as rapid services and are denoted by the letter "R." Throughout this document the limited stop service on Geary Boulevard is referred to as "38R" or "38 Rapid"

Geary is one of the busiest transit corridors in San Francisco, with its buses carrying over 50,000 passenger trips per weekday. Pedestrian travel is substantial along and across Geary Boulevard and Geary and O'Farrell streets. Motor vehicle traffic varies greatly depending on location along the corridor, with between 20,000 and about 44,000 vehicles traveling along segments of the Geary corridor.[1]

Based on travel time, speed data, and passenger load information provided by SFMTA, the Geary corridor's existing transit routes are often unreliable and

[1] The above range reflects the central portions of the Geary corridor. Average daily traffic volumes are slightly lower (about 16,000) in the westernmost portion of the corridor (west of 34th Avenue).

crowded. As a result, one of the main goals of the build alternatives is to improve transit travel times and reliability.

3.2.1.3 | MAJOR STUDY AREA ROADWAYS

Geary Boulevard is wide compared with many streets in San Francisco, with an average right of way of about 125 feet between property lines throughout most of the corridor. Landscaped medians, multiple vehicular lanes, parking lanes, and sidewalks exist within the right of way. The layout of the Geary corridor has evolved differently in various segments. The street width is greatest between Laguna and Scott streets in the central section of the Geary corridor. Some segments in the Outer Richmond neighborhood in western Geary corridor have a narrower right of way than the central section of the Geary corridor. East of Gough Street, the one-way streets couplet of O'Farrell and Geary streets extends east to Market Street. Along this section of the corridor, the right of way averages roughly 65 feet between property lines on Geary and O'Farrell streets.

The majority of Geary Boulevard has three travel lanes in each direction, providing an expansive right of way for vehicle traffic. On-street parking is generally available on most blocks of the Geary corridor. Most parking is parallel parking, though several blocks in the Outer Richmond have diagonal on-street parking.

The Geary corridor bisects several residential, commercial, and light industrial areas in San Francisco's northern neighborhoods. The corridor intersects many other essential City streets, providing linkages to residences, commerce, and public open spaces. These connections are essential for transit connections, as well as for automobile traffic, bicyclists and pedestrians, as they provide a direct route to many other destinations and neighborhoods within the City.

The following sections describe the roadway network that provides essential transportation connections along the Geary corridor. Each of the following roadways has a unique typology ranging from highways, urban arterial streets, and local streets. In total, almost 90 roadways intersect the Geary corridor between 48th Avenue and Market Street.

3.2.1.3.1 REGIONAL ROADWAYS

- **Geary Boulevard/Street**: Geary Boulevard/Street is an east-west corridor located in the northern portion of San Francisco. The number of travel lanes throughout the corridor varies from two to eight. The majority of the 90 intersections along the Geary corridor from 48th Avenue to Market Street, are signalized. Traffic signals on Geary Boulevard are coordinated through a master control system. A number of Muni bus routes operate on Geary Boulevard, including: 38 Geary (38 or 38 Local), 38 Rapid (38R), 38 Geary A Express (38AX), 38 Geary B Express (38BX), and Golden Gate Transit Route 92.
- **O'Farrell Street**: O'Farrell Street is a one-way eastbound arterial roadway from Market Street to Franklin Street continuing as Starr King Way for one block between Franklin and Gough Street. It forms a one-way couplet with Geary Street, comprising the eastern portion of the Geary corridor. Between Gough and Powell streets, O'Farrell has two eastbound travel lanes and a bus-only lane. Muni bus routes 38 and 38R operate on O'Farrell Street.

- **Highway 1/Park Presidio:** Highway 1/Park Presidio is a major highway traveling north/south through San Francisco, following 19th Avenue to Golden Gate Park, continuing through the Richmond District on 14th Avenue eventually traversing through the Presidio area, merging with US 101 at the Golden Gate Bridge in the north. In San Francisco, Highway 1 has six travel lanes and sidewalks along both sides. At the point where Geary intersects with Highway 1, Highway 1 has six travel lanes, sidewalks on both sides, and a landscaped median. The intersection is signalized. The highway is owned and maintained by the California Department of Transportation (Caltrans). The following Muni bus routes operate on Highway 1/Park Presidio: 28, 28R, 29, and NX Judah Express.
- **Van Ness Avenue and South Van Ness Avenue**: Van Ness and South Van Ness avenues intersect the Geary corridor. Van Ness is a part of US 101, a north-south principal arterial roadway owned and maintained by Caltrans and on the National Highway System that provides Interstate, interregional, and intraregional travel as well as goods movement. Regionally, US 101 connects Marin County to the north with San Francisco, and San Mateo and Santa Clara counties to the south. US 101 begins as an elevated highway traveling north/south into San Francisco. Upon entering the City center, US 101 merges with Van Ness Avenue. US 101 then follows Lombard Street east/west to Presidio Parkway. Presidio Parkway is currently open for use, though final construction continues through 2017. Presidio Parkway provides six travel lanes connecting to Highway 1 and the Golden Gate Bridge. At the point where Geary intersects with Van Ness Avenue, Van Ness Avenue has (as of winter 2017) four travel lanes, center-running bus only lanes under construction, and on-street parking on both sides of the street. As of 2017, Van Ness BRT revenue service is scheduled to begin in 2020. Muni bus routes 47, 49, 30X, and 76X operate on Van Ness Avenue, as do several Golden Gate Transit routes.

3.2.1.3.2 MAJOR STREETS

There are nine north-south major or secondary arterial streets crossing the Geary corridor and six east-west major or secondary arterial streets parallel to the corridor. Their general characteristics, boundaries, and functions are described below.

North/South Streets

- **Arguello Boulevard** is a two-way, two-lane street with curbside parking on both sides of the street. Arguello begins near the northern border of Golden Gate Park at West Conservatory Drive and terminates near the northern border of the Presidio, north of the Geary corridor. Muni bus routes 33 and 2 operate on the Richmond District portion of Arguello Boulevard.
- **Stanyan Street** is a two-way, two to three-lane street that intersects Geary Boulevard, with curbside parking throughout most of its length. Stanyan Street begins at Geary Boulevard and terminates at Belgrave Avenue to the south. Muni bus routes 33 and 7 operate on Stanyan Street.

- **Masonic Avenue** starts south of the Geary corridor as residential two-way, four-lane street with on-street parking. Upon crossing Golden Gate Park, it continues north as a four-lane thoroughfare in each direction. Masonic terminates shortly after bisecting Geary Boulevard at Presidio Avenue and provides access to downtown via the east-west street couplet of Bush and Pine streets. Presidio Avenue also provides access to and from the Presidio. The intersection of Geary Boulevard and Masonic Avenue features an underpass/tunnel 1/10th of a mile in length and service roads for local traffic to make turns. A mix of bus, pedestrian, and bicycle flows exist at the surface. Muni bus routes 43 and NX Judah Express operate on Masonic Avenue.
- **Divisadero Street** is a two-way, four-lane street with parallel curbside parking on both sides of the street. Divisadero Street provides many intra-city bus connections. It connects to east/west US 101 to Fillmore Street. Divisadero Street starts at Waller Street and terminates at Marina Boulevard, several blocks north of the Geary corridor. Muni bus routes 24 and 30 operate on Divisadero Street. Route 31 operates on Divisadero for about one block near the intersection of Divisadero Street and Turk Street. Divisadero serves as a retail and entertainment hub for the surrounding neighborhoods.
- **Fillmore Street** is a two-way, two-lane street running parallel to Divisadero Street. Fillmore Street begins at Duboce Avenue to the south, then bisects US 101/Lombard Street, and terminates at Marina Boulevard, several blocks north of the Geary corridor. At Fillmore Street, Geary Boulevard through-travel lanes operate in a short underpass, with side service roads on the surface for local traffic to make turns. Muni bus routes 22 and 3 operate on Fillmore Street.

Figure 3.2-1 Geary Corridor and Transportation Study Area

- **Gough Street** is a one-way southbound street with three lanes of traffic and curbside parking on both side of the street. Gough Street runs parallel to Van Ness Avenue and begins at Market Street. A number of Muni bus routes cross Gough Street, but no Muni route operates primarily on Gough Street. Intersecting bus routes include Golden Gate Transit Route 10 and the following Muni lines: 7, 6, 21, 5, 5R, 31, 38, 38R, 38AX, 38BX, 2, 3, 1, 10, 41, 45, and 30X.
- **Franklin Street** is a one-way northbound street with three lanes of traffic with curbside parking on both sides of the street. The Franklin Street/Geary Boulevard intersection is where Geary Boulevard transitions to a one-way westbound arterial roadway. Franklin Street begins at Market Street to the south and terminates at Bay Street. A number of Muni bus routes cross Franklin Street, but there is no Muni route that operates primarily on Franklin Street. Intersecting bus routes include: 21, 5, 5R, 31, 38, 38R, 38AX, 38BX, 2, 3, NX Judah Express, 1, 10, 45, 66, 30, and 30X.
- **Stockton Street**, in the vicinity of Geary Street, is a one-way southbound street with portions of the street reserved for transit-only. Stockton Street begins near Fisherman's Wharf at The Embarcadero and terminates at Market Street. Muni lines operating on Stockton Street include 8, 30, and 45; each of these routes currently *cross* Geary Street while operating on adjacent parallel Mason and Kearny streets due to the temporary closure of the southern end of Stockton Street during Central Subway construction.
- **Kearny Street**, in the vicinity of Geary Street, is a one-way northbound street. Mirroring Stockton Street, Kearny Street begins at Market Street and terminates at The Embarcadero. Muni lines operating on Kearny Street include 8, 8AX, and 8BX.

East/West Streets

- **California Street** is a two-way, four-lane street with on-street parking available throughout most of its span, excluding some parts of the Financial District. California Street begins near Lincoln Highway to the west and Drumm Street to the east. The following Muni bus routes operate on California Street: 1, 1AX, 28R, 1BX, 33, 2, 18X.
- **Pine Street** is a one-way westbound street with three lanes and curbside parking on both sides of the street. Pine Street begins at Market Street to the east and ends at Presidio Avenue to the west. The following Muni bus routes operate on Pine Street: 1, 1AX, 31, 38AX, and 38BX.
- **Bush Street** is a one-way eastbound street with three lanes and curbside parking on both sides of the street throughout most of its length. Bush Street begins at Presidio Avenue to the west and terminates at Market Street to the east. The following Muni bus routes operate on Bush Street: 1, 1AX, 31, 38AX, 38BX, NX Judah Express, and 27.
- **Balboa Street** begins as a two-way, two-lane street at the Great Highway to the west and transitions to a three-lane street (two westbound lanes and one eastbound lane) at Park Presidio Boulevard. Balboa Street becomes Turk Street at Arguello Boulevard. Muni bus routes 18, 31, 31AX, and 31BX operate on Balboa Street.

- **Market Street** is a two-way, four-lane, multimodal thoroughfare aligned diagonally through the center of San Francisco. Market Street serves primarily as a transit corridor, carrying more than 100,000 people daily via streetcar and bus on the surface, and Muni Metro light rail and regional Bay Area Rapid Transit (BART) below ground to and from downtown. It is also an important pedestrian and bicycle corridor, providing direct and convenient walking and bicycling access to many destinations. It includes wide sidewalks, numerous bus stop islands, and it is the highest volume bicycle route in San Francisco. Through automobile traffic is discouraged along Market Street, with several intersections prohibiting through automobile movements or left turns. Market Street has exclusive transit-only lanes from 12th to Fifth streets in the eastbound direction and from Eighth Street to Van Ness Avenue in the westbound direction, in addition to boarding islands and marked Class II (marked on-street) bike lanes west of Eighth Street. Market Street begins at The Embarcadero in the east and terminates at Portola Drive to the west. Bus routes that operate on Market Street include: 6, 7, 14, 14X, 21, 31, 37, 9, 9R. The following Muni rail lines operate on- or below-ground on Market Street: J, KT, L, M and, N. The following SamTrans bus lines operate on Market Street: KX, 397, and 292. Market Street is a major BART corridor, with four of the agency's five rail lines running beneath Market Street.[2]:
- **Turk Street** spans between Market Street and Arguello Boulevard. It is a one-way westbound street with two travel lanes from Market Street to Divisadero Street. It continues to Arguello Boulevard as a two-way street with two westbound lanes and one eastbound lane. Turk Street continues as Balboa Street, which runs in the western part of San Francisco.
- **Golden Gate Avenue** spans between Market Street and Parker Avenue. It is a one-way eastbound street with two travel lanes from Market Street to Divisadero Street. It continues to Parker Avenue as a two-way street with two eastbound lanes and one westbound lane. Muni bus routes 18, 31, 31AX, and 31BX operate on Turk Street.

3.2.1.4 | TRAVEL MODE SPLITS

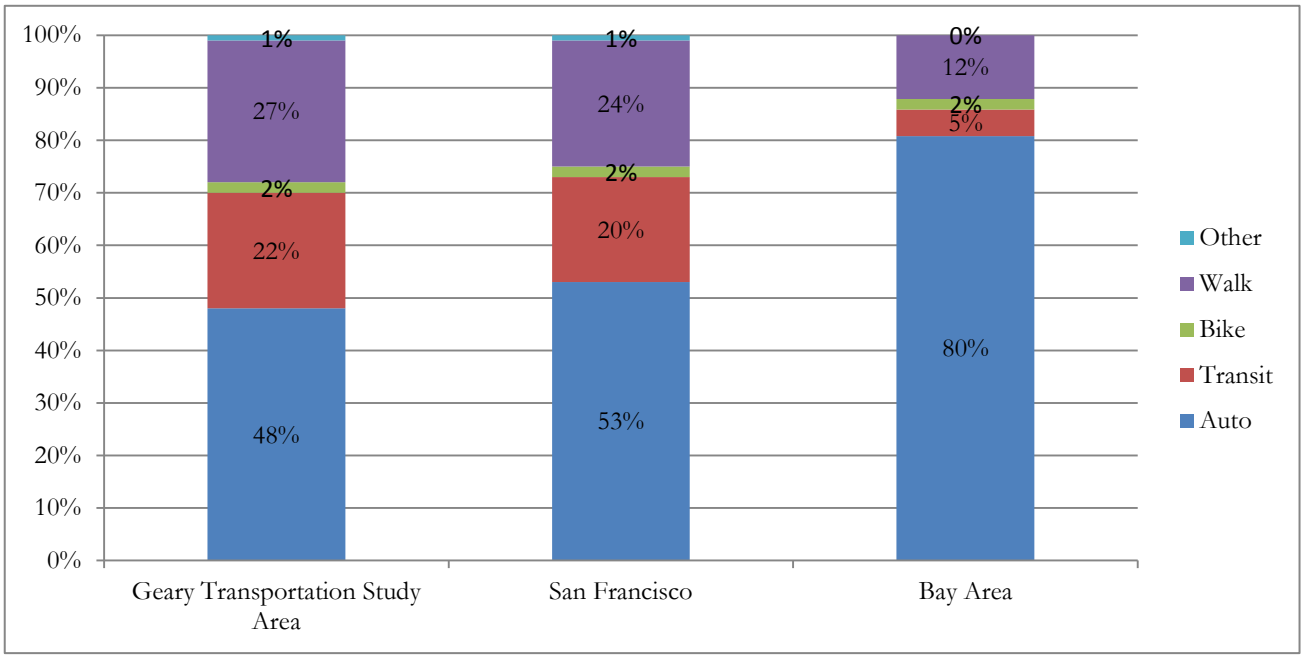
This section contains information on existing travel patterns derived from the modeling toolkit described in Appendix D-1 (Modeling Methodology Approach). It illustrates existing and future travel patterns, including travel demand, regional versus local travel patterns, the potential for trips to divert to different routes, and mode choices. Most of this data was obtained from local travel surveys and from the SF-CHAMP travel demand model.

Figure 3.2-2 presents total weekday trips by mode as reported by the California Household Travel Survey (2012), which is the latest iteration of this survey as of summer 2017. On an average weekday, slightly less than half of the trips that are made to, from, or within study area neighborhoods – the Richmond District, Western Addition, and the Tenderloin – are made by private vehicle. Meanwhile, slightly less than one-quarter of trips are made by transit, and slightly more than

[2] As of winter 2017, BART lines running beneath Market Street are: Richmond – Daly City/Millbrae, Warm Springs – Daly City, Pittsburg/Bay Point – SFO, Dublin/Pleasanton – Daly City, and Richmond – Daly City/Millbrae.

one-quarter of trips are made by walking. About 2 percent of total daily trips to, from, or within these neighborhoods are made by bicycle. Study area neighborhoods feature slightly less driving and more walking and transit than citywide averages. Walking and transit are far more common in both San Francisco and the study area than throughout the San Francisco Bay Area, where transit carries 5 percent of daily trips, and 12 percent are made by walking.

Figure 3.2-2 Mode Share for All Daily Weekday Trips (to/from/within specified geographies)



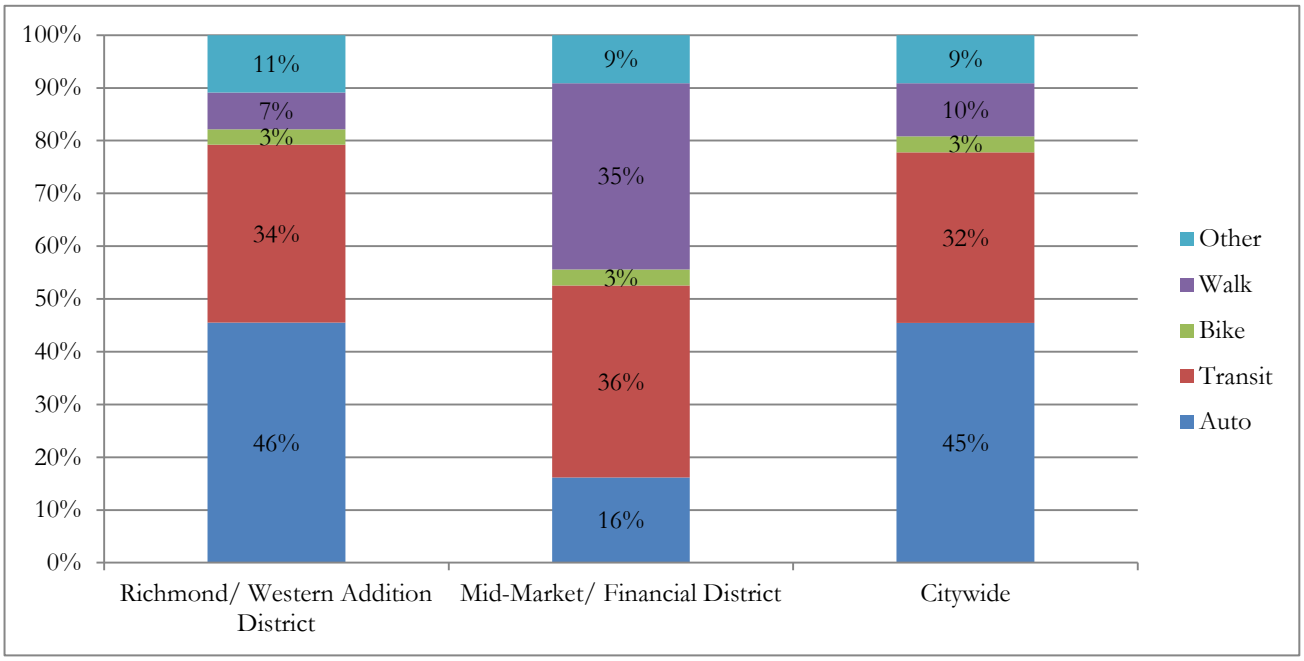
Note: "Other" category includes taxi and any mode other than walking, driving, transit, or bicycling.

Note: Percentages may not sum to 100 due to rounding.

Source: California Household Travel Survey (2012)

Figure 3.2-3 presents data on commute mode share in the Geary corridor and surrounding neighborhoods as reported in the 2012 American Community Survey (ACS) for the years 2008 through 2012. The modal distribution of commute trips from the Richmond and Western Addition areas is similar to citywide averages. Vehicle trips comprise slightly less than one-half of commuting trips, transit trips account for about one-third, and walking and bicycling trips to work are about 10 percent, combined.

Figure 3.2-3 Usual Mode for Commute to Work by Location of Residence (2008-2012)

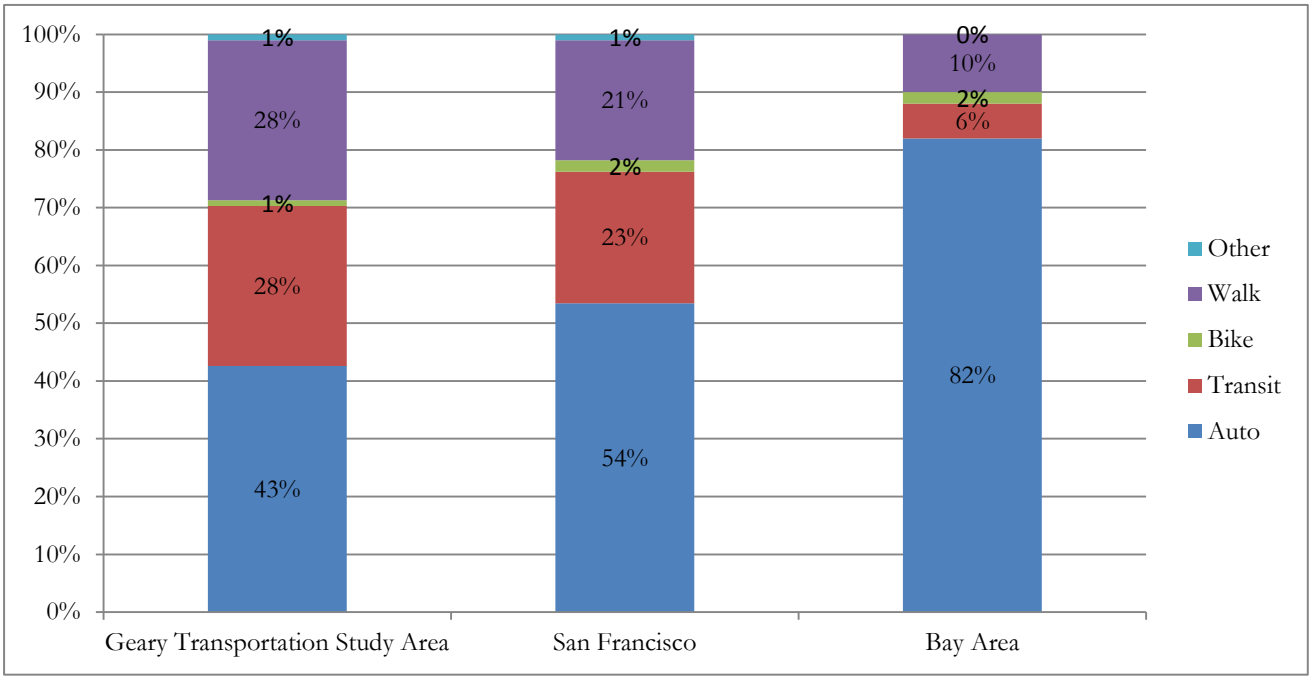


Note: "Other" category includes "Worked at Home," "Other Means," "Motorcycle," and "Taxicab."
Note: Percentages may not sum to 100 due to rounding.
Source: 2012 American Community Survey 5-Year Estimates (2008-12)

Areas of the study area that are closer to the Financial District have commute patterns with considerably less vehicle travel and significantly more walking than citywide averages.

Figure 3.2-4 presents total PM peak period trips by mode. During the PM peak commute period travel patterns in the Geary Transportation Study Area differ from all day trip making. During the PM peak period, transit ridership accounts for 28 percent of total Geary Transportation Study Area trips and 23 percent of San Francisco trips. These figures are higher than the overall weekday transit mode shares of 22 percent and 20 percent for trips in the Geary Transportation Study Area and San Francisco respectively. The increase in PM peak period transit trips corresponds to lower auto travel in the PM peak period. Auto mode share for trips to, from, or within the Geary Transportation Study Area falls from 48 percent of daily trips to 43 percent of trips in the PM peak period. In the PM peak period walking and transit are the primary travel modes for about 30 percent more Geary Transportation Study Area trips than auto travel.

Figure 3.2-4 Mode Share for All P.M. Peak Period Weekday Trips (to/from/within Specified Geographies)



Note: "Other" category includes taxi and any mode other than walking, driving, transit, or bicycling.

Note: Percentages may not sum to 100 due to rounding.

Source: California Household Travel Survey (2012)

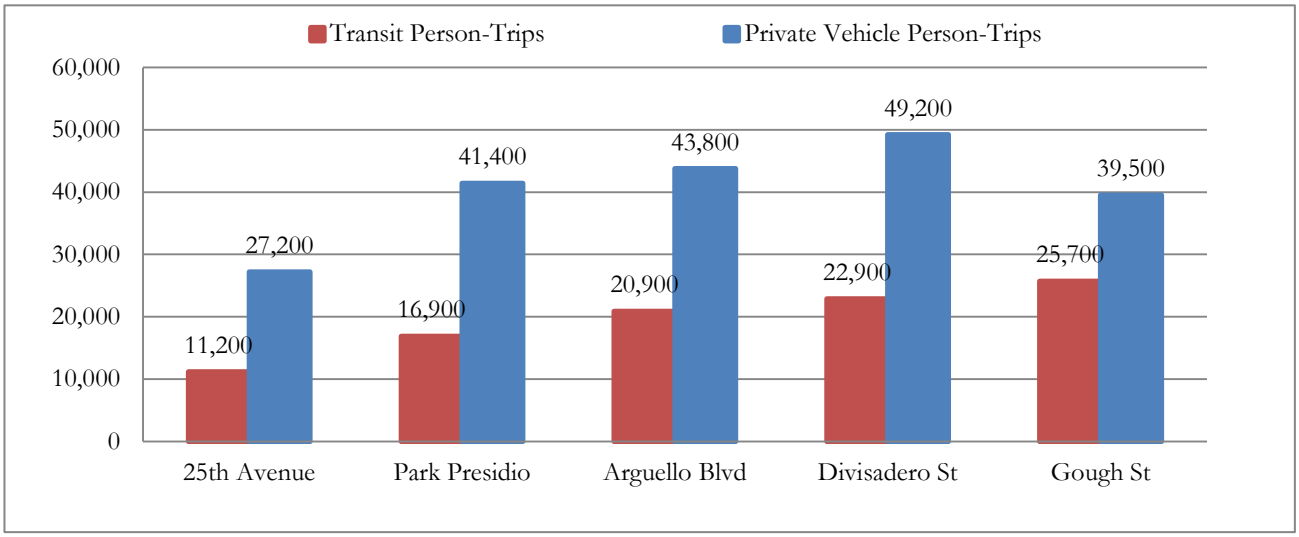
More recent ACS data have become available since publication of the Draft EIS/EIR. Annual estimates of citywide commute mode share are available through 2015. Between 2012 and 2015, the commute mode share for driving alone, carpooling, and riding motorcycles fell by 2.3 percent. During the same period, transit commute mode share increased by 1.6 percent and active modes (walking and biking) increased by 1.1 percent. Taxi commuting, which includes transportation network companies (TNCs) such as Uber and Lyft, rose during this period from 0.2 percent to 0.9 percent. Despite this growth, taxi and TNC commute mode share remained below 1 percent in 2015. The decline in driving and carpooling mode share between 2012 and 2015 is more than three times the mode share increase for taxis. The most significant trend between 2012 and 2015 is a shift from driving, or being driven, to transit, walking, and biking.

3.2.1.5 | TRAVEL DEMAND

Average weekday passenger boardings on Geary corridor bus lines exceed 50,000. Meanwhile, weekday traffic volumes reach about 44,000 vehicles at certain points along the corridor. The corridor also accommodates and attracts substantial pedestrian traffic, both along and across the Geary corridor. A number of bicycle facilities cross the corridor.

Traffic volumes on the Geary corridor peak in the area directly east of the Masonic tunnel complex. Traffic volumes decrease to the west and east of this area. Transit demand increases along the Geary corridor as one travels east on the 38, 38R, 38AX, and 38BX routes (see Section 3.3 for more discussion of transit-specific characteristics), and it peaks at or east of Van Ness Avenue. Figure 3.2-5 depicts existing person trips in vehicles (multiple occupants of a single vehicle are counted separately) and transit trips on the corridor.

Figure 3.2-5 Existing (2012) Weekday Vehicle-Person Trips for Geary Boulevard at Select Locations (for Travel Occurring on Geary Boulevard)



Source: SFMTA APC data and traffic counts, assembled by Fehr & Peers, 2011 and SFTCA 2014

3.2.2 | Future Travel Patterns

The San Francisco County Transportation Authority (SFCTA) has developed travel demand forecasts for the years 2020 and 2035. These forecasts, developed using SF-CHAMP, predict how travel could change in the corridor over time and how the build alternatives would alter travel relative to the No Build Alternative. The forecasts are based on planned roadway and transit network improvements throughout the City and Bay Area.

3.2.2.1 | FORECAST YEARS

The year 2020 represents opening day conditions and the year 2035 represents horizon year conditions. According to the Federal Transit Administration's (FTA) New and Small Starts processes – FTA's primary grant programs for funding major transit capital investments – the agency allows project sponsors, at their option, to calculate evaluation criteria using horizon year-based estimates as well as current year estimates. Year 2020 No Build has been selected as the environmental baseline against which to compare the opening and horizon year build alternatives. According to FTA guidance, project sponsors should determine the horizon year they wish to use – either 10 years or 20 years in the future from the current date. SFCTA and SFMTA have selected year 2035, just less than 20 years from now, as the project's horizon year.

3.2.2.2 | PLANNED NETWORK IMPROVEMENTS

SFCTA travel demand forecasts for future years assume that land uses and transportation infrastructure will change from current conditions. This section describes the transportation projects and land uses assumed in the 2020 and 2035 travel demand forecasts. Transportation System Assumptions

All future build alternatives for the same year (i.e., 2020 or 2035) are modeled with uniform transportation system and land use assumptions. This means that the only differences between the various model run scenarios are the definitions of the build alternatives.

In future year project scenarios, the transportation networks reflect forecasted changes to the transportation system, including all reasonably foreseeable transport projects. The baseline projects included in future year analysis that are most likely to affect transportation system performance in the study area include transit signal priority on the Geary corridor, four new traffic signals on the Geary corridor, the opening of the Van Ness Avenue BRT project, and completion of the Central Subway and Presidio Parkway projects. A separated bike lane project on Masonic Avenue will also reduce the number of travel lanes on Masonic Avenue. All of these projects are accounted for in the No Build and build alternatives.

A complete list of both regional transportation projects assumed to be completed by 2020 and by 2035 is included in Appendix D-1 (Modeling Methodology Approach); however, some of the projects in Appendix D-1 are considered regional and are not explicitly mentioned as being part of the No Build Alternative.

Also see Section 3.4.2.1 for information on changes to existing left-turn locations since the traffic analysis conducted for the Draft EIS/EIR.

3.2.2.2.1 LAND USE ASSUMPTIONS

The project uses Association of Bay Area Governments' (ABAG) Projections *2009* land use assumptions with San Francisco Planning Department allocations for future year analysis, i.e., projections for future years made by ABAG in 2009. *Projections 2009* was used for analysis of Geary BRT project because these were the most recent official land use forecasts available at the time when travel demand modeling was conducted. More recent land use projections have since been released by ABAG, however, as found in Appendix D-1 and D-2, those more recent projections would not affect the conclusions in the Draft EIS/EIR or Final EIS. Additional explanation of land use assumptions and a comparison between 2009 projections and more recent projections are provided in Appendix D-1 and Appendix D-2.Appendix D2-1's 2009 projections were revalidated before publication of the Draft EIS/EIR, and revalidated again as part of the Final EIS work in Appendix D2-2 (2017 Land Use Validation).

ABAG's land use assumptions anticipate significant growth in San Francisco's eastern neighborhoods, but minimal land use change in much of the study area and in the Richmond District in particular. One location within the study area where significant growth is anticipated prior to the project opening year is in the vicinity of Geary Boulevard and Van Ness Avenue where the California Pacific Medical Center (CPMC) Cathedral Hill campus is under development. Table 3.2-1 below summarizes key land use values for each analysis year.

Table 3.2-1 ABAG Projections (2009) Population and Employment Forecasts with SF Planning Department Allocation

GEOGRAPHY		EXISTING CONDITIONS (2012)	OPENING YEAR (2020)	2020 PCT CHANGE FROM EXISTING	HORIZON YEAR (2035)	2035 PCT CHANGE FROM EXISTING
Study Area	Households	75,600	77,400	2%	80,700	7%
	Household Population	151,900	154,900	2%	160,600	6%
	Employed Residents	78,900	80,600	2%	90,900	15%
	Jobs	89,500	96,100	7%	116,600	30%
San Francisco	Households	346,500	361,500	4%	415,200	20%
	Household Population	788,000	821,900	4%	960,600	22%
	Employed Residents	411,100	426,600	4%	543,800	32%
	Jobs	570,000	611,800	7%	807,800	42%

Source: ABAG, 2009

Opening Year – 2020

In 2020, study area population, households, and employed residents are projected to be 2 percent greater than in existing conditions (2012). In the same year, the number of jobs located in the study area is expected to be 7 percent greater than existing conditions. Much of the growth in residents and employment will be concentrated at the eastern end of the Geary corridor. The CPMC Cathedral Hill campus accounts for much of the forecasted growth in employment. This tabulation of the study area extends from the ocean to Powell Street and excludes the Financial District, SoMa, and the Transbay Transit Center area. Significant growth in both population and employment is forecasted for these downtown neighborhoods that are adjacent to the Geary corridor bus routes, but east of Powell Street. More information about the use of ABAG's *Projections 2009* land use assumptions to represent opening year conditions is provided in Appendix D-1.

Horizon Year – Year 2035

Between 2020 and 2035, population and employment growth in the study area is expected to continue to trail growth throughout San Francisco. About 20 percent more people and households in San Francisco are projected for 2035 than in 2012. The number of employed residents is anticipated to be greater by almost one-third than the total number of jobs in San Francisco, and that number is projected to be over 40 percent higher than in 2012. In 2035, the study area is expected to house 7 percent more households and 6 percent more people than in 2012. The number of employed residents and jobs located in this area are forecasted to increase by 15 percent and 30 percent, respectively.

3.2.2.3 | FUTURE TRAVEL DEMANDS

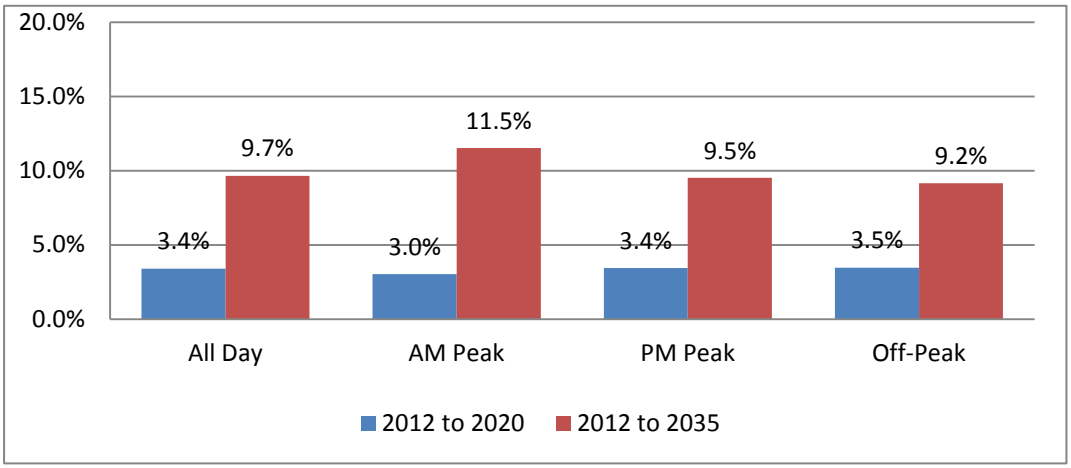
In the period between 2012 and 2020, total daily person trips to, from, or within the study area are forecasted to increase by about 3.5 percent, or 41,000, from 1.05 million to about 1.09 million (under No Build Alternative conditions). Factors contributing to growing trip-making include densification of land use in the San Francisco Bay Area and improvements to the transportation system, such as the Van Ness Avenue BRT project, the Central Subway Project, and more frequent transit

service along the Geary corridor. New trips are projected to occur at all times of day, but off-peak trips – those occurring outside of the morning and evening rush-hour commute periods – are expected to increase slightly faster than trips during the commute periods (see Figure 3.2-6). Almost half (47 percent) of the new trips in 2020 are anticipated to be made on public transit. About 12,000 new trips (30 percent) are forecasted to be auto trips, and the remainder are expected to be walking and bicycle trips. Relative to existing travel, transit ridership is projected to grow the fastest, at about 8 percent (2012 to 2020). Walking and biking is projected to increase by about 3 percent, and driving is forecasted to increase by 2 percent (see Figure 3.2-7). Between 2012 and 2020, the share of weekday daily trips on transit is expected to increase from 23 to 24 percent (see Figure 3.2-8). The share of auto trips is projected to not change substantially and remain at 48 percent. Walk and bike mode shares, 27 percent and 2 percent, respectively, are not expected to change significantly.

Between 2020 and 2035, also under No Build Alternative conditions, weekday total person trips to, from, or within the Geary corridor are forecasted to continue to increase. In 2035, daily total person trips are projected to be about 118,000 greater than in existing conditions, and almost 77,000 greater than in 2020. Unlike the period between 2012 and 2020, off-peak trips are not expected to grow as rapidly between 2020 and 2035. Instead, a.m. and p.m. commute-period trips are anticipated to grow faster. The anticipated higher growth of commute-period trips in 2035 is caused by a large increase in forecasted employment in the study area that occurs between 2020 and 2035. A 30 percent increase in the number of jobs located within the study area in 2035 (relative to existing conditions) is the driving force behind the 11.5 percent growth in a.m. peak period trips to, from, or within the study area during the same time. Of the new trips expected to occur in 2035 (relative to 2020), about half (49 percent) are anticipated to be new driving trips and about 30,000 (39 percent) and anticipated to be new transit trips. Although driving trips are forecasted to increase by more than any other mode, transit is projected to continue to experience the highest growth rate (see Figure 3.2-7). Transit trips are expected to grow by 12 percent from 2020 to 2035, while auto trips are anticipated to increase by 7 percent and non-motorized trips by 3 percent. Figure 3.2-8 shows future mode splits for all daily travel in the study area for 2020 and 2035.

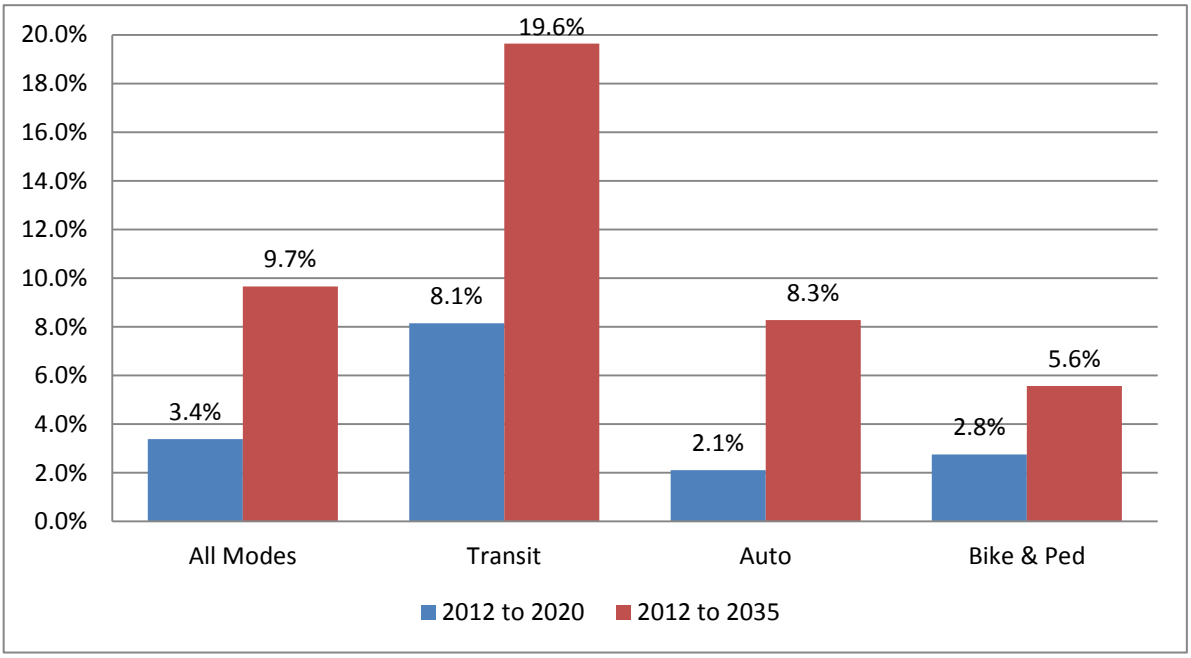
The study area can be subdivided into four subdistricts to analyze how travel patterns will change in different parts of the corridor. The four subdistricts are Outer Richmond, Inner Richmond, Japantown, and the Tenderloin. A fifth subdistrict, Downtown, is not analyzed in the same fashion because most trips to and from Downtown are not related to the Geary corridor. Figure 3.2-9 presents a map of the four subdistricts and the Downtown subdistrict.

Figure 3.2-6 Growth in Daily Trips To/From/Within the Study Area by Time of Day



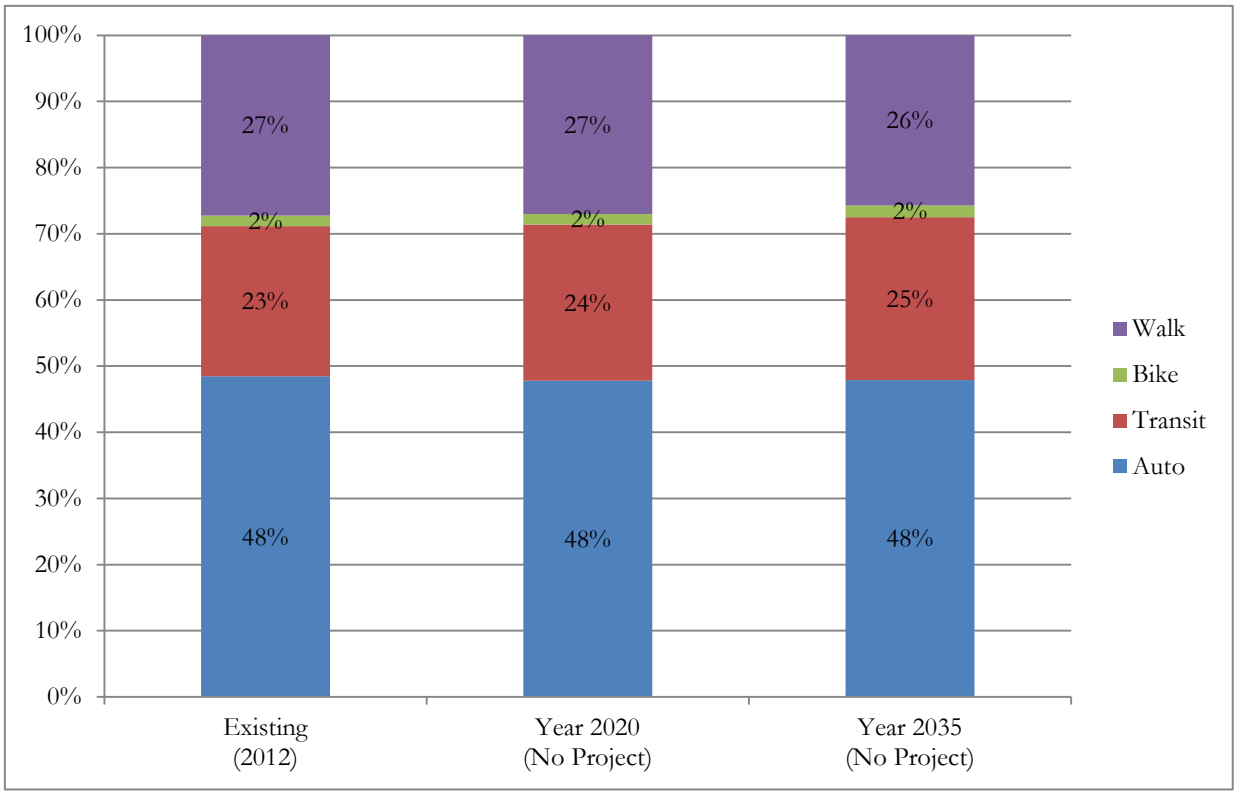
Source: CHTS 2012 and SF-CHAMP

Figure 3.2-7 Growth in Daily Trips To/From/Within the Study Area by Mode



Source: CHTS 2012 and SF-CHAMP

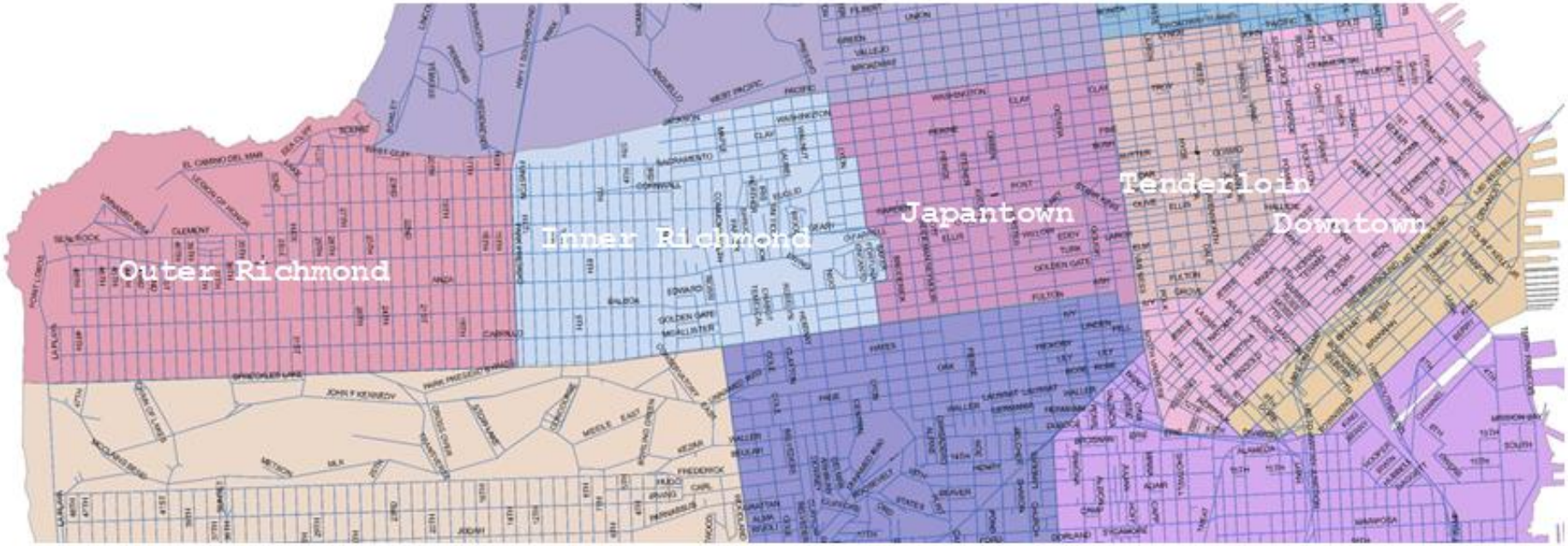
Figure 3.2-8 Daily Tripmaking Mode Share for Future Analysis Years (Daily Trips, to/from/within the Study Area)



Note: Percentages may not sum to 100 due to rounding.

Source: CHTS 2012 and SF-CHAMP

Figure 3.2-9 Subdistricts within the Study Area



Source: SFCTA, 2014

Table 3.2-2 shows the daily trips by destination for each district within the study area under existing conditions. This table shows the total number of trips to, from, and within each district and the percentage of those trips that fall into different destination/origin categories. Generally, about 15 percent of total trips that start or end in each district are trips that stay entirely within the study area (excluding the Downtown subdistrict). Another 25 percent of total trips that start or end within the study area subdistricts connect these subdistricts to the Downtown subdistrict.[3]

Table 3.2-2 Daily Trips by Origin/Destination for Each District within the Study Area (2012)

ORIGIN/DESTINATION	OUTER RICHMOND	INNER RICHMOND	JAPANTOWN	TENDERLOIN	DOWNTOWN
Trips To/From/Within District	221,000	258,000	349,000	520,000	908,000
Percentage of Trips Within District	16.5%	10.2%	8.5%	11.0%	14.8%
Percentage of Trips To/From West of District within the Study Area	--	9.5%	10.2%	13.3%	20.7%
Percentage of Trips To/From East of District within the Study Area and Downtown	26.8%	23.1%	24.5%	21.7%	--
Percentage of Trips To/From the Rest of San Francisco	44.0%	46.6%	46.7%	43.8%	41.0%
Percentage of Trips To/From the Rest of the Bay Area	12.6%	10.7%	10.1%	10.2%	23.4%

Source: SF-CHAMP.

Table 3.2-3 shows the growth in trips for each district by 2020, and Table 3.2-4 shows the growth in trips for each district by 2035. These tables show the additional trips to, from, and within each district, as well as the percent increase or decrease in trips under each origin/destination category. The greatest increase in trips is expected to be trips to or from areas outside of the study area. Excluding Downtown, the subdistrict with the greatest expected increase in trips will be Japantown, with 67,000 new trips, followed by the Tenderloin with 40,000 new trips by 2035.

[3] Note that the total trips of all four subdistricts sums to a number larger than the total number of trips to, from, or within the study area. This is because a trip that starts in one subdistrict and ends in another is counted in both subdistricts.

Table 3.2-3 Growth in Daily Trips from 2012 to 2020 by Origin/Destination for Each District within the Study Area

ORIGIN/DESTINATION	OUTER RICHMOND	INNER RICHMOND	JAPANTOWN	TENDERLOIN	DOWNTOWN
Additional Trips To/From/Within District	1,800	500	30,000	14,000	56,000
Growth Percentage of Trips Within District	-1.4%	-1.8%	10.2%	-0.8%	9.4%
Growth Percentage of Trips To/From West of District within the Study Area	--	-1.0%	4.2%	5.8%	4.1%
Growth Percentage of Trips To/From East of District within the Study Area	1.6%	1.9%	9.0%	2.9%	--
Growth Percentage of Trips To/From the Rest of San Francisco	1.7%	0.6%	9.6%	3.2%	6.3%
Growth Percentage of Trips To/From the Rest of the Bay Area	-1.0%	-2.4%	7.0%	0.5%	5.6%

Source: SF-CHAMP.

Table 3.2-4 Daily Trip Growth From 2012 to 2035 by Origin/Destination for Each District within the Study Area

ORIGIN/DESTINATION	OUTER RICHMOND	INNER RICHMOND	JAPANTOWN	TENDERLOIN	DOWNTOWN
Additional Trips To/From/Within District	10,000	14,000	67,000	40,000	190,000
Growth Percentage of Trips Within District	-0.9%	-0.4%	18.0%	-5.3%	27.5%
Growth Percentage of Trips To/From West of District within Study Area	--	-1.0%	9.6%	6.8%	8.0%
Growth Percentage of Trips To/From East of District within Study Area	2.1%	5.1%	14.7%	5.3%	--
Growth Percentage of Trips To/From the Rest of San Francisco	6.8%	7.2%	22.6%	11.2%	24.3%
Growth Percentage of Trips To/From the Rest of the Bay Area	9.8%	9.7%	24.0%	12.3%	22.6%

Source: SF-CHAMP.

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3.3 Transit Conditions

3.3.1 | Regulatory Setting

3.3.1.1 | SAN FRANCISCO GENERAL PLAN

The San Francisco *General Plan* (*General Plan*) addresses seven issues: land use, circulation, housing, conservation, open space, noise, and safety. Ten elements (sections), including the Transportation Element, comprise the plan. The *General Plan* also contains several area plans that cover specific geographic areas of San Francisco. The study area includes portions of the following area plans: Western Shoreline, Van Ness Avenue, Market Octavia, Civic Center, Downtown, South of Market, East SoMa, Northeastern Waterfront, and Rincon Hill.

The following sections of the Transportation Element are relevant to the Geary corridor: Transit First Policy, Policy 1.3, Policy 4.1, Policy 14.3, Policy 14.4, Policy 20.4, Policy 20.9, Policy 20.13, Policy 21.1, and Policy 21.2 are summarized below.

- **Transit First Policy:** The purpose of the Transit First Policy, first adopted by the San Francisco Board of Supervisors in 1973, is to restore balance to the transportation system in San Francisco that has long been automobile-dominant, and to improve overall mobility for all residents and visitors. Transit First encourages multimodalism, the use of transit and other alternatives to single-occupancy vehicles, and gives priority to the maintenance and expansion of the local transit system and improvement of regional transit coordination. Geary (both Boulevard and Street) is identified as a Transit Preferential Street in the Transit First Policy, along with O'Farrell Street between Market Street and Gough Street. The Transit Preferential Street program includes measures to improve transit vehicle speeds and minimize restraints of traffic on transit operations.
- **Policy 1.3:** Give priority to public transit and other alternatives to the private automobile as the means of meeting San Francisco's transportation needs, particularly those of commuters.
- **Policy 4.1:** Rapid transit lines from all outlying corridors should lead to stations and terminals that are adjacent or connected to each other in downtown San Francisco.
- **Policy 14.3:** Improve transit operation by implementing strategies that facilitate and prioritize transit vehicle movement and loading.
- **Policy 14.4:** Reduce congestion by encouraging alternatives to the single-occupant auto through the reservation of right-of-way and enhancement of other facilities dedicated to multiple modes of transportation.
- **Policy 20.1:** Give priority to transit vehicles based on a rational classification system of transit preferential streets.
- **Policy 20.4:** Develop transit preferential treatments according to established guidelines.
- **Policy 20.9:** Improve inter-district and intra-district transit service.

- **Policy 20.13:** Create dedicated bus lanes and Bus Rapid Transit (BRT) lanes to expedite bus travel times and improve transit reliability.
- **Policy 21.1:** Provide transit service from residential areas to major employment centers outside the downtown area.
- **Policy 21.2:** Where a high level of transit ridership or potential ridership exists along a corridor, existing transit service or technology should be upgraded to attract and accommodate riders.

The *General Plan* is regularly amended as necessary. The Transportation Element was last amended in December of 2010.

3.3.1.2 | SAN FRANCISCO TRANSPORTATION PLAN

The San Francisco Transportation Plan is the City's 30-year plan to identify goals, needs, and investment priorities for its transportation system. The plan identifies and supports transportation projects that improve how people travel in and around San Francisco. The San Francisco County Transportation Authority (SFCTA) adopted the first plan in 2004, and it established the City's investment strategy and policy initiatives including BRT. The previous version of the plan was released in December 2013 and described the planned key transportation investments to maintain livability, improve mobility, and provide accessibility for all travelers in Francisco. Among its key goals were to continue developing the City's rapid transit network, which includes BRT corridors, to promote faster transit travel times and increased reliability.

In 2017, SFCTA adopted SFTP 2040, an update to the 2013 SFTP. The updated SFTP reaffirmed the 2013 plan's goals, investment plan, and supporting policy recommendations. SFTP 2040 provided an update on existing and future conditions impacting the San Francisco transportation system, revised transportation funding revenue forecasts, updated project costs, and reassessed projects previously identified for funding in the 2013 plan. The new plan confirmed the importance of Geary BRT to achieving the plan's goals by including the project in the SFTP 2040 Investment Plan.

3.3.1.3 | TRANSIT EFFECTIVENESS PROJECT/MUNI FORWARD

San Francisco Municipal Transportation Agency (SFMTA) completed a comprehensive evaluation and overhaul of San Francisco's transit network known as the Transit Effectiveness Project (TEP) in 2014. Since 2014, many TEP recommendations have been implemented as a part of the Muni Forward program. Recommendations included changes to make Muni service more efficient, reliable, safe, and comfortable for its existing 700,000 daily passengers. The TEP was developed over several years of data collection, intensive planning, and public outreach efforts. Since completion, SFMTA has begun implementation of recommendations that have restructured transit service on certain transit lines to improve efficiency and connectivity and implement transit priority changes on the most heavily used lines to give buses and trains more priority on some City streets. The TEP's Draft EIR was released in 2013, and the Final EIR was published and certified in March 2014. SFMTA implemented the TEP's recommendations for the Geary corridor including increased peak period transit service frequencies on the Geary corridor and introduction of 38-Rapid service on Sundays. The SFMTA Board of Directors approved the final TEP plan on March 28, 2014.

3.3.2 | Affected Environment

San Francisco is served by several agencies providing public transportation services. SFMTA provides most transit operations in San Francisco, operating about 65 bus routes, six light rail lines, three cable car lines, and two historic streetcar lines.

Because it provides a direct route from the northwest part of the City to the downtown area, the Geary corridor is one of the most heavily traveled transit corridors in San Francisco. SFMTA currently operates four Muni bus routes on the Geary corridor that provide connections to both local and regional transit services. The Geary corridor bus routes currently provide local, rapid, and express service on Geary Boulevard, Geary Street, and O'Farrell Street, and can be characterized by high ridership throughout the day, with even higher usage during the a.m. and p.m. peak hours.

3.3.2.1 | SFMTA

SFMTA oversees all Muni transit service, bicycle and pedestrian programs, taxis, parking and traffic control operations in San Francisco. The SFMTA light rail system, a mixture of above- and below-ground service, has six routes serving residential areas and the downtown core. About 65 local, rapid, and express routes comprise the SFMTA bus system.

In addition to light rail and buses, SFMTA operates three cable car routes and two historic streetcar routes (F-Market & Wharves and E Embarcadero). A number of SFMTA transit routes connect to other regional transit providers, including Caltrain, Bay Area Rapid Transit (BART), and SamTrans.

SFMTA routes operate throughout the day; actual hours and headways vary by route and type of service (e.g., Owl service only runs during late-night hours and express routes run during weekday peak hours only). SFMTA's hours of operation for light rail service are between about 4 a.m. to 2 a.m. daily with slight variations by route.

Headway is the amount of time scheduled between two subsequent buses. A headway of 10 minutes means that a bus should arrive once every 10 minutes

3.3.2.1.1 GEARY CORRIDOR ROUTES

Four SFMTA routes currently serve the Geary corridor. Table 3.3-1 displays existing SFMTA transit services on the Geary corridor including hours of operation, headways, and average weekday ridership. Figure 3.3-1 depicts all existing public transit services along the Geary corridor.

Geary corridor bus service primarily operates on Geary Boulevard, Geary Street, O'Farrell Street, and Market Street. In addition to these streets, Geary bus service also operates on short segments of 48th, Point Lobos, 42nd, and 43rd avenues, Fremont and Beale streets, and Veterans Drive.

The 38 Geary (38 or 38 Local) route has a total of 98 stops (both directions) and provides local service along Geary Boulevard, Geary Street, and O'Farrell Street from 48th Avenue to the Transbay Transit Center. There are 48 eastbound[1] stops, 29 of which are located directly on Geary Boulevard, and 50 westbound stops, 41 of which are on Geary Boulevard or Geary Street. These stops are shared with express

[1] The Geary corridor travels in an east-west orientation. Eastbound buses are also considered 'inbound' lines whereas westbound buses are considered 'outbound' lines. As such, the terms eastbound/inbound and westbound/outbound are used interchangeably throughout this Draft EIS/EIR.

route stops where stops overlap. Normal service is from 5 a.m. to 1 a.m., with more frequent service during the a.m. and p.m. peak hours. From 1 a.m. to 5 a.m., Owl service makes all stops, but buses are run less frequently.

The 38 Geary Rapid (38R or 38 Rapid) travels the same route with only 24 stops in both directions. It has higher frequencies during the a.m. and p.m. peak periods and is typically a faster way to traverse the long corridor. The 38R operates from 6 a.m. until about 9:30 p.m.

Geary's current express routes are the 38 Geary B Express (38BX) and 38 Geary A Express (38AX). These routes only operate weekdays during the peak period in the peak direction (eastbound during the a.m. peak and westbound during the p.m. peak). The 38AX begins at 48th Avenue and makes limited stops to 25th Avenue, and then it operates express to the Financial District (via Bush and Sansome streets). In total, this route has 14 stops, 10 of which are west of 25th Avenue. The 38BX has 18 stops between 25th Avenue and its terminus at California and Battery streets. These routes provide weekday peak-direction express service during the peak hour and alleviate crowding on both the local and Rapid routes.

Table 3.3-1 Existing SFMTA Transit Services on Geary Corridor

ROUTES	ROUTE BOUNDARIES	WEEKDAY HOURS OF OPERATION	WEEKDAY A.M./P.M. PEAK HEADWAYS (MIN)	AVERAGE WEEKDAY RIDERSHIP (2011)
38 Geary	48th Avenue to temporary Transbay Transit Center	24 hour service	7.5/7.5	28,100
38R Geary Rapid	48th Avenue to temporary Transbay Transit Center	6 a.m. to 9:40 p.m.	4/5	27,100
38AX Geary A Express	48th Avenue to Davis/Pine streets	a.m. Peak Period/p.m. Peak Period	10/between 10 and 20	800
38BX Geary B Express	48th Avenue to Davis/Pine streets	a.m. Peak Period/p.m. Peak Period	10/between 10 and 20	900

Source: SFMTA, 2017. Headways for each service type represent combined headways east of 25th Avenue.

3.3.2.1.2 TRANSIT ROUTES CROSSING GEARY BOULEVARD

A number of SFMTA bus and light-rail lines cross the Geary corridor, offering multiple transfer opportunities to passengers of bus routes that travel along the Geary corridor. These crossing routes are listed in Table 3.3-2, including information on each route's operating characteristics and average weekday ridership. Figure 3.3-1 depicts all transit services that currently traverse or intersect with the Geary corridor.

Transfer points along the Geary corridor include routes 18 46th Avenue, 19 Polk, 22 Fillmore, 24 Divisadero, 27 Bryant, 28/28R 19th Avenue, 29 Sunset, 30 Stockton, 33 Stanyan, 43 Masonic, 44 O'Shaughnessy, 45 Union Stockton, 47 Van Ness, 49 Van Ness/Mission, Powell-Mason cable car, and Powell-Hyde cable car. Figure 3.3-1 shows bus routes that intersect the 38 and 38R.

Geary corridor bus routes also connect passengers to transit services near Market Street, providing access to regional and local services including BART, Muni light rail, and other Muni bus routes at Market Street.

Table 3.3-2 Existing Transit Routes Crossing the Geary Corridor

ROUTES	CROSS STREET AT GEARY	WEEKDAY HOURS OF OPERATION	WEEKDAY A.M./P.M. PEAK HEADWAYS (MIN)	AVERAGE WEEKDAY RIDERSHIP (2011)
18 46th Avenue	33rd Avenue	5 a.m. to 1 a.m.	20/20	3,700
29 Sunset	25th Avenue	5:45 a.m. 1 a.m.	10/10	18,800
28 19th Avenue	Park Presidio Boulevard	5:45 a.m. 1 a.m.	11/10	12,800
28L 19th Avenue	Park Presidio Boulevard	a.m. Peak and p.m. Peak Only	12/-	3,000
44 O'Shaughnessy	6th Avenue	5 a.m. to 1 a.m.	9/9	16,900
33 Stanyan	Arguello Boulevard	5 a.m. to 1 a.m.	15/15	6,200
43 Masonic	Masonic Avenue	5 a.m. to 1:10 a.m.	10/12	12,000
24 Divisadero	Divisadero Street	24 hours daily	10/10	11,400
22 Fillmore	Fillmore Street	24 hours daily	9/8	16,800
49 Mission/Van Ness	Van Ness Avenue	6 a.m. – 1:15 a.m.	8/8	26,800
47 Van Ness	Van Ness Avenue	6 a.m. – 1:15 a.m.	10/10	13,100
19 Polk	Polk Street	5:20 a.m. to 1:30 a.m.	15/15	7,600
27 Bryant	Leavenworth Street/ Jones Street	5 a.m. to 1 a.m.	15/15	7,900
30 Stockton	Mason Street/ Kearny Street	5:20 a.m. to 1:30 a.m.	7.5/8	32,400
45 Union Stockton	Mason Street/ Kearny Street	5:30 a.m. to 1 a.m.	8/12	11,700
Golden Gate Transit Route 92	Park Presidio to Webster Street	a.m. Peak and p.m. Peak Only	Between 30 and 60/between 30 and 60	230
Other Golden Gate Transit Routes: 10, 70, 101/101x, 54, 93	These routes cross the Geary corridor at Van Ness Avenue	Varies	Varies	Varies by route
BART	Market Street at Montgomery BART	4 a.m. to 12 a.m.	3/3	44,300*

Connecting services at Market Street include the 9R-San Bruno, 9L-San Bruno Limited, F-Market & Wharves, J-Church, KT-Ingleside/Third Street, L-Taraval, M-Ocean View, and N-Judah routes. Connecting services at Market Street and Sansome Street include the 10-Townsend and 12-Folsom/Pacific routes. Connecting services at Market Street between 3rd and 5th Streets include the 8X Bayshore Express, 8AX-Bayshore A Express, 8BX-Bayshore B Express, and 81X-Caltrain Express (NB Only) routes. *Average Weekday Entries to Montgomery Street BART Station, 2015.

Source: SFMTA, 2013; BART, 2015; Golden Gate Transit, 2013.

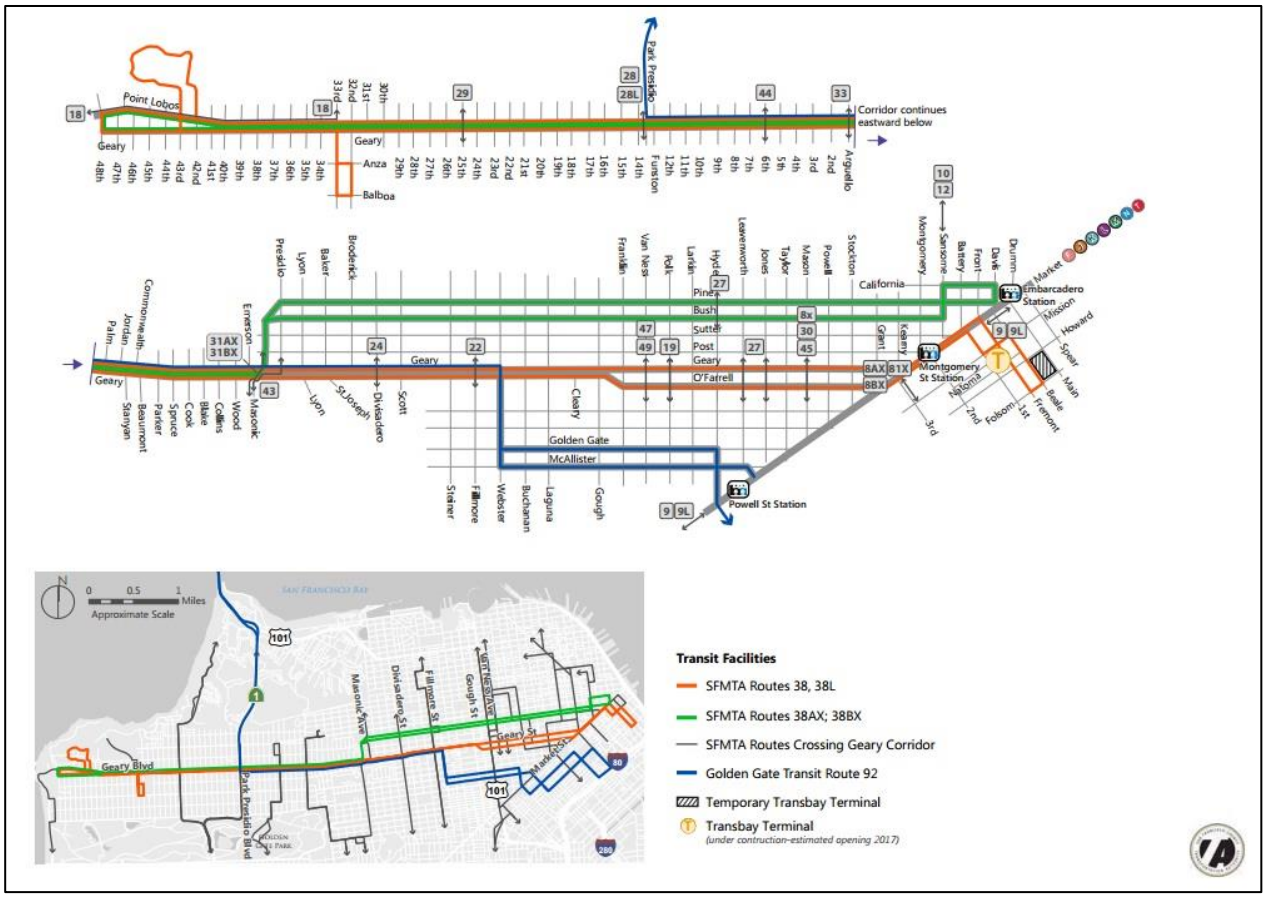
3.3.2.2 | GOLDEN GATE TRANSIT SERVICES

Golden Gate Transit is a public transit system serving Marin and Sonoma counties, with connections to San Francisco and Contra Costa counties. The Golden Gate Bridge Highway and Transportation District operates Golden Gate Transit service which has 20 bus routes. Most routes operate weekdays only in the a.m. and p.m. peak-travel periods (about 6 to 9 a.m. and 4 to 8 p.m.). Golden Gate Transit Route 92 provides interregional connections to the Geary corridor from the North Bay. Route 92 operates along Geary Boulevard (between Park Presidio Boulevard and Webster Street) on part of its route. The entire route spans from Manzanita Park and Ride in Mill Valley (Marin County) to Third and Perry streets in San Francisco. Several other Golden Gate Transit routes cross Geary Boulevard at Van Ness Avenue.

Route 92 makes eight eastbound and eight westbound stops along Geary Boulevard. Route 92 operates only in the weekday a.m. and p.m. peak periods. In the

southbound direction (Marin County to San Francisco), Route 92 operates between 6:30 and 9:30 a.m. and 3 and 7 p.m. at 30- to 60-minute headways. In the northbound direction (San Francisco to Marin County), Route 92 operates between 7 and 9 a.m. and 3 and 6 p.m. Average weekday ridership on Route 92 is 226 passengers. Of these passengers, an average of 122 travel in the northbound direction from San Francisco into Marin County each day. An average of 104 passengers travel southbound from Marin County into San Francisco. Figure 3.3-1 depicts all transit services that currently traverse or intersect with the Geary corridor, including Golden Gate Transit Route 92.

Figure 3.3-1 Existing Geary Corridor Transit Routes



Source: Fehr & Peers, 2014.

3.3.2.3 | PRIVATE SHUTTLES

The Geary corridor is also served by several private shuttle services. Most shuttles are institutionally based, though several private employer shuttles cross the Geary corridor at various points along their routes. Key private shuttle services are described below.

- **Kaiser Permanente San Francisco Medical Center Downtown Commuter Shuttle Service:** The Kaiser shuttle operates on weekdays in the a.m. peak (6:20 a.m. and 9:45 a.m.) and the p.m. peak (2:30 p.m. and 7:15 p.m.). The shuttle starts at the Transbay Transit Center at First and Mission streets and terminates on Sixth Avenue between Geary Boulevard and Anza

Street. The Kaiser shuttle stops at the Kaiser Campus at 2238 Geary Blvd. near the intersection of Divisadero Street, and at Sixth Street between Geary Boulevard and Anza Street (660 6th Street). Passengers on the Kaiser Shuttle can also connect to Muni service at the Civic Center Station, another stop on the shuttle's route.[2]

- **UCSF Shuttles:** University of California, San Francisco (UCSF), a major educational institution, health-care provider, and regional employer, operates 15 shuttle routes within San Francisco, connecting students, employees, and patients to their facilities and campuses. Three following three UCSF shuttle routes intersect with or travel along the Geary corridor:
  - **The Blue route** crosses Geary Boulevard at Masonic Avenue, but it does not stop on the Geary corridor. This shuttle connects San Francisco General Hospital in Mission Bay to the UCSF Medical Center at Mount Zion.
  - **The Tan route** travels along Geary Boulevard between Stanyan Street to the west and Scott Street to the east; however, the Tan route does not make a stop on the Geary corridor. The Tan route connects the UCSF Medical Center just south of Golden Gate Park on Parnassus Avenue to the UCSF Medical Center at Mount Zion.
  - **The Purple route** connects the UCSF Medical Center on Parnassus Avenue to the UCSF Medical Center at Mount Zion. Along its route, the Purple route shuttle stops at 3360 Geary Street between Commonwealth and Parker avenues. The Purple route stops about 16 times daily at this location between 6:45 a.m. and 6 p.m. on weekdays only.[3]
- **Institute on Aging:** The Institute on Aging has multiple locations along the Geary corridor that are served by shuttles. The main Coronet Campus (3575 Geary Boulevard) and the On Lok Lifeways facility (2700 Geary Boulevard) both have curbside shuttle passenger-loading areas at the entrance to the buildings. A variety of shuttle and paratransit service providers temporarily stop in front of the building and require sidewalk access to load and unload disabled senior passengers.
- **Other Shuttles:** Other shuttles such as the Academy of Art University shuttle, tour buses, private shuttles (such as Chariot), and private technology company shuttles also operate on the Geary corridor. Most private technology company shuttles currently travel on perpendicular streets and do not stop directly on the Geary corridor.

3.3.2.4 | EXISTING SFMTA OPERATING CHARACTERISTICS

This section discusses existing SFMTA bus performance along the Geary corridor. It specifically addresses bus stops and transfer points along the corridor, ridership, crowding, travel time, speed, delay and route segment reliability on routes 38 Geary, 38R, 38AX, and 38BX. In this section, references to Geary Rapid or express service include routes 38R, 38AX, and 38BX; 38 refers to Geary local service. All data was collected in 2011 using SFMTA Automatic Passenger Counter (APC) technology. Figure 3.3-1 shows the locations of current bus routes that operate on or across the Geary corridor.

[2] http://www.permanente.net/homepage/kaiser/pdf/36879.pdf.
[3] http://campuslifeservices.ucsf.edu/transportation/services/shuttles/routes_timetables.

3.3.2.4.1 RIDERSHIP

The total weekday ridership for routes 38, 38R, 38AX, and 38BX combined is over 50,000 trips, or boardings per weekday. Figures 3.3-4 and 3.3-5 detail boardings by stop along the Geary corridor. In current conditions, 38R ridership is generally slightly higher than Local bus ridership throughout the corridor. The westbound direction experiences the highest number of daily boardings at Geary and Powell streets with about 1,600 boardings per day on route 38, as well as 1,600 boardings per day on route 38R. The 38 eastbound route experiences the highest boardings at Geary Boulevard and Fillmore Street (about 700 passengers per day) and the 38R route has the most daily boardings at Geary Boulevard and Divisadero Street (almost 1,200 passengers per day). Table 3.3-3 summarizes seating capacities for Geary corridor bus routes.

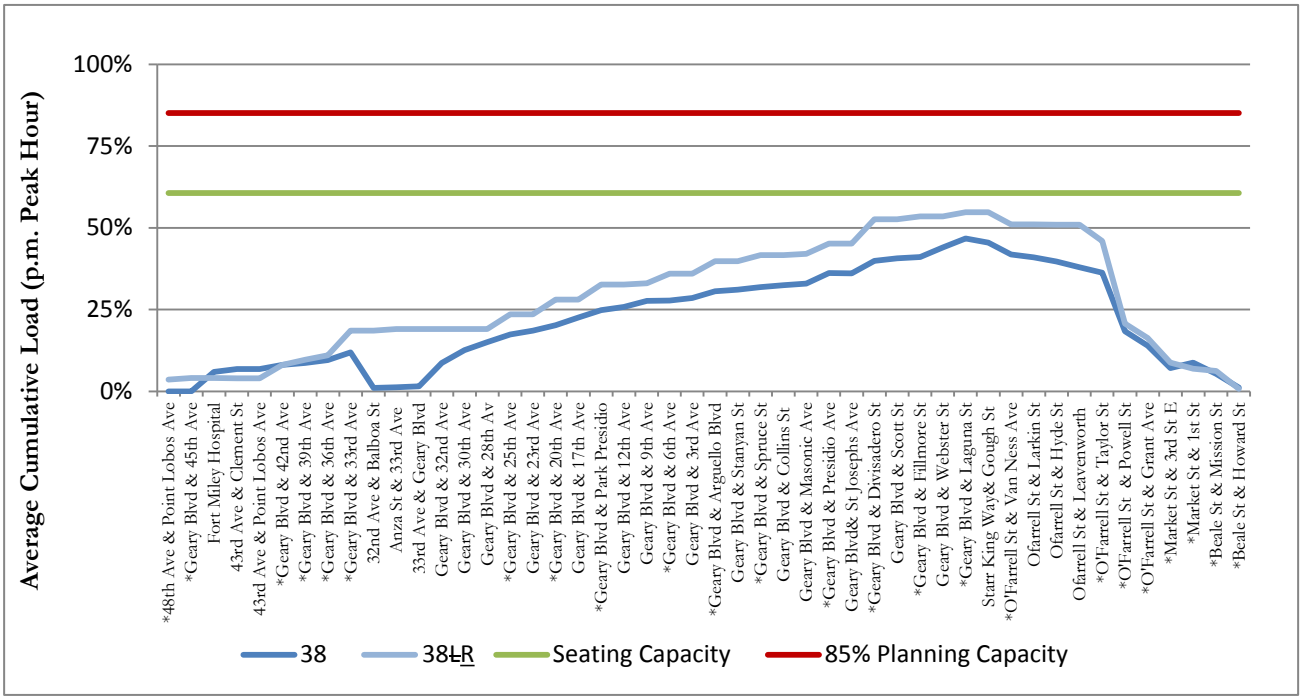
Table 3.3-3 Bus Capacities for Geary Corridor Routes

ROUTES	SEATING CAPACITY	85% CAPACITY	100% CAPACITY
Route 38 (Local)	57	80	94
Route 38R	57	80	94
Route 38AX	36	54	63
Route 38BX	36	54	63

Source: SFMTA

Figures 3.3-2 and 3.3-3 display average peak hour passenger load by stop on both eastbound and westbound 38 and 38R routes. Seating capacity and the 85 percent planning capacity used by SFMTA are also shown. SFMTA seeks to maintain transit frequencies that maintain passenger loads at or below this threshold.

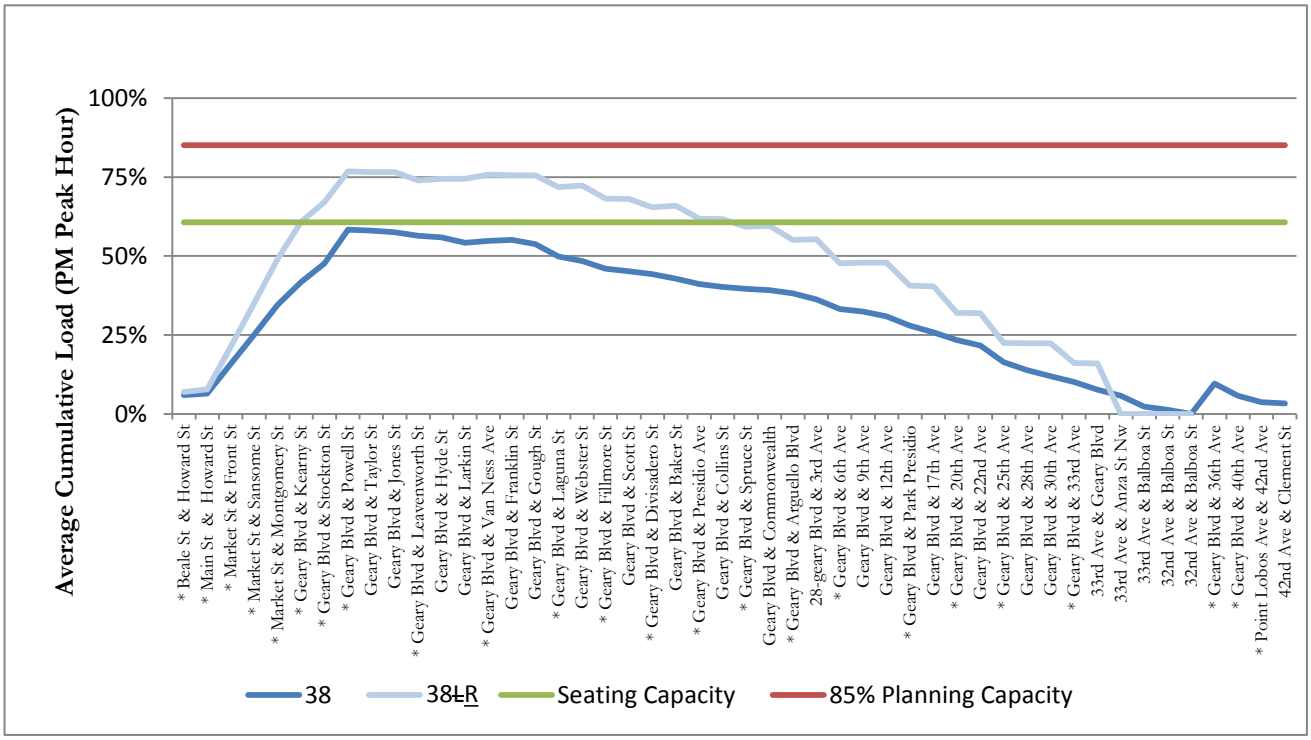
Figure 3.3-2 Average Load by Stop: Eastbound P.M. Peak Hour, 38 and 38R



*Denotes Route 38-Geary and Route 38R-Geary Rapid combined stop.

Source: SFMTA, Fall 2012 APC Data, "Average Max Loads by Stop"

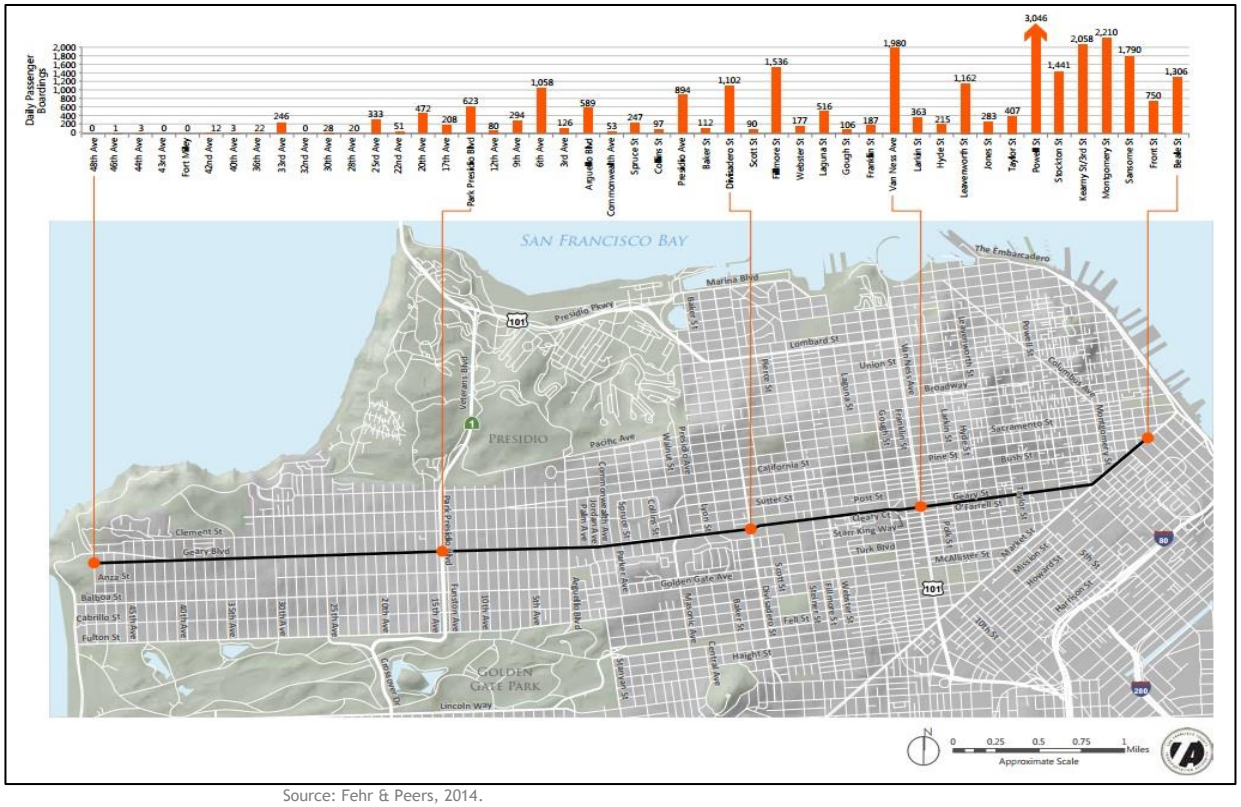
Figure 3.3-3 Average Load by Stop: Westbound P.M. Peak Hour, 38 and 38R



*Denotes Route 38-Geary and Route 38R-Geary Rapid combined stop.

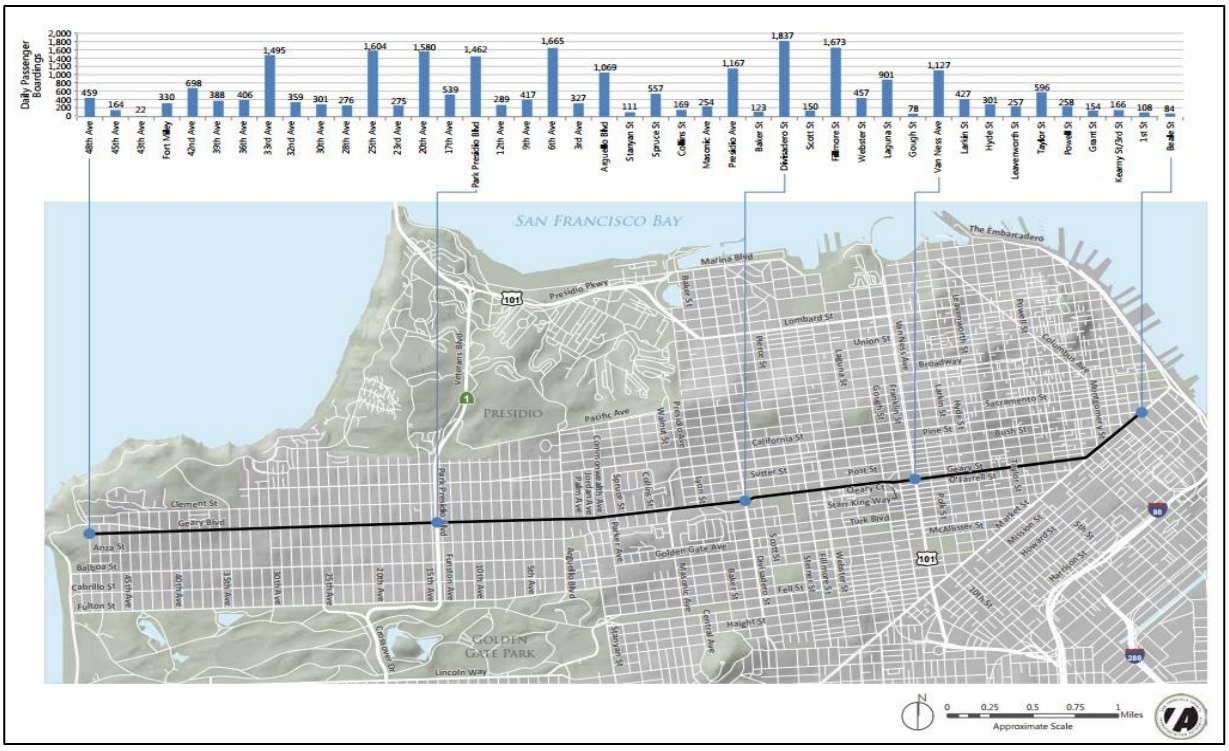
Source: SFMTA, Fall 2012 APC Data, "Average Max Loads by Stop"

Figure 3.3-4 Existing Westbound Transit Boardings along Geary Corridor



Source: Fehr & Peers, 2014.

Figure 3.3-5 Existing Eastbound Transit Boardings along Geary Corridor



Source: Fehr & Peers, 2014.

Afternoon (p.m.) peak-period passenger loads are shown because they represent the period when the maximum use of the transportation system occurs. The focus on p.m. peak hour results is also consistent with the recommendations in the San Francisco Planning Department's Transportation Impact Analysis Guidelines, the document that guides California Environmental Quality Act- analysis in the City of San Francisco. While *average* load during p.m. peak hours does not exceed the 85 percent capacity utilization threshold, a high proportion of buses experience substantially more crowding than the hourly average load, resulting in excessive bus bunching and unreliability throughout the peak periods.

A bus is considered to be bunched if it arrives at a station less than one or two minutes after the previous bus.

The 85 percent planning capacity is SFMTA's established capacity utilization threshold for peak period ridership, meaning total seated and standing loads are at 85 percent of the total bus capacity

3.3.2.4.2 BUS CROWDING (LOAD FACTOR)

Bus crowding, which is also referred to as capacity utilization or "load factor," is measured by the number of passengers on board a bus relative to the vehicle's carrying capacity. SFMTA regularly measures and reports bus crowding on all transit routes. The point along the corridor with the highest number of bus passengers on board is referred to as the "maximum load point." This point differs depending on the route and direction. During the p.m. peak hour, the maximum load point on both the 38 and 38R westbound routes is at the Geary and Powell stop. The maximum load point for the 38AX and 38BX westbound routes during the p.m. peak hour is at the Pine and Montgomery stop. The 38R route experiences the most crowding during the p.m. peak hour of the four Geary corridor routes. During the a.m. peak hour, the maximum load point on the inbound 38 eastbound route is at the O'Farrell and Leavenworth stop; the 38R eastbound route maximum load point is at Geary and Laguna.

3.3.2.4.3 TRAVEL TIME, SPEED, AND DELAYS

Transit performance can be indicated from a route's travel time and speed, as well as the amount of time transit vehicles are spent delayed. Travel times or speed are directly affected by delays on the corridor. Delays can be caused by a multitude of sources, including:

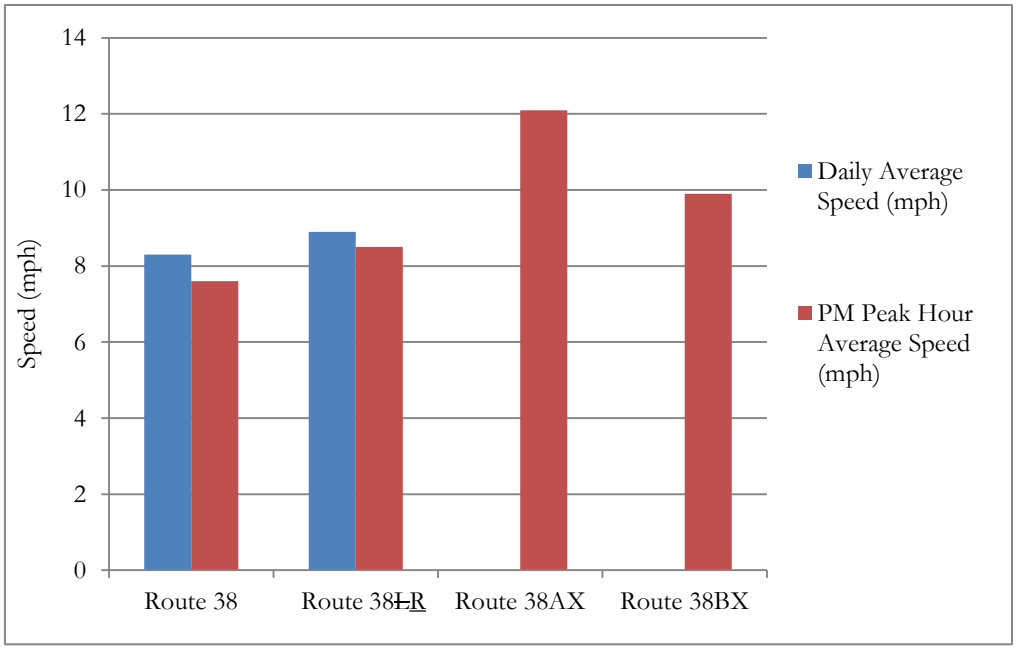
- **Transit Stop Delay**: Delay caused by buses decelerating and pulling into a transit stop as well as accelerating back up to average speed. Buses may delay other buses at transit stops. Local buses that do not pull fully out of the rightmost travel lane to access a stop can obstruct rapid stop buses attempting to pass.
- **Dwell Delay**: Delay caused by Muni customers entering and leaving the transit vehicle. This is measured from the time of opening the doors to closing the doors. Long dwell times can be a result of high passenger demand, a large number of passengers paying cash fares, or slow boarding and exiting due to crowded conditions within a bus.
- **Merge Delay**: Delay caused by a transit vehicle merging back into traffic after serving a transit stop.
- **Congestion Delay**: Delay caused by traffic queues such as those due to turning traffic waiting for gaps in crossing pedestrians or general traffic congestion.

- **Traffic Signal Delay**: Delay caused by a traffic signal, including stopped and congestion delay.
- **Stop Sign Delay**: Delay caused by a stop sign, including deceleration, re-acceleration, and congestion.
- **Parking Delay**: Delay caused by delivery vehicles, parking maneuvers, double parking, driveways, and other on-street parking friction factors. Drivers seeking a parking space may also drive slowly and interfere with bus operations as they search for a spot.

As shown in Figure 3.3-6, during the p.m. peak period, the average vehicle speeds for the 38 and 38R buses is about 7 to 8 mph, including dwell time. Westbound travel speeds for the 38 and 38R buses remain relatively consistent through the study network. The eastbound travel speed for the 38 and 38R buses is also relatively constant throughout the study network, with somewhat higher average speeds west of Divisadero Street and lower average speeds east of Webster Street. Excluding the segment between Webster Street and Van Ness Avenue, the 38R's average travel speed is about 10 mph for the duration of the network. The same is true for the 38 between Park Presidio Boulevard and Steiner Street.

Combining both directions, the average p.m. peak hour rapid (38R) travel time is 47 minutes compared with the local route travel time of 54.5 minutes between 48th Avenue and the Transbay Transit Center.

Figure 3.3-6 Existing Transit Speeds



Note: Average speeds of Geary corridor routes are reported between 48th Avenue and the Transbay Transit Center, except for Express Routes, which are the average speeds of the total express route begin and end points. Daily average speed is not shown for the Express Routes as they only operate during peak periods.

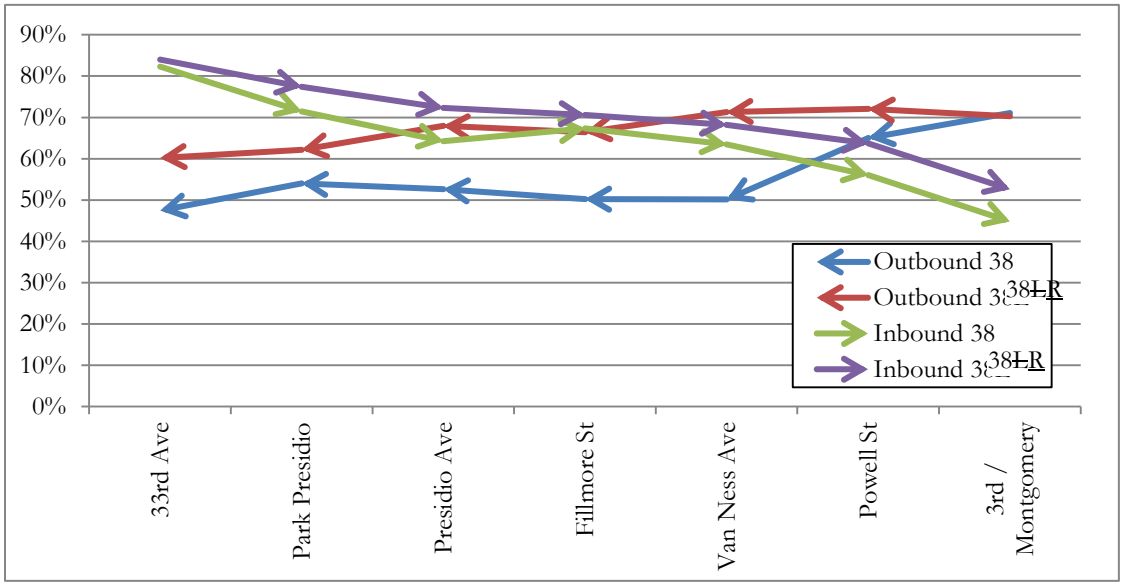
3.3.2.4.4 ROUTE SEGMENT RELIABILITY

Transit travel time reliability is a measure of how well buses adhere to their schedules. Factors that affect transit delay also affect transit reliability, including dwell time, transit congestion, traffic congestion, and parking maneuvers (see Section 3.3.2.4.3).

Bus bunching is one additional factor that affects transit reliability. When a bus becomes delayed due to another cause, the gap in time between the previous bus and the delayed bus grows and, as a result, more passengers arrive at each stop during that time for the delayed bus to load. The additional passengers increase the delayed bus's dwell time at each stop, generating increased delay until the following bus eventually catches up to the delayed bus.

Figures 3.3-7 to 3.3-9 present three measures of existing conditions bus reliability including on-time performance, headway adherence, and bus bunching. These measures represent the p.m. peak hour for an average month in 2013.

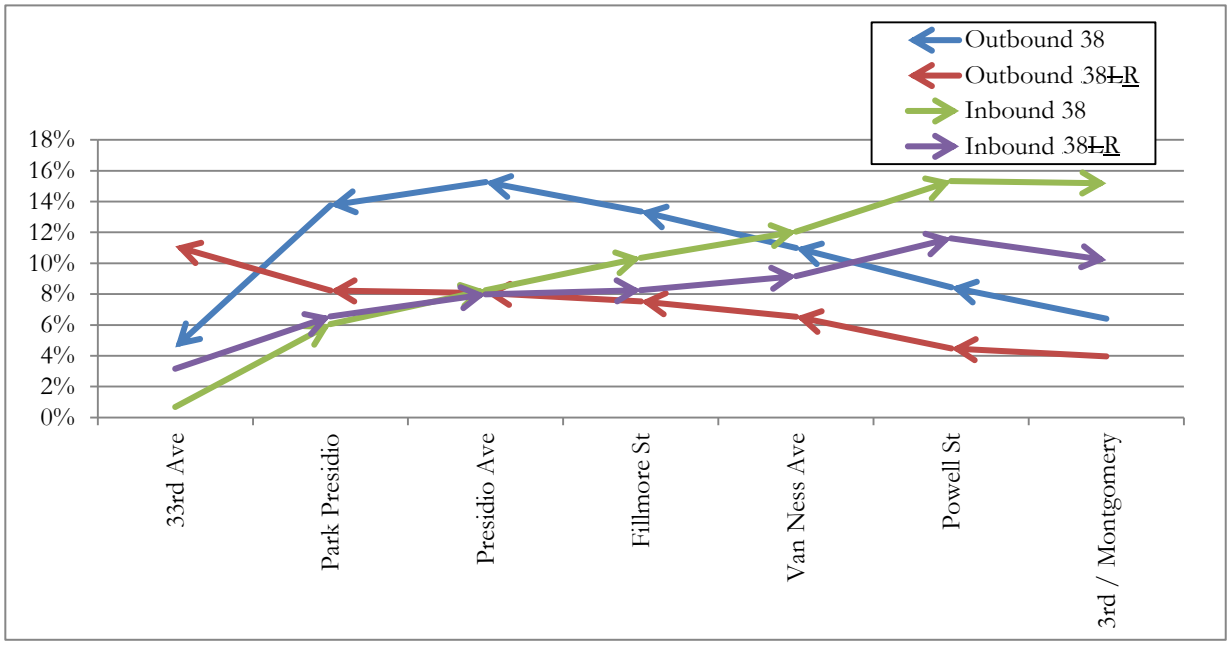
Figure 3.3-7 Geary Corridor Transit On-Time Performance (P.M. Peak Hour, Weekdays, 2013)



Note: Target on-time performance is 85 percent.

Source: SFMTA, 2014

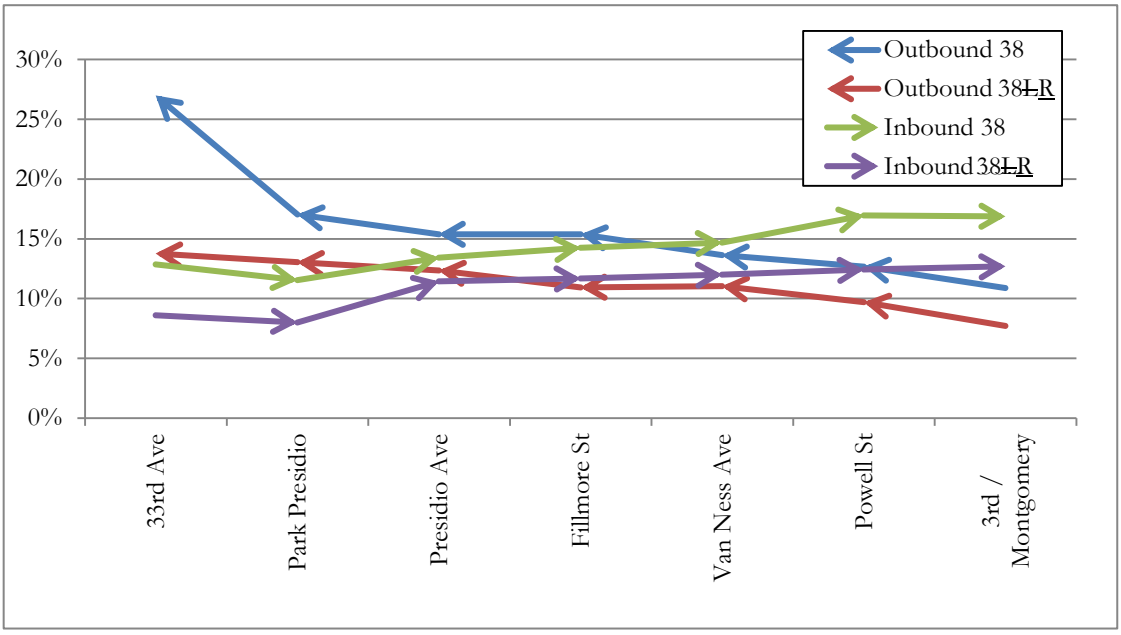
Figure 3.3-8 Geary Corridor Transit Headway Adherence (Headways Exceeding Schedule by More Than Five Minutes, P.M. Peak Hour, Weekdays, 2013)



Note: SFMTA targets for headway adherence are that buses operate without gaps of more than 5 minutes above scheduled headways; thus any proportion of buses exceeding headways by greater than 5 minutes exceeds SFMTA's standard.

Source: SFMTA, 2014

Figure 3.3-9 Geary Corridor Transit Bus Bunching (Gaps Between Buses Less Than One to Two Minutes, P.M. Peak Hour, Weekdays, 2013)



Note: SFMTA targets for bus bunching are that all buses operate without gaps of between one and two minutes; thus any proportion of buses bunching does not meet SFMTA's standard.

Source: SFMTA, 2014

The first measure is on-time performance. For this metric, a bus is considered on time if it reaches a checkpoint no more than one minute early and no more than four minutes later than its scheduled arrival time. SFMTA's target on-time performance standard is 85 percent. On-time performance tends to degrade as a bus travels farther away from the origin station. In the p.m. peak hour, westbound 38 and 38R buses reach selected checkpoints on time between 47 and 71 percent of the time. Eastbound service on the 38 and 38R is more likely to be on time at the beginning of the run, but less likely to be on time by the end of the run than westbound services.

Other measures of transit reliability also have tendencies to show degrading conditions as a bus travels along a route. This pattern is evident in charts of headway adherence and bus bunching on the Geary corridor. Figure 3.3-8 shows the percentage of p.m. peak hour buses that arrive at each checkpoint after a service gap that exceeds scheduled headways by more than five minutes. Westbound p.m. peak-hour 38R buses have headway gaps exceeding scheduled headways by more than five minutes 8 percent of the time at Market and Montgomery streets. This number increases to 14 percent by 33rd Avenue. Figure 3.3.-9 presents p.m. peak hour bus bunching conditions on the Geary corridor. Fewer than 10 percent of buses arrived bunched at early checkpoints, but bus bunching becomes more frequent later in each bus route. P.m. peak hour Geary corridor buses that are approaching their route termini experience bus bunching rates ranging between 10 and 16 percent.

3.3.3 | Methodology

3.3.3.1 | FUTURE YEAR TRANSIT FORECASTS (2020/2035)

METHODOLOGY

SFCTA estimates daily transit ridership projections by applying the difference in transit ridership between the base year model scenario and each future year scenario to existing observed ridership

Future year transit ridership forecasts were developed using SFCTA's activity-based travel demand forecasting process. SFCTA used the San Francisco Chained Activity Modeling Process (SF-CHAMP) model to estimate transit vehicle boardings, alightings, and vehicle loads by transit route and by time of day for all San Francisco Bay Area transit routes. Year 2020 No Build conditions were used as the environmental baseline to compare future year transit forecasts due to anticipated changes in transit ridership expected between existing conditions (2012) and opening year (2020). Between 2012 and 2020, corridor ridership is expected to increase by almost 30 percent.

As described in Appendix D-1 (Modeling Methodology Approach), ridership modeling considers currently planned Muni improvements. The model also accounts for reduced dwell times caused by Muni all door boarding introduced in 2012. For the build scenarios, SF-CHAMP incorporates travel time savings that would be realized from the creation of dedicated bus lanes.

Several key transit projects related to the Geary corridor are anticipated to occur before 2020 and are accounted for in the modeling process. These include the following:

- **Van Ness Avenue BRT "Center A" Scenario**: The project was approved in September 2013, and operational service is expected by 2020. Van Ness Avenue BRT service, which would operate in dedicated bus lanes running in the center median of Van Ness Avenue, is assumed in all future year scenarios for this transportation evaluation.

- **Central Subway Project**: This project is assumed to be operational by 2020. This project will add a new north-south light rail subway tunnel under Stockton and Fourth streets. Geary corridor bus-riders will be able to transfer to or from the Central Subway at Union Square, and they will be able to connect to Chinatown, the Moscone Center, the Caltrain Station at Fourth and King streets, and other destinations along the current alignment of the Muni "T" light rail line.

SFMTA's implementation of Muni Forward/TEP will occur incrementally beyond 2020. Several other SFMTA projects are under construction and will have some interaction with the Geary corridor. The transit ridership effects of other projects are assumed as part of the travel demand forecasts prepared for this document. Appendix D-1 (Modeling Methodology Approach) describes other regional transit projects assumed as part of the travel demand forecasts.

No identified improvements are planned for Golden Gate Transit Route 92 in 2020 or 2035.

VISSIM analysis was conducted under baseline (2013), opening year (2020), and horizon year (2013) conditions

For more detailed information on the VISSIM model development process, please see Appendix D2-1

3.3.3.2 | TRANSIT OPERATIONS ANALYSIS METHODOLOGY

This section summarizes the methodology used to model future transit performance of the five alternatives modeled: No Build Alternative, Alternative 2, Alternative 3, Alternative 3-Consolidated, and the Hybrid Alternative/Locally Preferred Alternative (LPA). The multimodal transportation simulation software package VISSIM was used to simulate transit performance for the No Build and build alternatives. The main assumptions in the VISSIM model are summarized below.

Dwell Times: Dwell time is the amount of time a bus is stationary at a scheduled stop to allow passengers to board and alight from the vehicle, including the time required to bring the vehicle to a full stop, open doors, and close doors. Dwell times were adjusted based on SF-CHAMP model results and normalized based on existing dwell times (2013) to minimize any large variations occurring at some stops. Ultimately, for all alternatives (including the No Build Alternative), the average 85th percentile and maximum dwell times were included in the VISSIM model for both 2020 and 2035. All-door boarding and low-floor buses also have an effect on bus dwell times. Estimated dwell times were calculated for future conditions for the No Build and build alternatives. Appendix D3-1 (SF-CHAMP Validation) provides additional detail about the calculation of future dwell times.

All-Door Boarding: On July 1, 2012, SFMTA began systemwide all-door boarding, which allows passengers to board from both the front and back doors on the vehicle. All-door boarding reduces dwell times and is more convenient for passengers. In keeping with SFMTA's policy, the No Build and build alternatives are assumed to operate with all-door boarding in both the opening and horizon years.

Pedestrian Activity Growth: Pedestrian activity in the Geary corridor is expected to increase by 2020 in response to new land use development and increased ridership. Drawing upon SF-CHAMP model forecasts, pedestrian volumes on Geary Boulevard are assumed to increase as follows: 2 percent between 25th Avenue and Broderick Street; 4 percent between Broderick Street and Laguna Street; and 20 percent between Laguna Street and Van Ness Avenue by 2020. Similar increases are assumed for the year 2035.

Bicyclist Activity Growth: Consistent with recent trends in bicycling growth in San Francisco, additional cyclists are expected on the Geary corridor in the future. By 2020, bicyclist activity is expected to grow by 20 percent across the entire Geary corridor. The same is assumed in 2035.

Transit Signal Priority (TSP): TSP optimizes signal timings along a street segment to prioritize bus clearance through an intersection or series of consecutive intersections. The No Build Alternative and all build alternatives are assumed to have TSP installed at all signalized intersections from 25th Avenue to Gough Street along the Geary corridor by 2020. As further noted in Chapter 2, the build alternatives contemplate a different type (fiber-based) TSP than the No Build Alternative (wireless).

Unconstrained Transit Speed Assumptions: Free-flow transit speeds – the speed that buses travel when fully accelerated and unconstrained by traffic signals or other vehicles – are assumed to remain generally unchanged by 2020, as speed limits are not expected to change. However, in center-running bus lane sections of the corridor for Alternatives 3 and 3-Consolidated, and the Hybrid Alternative/LPA, free-flow transit speeds are assumed to be slightly higher than in sections where buses run adjacent to a lane of parked vehicles. Empirical data related to bus operations indicate that buses can achieve slightly higher maximum speeds when they operate in dedicated roadway that is free from traffic and parking interference.

Bus Service Frequency: Bus service frequencies in 2020 and 2035 vary according to the alternative.

Traffic Signal Cycle Lengths: Signal cycle lengths in 2020 and 2035 were adjusted on the Geary corridor according to future traffic forecasts. These adjustments account for mandated changes in pedestrian crossing times, such as the addition of flashing "don't walk" timings.

New Traffic Signals: The No Build Alternative will result in several newly signalized locations on the Geary corridor by 2020. The project would result in several additional locations that would become newly signalized by 2020. Appendix D-1 (Modeling Methodology Approach) provides additional discussion of planned signals.

Pedestrian Countdown Signals: No new dedicated pedestrian signals are assumed under the No Build Alternative. However, the build alternatives assume several new pedestrian crossings will be constructed (see Appendices D-1 and D3-1). While new signals have a minor effect on auto and bus travel times, they provide walking accessibility and improve safety. For center-running build alternatives, they also, in some cases, provide access to bus platforms. Pedestrian countdown signals would be installed to improve street crossings and facilitate access to bus stops under the No Build and build alternatives. Flashing "don't walk" times were assumed to be longer for 2020 and 2035 conditions, which would reduce the amount of green-signal time for through traffic movements on the Geary corridor.

Parking Delay: On-street parking maneuvers currently affect bus operations on the Geary corridor. Under the No Build Alternative and Alternative 2, buses would continue to operate adjacent to on-street parking for the entirety of the Geary corridor. Under Alternatives 3 and 3-Consolidated, and the Hybrid

Alternative/LPA, bus operations are not assumed to be affected by parking maneuvers (in center-running sections only).

3.3.3.2.1 BUS OPERATIONS AT TRANSITIONS

Some build alternatives would require bus drivers to transition from side-running bus lane operations to center-running operations, and vice versa. This transitional maneuver can cause delay, which can vary depending on traffic conditions at the time a driver is attempting to transition. The VISSIM model assumed a queue-jump[4] traffic signal for buses at the nearest signalized intersection at the beginning of the transition. The VISSIM model results accounted forany delays or travel time penalties associated with a transition.

3.3.3.3 | ANALYSIS METRICS

The output metrics from the VISSIM model used to measure the performance of each alternative are summarized below.

- **Bus Travel Times:** Measure of the amount of time, in minutes, it takes for a bus to travel between designated segment(s) along the Geary corridor.
- **Bus Reliability:** Bus reliability is measured as the difference between average travel time and the 95th percentile travel time for a given segment.
- **Systemwide Multimodal Delay:** Measure of total hours of delay, network-wide, by mode (automobiles, transit, bicyclists, and pedestrians).

3.3.4 | Environmental Consequences

This section describes potential impacts and benefits for transit operations. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 3.3.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding transit operations impacts in the Draft EIS/EIR.

3.3.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe effects to transit conditions during construction or operation.

[4] A **queue-jump** signal provides preference to buses at intersections, consisting of a special traffic signal phase specifically for vehicles within the queue jump.

As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe effects to transit conditions relative to what was disclosed in the Draft EIS/EIR.

SFMTA conducted supplemental transportation analyses of the modifications, documented in separate memoranda,[5,6,7] the results of which are discussed below.

Retention of the Webster Street Pedestrian Bridge

Construction: The proposed modification would eliminate demolition and excavation activities at this location. This would result in a reduced number of traffic and transit disruptions in the immediate area during construction. Therefore, this modification would not result in any new or more severe transit impacts during construction.

Operation: Retaining the Webster Street pedestrian bridge would require westbound BRT buses to travel in mixed-flow travel lanes approaching the Webster Street intersection. This is because the pedestrian bridge supports would not permit full extension of the westbound bus-only lane across the Webster Street intersection. SFMTA examined whether the change in bus lane configuration here, along with anticipated pedestrian improvements, would have any potential to substantially alter bus service through this area. SFMTA concluded that retaining the Webster Street pedestrian bridge could result in one-second westbound bus delays on average, and such delays would not substantially affect BRT service. Therefore, this modification would not result in any new or more severe transit impacts during operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: Given that a new BRT stop would not be built between Spruce and Cook streets, construction (and associated traffic and transit disruptions) would be reduced in this area. Therefore, this modification would not result in any new or more severe transit impacts during construction.

Operation: Without BRT stops in this location, overall BRT travel time would be slightly faster (due to one less BRT stop), which would benefit riders traveling between other stops. BRT buses would stop at Arguello Boulevard to the west and Presidio and Masonic avenues to the east; however, this would result in a greater walking distance to or from a BRT stop (about 5 blocks) for people starting or ending journeys in the Spruce Street-Cook Street area who prefer to use the BRT service. However, the stops would continue to be served by local and commute-period express buses. Therefore, this modification would not result in any new or more severe transit impacts during operation.

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[5] San Francisco Municipal Transportation Agency. *Geary Boulevard Bus Rapid Transit: Pedestrian Bulbout Parking Effects Analysis*. November 15, 2016. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

[6] San Francisco Municipal Transportation Agency. *Geary Corridor Bus Rapid Transit Project – Possible Modifications to Staff Recommended Alternative Bus Stops at Laguna and Collins Streets – Supplemental Transportation Analysis Technical Memorandum.* January 4, 2017. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

[7] [7] San Francisco Municipal Transportation Agency. *Geary Boulevard Bus Rapid Transit: 27th Avenue Transition – Transportation Analysis Technical Memorandum*. April 18, 2017. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: All pedestrian improvements would be constructed within existing transportation right of way. Construction-period disruptions would be short in duration and similar to that which would occur for other previously proposed pedestrian improvements throughout the corridor. Therefore, this modification would not result in any new or more severe transit impacts during construction.

Operation: None of the additional pedestrian improvements would be constructed where a traffic or transit lane currently exists or is planned to exist, so they would not affect traffic or transit lane configurations or capacity. Therefore, they would not affect vehicle delay and no new or more severe effects to mixed-flow travel lanes or bus/automobile travel times would occur. Therefore, this modification would not result in any new or more severe transit impacts during operation.

Addition of BRT Stops at Laguna Street

Construction: Construction-period disruptions would be short in duration and similar to that which would occur for other previously proposed BRT stops throughout the corridor. Therefore, this modification would not result in any new or more severe transit impacts during construction.

Operation: A separate memorandum[8] analyzed and described the changes to transit performance at Laguna Street from adding Laguna Street as a BRT stop. The analysis concluded that the revision would increase the average travel time of the inbound and outbound BRT service by 49 seconds from end to end compared with the Hybrid Alternative/LPA as analyzed in the Draft EIS/EIR. This would be a negligible increase in travel time. Therefore, this modification would not result in any new or more severe transit impacts during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: Given that existing bus stops would no longer be removed at Collins Street, construction (and associated traffic and transit disruptions) would be reduced in this area. Therefore, this modification would not result in any new or more severe transit impacts during construction.

Operation: As proposed in the Draft EIS/EIR, the removal of the bus stops at Collins Street would have reduced the travel time of the local bus by removing the delay associated with the stops. Retaining the bus stops at Collins Street would eliminate the travel time savings associated with the stop removal. The potential revision would increase the travel time of the local service by 16 seconds in the inbound direction and 35 seconds in the outbound direction, relative to what was described in the Draft EIS/EIR for the Hybrid Alternative/LPA. This would be a negligible decrease and would thus still result in local service travel time savings for the Hybrid Alternative/LPA. Therefore, this modification would not result in any new or more severe transit impacts during operation.

[8] San Francisco Municipal Transportation Agency, San Francisco County Transportation Authority. *Analysis of Geary Corridor Stop Options at Laguna Street*. September 14, 2016. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities but would simply shift about half of it one block to the west. Therefore, this modification would not result in any new or more severe transit impacts during construction.

Operation: Negligible changes to signal timing would result from the relocated transition point. The transition from center- to side-running would remain operationally the same as described in the Draft EIS/EIR, except that transit vehicles in the westbound direction would change from the center-running bus-only lane to the side-running bus-only lane one block farther west. This change would not result in traffic delay or delays to transit operations. Therefore, the relocation of the transition point would not create additional transit delay than what was previously identified in the Draft EIS/EIR.

Travel Time Variability – All Modifications

As described in Section 3.3.4.5 below, travel time variability is an important measure of bus service reliability. Some of the individual modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR may increase transit travel time variability (i.e., Laguna Street bus stop modifications), while others may decrease variability (i.e., Spruce-Cook bus stop modifications). The pedestrian crossing improvements would have no effect on variability because none would alter any travel lane configuration or right-turn movement. The Webster Street bridge retention and relocation of the westbound center- to side-running bus lane transition would have negligible effects on variability. The Collins Street bus stop retention would affect local and express services and would have minimal impacts on variability. The Spruce-Cook and Laguna bus stop modifications would only affect BRT service and, taken together, would have negligible impacts. In sum, any changes to the estimated travel time variations resulting from modifications to the Hybrid Alternative/LPA would be minimal and likely within the round-off error (10 seconds). With all six minor modifications, the Hybrid Alternative/LPA would still provide a travel time reliability benefit relative to the No Build Alternative.

3.3.4.2 | FUTURE GEARY CORRIDOR RIDERSHIP

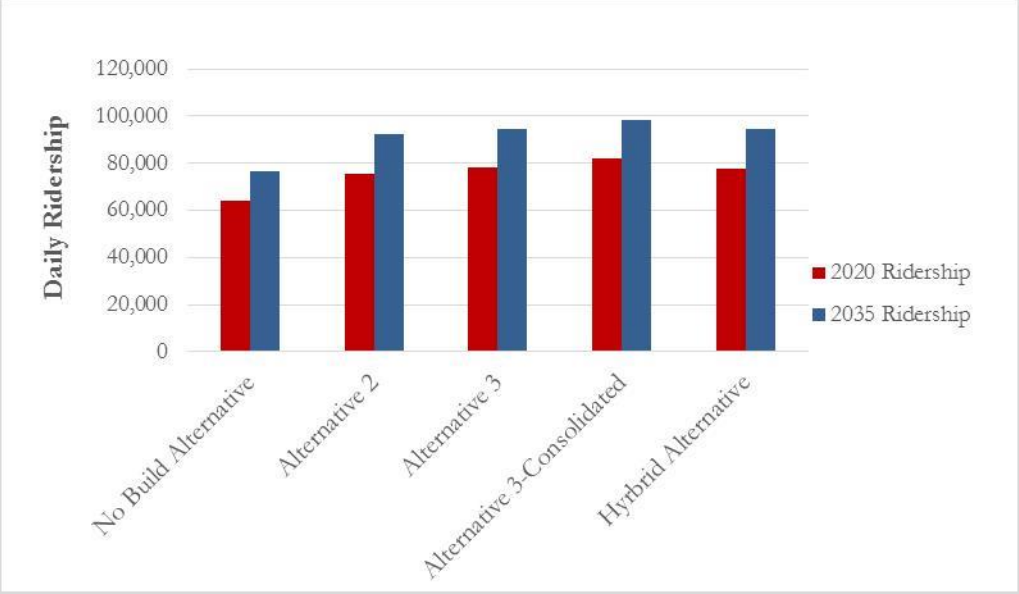
Projections of future Geary corridor bus ridership show that weekday Geary corridor boardings would increase by about 21 percent from over 50,000 in 2012 to about 64,000 in the year 2020 in the No Build Alternative. Ridership is projected to increase by an additional 19 percent to about 77,000 in 2035 under the No Build Alternative. This ridership increase is related directly to the expected increases in study area population. Both the No Build and build alternatives would result in higher ridership on Geary corridor bus routes, but the No Build Alternative would result in substantially lower ridership than any of the build alternatives.

In 2020, the build alternatives would result in daily transit boardings of up to 82,000 boardings (28 percent higher than in the No Build Alternative). In 2035, the build alternatives would serve between 92,000 and 99,000 daily transit riders (20 percent to 28 percent higher than in the No Build Alternative).

In both future years, Alternative 2 would attract the lowest amount of ridership among the build alternatives. Meanwhile, Alternative 3-Consolidated would serve the highest number of projected transit trips. Alternatives 3 and the Hybrid

Alternative/LPA would attract ridership levels somewhere between those of Alternatives 2 and 3-Consolidated. Alternative 3-Consolidated would attract more riders than the other build alternatives because it would offer the shortest waiting times and the shortest average walking distances to stations. In the other build alternatives, travelers may need to wait for a local service or an express service; under Alternative 3-Consolidated all riders would board the first bus that shows up. Because the overall level of service is similar in each scenario, Alternative 3-Consolidated would offer the shortest waiting times. By providing high-frequency and rapid service at all stations, Alternative 3-Consolidated would offer shorter walking distances for travelers wishing to use a rapid or BRT service. Ridership under Alternative 3-Consolidated would suffer from longer minimum walking distances to all stations and slightly slower travel speeds, but the benefit of more BRT stations and shorter waiting times would do more to attract ridership than the lack of local stops and slower travel speeds would do to discourage riders. Projected ridership for 2020 and 2035 is presented in Figure 3.3-10. As shown, projected daily ridership for 2020 varies by build alternative between 75,000 and nearly 82,000. By 2035, build alternative daily ridership would approach 100,000 for Alternative 3-Consolidated.

Figure 3.3-10 2020 and 2035 Daily Transit Ridership



Note: Figure was revised to correct typographical errors.

Source: SFCTA, 2014

3.3.4.3 | STOP LOCATIONS

In the No Build Alternative, the bus stop locations for Geary corridor bus services would remain where they are today. In the build alternatives, some bus stations may be relocated, removed, or be served by different classes of transit service.

Table 3.3-4 quantifies the number of local and rapid stop locations, by direction, for each build alternative. All of the build alternatives would result in fewer overall bus stop locations than the No Build Alternative. The reduced number of bus stops is designed to reduce dwell times at stations and to improve bus travel time along the Geary corridor.

In addition to the total number of stops on the Geary corridor, the average stop spacing would change under the build alternatives. Average stop spacing is presented in Table 3.3-5 below.

Table 3.3-4 Number of Bus Stops between 34th Avenue and Market Street

STOP COUNT	ALTERNATIVE				
	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/LPA
LOCAL STOPS					
Eastbound Local Stops	33	30	27	NA	25
Westbound Local Stops	34	31	28	NA	28
BRT STOPS					
Eastbound BRT/Rapid Stops	15	12	13	20	18
Westbound BRT/Rapid Stops	16	13	14	21	19

Source: Fehr & Peers, 2014

Table 3.3-5 Average Bus Stop Spacing from 33rd Avenue to Kearny Street

SERVICE TYPE	AVERAGE STOP SPACING IN FEET				
	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/LPA
AVERAGE STOP SPACING (IN FEET)					
BRT/Rapid Stops	1540	2180	2180	1310	1740
Local Stops	720	840	960	1310	1090
AVERAGE DISTANCE TO STOP (IN FEET)					
BRT/Rapid Stops	380	540	540	330	410
Local Stops	180	210	240	330	270

Source: Fehr & Peers, 2014; SFMTA, 2016

3.3.4.4 | SERVICE TYPES

With implementation of any of the build alternatives, bus service would differ from existing conditions. Current route 38 is referred to as local service, and future references to rapid or BRT service are equivalent to the current 38R. Consolidated service would be a new service type that consolidates current 38 and 38R to one route. The existing 38AX and 38BX express routes would be consolidated into a single express service labeled 38X. The existing 38AX and 38BX services now operate as local services outside of the express portions of their routes. The consolidated 38X bus route would operate similarly (i.e., limited stop) service outside of the express portion of the route.

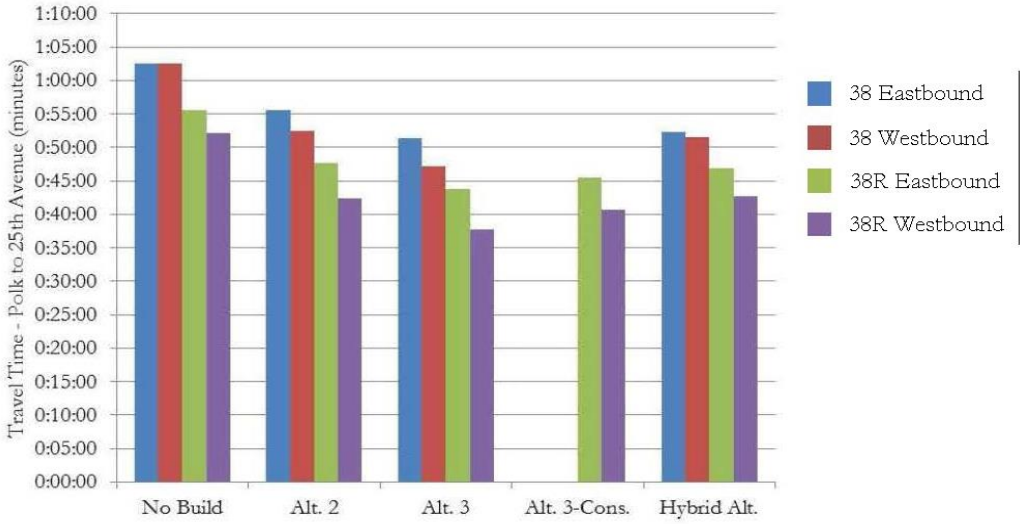
3.3.4.5 | BUS TRAVEL TIMES (2020)

In future scenarios, bus travel times are expected to vary by alternative. In all 2020 scenarios, the No Build Alternative would result in the highest travel times. In the No Build Alternative, anticipated infrastructure improvements will marginally improve travel time, but future increases in vehicular traffic will offset any benefits of these basic improvements. Therefore, the No Build Alternative would perform the worst in terms of bus travel times.

Alternatives 3 and 3-Consolidated would have center-running bus-only lanes that help reduce travel times. Alternatives 3 and 3-Consolidated have the lowest travel times of all alternatives in 2020, with reductions in travel time of between 15 and 30 percent relative to the No Build Alternative for the entire Geary corridor. For the segment between Van Ness and 25th avenues where the build alternatives would have the greatest impact, travel time reductions would be between 30 and 40 percent. Alternative 2 and the Hybrid Alternative/LPA would reduce travel times by 10 to 20 percent for the entire Geary corridor, and by 15 to 30 percent between Van Ness and 25th avenues.

Figures 3.3-11 and 3.3-12 show travel times by alternative in 2020 and 2035. Tables 3.3-6 and 3.3-9 display the percent reduction in travel times from the No Build Alternative.

Figure 3.3-11 Year 2020 Geary Corridor Bus Travel Times (Entire Corridor, 48th Avenue to Transbay Transit Center)



Source: Fehr & Peers and SFCTA, 2014. Figure legend has been revised to correct a typographical error that appeared in the Draft EIS/EIR.

Table 3.3-6 Year 2020 Geary Corridor Bus Travel Time Percent Reduction Compared with No Build Conditions (Entire Corridor, 48th Avenue to Transbay Transit Center)

			TRAVEL TIME REDUCTION FROM NO BUILD				
SCENARIO	ROUTE	DIRECTION	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/ LPA
2020	38 Geary	EB	-	-11%	-18%		-16%
		WB	-	-16%	-25%		-18%
	38R Geary	EB	-	-14%	-21%	-18%	-16%
		WB	-	-19%	-28%	-23%	-18%

Source: Fehr & Peers and SFCTA, 2014

3.3.4.6 | TRAVEL TIME RELIABILITY (2020)

Travel time reliability improves with the build alternatives compared with the No Build Alternative. Reliability was calculated for all alternatives using bus travel time results from the VISSIM microsimulation model for the section of the Geary corridor between 25th and Van Ness avenues. As indicated in Tables 3.3-7 and 3.3-8, the difference between the 95th percent and average p.m. peak-hour travel time decreases substantially under all build alternatives for westbound and eastbound buses, meaning that service reliability correspondingly improves. Westbound p.m. peak-hour local and BRT buses would have the most improved reliability under Alternative 3, though other build alternatives would improve reliability by almost as much. Eastbound bus service would have the best reliability under the consolidated service of Alternative 3-Consolidated. The No Build Alternative would consistently underperform relative to any of the build alternatives in terms of travel time reliability.

Table 3.3-7 Transit Travel Time Variations, P.M. Peak Hour (2020) Westbound (Difference between 95th Percent Travel Time and Mean Travel Time)

SEGMENT	SERVICE TYPE	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE /LPA
Van Ness Ave to 25th Ave	Local	0:05:00	0:03:40	0:03:00	NA	0:04:10
	BRT	0:04:20	0:03:10	0:02:30	0:02:40	0:02:50

Source: Fehr & Peers and SFCTA, 2014

Table 3.3-8 Transit Travel Time Variations, P.M. Peak Hour (2020) Eastbound (Difference between 95th Percent Travel Time and Mean Travel Time)

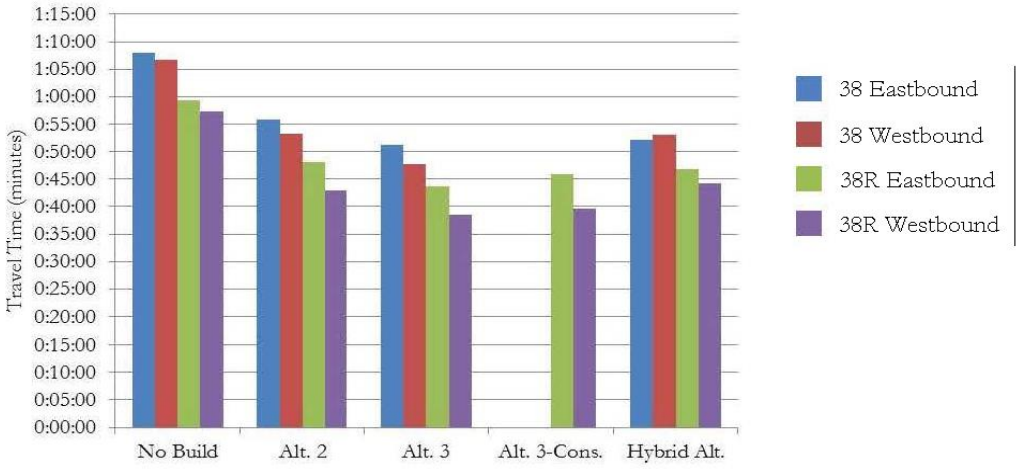
SEGMENT	SERVICE TYPE	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE /LPA
Van Ness Ave to 25th Ave	Local	0:04:40	0:02:50	0:04:10	NA	0:03:00
	BRT	0:03:40	0:03:00	0:02:30	0:02:20	0:03:20

Source: Fehr & Peers and SFCTA, 2014

3.3.4.7 | BUS TRAVEL TIMES - LONG-TERM HORIZON YEAR (2035)

Similar to 2020, Alternatives 3 and 3-Consolidated have the lowest travel times of all alternatives, with reductions in travel time of between 20 and 35 percent relative to the No Build Alternative for the entire Geary corridor, and 40 to 50 percent between Van Ness Avenue and 25th Avenue. Alternatives 2 and the Hybrid Alternative/LPA would have travel times that are 15 to 25 percent lower than the No Build Alternative for the entire Geary corridor, and 15 to 30 percent lower between Van Ness and 25th Avenues. The following tables (3.3-9 through 3.3-11) show travel times and percent reductions in travel times from 48th Avenue to the Transbay Transit Center by alternative in 2035. Smaller variations between the 95th percent and mean travel times indicate overall improvements – in other words, more buses are completing their routes in a shorter amount of time.

Figure 3.3-12 Year 2035 Geary Corridor Bus Travel Times (Entire Corridor, 48th Avenue to Transbay Transit Center)



Source: Fehr & Peers and SFCTA, 2014. Figure legend has been revised to correct a typographical error that appeared in the Draft EIS/EIR.

Table 3.3-9 Year 2035 Geary Corridor Bus Travel Time Percent Reduction Compared with No Build Conditions (Entire Corridor, 48th Avenue to Transbay Transit Center)

			TRAVEL TIME REDUCTION FROM NO BUILD				
SCENARIO	ROUTE	DIRECTION	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE /LPA
2035	38-Geary	EB	-	-18%	-25%	-	-23%
		WB	-	-20%	-29%	-	-21%
	38R-Geary	EB	-	-19%	-26%	-23%	-21%
		WB	-	-25%	-33%	-31%	-23%

Source: Fehr & Peers and SFCTA, 2014

3.3.4.8 | TRAVEL TIME RELIABILITY- LONG-TERM HORIZON YEAR (2035)

In Year 2035 conditions, bus travel time reliability would improve with the build alternatives. As indicated in Tables 3.3-10 and 3.3-11, the difference between the 95th percent and average p.m. peak hour travel time decreases substantially under all build alternatives for westbound and eastbound buses.[9] Westbound p.m. peak hour buses would have the best reliability under Alternative 3-Consolidated. Eastbound bus service would have the best reliability for local buses under the Hybrid Alternative/LPA and for BRT buses under Alternative 3.

[9] See note 6 above.

Table 3.3-10 Transit Travel Time Variations, P.M. Peak Hour (2035) Westbound (Difference between 95th Percent Travel Time and Mean Travel Time)

SEGMENT	SERVICE TYPE	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE /LPA
Van Ness Ave to 25th Ave	Local	0:06:00	0:03:40	0:03:20	NA	0:04:10
	BRT/Rapid	0:05:40	0:03:10	0:03:10	0:02:20	0:04:10

Source: Fehr & Peers and SFCTA, 2014

Table 3.3-11 Transit Travel Time Variations, P.M. Peak Hour (2035) Eastbound (Difference between 95th Percent Travel Time and Mean Travel Time)

SEGMENT	SERVICE TYPE	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE /LPA
Van Ness Ave to 25th Ave	Local	0:06:10	0:04:00	0:03:30	NA	0:03:00
	BRT/Rapid	0:05:30	0:03:20	0:02:30	0:02:40	0:03:00

Source: Fehr & Peers and SFCTA, 2014

3.3.4.9 | OTHER TRANSIT OPERATING CHARACTERISTICS: PLATFORM CROWDING AND VEHICLE CROWDING (2020 AND 2035)

3.3.4.9.1 PLATFORM CROWDING

Locations analyzed for potential transit platform crowding were chosen based on the number of boarding passengers as approximated using the SF-CHAMP model and assessed by build alternative. Peak ridership stations are stations with the highest number of boarding passengers during the a.m. or p.m. peak hour. Because transit ridership is forecasted for both a.m. and p.m. peak hours, a.m. period statistics are reported here for additional information, though as described previously the transportation operational analysis focuses only on the p.m. peak-hour time period.

Refer to Tables 3.3-12 and 3.3-13 and Figure 3.3-13 for peak station information in 2020 and 2035. In existing conditions none of the four future peak ridership station locations have boarding platforms. However, the existing sidewalk space would accommodate the increase in passengers in all future scenarios providing substantially more than 5 square feet per person, which is the generally acceptable area. While waiting bus riders may conflict with pedestrians trying to use the sidewalk, there is sufficient sidewalk space farther down the block for passengers to wait under all build alternatives.

Table 3.3-12 Year 2020 Platform Space per Passenger during Peak Hour: Highest Ridership Stations

				2020 PLATFORM SPACE IN SQUARE FEET PER PERSON				
YEAR	DIRECTION	PEAK HOUR	PEAK STATION	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE /LPA
2020	Inbound	a.m.	Geary/ 25th	75	63	56	57	68
		p.m.	Geary/ Fillmore	33	30	32	31	29
	Outbound	a.m.	Geary/ Kearny*	95	95	98	86	92
		p.m.	Geary/ Powell	81	94	92	78	92

All measurements in square feet per person – lower numbers indicate more crowded conditions; All calculations made based on peak hour frequency of combined local, rapid, consolidated, and express service. *The Transbay Transit Center is not used as the peak station because platform dimensions are larger than typical platforms. Therefore, the station with the second greatest amount of boarding passengers was chosen.

Source: Fehr & Peers, 2014; SFCTA, 2014

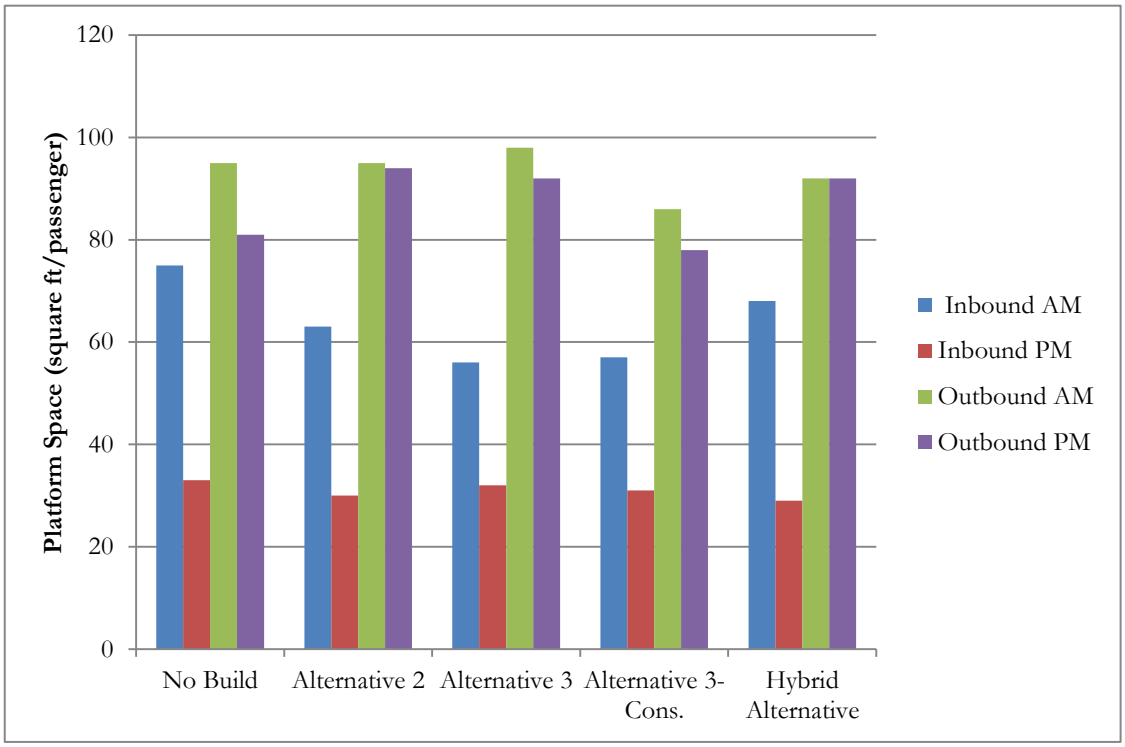
Table 3.3-13 Year 2035 Platform Space per Passenger during Peak Hour: Highest Ridership Stations

				2035 PLATFORM SPACE IN SQUARE FEET PER PERSON				
YEAR	DIRECTION	PEAK HOUR	PEAK STATION	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE /LPA
2035	Inbound	a.m.	Geary Blvd/25th	86	73	64	67	82
		p.m.	Geary Blvd/ Fillmore	26	26	25	24	23
	Outbound	a.m.	Geary/ Stockton*	64	68	71	55	70
		p.m.	Geary/ Powell	59	65	65	47	66

All measurements in square feet per person – lower numbers indicate more crowded conditions; All calculations made based on peak hour frequency of combined local, rapid, consolidated, and express service. *The Transbay Transit Center is not used as the peak station because platform dimensions are larger than typical platforms on the corridor. Therefore, the station with the second greatest amount of boarding passengers was chosen.

Source: Fehr & Peers, 2014; SFCTA, 2014

Figure 3.3-13 Year 2020 Platform Space per Passenger during Peak Hour: Highest Ridership Stations



Source: Fehr & Peers and SFCTA, 2014

3.3.4.9.2 CROWDING/VEHICLE LOAD FACTORS

The peak load factor refers to the average peak hour occupancy of the vehicle at its maximum load point along its route. Future load factors can be found in Tables 3.3-14 and 3.3-15 and Figures 3.3-14 through 3.3-17. Because load factor refers to the maximum load point on a route, it is not necessarily the location with the highest number of boardings but rather the location of peak accumulation for passengers on the bus.

Muni's peak period load factor standard is currently 85 percent. Due to increased ridership in all alternatives, the average combined load factor of 38 and 38R buses traveling in the peak direction during the peak hour (a.m. inbound, p.m. outbound) would exceed 85 percent load factor under 2020 and 2035 conditions. Year 2020 inbound a.m. load factors are highest for Alternative 3, while load factors for other alternatives are equal to or lower than No Build Alternative load factors. Year 2020 outbound load factors are lower than No Build Alternative for all build alternatives.

Year 2035 average combined 38 and 38R load factors are slightly higher than Year 2020 factors, and inbound a.m. load factors exceed the No Build Alternative load factor for both Alternative 3 and the Hybrid Alternative/LPA. Similar to 2020 conditions, Year 2035 outbound load factors are lower than No Build Alternative conditions for all build alternatives.

Table 3.3-14 Year 2020 Load Factors at Peak Hour

			PEAK HOUR LOAD FACTOR 2020			
SCENARIO	ROUTE	ALTERNATIVE	A.M. MAX LOAD POINT	A.M. CAPACITY UTILIZATION	P.M. MAX LOAD POINT	P.M. CAPACITY UTILIZATION
Load Factor at Peak Location	Inbound	No Build	Laguna	108%	Laguna	62%
		Alternative 2	Fillmore	102%	Fillmore	55%
		Alternative 3	Laguna	113%	Fillmore	60%
		Alternative 3-Consolidated	Laguna	90%	Laguna	67%
		Hybrid Alternative/LPA	Webster	108%	Fillmore	56%
	Outbound	No Build	Van Ness	60%	Powell	107%
		Alternative 2	Webster	54%	Taylor	95%
		Alternative 3	Laguna	53%	Van Ness Ave	98%
		Alternative 3-Consolidated	Gough	62%	Franklin	82%
		Hybrid Alternative/LPA	Webster	53%	Powell	97%

Note: Load factors are combined average of 38 and 38R routes.

Source: Fehr & Peers, 2014; SFCTA, 2014

Table 3.3-15 Year 2035 Load Factors at Peak Hour

			PEAK HOUR LOAD FACTOR 2035			
SCENARIO	ROUTE	ALTERNATIVE	A.M. MAX LOAD POINT	A.M. CAPACITY UTILIZATION	P.M. MAX LOAD POINT	P.M. CAPACITY UTILIZATION
Load Factor at Peak Location	Inbound	No Build	Laguna	113%	Laguna	77%
		Alternative 2	Fillmore	108%	Fillmore	70%
		Alternative 3	Gough	117%	Fillmore	77%
		Alternative 3-Consolidated	Laguna	92%	Laguna	86%
		Hybrid Alternative/LPA	Webster	114%	Webster	72%
	Outbound	No Build	Kearny	102%	Powell	115%
		Alternative 2	Transbay Transit Center	88%	Taylor	106%
		Alternative 3	Transbay Transit Center	87%	Powell	112%
		Alternative 3-Consolidated	Transbay Transit Center	95%	Powell	86%
		Hybrid Alternative/LPA	Kearny	80%	Powell	111%

Note: Load factors are combined average of 38 and 38R routes.

Source: Fehr & Peers, 2014; SFCTA, 2014

Figure 3.3-14 Geary Transit Load Profiles (2020 Inbound, A.M. Peak Hour)

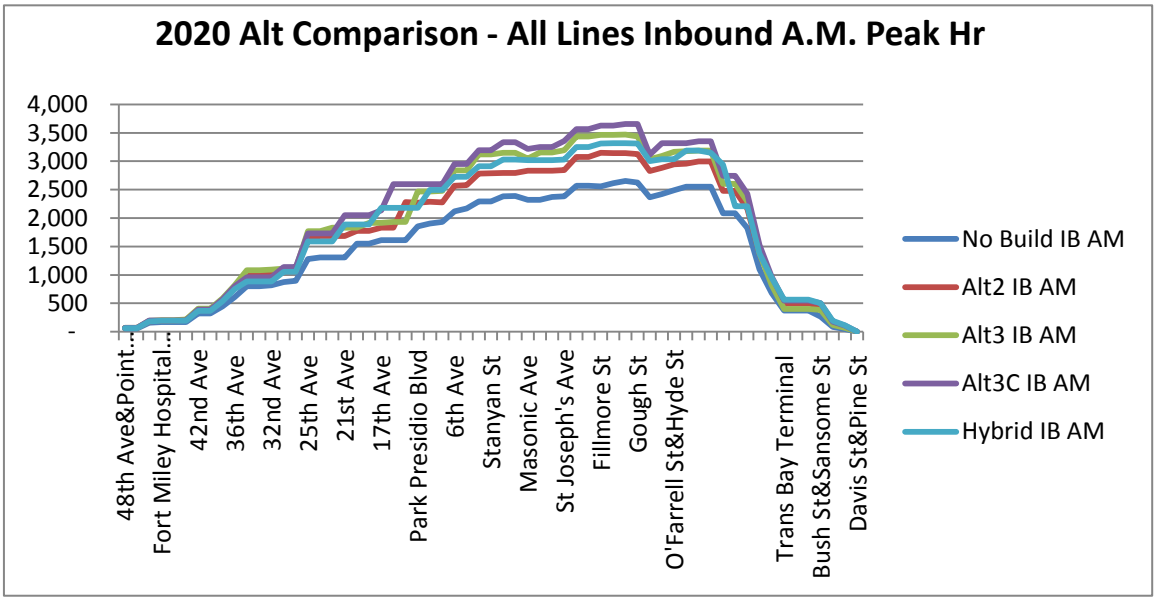


Figure 3.3-15 Geary Transit Load Profiles (2020 Outbound, P.M. Peak Hour)

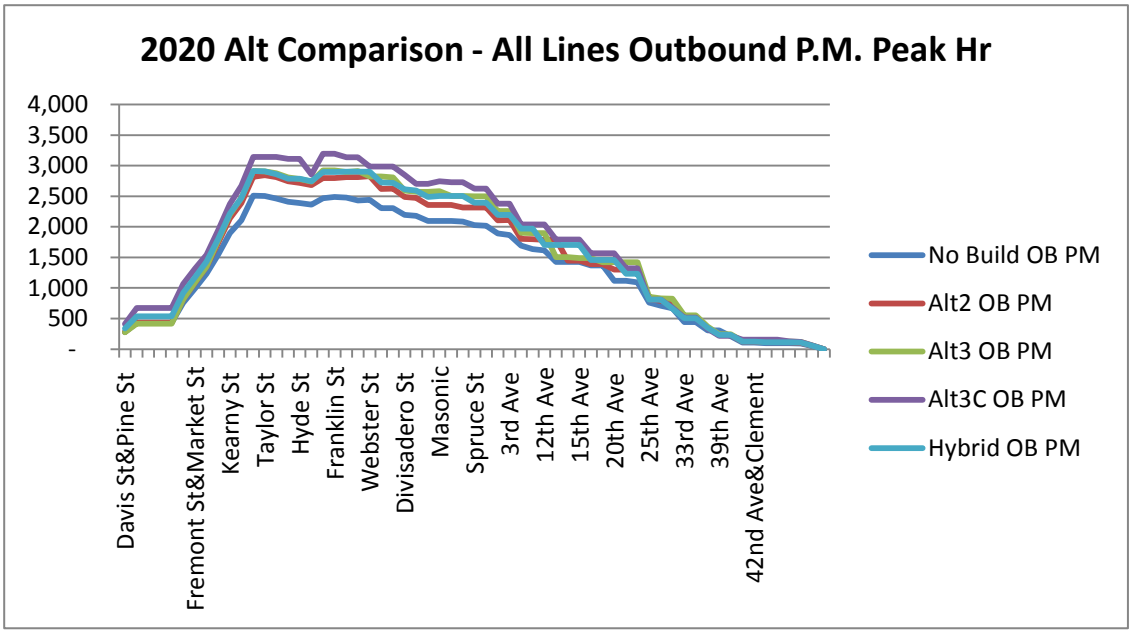


Figure 3.3-16 Geary Transit Load Profiles (2035 Inbound, A.M. Peak Hour)

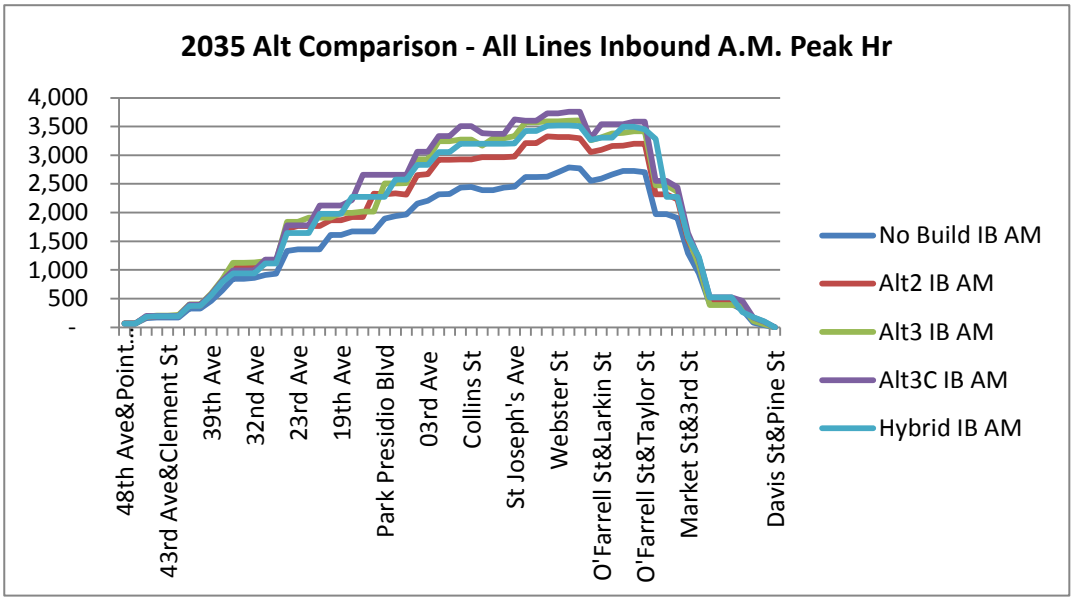
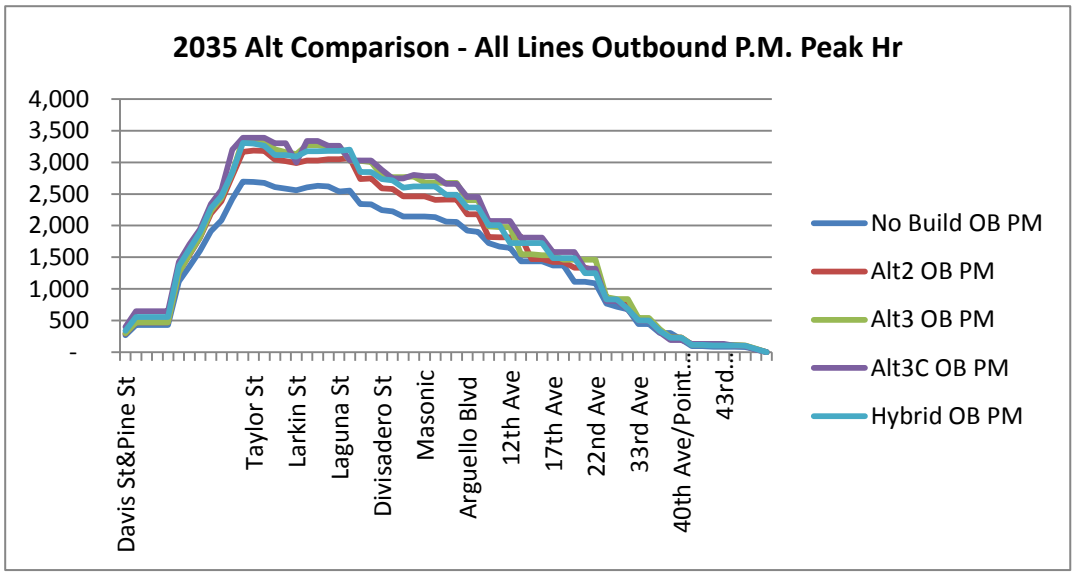


Figure 3.3-17 Geary Transit Load Profiles (2035 Outbound, P.M. Peak Hour)



3.3.4.10 | CONCLUSIONS OF EFFECTS ON TRANSIT

3.3.4.10.1 TRAVEL TIMES/RELIABILITY

Each build alternative would reduce bus travel times on the Geary corridor as well as improve reliability through transit signal priority, decreased bus bunching and more efficient passenger boarding at platforms

By 2020, transit service on the Geary corridor for all build alternatives would operate at faster speeds and be more reliable than local and rapid buses operating under No Build conditions. According to Figure 3.3-11, Alternative 3 would experience the largest travel time improvement, followed by Alternative 3-Consolidated and the Hybrid Alternative/LPA. For transit reliability, Alternative 3 and Alternative 3-Consolidated would experience the greatest improvement, followed by Alternative 2 and the Hybrid Alternative/LPA (Tables 3.3-7 and 3.3-8). Travel time savings in 2035 are estimated to be greater than 2020, indicating that No Build transit operating conditions will deteriorate even further in the long-term horizon. In other words, the No Build Alternative would result in the worst future transit conditions of all the alternatives.

In addition, more intersections that are currently unsignalized will be signalized for all build alternatives, improving the flow of traffic and providing streetscape improvements that would improve pedestrian crossings and safety including for transit riders' beginning and ending legs of their journeys. As a result, the improvements to transit service in the build alternatives would also contribute to improved multimodal accessibility in the Geary corridor.

3.3.4.10.2 CROWDING

Passenger waiting and boarding experience would notably improve for all build alternatives compared to the No Build Alternative. At stations with the heaviest forecasted use, passengers would be accommodated with more than five square feet per passenger. The No Build Alternative and all build alternatives are assumed to operate low-floor buses. This would reduce dwell time and improve accessibility to vehicles, especially for people with disabilities and other mobility-impaired passengers. Lastly, all build alternatives would be designed to be rail-ready consistent with requirements of Proposition K (see Section 1.2 for more detail on Proposition K). As a result, the build alternatives would not present any adverse effects to transit in 2020 or 2035.

3.3.4.11 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, Alternatives 3 and 3-Consolidated would have the greatest benefits to transit performance in terms of transit travel times, followed by the Hybrid Alternative/LPA, then Alternative 2. The No Build Alternative would perform the worst in terms of transit travel times.

3.3.5 | Avoidance, Minimization and Mitigation Measures

In the peak direction during the peak hour, all build alternatives would exceed Muni's 85 percent capacity utilization threshold under Year 2020 and 2035 conditions. In Alternatives 2, 3, and the Hybrid Alternative/LPA, high capacity utilization would be a result of increased ridership from the project. To reduce or eliminate this effect, additional service hours could be considered for the Geary corridor when the project is implemented and when actual ridership patterns are known.

Muni relies on regularly collected passenger data to inform its service-planning, and occasionally it makes minor modifications to best match service hours to customers. This type of flexibility and responsiveness is necessary to provide the most efficient transit service possible. Therefore, while the specific service plan assumed for this analysis is based on current conditions and best available information, SFMTA would likely need to make adjustments to the service plan to best deploy buses to meet demand along the Geary corridor.

In addition, some additional service on routes serving parallel transit corridors could help absorb increased loads along the Geary corridor. These routes include 1 California, 2 Clement, 5 Fulton, 5R Fulton Rapid, and 31 Balboa. Because service headways would result in only minimal changes to transit operations on parallel routes, transit and traffic conditions would be similar to the No Build Alternative and would not cause a substantial increase in delays to other routes that travel along the same segment, or that may intersect with these routes and lines (e.g., 22 Fillmore, 43 Masonic).

3.4 Automobile Traffic

3.4.1 | Regulatory Setting

Several policies and plans guide automobile transportation on and around the Geary corridor.

3.4.1.1 | THE SAN FRANCISCO GENERAL PLAN

The San Francisco *General Plan* (*General Plan*) is discussed in Section 3.3.1.1. Relevant policies in the General Plan relating to automobile traffic include:

- **Transit First Policy:** Geary (both Boulevard and Street) is identified as a Transit Preferential Street in the City's Transit First Policy, along with O'Farrell Street between Market Street and Gough Street. The Transit Preferential Street program includes measures to improve public transit vehicle speeds and to minimize the effects of traffic on transit operations.
- **Policy 1.3:** Give priority to public transit and other alternatives to the private automobile as the means of meetings San Francisco's transportation needs, particularly those of commuters.
- **Policy 14.1:** Reduce road congestion on arterials through the implementation of traffic control strategies, such as traffic signal synchronization (consistent with posted speed limits) and turn controls, which improve vehicular flow without impeding movement for pedestrians and bicyclists.
- **Policy 14.4:** Reduce congestion by encouraging alternatives to the single occupant auto through the reservation of right-of-way and enhancement of other facilities dedicated to multiple modes of transportation.

GENERAL PLAN

General Plan Policy 1.3 supports giving priority to public transit and other alternatives to the automobile to meet San Francisco's transportation needs. However, the General Plan also supports strategies to reduce traffic congestion on major thoroughfares through traffic signal timing and turn restrictions

3.4.1.2 | SAN FRANCISCO CONGESTION MANAGEMENT PROGRAM (2013)

The San Francisco County Transportation Authority (SFCTA) has served as the congestion management agency (CMA) for San Francisco County since 1990. In this capacity, SFCTA's responsibilities include but are not limited to:

- Developing and adopting the biennial Congestion Management Program (CMP).
- Monitoring City agencies' compliance with CMP requirements.
- Reviewing the programming of all transportation funds for San Francisco.
- Providing input into the Regional Transportation Plan (RTP).
- Developing and updating the long-range transportation plan for San Francisco.

SFCTA last updated the CMP in 2015. The purpose of the CMP update is four-fold: 1) comply with California state law by adopting a biennial CMP and submitting it to the Metropolitan Transportation Commission (MTC) for a conformance finding to ensure the City's eligibility for state fuel tax revenues; 2) monitor the performance of San Francisco's transportation system and guide San Francisco agencies involved in congestion management; 3) outline the congestion management work program for fiscal years 2015/2016 and 2016/2017; and 4) set forth policies and technical tools to implement the CMP work program.

The original 1989 CMP legislation required CMAs to monitor congestion on a designated CMP roadway network and to identify as deficient any network segments that fall below the adopted level of service (LOS) standard (segments already below the threshold in 1991 are exempt). However, in 2002 local jurisdictions were granted the authority to designate infill opportunity zones (IOZs) in areas meeting certain requirements. Within a designated IOZ, the CMA is not required to maintain traffic conditions to the adopted automobile LOS standard. The San Francisco IOZ, adopted in 2009, covers most of the City, including the entirety of the Geary corridor.

In the 2015 CMP, the Geary corridor is highlighted as a key corridor for enhancing transit service and reliability to ensure that transit is a viable option to the automobile. Along with the Van Ness Avenue Bus Rapid Transit (BRT) Project, the proposed project is a key element of the City's Transit Priority Network. The project was also identified in the Countywide Transportation Plan and the Proposition K Expenditure Plan, as well as confirmed as a priority in San Francisco Municipal Transportation Agency's (SFMTA) Transit Effectiveness Project (TEP) and became a part of the SFMTA Muni Rapid Network when the Rapid Network was introduced in 2015.

3.4.1.3 | METROPOLITAN TRANSPORTATION COMMISSION (MTC)

The majority of federal, state, and local financing available for transportation projects is allocated at the regional level by MTC, the transportation planning, coordinating, and financing agency for the nine-county Bay Area. The current RTP, which is combined with the region's Sustainable Communities Strategy, is known as *Plan Bay Area 2040* and was adopted by MTC in 2017. *Plan Bay Area 2040* specifies a detailed set of investments and strategies throughout the region from 2017 through 2040 to maintain, manage, and improve the surface transportation system. *Plan Bay Area 2040* specifies how anticipated federal, state, and local transportation funds will be spent in the Bay Area through the year 2040.

3.4.1.4 | BAY AREA AIR QUALITY MANAGEMENT DISTRICT (BAAQMD)

On-road motor vehicles are the largest source of air pollution and greenhouse gases in the Bay Area. The Bay Area Air Quality Management District (BAAQMD) is the regional agency with the authority to develop and enforce regulations for the control of air pollution throughout the Bay Area. The Clean Air Plan is BAAQMD's plan for reducing the emissions of air pollutants and greenhouse gases. BAAQMD has also published California Environmental Quality Act (CEQA) guidelines for evaluating the potential for projects to result in air quality impacts related to traffic congestion and vehicle miles traveled (VMT).

3.4.1.5 | CALTRANS

Caltrans, or the California Department of Transportation, is responsible for managing all freeways and designated State Highways in California. On these facilities, Caltrans seeks to manage traffic congestion while accommodating other travel modes. Caltrans facilities within the Geary corridor include Van Ness Avenue (US 101) and Park Presidio Boulevard (Highway 1). Caltrans typically requires that traffic congestion on its facilities not be degraded to unacceptable levels due to local plans and projects.

3.4.2 | Affected Environment

Please refer to Section 3.2.1.3, which describes the study area roadway network in detail.

3.4.2.1 | EXISTING LEFT-TURN LOCATIONS

There are a total of 40 left-turn locations (with both permitted and protected left-turn signal phasing) on Geary Boulevard from 25th Avenue to Gough Street. Protected left-turn signal phasing – signals with left-turn arrows – grants the right-of-way to vehicular traffic; permissive phasing (e.g., green circular light requiring yielding to conflicting traffic and pedestrian movements) does not. For more detail on existing and proposed left-turn locations, see Chapter 2 (Descriptions of Project Alternatives), and Figures 2-9, 2-13, 2-17, and 2-20.

Left Turn Changes

Between 2013 and 2015, after preparation of the traffic study for the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR), SFMTA changed existing left-turn conditions at Third and Seventh avenues as follows.

- At Geary and Third Avenue, the eastbound left-turn lane from Geary onto northbound Third Avenue was removed.
- At Geary and Seventh Avenue, the westbound left-turn lane from Geary onto southbound Seventh Avenue was removed.

As part of the traffic analysis in this Final EIS, SFCTA evaluated the potential for these changes to affect 2020 and 2035 traffic impacts for the No Build Alternative and build alternatives as reported in the Draft EIS/EIR, including the Hybrid Alternative/LPA. SFCTA found that neither of these changes to existing left turns would affect project impact conclusions from the Draft EIS/EIR for the reasons set forth below.[1]

Third Avenue

In the Draft EIS/EIR, all build alternatives retained the (then) existing eastbound left turn at Third Avenue. The Hybrid Alternative also called for removal of the existing eastbound left turn at Fourth Avenue. However, the left turn at Third Avenue was removed after traffic analysis for the Draft EIS/EIR had been completed. Thus, at Third Avenue, the build alternatives would now reopen (rather than retain) the eastbound left turn.

[1] Tischler, Dan. Senior Transportation Planner, SFCTA. Personal communication. May 3, 2017.

As part of the traffic study conducted for the Draft EIS/EIR, SFCTA used p.m. peak-hour traffic counts conducted in 2010, which recorded 18 left turns at Third Avenue and 20 left turns at Fourth Avenue (which also has an eastbound left-turn lane). In April 2015, prior to the release of the Draft EIS/EIR, SFCTA conducted additional traffic counts to assure the continued validity of the 2010 count data. The 2015 traffic count showed that overall p.m. peak-hour eastbound and westbound traffic volumes were 16 percent lower in this area than in 2010.

These observations indicate:

- As measured in 2010, eastbound left-turn demand was about the same at both Third Avenue and Fourth Avenue (about 20 vehicles in the p.m. peak hour),
- Combined eastbound left-turn demand at the two intersections (less than 40 vehicles in 2010) can be met by a single left-turn location, and
- Traffic volumes in the area did not increase from 2010 to 2015, and left-turn demand is stable at this location

Based on the foregoing, the closure of the eastbound left turn at Geary and Third Avenue would not alter any traffic impact conclusions for build or No Build conditions from what was reported in the Draft EIS/EIR, as each of the build or No Build alternatives would include at least one east-bound left-turn lane, at either Third or Fourth Avenue. No further analysis is thus necessary.

Seventh Avenue

In the Draft EIS/EIR, Alternatives 3-Consolidated and the Hybrid Alternative proposed to remove the westbound left turn at Seventh Avenue; however, this left turn has since been removed. The removal of a left turn could affect traffic levels by shifting left-turn demand to one or more nearby remaining left-turn locations. At this location, any relocation of left-turn demand has already occurred because of the left-turn closure. Accordingly, the removal of this left turn would not change any of the impact conclusions for build or No Build conditions from what was reported in the Draft EIS/EIR. No additional analysis is therefore necessary.

3.4.2.2 | ROADWAY TRAFFIC VOLUMES

Traffic volumes on the Geary corridor are generally higher than those on many other corridors in San Francisco. Overall, the number of Geary corridor travel lanes and its wide right-of-way accommodate existing traffic demand. However, traffic can become congested during peak periods in the vicinity of a few high-volume intersections, including Masonic Avenue, Park Presidio Boulevard, Fillmore Street, Franklin Street, and Van Ness Avenue.

The intersection of Geary Boulevard and Masonic Avenue features complexities, including a long underpass, service roads for local traffic to make turns, and a mix of automobile, bus, pedestrian and bicycle flows at the surface. This intersection also tends to get crowded from cars accessing the driveway of a grocery store off of Masonic Avenue. At Fillmore Street, Geary Boulevard traffic demands are high and through travel lanes operate in a two-block long underpass, with side service roads for local traffic to make turns. Double-parking can also cause traffic delay along the corridor and is common near land uses that generate short-duration trips in areas with little available parking (e.g. post offices, banks, and convenience retail) or when

longer delivery vehicles park in diagonal parking spaces. At Geary Boulevard and Park Presidio Boulevard, a travel lane reduction occurs in the westbound direction, limiting roadway capacity. A lane reduction also occurs at O'Farrell and Franklin in the eastbound direction.

Seventy-two-hour traffic counts over the course of three consecutive weekdays were collected at 10 locations along Geary Boulevard (west of Van Ness Avenue). The purpose of the three-day traffic counts was to determine periods of typical peak traffic. Based on these results, the p.m. peak period was chosen as the analysis time period as it represents the period when the maximum use of the transportation system occurs. It is also consistent with the approach suggested in the San Francisco Planning Department's *Transportation Impact Analysis Guidelines*, the document that guides CEQA analysis in the City of San Francisco.

Table 3.4-1 displays weekday average daily traffic (ADT) and p.m. peak-hour volumes on Geary Boulevard in both directions. The p.m. peak hour typically occurs between 5 and 6 p.m. About 7 to 8 percent of average daily volumes travel during the p.m. peak hour along the corridor. Traffic volumes are generally higher in the eastern area of the Geary corridor. Daily traffic volumes increase closer to 20,000 in each direction at some locations, including Geary Boulevard between Baker Street and Lyon Street, and at Webster Street.

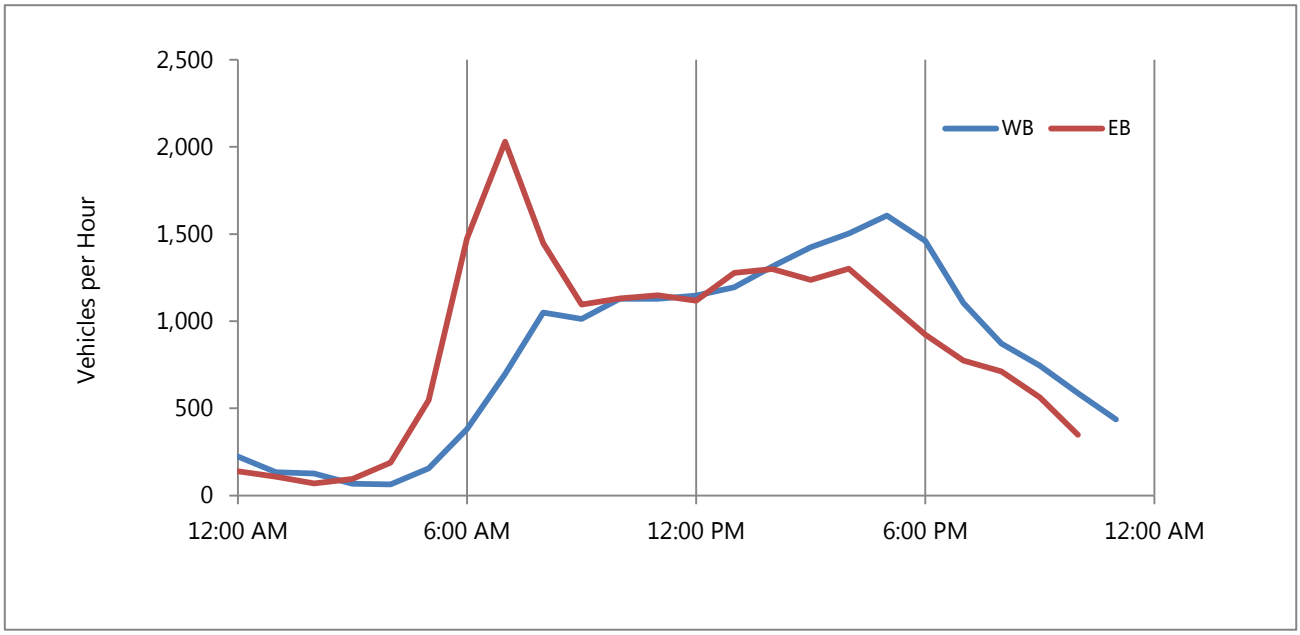
Table 3.4-1 Average Daily Weekday Traffic and P.M. Peak-Hour Volumes

LOCATION ON GEARY CORRIDOR	ADT (WB/EB)	P.M. PEAK HOUR (WB/EB)
32nd Avenue	8,900 / 8,960	770 / 650
25th Avenue	9,490 / 11,720	860 / 800
Park Presidio Boulevard	14,710 / 17,040	1,260 / 1,130
Arguello Boulevard	17,530 / 17,390	1,240 / 1,580
Geary between Wood Street/Collins Street	17,940 / 15,010	1,530 / 1,000
Geary between Baker Street/Lyon Street	22,410 / 20,820	1,920 / 1,350
Divisadero Street	19,780 / 20,580	1,640 / 1,340
Webster Street	20,000 / 20,910	1,700 / 1,330
Gough Street	16,960 / 15,990	1,250 / 1,050

Source: SF-CHAMP

Figure 3.4-1 displays typical weekday automobile demand patterns across a 24-hour period at the intersection of Divisadero Street and Geary Boulevard. Volumes peak in the a.m. at around 8 a.m. and then drop to a stable mid-afternoon rate. Volumes begin to climb again in the late afternoon through about 6 p.m. The a.m. and p.m. peak hours carry about the same number of vehicles in both directions; however, p.m. peak conditions occur over a longer time frame than the a.m. peak, which is more compressed in duration. This is consistent with overall travel characteristics in San Francisco, and as a result, the p.m. peak-hour conditions are the focus of the transportation and traffic analysis.

Figure 3.4-1 Existing Weekday Geary Boulevard Traffic Volumes at Divisadero Street



Source: Fehr & Peers, 2009

SFCTA initially collected traffic counts in the Geary corridor between 2010 and 2012. The first comprehensive traffic count collection effort took place in 2010. The team later conducted additional traffic counts on the Geary corridor in 2012. The traffic analysis in this document is based on the traffic counts collected between 2010 and 2012, which were determined to be similar throughout the corridor.

To confirm that traffic conditions had not changed significantly since 2012, the project team conducted an additional round of traffic counts in May 2015. These counts were conducted at locations where previous traffic counts had been done in 2010 and/or 2012. Late afternoon/early evening (p.m.) peak-hour traffic volumes observed in May 2015 were determined to range from 5 to 25 percent lower than in the most recent previous count (2010 or 2012). Across all comparable intersections, 2015 p.m. peak-hour traffic counts averaged about 12 percent lower than in 2010 and 2012.

The observed reduction in traffic volume on the Geary corridor in 2015 suggests that the Draft EIS/EIR document may have overstated the severity of traffic congestion on Geary Boulevard in existing year (2015) and future year conditions. In preparing this Final EIS, SFCTA and SFMTA consulted the most recent available data (from 2016). The 2016 data also show that traffic volumes in the Geary corridor are similar to or lower than the counts used in the Draft EIS/EIR.[2]

3.4.2.3 | TRAFFIC VOLUMES ON STREETS PARALLEL TO THE GEARY CORRIDOR

Average daily traffic (ADT) volumes along Geary Boulevard were reviewed for five to 10 block segments of each street parallel to Geary Boulevard between 25th Avenue and Webster Street. California Street experiences a range of about 10,000 to 15,000 ADT in this area. Clement Street's ADT ranges from 6,000 to 17,000 ADT.

[2] Tischler, Dan. Senior Transportation Planner, SFCTA. Personal communication. March 8, 2017.

Anza Street experiences a range of about 7,000 to 8,000 ADT between 25th Avenue and Masonic Avenue. Balboa Street/Turk Street ADT ranges between 3,000 and 12,000 vehicles. From where Turk transitions to Golden Gate Avenue until Scott Street, Golden Gate Avenue experiences about 12,000 ADT. Overall, Clement Street and California Street carry more traffic than the streets immediately to the south of Geary Boulevard. Each of these streets have ample capacity to serve the current traffic demands.

3.4.2.4 | VEHICULAR TRAFFIC TRAVEL TIMES

The speed limit on Geary is 25 miles per hour throughout the corridor, with the exception of Collins to Gough streets, where the speed limit is 35 miles per hour in both directions (where the roadway serves as an expressway). Table 3.4-2 displays average vehicular travel times and variations, in minutes, for the Geary corridor during the p.m. peak period hour between Polk Street and 25th Avenue. Both vehicular and travel time summaries were developed using the existing conditions VISSIM microsimulation model, and do not represent observations. As such, the results represent conditions in which traffic demand is consistent over the course of the peak hour. Overall, westbound travel on the Geary corridor between 25th Avenue and Polk Street currently takes slightly more time than eastbound travel (about 16 and 14 minutes, respectively). Travel times vary by segment, but are more consistently closer to two to three minutes heading eastbound on the Geary corridor.

Table 3.4-2 P.M. Peak-Period Vehicle Travel Times

SEGMENT ALONG GEARY BOULEVARD	TRAVEL TIME (MINUTES)
WESTBOUND	
Polk Street to Laguna Street	1:40
Laguna Street to Broderick Street	3:30
Broderick Street to Stanyan	4:20
Stanyan Street to Park Presidio Boulevard	3:50
Park Presidio Boulevard to 25th Avenue	2:50
Total (Polk Street to 25th Avenue)	16:10
EASTBOUND	
25th Avenue to Park Presidio Boulevard	2:55
Park Presidio Boulevard to Stanyan Street	3:50
Stanyan Street to Broderick Street	2:10
Broderick Street to Laguna Street	2:25
Laguna Street to Polk Street	2:35
Total (25th Avenue to Polk Street)	13:55

Note: Standard deviation of travel time is presented for individual segments only.

Source: Fehr & Peers, 2014

3.4.2.5 | P.M. PEAK-HOUR INTERSECTION LEVELS OF SERVICE (LOS)

Detail on existing LOS and delay during the p.m. peak hour at all on-corridor and off-corridor study intersections can be found in Appendix D-4. LOS is used to describe how efficiently an intersection operates for private vehicle traffic. Intersection LOS designations range from "A," which indicates negligible delays with free flow speed (i.e., less than 10 seconds per vehicle for signalized intersections and unsignalized approaches) to "F," which indicates delays with queuing that may block upstream intersections (i.e., greater than 80 seconds per

vehicle for signalized intersections and greater than 50 seconds for unsignalized approaches). Table 3.4-3 summarizes LOS thresholds for signalized intersections.

Table 3.4-3 Signalized Intersection Level of Service Thresholds

LOS	AVERAGE CONTROL DELAY (SECONDS PER VEHICLE)	DESCRIPTION
A	< 10	Operations with very low delay occurring with favorable progression and/or short signal cycle lengths.
B	10-20	Operations with low delay occurring with good progression and/or short signal cycle lengths.
C	20-35	Operations with average delays resulting from fair traffic progression and/or longer signal cycle lengths.
D	35-55	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high volume to capacity ratios. Many vehicle stops and signal cycle failures are noticeable.
E	55-80	Operations with high delay values indicating poor progression, long cycle lengths, and high volume to capacity ratios. Individual cycle failures are frequent occurrences. This is oftentimes considered to be the limit of acceptable delay.
F	> 80	Operation with delays unacceptable to most drivers occurring due to over saturated or above capacity conditions, poor progression, and/or very long signal cycle lengths.

Source: Highway Capacity Manual, Transportation Research Board, 2000

LOS has been a performance metric used by the City to evaluate intersection operations for automobiles. However, pursuant to changes in CEQA and a resolution adopted by the San Francisco Planning Commission after publication of the Draft EIS/EIR (Resolution 19579), automobile delay as measured by LOS is no longer considered a significant impact on the environment. Senate Bill 743 established a process to change the analysis of transportation impacts under CEQA to include alternative performance metrics. Based on the draft alternative methods of transportation analysis currently proposed by the Governor's Office of Planning and Research, and consistent with the evaluation of other recent projects in San Francisco, the Draft EIS/EIR included information on LOS as well as other automobile performance metrics, including project-related changes to travel times, reliability, and VMT. This Final EIS retains the LOS-based analysis and resultant impact conclusions, and also reports on other travel metrics consistent with local regulatory changes.

Figure 3.4-2 illustrates the locations and conditions of study intersections (on- and off-corridor) and associated p.m. peak-hour (5 to 6 p.m.) LOS. The vast majority of Geary corridor intersections currently operate at LOS C or better. However, the unsignalized intersection of Presidio Avenue and Geary Boulevard currently operates at LOS E.

Most study intersections outside of the section of Geary Boulevard between Van Ness Avenue and 25th Avenue operate at LOS C or better. Five intersections operate at LOS D: Anza Street and Park Presidio Boulevard, Fulton Street and Park Presidio Boulevard, Pine Street and Franklin Street, Geary Boulevard and Polk Street, and O'Farrell Street and Hyde Street. The intersection of Fulton Street and Stanyan Street currently operates at LOS E during the p.m. peak hour.

There are about 90 intersections along the entire Geary corridor from Market Street to 48th Avenue, of these, 78 were selected as study intersections. The 22 intersections that were not selected are either minor unsignalized intersections with low side street traffic volumes, intersections located directly adjacent to other

selected intersections along the Geary corridor that have similar operating characteristics, or intersections that would not experience major changes in travel patterns as a result of the project. Among the 78 selected intersections are those with unique geometry, those more prone to peak-hour congestion, those maintained by other jurisdictions (e.g., Caltrans), or those that intersect a street with a Muni Rapid line.

3.4.2.6 | REGIONAL AND CITY VEHICLE MILES TRAVELED

Many factors affect travel behavior. These factors include development density, diversity of land uses, design of the transportation network, access to regional destinations, distance to high-quality transit, development scale, demographics, and transportation demand management. Typically, low-density development at great distance from other land uses, located in areas with poor access to non-private vehicular modes of travel, generate more automobile travel compared with development located in urban areas, where a higher density, mix of land uses, and travel options other than private vehicles are available.[3]

Given these travel behavior factors, San Francisco has a lower VMT ratio than the nine-county San Francisco Bay Area region. In addition, some areas of the City have lower VMT ratios than other areas of the City. These areas of the City can be expressed geographically through transportation analysis zones. Transportation analysis zones are used in transportation planning models for transportation analysis and other planning purposes. The zones vary in size from single city blocks in the downtown core, multiple blocks in outer neighborhoods, to even larger zones in historically industrial areas like the Hunters Point Shipyard.

For example, for households, the regional average daily household VMT per capita is 17.2. The City's average daily household VMT per capita is 8.4.

[3] Adapted from Ganson, C; Governor's Office of Planning and Research, "Updating Transportation Metrics." June 2015.

Figure 3.4-2 Existing LOS at Core Area and Off-Corridor Study Intersections

3.4.3 | Methodology: Traffic Evaluation

Traffic operations were analyzed for three project years: existing conditions (2012); the anticipated project opening year (2020); and the project horizon year (2035). Analysis was conducted for the No Build Alternative, as well as for all build alternatives, each existing, opening year (baseline), and horizon year conditions.

Traffic volumes used in the existing conditions analysis were based on field counts. Future traffic volumes were in turn developed using several analysis tools. These tools included travel forecasting and assignment models such as San Francisco Chained Activity Modeling Process (SF-CHAMP) and dynamic traffic assignment (DTA), as well as traffic and transit operations models such as VISSIM and Synchro. All models and analysis tools are described in more detail in Appendices D-1 and D-2. The modeling tools used to analyze build alternatives vary depending on the section of the Geary corridor analyzed. VISSIM, DTA, and Synchro were mainly used in the Geary corridor west of Van Ness Avenue. Synchro was mainly used east of Van Ness Avenue. To derive future year turning movement traffic volumes, SF-CHAMP outputs were used to create growth factors that were applied to existing conditions volumes (Appendix D-3). Because it is outside the core subarea, no modeling was conducted in the portion of the Geary corridor south of Market Street.

The forecasts in ABAG *Projections 2009* for year 2015 in the study area reflect conditions that are expected to occur more closely to the project's opening year. Forecasts were provided for year 2015, which had assumed a more robust land use growth trajectory than has actually occurred, including construction of the California Pacific Medical Center (CPMC) Cathedral Hill campus by 2015 (but now scheduled to be completed by 2020). Signal timing and phasing data were provided by SFCTA. For future scenarios, these data were optimized using the Synchro model. For this Final EIS, *Projections 2009* were assessed in comparison to more recent projections (see Appendix D2-2 for details); this assessment concluded that the 2009 projections still provide a reasonable estimate of expected growth for "worst-case" environmental impact analysis, and thus remain reasonable projections for the purposes of this Final EIS. Traffic counts conducted since the publication of the Draft EIS/EIR also show that traffic levels have not increased.

Traffic conditions were analyzed at 49 on-corridor intersections and 29 off-corridor intersections. As previously mentioned, the p.m. peak period was chosen as the analysis time period as it represents the period when the maximum use of the transportation system occurs. It is also consistent with the approach suggested in the San Francisco Planning Department's *Transportation Impact Analysis Guidelines*.

SFCTA uses SF-CHAMP to estimate VMT by private automobiles and taxis for different land use types. Travel behavior in SF-CHAMP is calibrated based on observed behavior from the California Household Travel Survey (CHTS) 2010-2012, Census data regarding automobile ownership rates and county-to-county worker flows, and observed vehicle counts and transit boardings. (The CHTS is conducted every 10 years by Caltrans, therefore, these data remain the most recent available data input into SF-CHAMP.) The 2016 data collected to re-validate the

model results also show that traffic volumes in the Geary corridor are similar to or lower than the counts used in the Draft EIS/EIR.[4]

The SF-CHAMP model was used to estimate vehicle miles traveled from private automobiles and taxis, the latter of which is a type of for-hire vehicle, like transportation network companies (or TNCs), such as Uber and Lyft. The observed data used to calibrate SF-CHAMP is from the years with the latest data available, 2010-2012. Since that time, the prevalence of for-hire vehicles has increased in San Francisco, mostly due to growth in the number of vehicle trips taken by TNCs. SF-CHAMP estimates the probability of driving based on auto ownership, household income, and other variables.

To the extent that people previously would have traveled in another personal or for-hire vehicle (i.e., taxi), but now travel using a TNC service, use of transportation network companies would be accounted for in previous household travel surveys and thus would be accounted for in the vehicle miles traveled estimates from SF-CHAMP. Any travel using TNC services that exceeds the SF-CHAMP estimates, when combined with other personal, commercial, and for-hire vehicle use, has not resulted in a substantial net increase in vehicle volumes in the corridor as evidenced by the 2016 traffic counts referenced above, which showed that traffic volumes in the Geary corridor were similar to or lower than the counts used in the Draft EIS/EIR. In addition, as described in Section 3.2.1.4, recent Census data show that while taxi and TNC commute mode share increased between 2012 and 2015, it remained below 1 percent in 2015. The same data indicated that the most significant trend between 2012 and 2015 was a shift from driving, or being driven, toward transit, walking, and biking.

3.4.3.1 | ROADWAY NETWORK CHANGES

The primary assumptions accounted for in the modeling process for the build alternatives are summarized below. The modeling used for the build alternatives in 2020 and 2035 accounts for changes in roadway geometry and circulation patterns that would be implemented to accommodate project-related improvements in the Geary corridor. For more detailed information on these changes, please see Chapter 2 (Descriptions of Project Alternatives). The following briefly identifies the changes in roadway operations accounted for in the future models.

- **Reduction in Number of Mixed Travel Lanes:** West of Van Ness Avenue, the number of mixed travel lanes would be reduced due to the reconfiguration of the roadway space to improve traffic safety and/or accommodate bus-only lanes in both westbound and eastbound direction for Alternative 2 (side-running) and down the center median for center-running alternatives.
- **Left-turn Prohibitions:** Due to the reconfiguration of the roadway, including the median, for all build alternatives motorists would experience a reduction in left-turn opportunities along Geary Boulevard. Please see Chapter 2 (Descriptions of Project Alternatives), for specific locations of left-turn removals in the Geary corridor.

[4] Tischler, Dan. Senior Transportation Planner, SFCTA. Personal communication. March 8, 2017.

- **Additional Signalized Intersections and Pedestrian Crossings:** A list of new signalized pedestrian crossings and crosswalks under all build alternatives can be found in Table 3.5-5.

For more detailed information on roadway network changes assumed as part of future forecasts and for a detailed discussion of the VISSIM and Synchro traffic analysis model development process, please see Appendices D-1 through D-3.

3.4.3.2 | EVALUATION METRICS

This section summarizes the metrics used to measure the performance of each alternative in future year conditions. These metrics were chosen based on the nature of the proposed project and the aforementioned guidance and regulations set forth by the Governor's Office of Planning and Research and the San Francisco Planning Department.

- **Auto Travel Time:** In addition to bus travel times reported in Section 3.3, automobile travel times are also presented for the core section of the Geary corridor.
- **Intersection Delay/LOS:** Signalized intersection operations are evaluated based on average vehicular delay (seconds per vehicle). Unsignalized intersections are analyzed using LOS based on the approach with the highest delay. Using Highway Capacity Manual (2010) methodology, the LOS is calculated based on the average of the total vehicular delay per approach weighted by the number of vehicles at each approach.
- **Systemwide Multimodal Delay:** Delay at intersections and along streets affects travelers in all modes. In addition to total vehicle delay, system-wide delay is measured and reported for other travel modes, including bicycles and pedestrians. Transit system-wide delay is also reported in Section 3.3 above.
- **VMT/Vehicle Hours Traveled (VHT):** In addition to local traffic evaluation metrics, the project's contribution to regional VMT and VHT is also reported.

3.4.4 | Environmental Consequences

This section describes how the roadway system in the Geary corridor would operate under the future year scenarios for each alternative. Traffic demand was estimated for the years 2020 and 2035. The No Build Alternative and the four build alternatives are analyzed for both.

As set forth in Section 3.4.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding traffic impacts in the Draft EIS/EIR.

Future traffic volumes were estimated using a multi-step process consisting of the SF-CHAMP travel demand forecasting model and the San Francisco northwest Quadrant DTA model. This section provides several measures of aggregate traffic demand for each of the analysis scenarios. The changes projected to occur in the horizon years would mostly be due to changes in signalization at certain intersections as well as the introduction of new transit service on the Geary corridor.

3.4.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

This section presents analysis of whether the six modifications to the Hybrid Alternative/LPA, as discussed in Section 2.2.7.6, could result in any new or more severe effects to automobile traffic conditions during construction or operation than what was previously disclosed in the Draft EIS/EIR.

The Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe effects to automobile traffic conditions relative to what was disclosed in the Draft EIS/EIR and set forth below in Sections 3.4.4.2 to 3.4.4.11.

SFMTA conducted supplemental transportation analyses of the modifications, documented in separate memoranda,[5,6,7] the results of which are discussed below.

Retention of the Webster Street Pedestrian Bridge

Construction: The proposed modification would eliminate demolition and excavation activities at this location. This would result in a reduced number of traffic disruptions in the immediate area. Therefore, this modification would not result in any new or more severe traffic impacts during construction.

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[5] San Francisco Municipal Transportation Agency. *Geary Boulevard Bus Rapid Transit: Pedestrian Bulbout Parking Effects Analysis*. November 15, 2016. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

[6] San Francisco Municipal Transportation Agency. *Geary Corridor Bus Rapid Transit Project – Possible Modifications to Staff Recommended Alternative Bus Stops at Laguna and Collins Streets – Supplemental Transportation Analysis Technical Memorandum.* January 4, 2017. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

[7] [7] San Francisco Municipal Transportation Agency. *Geary Boulevard Bus Rapid Transit: 27th Avenue Transition – Transportation Analysis Technical Memorandum*. April 18, 2017. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

Operation: The retained pedestrian bridge and staggered crosswalk at Webster Street would require a minor signal timing change; however, this change would not result in a change in LOS at any nearby intersections relative to what was described in the Draft EIS/EIR. This modification would not reduce travel lane capacities. Therefore, this modification would not result in any new or more severe traffic impacts during operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: Given that a new BRT stop would not be built between Spruce and Cook streets, construction (and associated traffic disruptions) would be reduced in this area. Therefore, this modification would not result in any new or more severe traffic impacts during construction.

Operation: Retention of the existing bus stops between Spruce and Cook streets would not involve any changes to traffic signal timing, nor would it change travel lane capacities. As such, this modification could not have any effect on any of the automobile traffic effects as previously disclosed in the Draft EIS/EIR. Therefore, this modification would not result in any new or more severe traffic impacts during operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: All pedestrian improvements would be construction within existing transportation right of way. Construction-period disruptions would be short in duration and similar to that which would occur for other previously proposed pedestrian improvements throughout the corridor. Therefore, this modification would not result in any new or more severe traffic impacts during construction.

Operation: Addition of more pedestrian enhancements throughout the corridor would not involve any changes to traffic signal timing, nor would it reduce travel lane capacities. As such, this modification could not have any effect on any of the automobile traffic effects as previously disclosed in the Draft EIS/EIR. Therefore, this modification would not result in any new or more severe impacts during operation.

Addition of BRT Stops at Laguna Street

Construction: Construction-period traffic disruptions would be short in duration and similar to that which would occur for other previously proposed BRT stops throughout the corridor. Therefore, this modification would not result in any new or more severe traffic impacts during construction.

Operation: Addition of BRT stops at Laguna Street would not involve any changes to traffic signal timing, nor would it reduce travel lane capacities. The existing curbside bus stops would be relocated to new transit islands that would separate right-turning vehicles from the bus lane. This would shift the locations of the eastbound and westbound right-turn lanes immediately adjacent to the curb, though this would not substantially affect vehicle travel times. As such, this modification could not have any effect on any of the automobile traffic effects as previously disclosed in the Draft EIS/EIR. Therefore, this modification would not result in any new or more severe traffic impacts during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: Given that existing bus stops would no longer be removed at Collins Street, construction (and associated traffic disruptions) would be reduced in this area. Therefore, this modification would not result in any new or more severe traffic impacts during construction.

Operation: Retention of the existing bus stops at Collins Street would not involve any changes to traffic signal timing, nor would it reduce travel lane capacities. As such, this modification could not have any effect on any of the automobile traffic effects as previously disclosed in the Draft EIS/EIR. Therefore, this modification would not result in any new or more severe traffic impacts during operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities but would simply shift about half of it one block to the west. Therefore, this modification would not result in any new or more severe traffic impacts during construction.

Operation: In the revised design at the 27th Avenue bus lane transition, the westbound transit signal queue jump would be located at 27th Avenue, rather than 26th Avenue as proposed in the Draft EIS/EIR. Both intersections have very similar traffic characteristics. Any associated delay for automobiles traveling in the westbound direction would occur at 27th Avenue rather than at 26th Avenue. As both the eastbound and westbound queue jumps would now be consolidated into one intersection (i.e., at 27th Avenue), signal coordination through the area would be slightly more efficient, though the change would be negligible because the entire queue jump phase is only a few seconds. Therefore, this modification would not result in any new or more severe traffic impacts during operation.

3.4.4.2 | FUTURE TRAFFIC VOLUME FORECASTS (P.M. PEAK HOUR) BY YEAR BY ALTERNATIVE

2020 No Build Alternative

Geary corridor traffic volumes vary by year, alternative, and section of the Geary corridor. By 2020 under the No Build alternative, westbound p.m. peak-hour traffic volumes east of Divisadero Street are projected to increase by up to 35 percent relative to existing conditions, while volumes to the west of Divisadero Street are expected to decline by as much as 29 percent. The anticipated increase in traffic volumes east of Divisadero Street would be related to planned intensification of land use in and around San Francisco's downtown areas. The CPMC Cathedral Hill development near Geary Boulevard and Van Ness Avenue would contribute to the increase in traffic. At the western end of the Geary corridor, traffic levels are projected to moderately decline. Factors that could contribute to declining traffic volumes may include the addition of new traffic signals on Geary Boulevard and land use shifts in the Presidio and in the North Bay. New traffic signals would add an incremental amount of delay to traffic on Geary Boulevard. For trips where Geary Boulevard and an alternate route have the same travel time, drivers may become more likely to use the alternate route. As employment opportunities in the Presidio and the North Bay increase, traffic patterns for some commuters could shift away from western Geary Boulevard to north-south oriented streets providing access to the Presidio and Golden Gate Bridge.

2020 No Build Alternative eastbound p.m. peak-hour traffic is projected to fall relative to existing conditions. The greatest declines, up to 32 percent, are expected to occur between Webster Street and Park Presidio. Traffic reductions are anticipated to be less pronounced to the west of Park Presidio and in the vicinity of Van Ness Avenue. Two potential contributors for the reduction in eastbound traffic by 2020 include the opening of Presidio Parkway and improved westbound signal progression throughout the Geary corridor. Presidio Parkway added an additional eastbound lane in the p.m. peak period and may attract some drivers that would otherwise have used the Geary corridor to access San Francisco's northeastern neighborhoods. Improved signal progression would help to smooth traffic flow in the westbound direction, where p.m. peak-hour traffic demand is highest, but could increase eastbound travel time for the smaller number of vehicles traveling in the counter-peak direction. Some drivers may find that eastbound travel is faster on alternate routes and switch routes from Geary Boulevard.

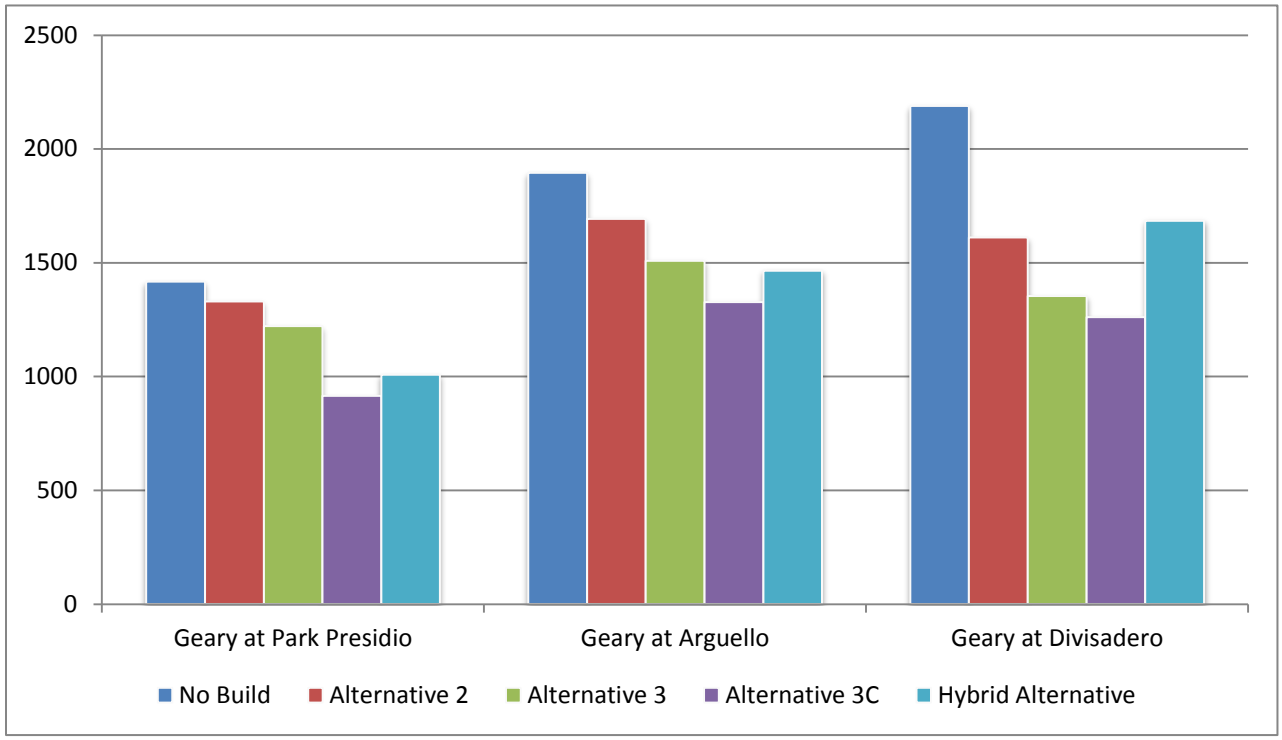
2020 Build Alternatives

By 2020, all the build alternatives are projected to have less p.m. peak-hour traffic on Geary Boulevard than in the 2020 No Build Alternative. The reduction in traffic in the build alternatives is primarily due to the reduction in traffic capacity caused by the removal of mixed flow travel lanes, but also due to improved transit service. As Geary corridor transit service improves, some drivers will switch travel mode from driving to transit for travel on the Geary corridor.

The amount that traffic on Geary Boulevard will change from the No Build Alternative differs by build alternative, location, and direction. Of the build alternatives, Alternative 2 would cause the smallest change in traffic along the Geary corridor and Alternative 3-Consolidated would cause the greatest change in traffic volumes. Under Alternative 2, average p.m. peak-hour traffic on Geary Boulevard between Polk Street and 25th Avenue would decline by about 19 percent in the westbound direction and 12 percent in the eastbound direction relative to the No Build Alternative. Under Alternative 3-Consolidated, average p.m. peak-hour traffic on Geary Boulevard between Polk Street and 25th Avenue would decline by about 36 percent in the westbound direction and 39 percent in the eastbound direction relative to the No Build Alternative. Alternative 3 and the Hybrid Alternative/LPA would have impacts on Geary corridor traffic that fall between those of Alternatives 2 and 3-Consolidated. The elimination of the Fillmore Street underpass and the removal of three out of the four existing mixed traffic tunnel lanes at the Masonic tunnel complex would decrease traffic capacity under Alternatives 3 and 3-Consolidated by more than under Alternative 2 and the Hybrid Alternative/LPA. Consequently, traffic volumes under Alternative 3 and 3-Consolidated are expected be lower than under Alternative 2 and the Hybrid Alternative/LPA.

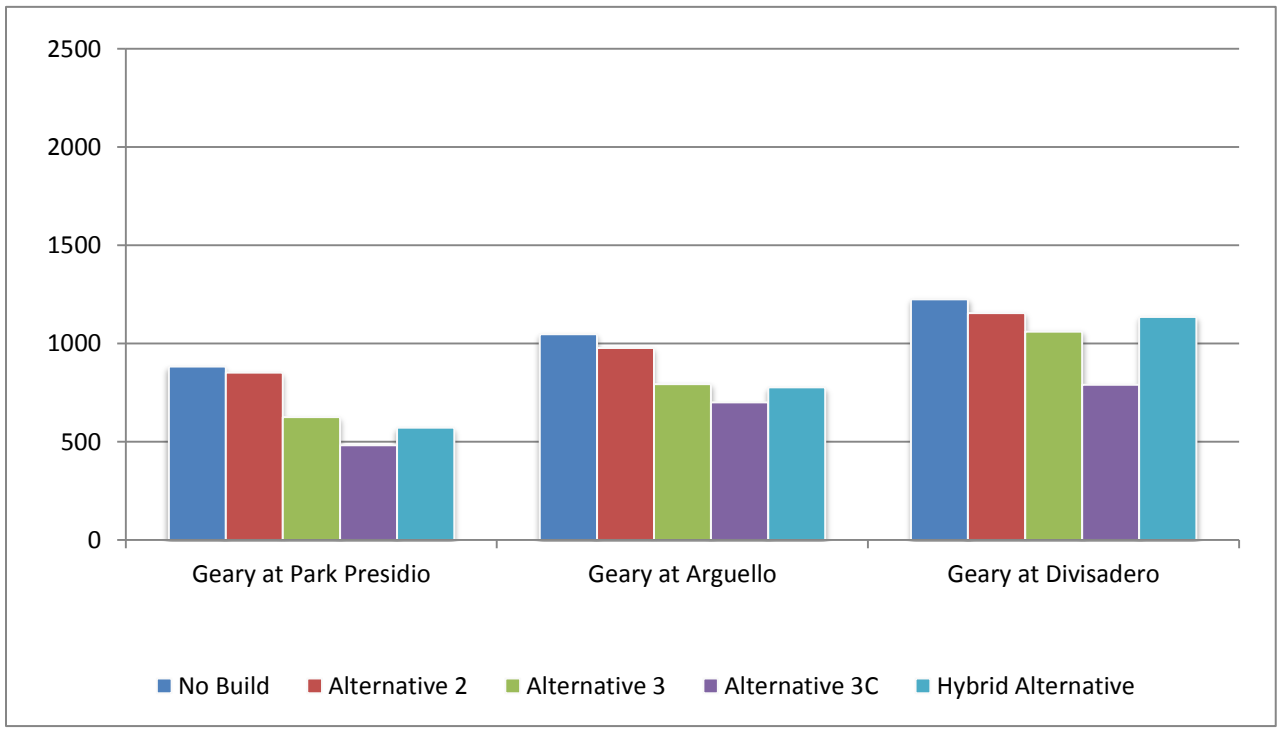
Figures 3.4-3 and 3.4-4 present p.m. peak-hour traffic volumes at important Geary corridor intersections for each of the alternatives. Table 3.4-4 presents key Geary corridor traffic volume metrics highlighting differences between each build alternative and the No Build Alternative. Traffic diversions are discussed later in this section.

Figure 3.4-3 Geary Boulevard 2020 Westbound P.M. Peak-Hour Traffic at Key Intersections (Vehicles per Hour)



Source: DTA model forecast, SFCTA, 2014

Figure 3.4-4 Geary Boulevard 2020 Eastbound P.M. Peak-Hour Traffic at Key Intersections (Vehicles per Hour)



Source: DTA model forecast, SFCTA, 2014

Table 3.4-4 P.M. Peak-Hour Geary Corridor Traffic Volume Differences Between 2020 Build Alternatives and the 2020 No Build Alternative

METRIC		ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE/LPA
WESTBOUND (VAN NESS TO 25TH AVE)					
Avg. Traffic Change	#	-320	-480	-600	-410
	%	-19%	-29%	-36%	-25%
Westbound Maximum Traffic Change	#	-850	-1020	-1020	-840
	%	-39%	-44%	-48%	-42%
EASTBOUND (VAN NESS TO 25TH AVE)					
Avg. Traffic Change	#	-130	-280	-420	-280
	%	-12%	-26%	-39%	-26%
Maximum Traffic Change	#	-400	-540	-780	-520
	%	-33%	-46%	-55%	-45%

Note: Average traffic change is the average changes for all blocks between Van Ness and 25th avenues. Not all blocks have the same length and these calculations are not weighted by distance.

Source: Fehr & Peers, 2014

2035 No Build Alternative

Between 2020 and 2035, No Build Alternative p.m. peak-hour traffic volumes are projected to increase throughout the Geary corridor. Traffic is expected to grow the most east of Divisadero Street where p.m. peak-hour traffic volume would increase by up to 22 percent in the westbound direction and by up to 45 percent in the eastbound direction. Throughout the Geary corridor (between Van Ness and 25th avenues), 2035 p.m. peak-hour traffic volume is projected to be about 5 percent higher in the westbound direction and 25 percent higher in the eastbound direction. Westbound traffic volume is anticipated to be greater than 2,000 vehicles per hour between Gough Street and the Masonic tunnel complex, greater than 1,500 vehicles per hour from there to Park Presidio, and less than 1,000 vehicles per hour west of Park Presidio. Eastbound traffic volumes are expected to be less than 1,000 vehicles per hour to the west of Park Presidio, between 1,000 and 1,500 vehicles per hour between Park Presidio and Arguello Boulevard, and between 1,500 and 2,000 vehicles per hour between Arguello Boulevard and Gough Street.

2035 Build Alternatives

The 2035 build alternatives are forecast to carry lower volumes of traffic on the Geary corridor than the 2035 No Build Alternative. Less traffic capacity on the Geary corridor and higher quality transit service are the primary reasons 2035 traffic would decrease.

In 2035 the relative impacts of the four build alternatives on Geary corridor traffic volumes would be similar to 2020 conditions. Alternative 2 would cause the smallest reduction in Geary corridor traffic and Alternative 3-Consolidated would cause the greatest reduction in Geary corridor traffic volumes when compared with the No Build Alternative. The magnitude of traffic volume differences between the No Build Alternative and the build alternatives is greater in 2035 than in 2020. Under Alternative 2, 2035 average p.m. peak-hour traffic on Geary Boulevard between Polk Street and 25th Avenue would decline by about 17 percent in the westbound

direction and 24 percent in the eastbound direction relative to the No Build Alternative. Under Alternative 3-Consolidated, average p.m. peak-hour traffic on Geary Boulevard between Polk Street and 25th Avenue would decline by about 35 percent in the westbound direction and 53 percent in the eastbound direction relative to the No Build Alternative.

Traffic volume reductions for individual locations throughout the Geary corridor relative to the No Build Alternative are projected to range between zero and 44 percent for Alternative 2 and the Hybrid Alternative/LPA. Under Alternatives 3 and 3-Consolidated, p.m. peak-hour traffic on the Geary corridor could fall by 10 percent to 50 percent in the westbound direction, and by 34 percent to 64 percent in the eastbound direction. Under all build alternatives traffic volume reductions on the Geary corridor would be greatest to the east of Divisadero Street and lowest in on the blocks to the west of Arguello Boulevard.

Figures 3.4-5 and 3.4-6 present p.m. peak-hour traffic volumes at important Geary corridor intersections for each of the alternatives. Table 3.4-5 presents key Geary corridor traffic volume metrics highlighting differences between each build alternative and the No Build Alternative.

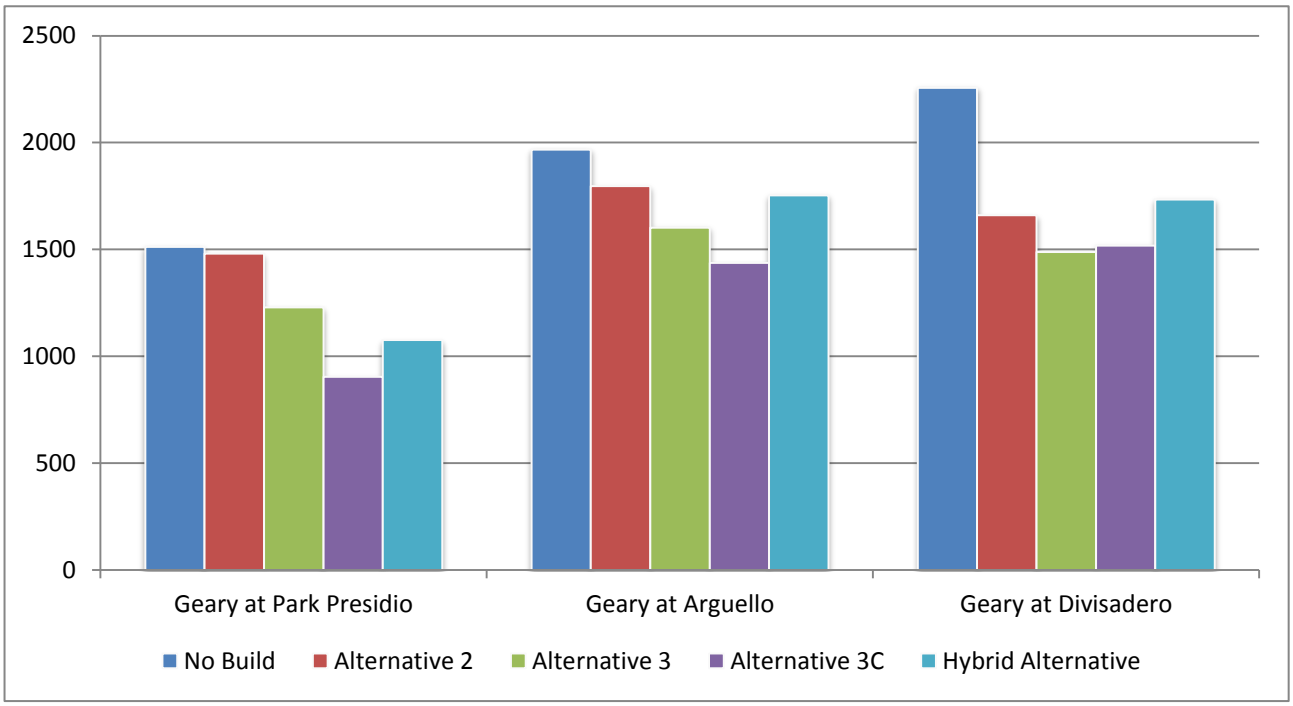
Table 3.4-5 P.M. Peak-Hour Geary Corridor Traffic Volume Differences Between 2035 Build Alternatives and the 2035 No Build Alternative

METRIC		ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE/LPA
WESTBOUND (VAN NESS TO 25TH AVE)					
Avg. Traffic Change	#	-310	-490	-620	-380
	%	-17%	-28%	-35%	-22%
Westbound Maximum Traffic Change	#	-940	-1,200	-1,170	-950
	%	-40%	-50%	-49%	-40%
EASTBOUND (VAN NESS TO 25TH AVE)					
Avg. Traffic Change	#	-320	-700	-700	-380
	%	-24%	-52%	-53%	-28%
Maximum Traffic Change	#	-810	-1,250	-1,140	-810
	%	-44%	-62%	-64%	-44%

Note: Average traffic change is the average changes for all blocks between Van Ness and 25th avenues. Not all blocks have the same length and these calculations are not weighted by distance.

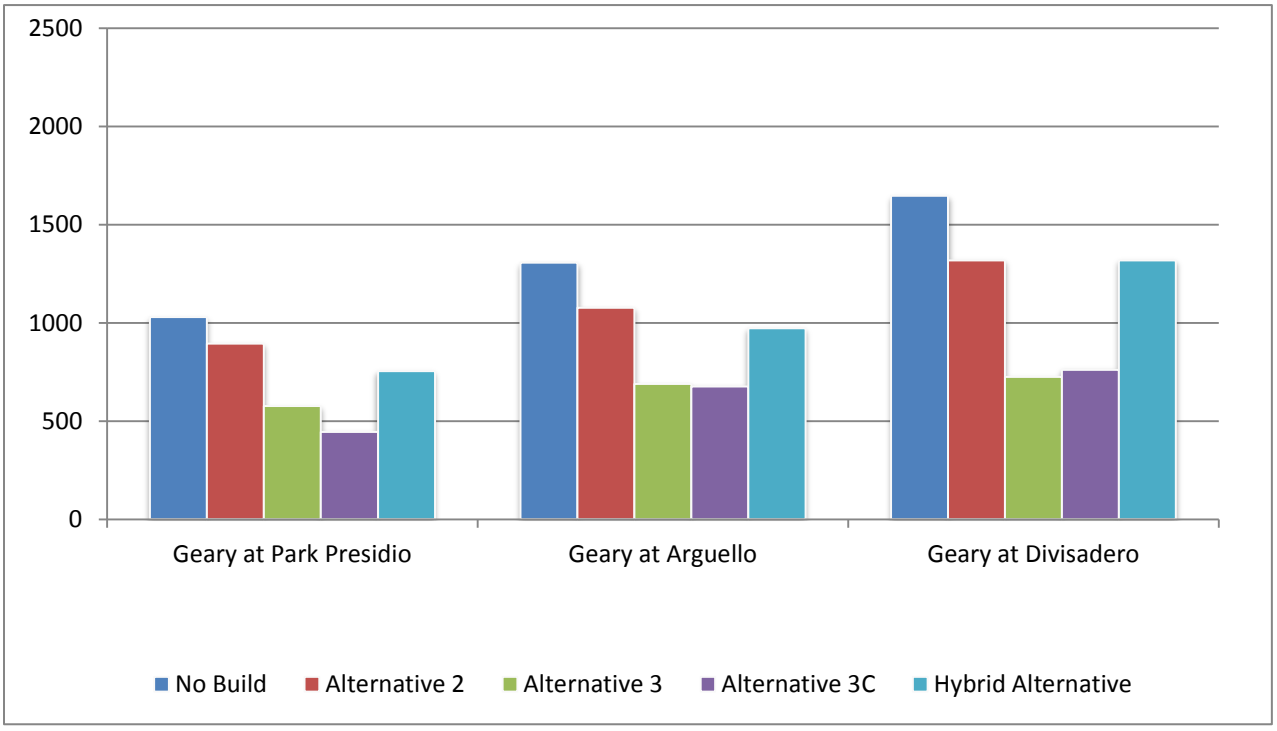
Source: Fehr & Peers, 2014

Figure 3.4-5 Geary Boulevard 2035 Westbound P.M. Peak-Hour Traffic at Key Intersections (Vehicles per Hour)



Source: DTA model forecast, SFCTA, 2014

Figure 3.4-6 Geary Boulevard 2035 Eastbound P.M. Peak-Hour Traffic at Key Intersections (Vehicles per Hour)



Source: DTA model forecast, SFCTA, 2014

3.4.4.3 | LEFT-TURN REDUCTIONS BY YEAR BY ALTERNATIVE

Due to the reconfiguration of the Geary corridor that would occur as a result of the project for all build alternatives, motorists would experience a reduction in left-turn opportunities along the Geary corridor. Under existing conditions, there are a total of 40 left-turn locations (both permitted and protected) on Geary Boulevard from 25th Avenue to Gough Street (a full list of left-turn locations for all future No Build and build alternatives can be found in Chapter 2 (Descriptions of Project Alternatives), and breakdown of the number of protected and permissive left turns is included in Section 3.5; see Table 3.5-6). See also Section 3.2.2.2.1 for information on changes to existing left-turn locations since the traffic analysis that was conducted for the Draft EIS/EIR. Table 3.4-6 displays the total number of left-turn locations between Gough Street and 25th Avenue, by alternative. These changes are assumed in both 2020 and 2035 scenarios.

The left-turn locations that would remain generally represent a consolidation of two left turns that are currently located in close succession or in close proximity to another left-turn lane. For example, left turns are currently permitted at both 11th and 12th avenues at Geary Boulevard. Under Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA, the eastbound left turn at 12th would be removed due to the close proximity to the eastbound left turn at 11th Avenue, where existing left turns would remain. This consolidation pattern provides motorists alternative turn locations in close proximity.

Peak-hour traffic demand for left-turn locations is projected to decrease under all future build alternatives compared with No Build Alternative conditions. For example, left-turn volumes are expected to decrease by 44 percent under Alternative 3-Consolidated relative to 2020 No Build conditions. The decrease in demand is likely attributable to anticipated traffic reductions under all build alternatives, but may also be related to the reduction in left-turn opportunities and the diversion of traffic to surrounding roadways.

Left-turn volume is projected to decrease by 24 percent under the Hybrid Alternative/LPA relative to 2020 No Build Alternative conditions. Part of the reduction in left-turn demand under the build alternatives can be explained by the overall decrease in traffic demand in these alternatives. With less traffic traveling along the Geary corridor, there will be fewer cars that need to make left-turn movements. Also, trips that will be most inconvenienced by left-turn prohibitions are more likely to divert to alternate routes. Trips on the Geary corridor that are not affected by left-turn restrictions are more likely to stay on Geary Boulevard under the build alternatives.

Traffic assignment modeling of left-turn traffic demand shows that the reduction in left-turn locations would not cause motorists to make multiple right-turns to complete a left turn; instead, they would likely make a left turn at a turn lane in close proximity to the removed turn lane, or divert entirely to a parallel east-west route. Most of the left-turn pocket removals would be just upstream or downstream of a left-turn pocket that would remain. Overall, the future reduction in left-turn locations would not be expected to adversely affect traffic circulation on the Geary corridor.

Table 3.4-6 Left-Turn Locations on Geary Corridor, by Alternative

	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE /LPA
Total number of left-turn locations	40	36	20	21	28

Total left-turn locations in eastbound and westbound directions between 25th Avenue and Gough Street on Geary Boulevard. Excludes existing left-turn locations east of Gough Street that would be maintained under all build alternatives.

Source: Fehr & Peers, 2014

3.4.4.4 | VEHICLE DIVERSIONS

Vehicle diversions are changes in private vehicle travel routes. If traffic volumes decrease on one street and increase on another street as a result of the project, the shift in traffic volume is considered diverted traffic.

All of the build alternatives would convert one mixed-flow travel lane in each direction between Van Ness and 14th Avenues and between 28th and 34th Avenues into a bus-only lane in each direction of travel on the Geary corridor. Between Gough and Scott streets, the "expressway" portion of Geary Boulevard would be reduced by two mixed-flow travel lanes in each direction. The change would improve transit operating conditions on Geary Boulevard, but would decrease private vehicle traffic capacity along the Geary corridor. The reduction in the number of mixed-flow travel lanes would be partially offset by providing buses with dedicated travel lanes, allowing each of the remaining mixed-flow lanes to accommodate more traffic in the spaces currently occupied by buses. Some of the current demand for private vehicle travel on Geary Boulevard would shift modes to transit under the build alternatives; however, there would also be some diversion of traffic from Geary Boulevard to alternate travel routes.

Depending on the location along the Geary corridor, at least 12 percent and at most 39 percent of private vehicle trips that would use the Geary corridor under the 2020 No Build Alternative would shift to other options under the build alternatives. The build alternatives would result in a 17 to 53 percent reduction in private vehicle trips on the Geary corridor relative to the No Build Alternative. Travelers making these trips would change their behavior in one of the following ways:

- Switch to transit, biking, or walking.
- Switch route by continuing to travel in the study area but on a parallel street instead.
- Switch route by shifting to travel outside of the study area but on a parallel street instead.
- Change trip destination.
- Change time of day of their trip and potentially choose to make trips outside of the peak travel hours.
- Not make a trip.

Most of the private vehicle trips diverted from the Geary corridor would either change modes or shift to an alternate route within the study area.

Change in Circulation Patterns within the Study Area

Traffic diversions away from the Geary corridor under the build alternatives would result due to multiple reasons. One reason for diversions is that Geary Boulevard would have fewer travel lanes for mixed traffic. Rather than travel through a portion of the corridor while experiencing some peak-hour traffic congestion, some travelers would choose to use alternate routes. Another cause of diversion is that under the build alternatives there would be fewer opportunities for drivers to execute left turns from Geary Boulevard, resulting in some increase in traffic on parallel streets. The reduction in left-turn opportunities would be most pronounced in the center-running segments of the applicable alternatives (Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA).

Traffic diversions from the Geary corridor to parallel streets in the study area are reported in aggregate for north-south "screenlines" in the study area. The changes in traffic on all parallel streets – other than Geary Boulevard – between Fulton Street in the south and the Presidio or Pacific Street to the north are combined to calculate total diversions of traffic from Geary Boulevard. Since the amount of traffic diversion from Geary Boulevard differs by location along the corridor, traffic diversions from Geary Boulevard are reported for five representative screenline locations throughout the corridor. These screenlines include:

- 30th Avenue
- Park Presidio Boulevard
- Arguello Boulevard
- Masonic Avenue
- Divisadero Street
- Webster Street

To illustrate the meaning of a screenline, the 30th Avenue screenline includes traffic traveling across 30th Avenue on the following parallel streets: Fulton, Cabrillo, Balboa, Anza, Clement, California, and Lake streets as they cross 30th Avenue. Any change in the total traffic along all of these streets (as they cross 30th Avenue) in a build alternative is considered to be traffic diverted from Geary Boulevard. Table 3.4-7, below, shows the amount of traffic diverted from Geary Boulevard for each 2020 build alternative.

Table 3.4-7 Diversions from Geary Boulevard to Parallel Roadways, Total Difference in Volume on All Parallel Streets vs. No-Build Alternative, 2020 P.M. Peak Hour

	WESTBOUND			
STREET	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE/LPA
30th Ave	<+100	+100	+200	<+100
Park Presidio	+200	+200	+400	+300
Arguello	+200	+300	+500	+400
Masonic	<+100	+200	+400	+200
Divisadero	<+100	+100	+400	+300
Webster	+400	+300	+700	+600
	EASTBOUND			
STREET	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE/LPA
30th Ave	<+100	+300	+200	+200
Park Presidio	<+100	+300	+300	+300
Arguello	+100	+200	+300	+400
Masonic	+300	+400	+500	+400
Divisadero	<+100	<+100	+300	<+100
Webster	<+100	<+100	+400	+300

Source: SFCTA, 2014

Under the build alternatives, year 2020 p.m. peak-hour traffic diversions from Geary Boulevard to parallel streets within the Geary corridor are expected to range from 100 to 700 vehicles per direction. The maximum diversions would occur under Alternative 3-Consolidated. Overall, peak-hour traffic diversions from the Geary corridor are higher in the eastern end of the study area and lower in the western portion. Unlike the rest of the Geary corridor, several blocks of Geary Boulevard between Gough Street and Scott Street currently have four lanes of traffic in each direction. Other areas of the corridor generally have two or three travel lanes in each direction. The four-travel-lane segment of Geary features some of the highest peak-period traffic volumes in the Geary corridor. This area is also forecasted to experience more land development and a greater increase in traffic demand in 2020 and 2035 than other segments of the corridor. Under the build alternatives, the reduction of travel lanes from four to two in each direction would reduce Geary Boulevard capacity. To avoid congested conditions on Geary Boulevard, many of the drivers that would use this segment would shift to alternate routes. The higher traffic volumes and greater reduction of capacity at the eastern end of the corridor would make this effect more pronounced in this area than in other segments of the Geary corridor.

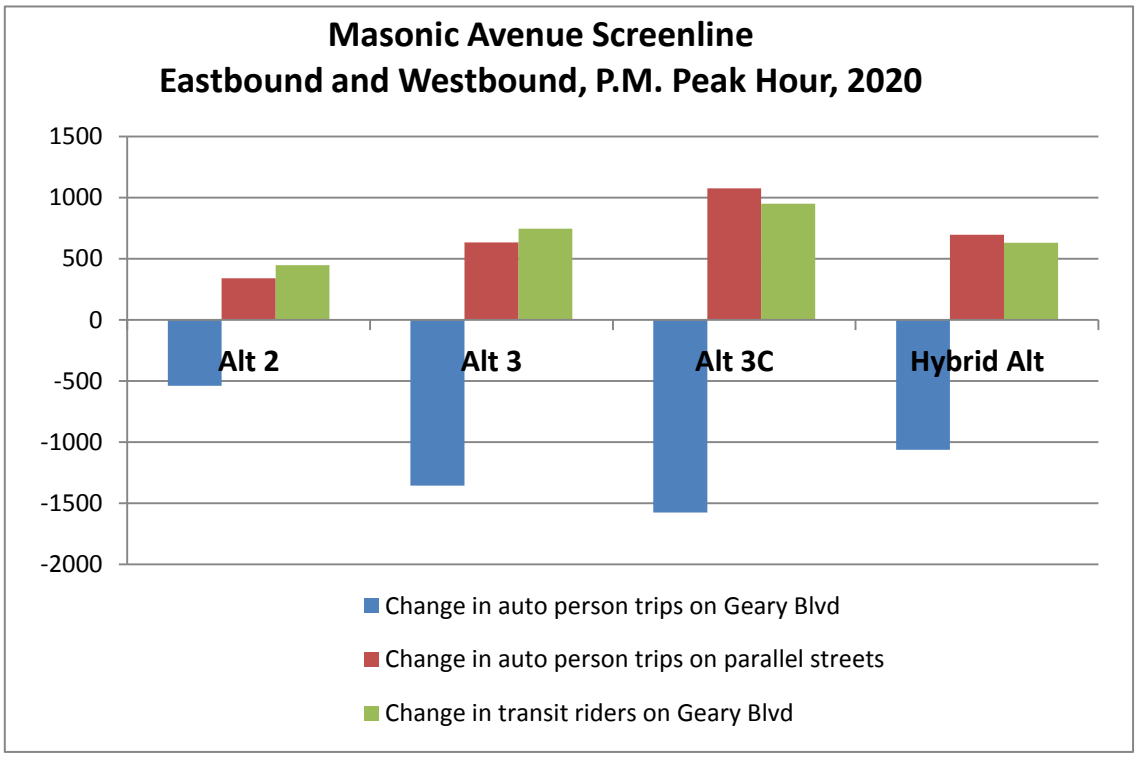
Traffic diversions from Geary Boulevard are likely to be lower at other off-peak times of the day when there is less demand for travel on Geary Boulevard. During off-peak times, traffic capacity on Geary Boulevard for all of the build alternatives should be adequate to serve demand.

Traffic diversions from Geary Boulevard are not concentrated on any particular street. Instead they are spread out across all of the parallel streets within the Geary corridor. Higher capacity streets with the ability to carry more vehicles, such as California and Fulton Streets, would carry relatively greater shares of the diverted

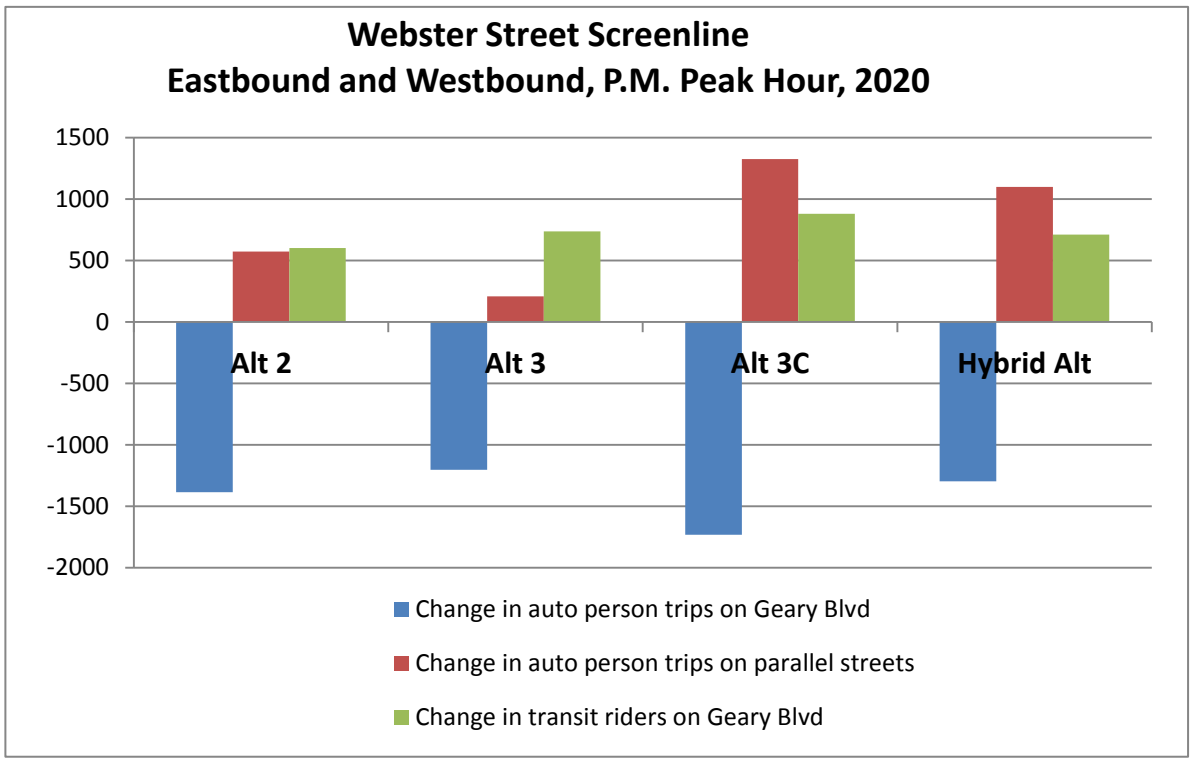
traffic. Smaller side streets would carry relatively smaller amounts of diverted traffic. The number of additional private vehicles along these parallel streets would vary greatly throughout the corridor. For California and Fulton Streets the increased traffic due to diversions from Geary Boulevard would range from less than 10 to 200 vehicles per hour for 2020 during the p.m. peak hour. At most a parallel street would experience an additional three to four vehicles per minute during the p.m. peak hour.

Figure 3.4-7 shows how traffic reductions on Geary Boulevard relate to both increases in traffic on parallel streets and increases in transit ridership on the Geary corridor for three select screenlines in the study area – Park Presidio, Masonic Avenue, and Webster Street. To compare traffic with transit riders using a consistent metric, traffic changes are measured in terms of auto person trips, not vehicles. Since each auto contains one or more occupants the amount of auto person trips is generally greater than the number of auto vehicles. In most 2020 scenarios, and at most locations, the reduction of auto person trips on Geary Boulevard is less than the sum of the increase in transit riders on the Geary corridor and the increase in auto person trips on nearby parallel streets.

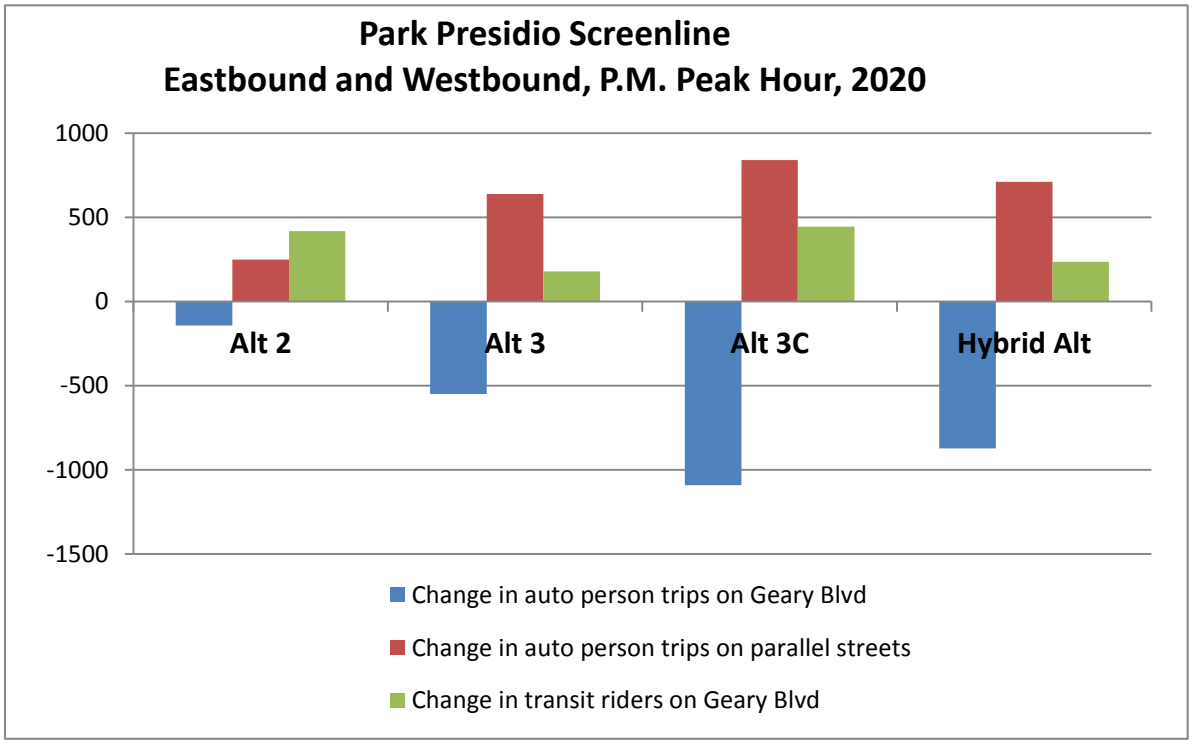
Figure 3.4-7 Change in Passenger Trips in the Study Area Between the Build Alternatives and the No Build Alternative



Source: DTA model forecast, SFCTA, 2014



Source: DTA model forecast, SFCTA, 2014



Source: DTA model forecast, SFCTA, 2014

The 2035 forecasts show higher p.m. peak-hour traffic diversions ranging from 100 up to 1,200 (in the case of Alternative 3 westbound at Webster Street). Changes in diversions from 2020 to 2035 are more pronounced at the eastern screenlines of Masonic, Divisadero, and Webster than at 30th Avenue, Park Presidio, and Arguello. In 2035, diversions from Geary Boulevard are greatest under Alternatives 3 and 3-Consolidated. At the Webster and Divisadero screenlines, more than half of p.m. peak-hour traffic diverted from Geary Boulevard travels in the westbound direction. At the 30th Avenue and Park Presidio screenlines the majority of diverted traffic is traveling in the eastbound direction. Table 3.4-8, below, shows the amount of traffic diverted from Geary Boulevard for each 2035 build alternative.

Table 3.4-8 Diversions from Geary Boulevard to Parallel Roadways, Total Difference in Volume on All Parallel Streets vs. No-Build, 2035 P.M. Peak Hour

SCREENLINE STREET	WESTBOUND			
	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE/LPA
30th Ave	+100	+200	+200	+100
Park Presidio	+100	+300	+500	+300
Arguello	+300	+600	+600	+400
Masonic	+300	+700	+700	+200
Divisadero	+500	+800	+700	+400
Webster	+1,100	+1,200	+1,000	+600
SCREENLINE STREET	EASTBOUND			
	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE/LPA
30th Ave	+100	+300	+400	+300
Park Presidio	+100	+400	+400	+400
Arguello	+200	+500	+400	+400
Masonic	+400	+900	+800	+500
Divisadero	+300	+800	+700	+300
Webster	+600	+1,000	+900	+700

Source: SFCTA, 2014

Figures 3.4-8 and 3.4-9 show p.m. peak-hour traffic diverted from Geary Boulevard as a percentage of traffic on the destination streets that receive diverted traffic under the build alternatives. Both figures compare diverted traffic percentages for 2020 and for 2035. These figures show how diverted traffic increases throughout the Geary corridor between 2020 and 2035, but also that diverted traffic increases more at the Masonic, Divisadero, and Webster screenlines than at the 30th Avenue, Park Presidio Boulevard, and Arguello Boulevard screenlines.

Figure 3.4-8 **P.M. Peak-Hour Traffic Diversions (Vehicles) from Geary Boulevard (Both Directions) to Adjacent Streets as Percent of Traffic on Recipient Streets - Average for 30th Ave, Park Presidio, and Arguello Screenlines**

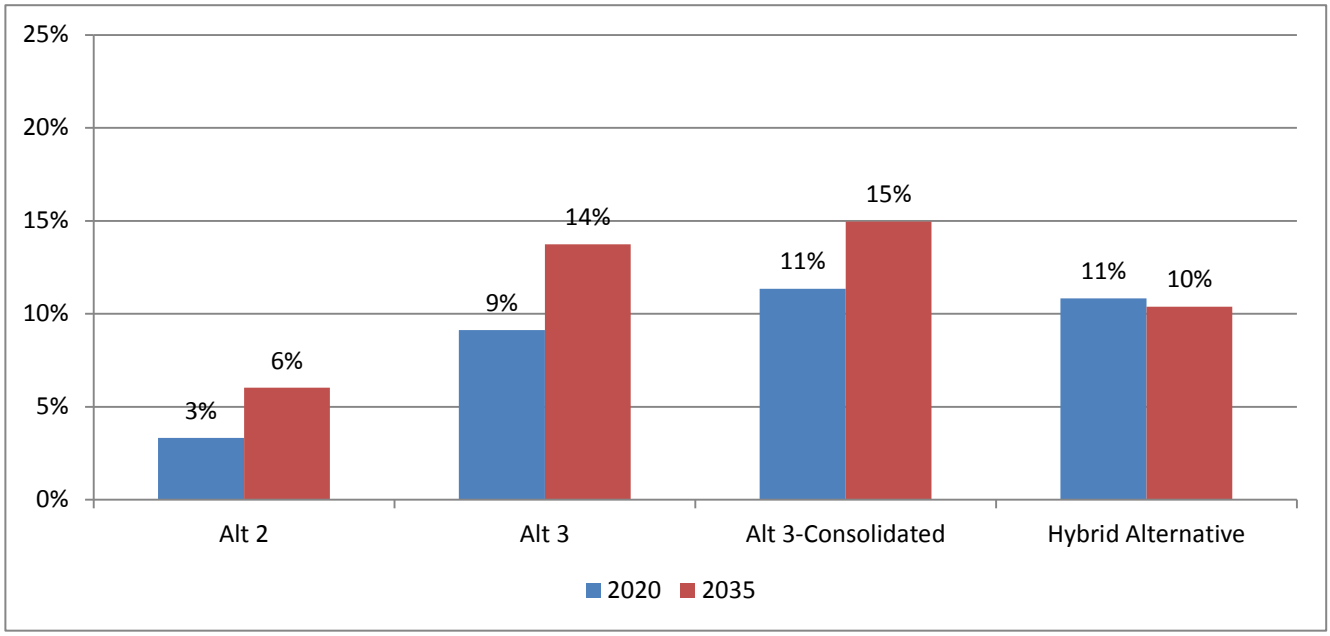


Figure 3.4-9 **P.M. Peak-Hour Traffic Diversions (Vehicles) from Geary Boulevard (Both Directions) to Adjacent Streets as Percent of Traffic on Recipient Streets - Average for Masonic, Divisadero, and Webster Screenlines**

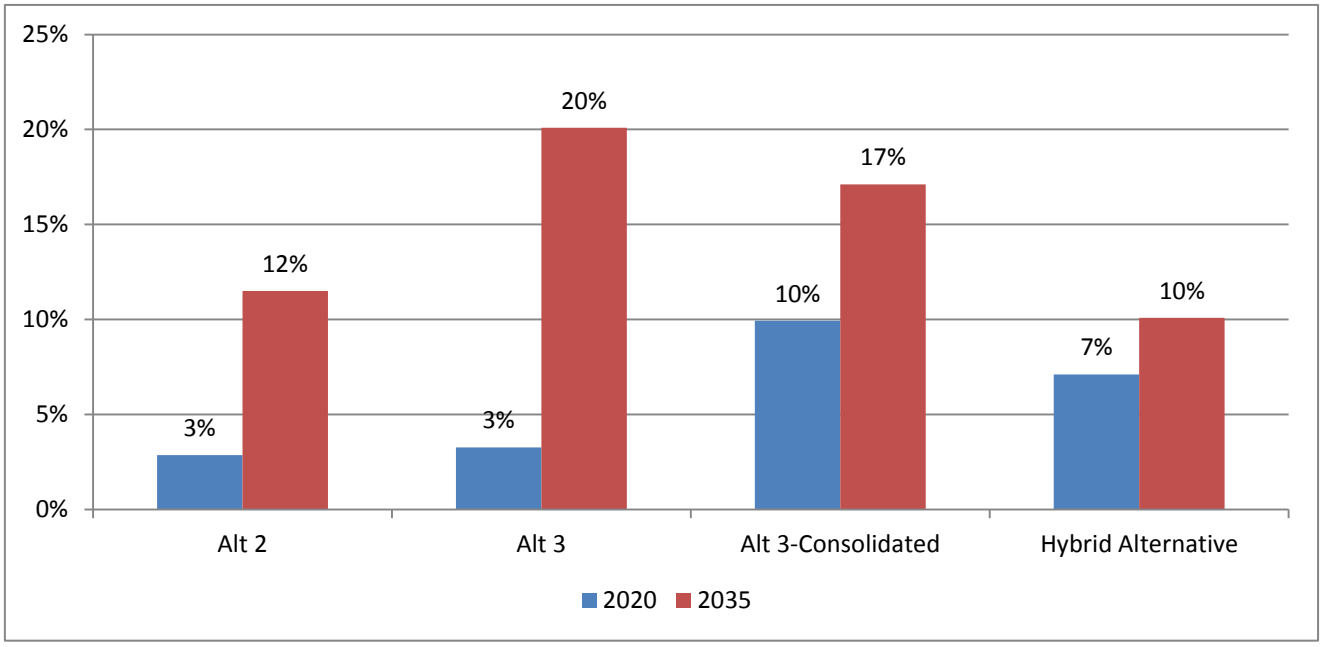
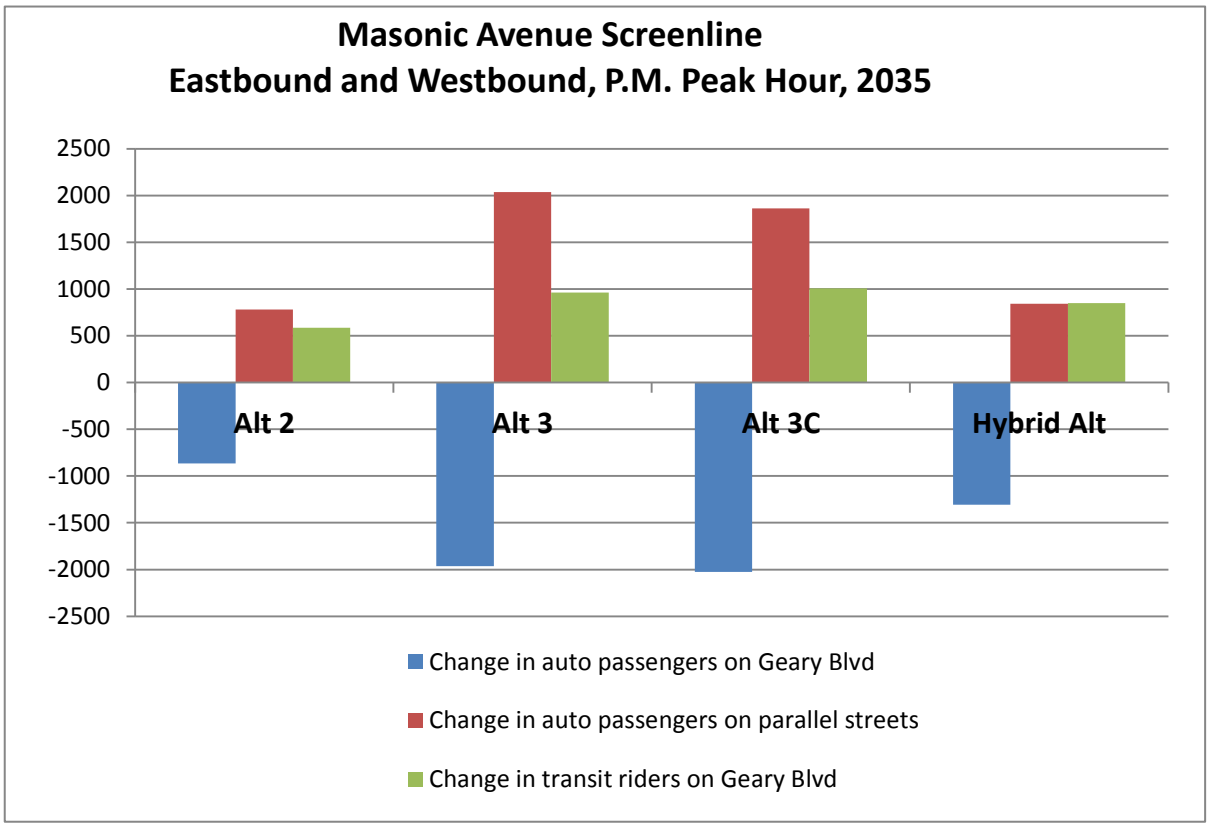
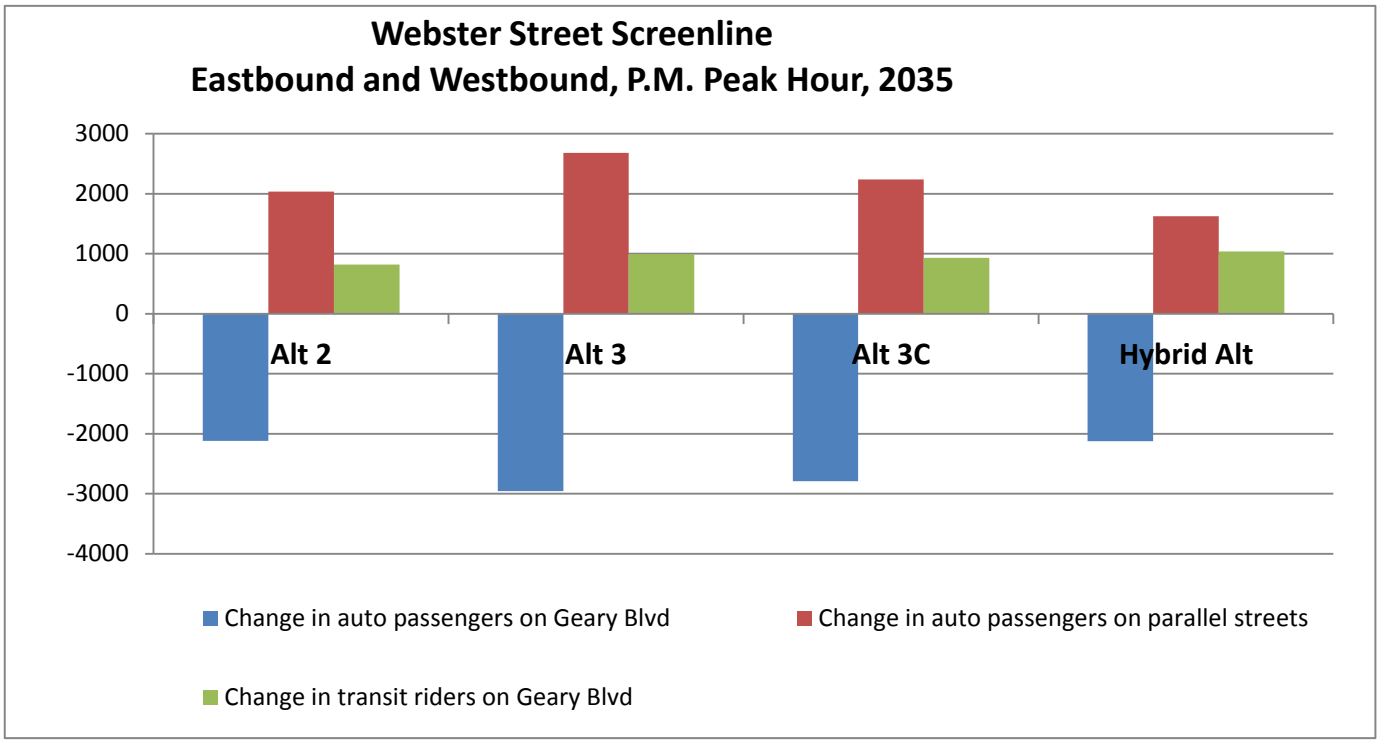
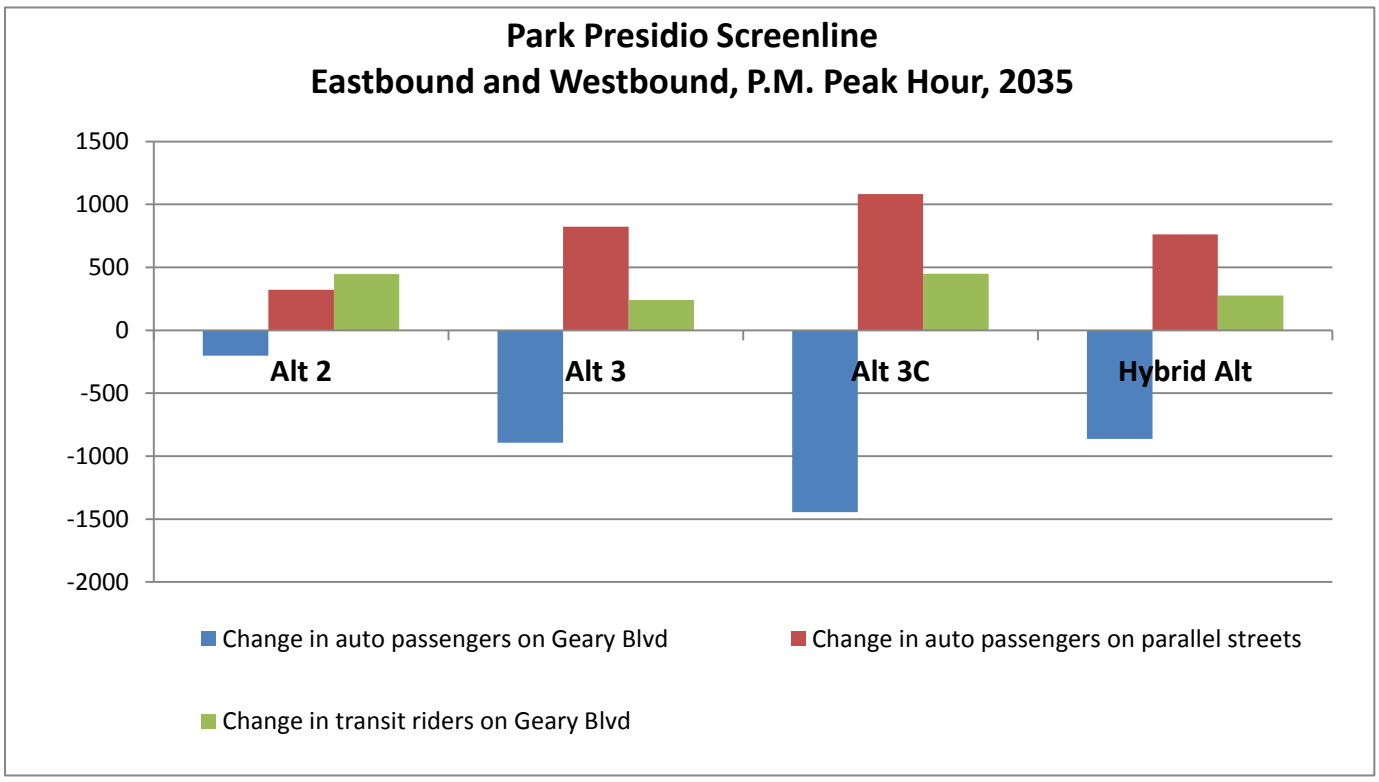


Figure 3.4-10 shows how 2035 traffic reductions on Geary Boulevard compare to increases in traffic on parallel streets and increases in transit ridership on the Geary corridor for three select screenlines in the study area – Park Presidio Boulevard, Masonic Avenue, and Webster Street. To facilitate consistent measurement between auto travel and transit travel, traffic changes are measured in terms of auto person trips. In most 2035 scenarios and at most locations the reduction of auto person trips on Geary Boulevard is less than the sum of the increase in transit riders on the Geary corridor and the increase in auto person trips on nearby parallel streets.

Figure 3.4-10 Change in Passenger Trips in the Study Area Between the Build Alternatives and the No Build Alternative




Webster Street Screenline
Eastbound and Westbound, P.M. Peak Hour, 2035
3000
2000
1000
0
-1000
-2000
-3000
-4000
Alt 2
Alt 3
Alt 3C
Hybrid Alt
Change in auto passengers on Geary Blvd
Change in auto passengers on parallel streets
Change in transit riders on Geary Blvd


Park Presidio Screenline
Eastbound and Westbound, P.M. Peak Hour, 2035
1500
1000
500
0
-500
-1000
-1500
-2000
Alt 2
Alt 3
Alt 3C
Hybrid Alt
Change in auto passengers on Geary Blvd
Change in auto passengers on parallel streets
Change in transit riders on Geary Blvd

3.4.4.5 | CHANGE IN CIRCULATION PATTERNS OUTSIDE OF THE STUDY AREA

Under the build alternatives, some vehicle trips would divert from Geary Boulevard to alternate routes that are outside of the study area. For example, some east-west oriented trips may divert from Geary Boulevard to Fell and Oak streets, an arterial roadway couplet that is located south of the study area. Other trips may divert from Geary Boulevard to Lombard Street for access to and from the Presidio and the Golden Gate Bridge. The scale of these diversions to routes outside of the study area would be minor and are unlikely to affect traffic operations on the potential destination roadways.

3.4.4.6 | EFFECTS ON TAXI AND SHUTTLE OPERATIONS

The build alternatives would not affect taxi or shuttle operations beyond the effects of the project on private vehicle traffic. Through roadway signing and marking, as well as enforcement, taxis and shuttles would not be permitted to use the dedicated center-running bus-only lanes along the Geary corridor. In locations where buses would operate next to the curb, parking would be prohibited; however, loading zones for taxis and shuttles would be provided at upstream or downstream curb space. Please refer to Section 3.6, Parking and Loading Conditions.

3.4.4.7 | EFFECTS ON TRUCK TURNING MOVEMENTS AND DIVERSIONS

Under the build alternatives, some private vehicle traffic would divert from Geary Boulevard to alternate routes. Noticeable truck diversions to alternate streets are not expected under the build alternatives. Many of the streets that run perpendicular to Geary Boulevard are narrow residential side streets that are not intended to accommodate large trucks. In some cases, planned pedestrian improvements such as curb extensions related to the build alternatives may increase the difficulty of truck turns. Geary Boulevard is classified as a "Throughway" in San Francisco's adopted *Better Streets Plan*, indicating the need for its design to allow the turning movements of a single-unit, 30-foot truck to occur fully within the lane of travel, and to accommodate those of a 40-foot-wheelbase trailer truck within the overall travelway. The build alternatives, including pedestrian bulb-outs at some locations, would change the configuration of some of the intersections along the Geary corridor. SFCTA conducted a truck turning analysis to confirm that the proposed designs of the build alternatives would provide for these movements, as well as those of a standard San Francisco fire truck apparatus. The results indicated that, even in the most constrained situation where pedestrian bulb-outs are proposed at an intersection with a center-running bus lane and new dual medians, the proposed designs for all build alternatives provide sufficient space for the movements of the vehicle types described above.

Under the build alternatives, some private vehicle traffic would divert from Geary Boulevard to alternative routes. However, the build alternatives are not expected to result in noticeable truck diversions to other streets. Currently, heavy vehicles comprise 3.6 percent of the traffic on Geary, including trucks currently serving the businesses on Geary. Because of the local truck destinations on Geary itself, and because Geary will remain the primary route in the area for trucks, these heavy vehicles are not expected to divert from Geary in the future.

3.4.4.8 | FUTURE VEHICLE MILES TRAVELED AND VEHICLE HOURS TRAVELED FORECASTS

A performance measure used to quantify the amount of vehicle travel is VMT. VMT measures the amount of miles that vehicles travel over the roadway network and is highly correlated to greenhouse gas emissions related to transportation. VMT measurement has one primary limitation: it cannot be easily directly observed or measured. It is calculated based on the number of vehicles multiplied by the distance traveled by each vehicle. VMT is a measurement of total miles traveled by all vehicles in a roadway network. National trends in VMT have been shifting recently. After 50 years of steady growth, total national VMT per capita leveled off in 2004 and declined by 8 percent between 2004 and 2013 (Polzin, 2013; Bureau of Transportation Statistics, 2015).

Daily weekday VMT in San Francisco is expected to increase by 4.3 percent from existing conditions under the 2020 No Build Alternative. Relative to VMT in the 2020 No Build Alternative, the build alternatives are projected to result in a decrease in VMT by about 0.1 to 0.4 percent (see Table 3.4-9). Of the build alternatives, Alternative 2 would have the smallest impact on VMT and Alternative 3-Consolidated would have the greatest. These numbers indicate that the project could enhance transit service levels without causing major disruptions to vehicular traffic patterns in San Francisco.

Table 3.4-9 Daily Weekday San Francisco VMT and VHT, 2020

	ALTERNATIVE				
METRIC	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE/ LPA
SF VMT	9.22 million	9.21 million	9.20 million	9.19 million	9.20 million
SF VHT	444,000	444,000	443,500	443,100	443,200

Source: SFCTA, 2014

As shown in Table 3.4-10, the build alternatives would have a measureable impact on San Francisco VMT, VHT, and miles traveled per resident in 2035. All build alternatives would decrease VMT and VHT relative to the No Build Alternative in 2035: Alternatives 2 and 3 would decrease VMT by about 0.2 percent, and Alternative 3-Consolidated and the Hybrid Alternative/LPA would decrease VMT by about 0.4 percent.

Table 3.4-10 Daily Weekday San Francisco VMT and VHT, 2035

	ALTERNATIVE				
METRIC	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE /LPA
SF VMT	11.16 million	11.14 million	11.13 million	11.12 million	11.12 million
SF VHT	644,100	641,500	641,500	640,700	635,100

Source: SFCTA, 2014

3.4.4.9 | AUTOMOBILE TRAVEL TIMES AND RELIABILITY

This section presents vehicular travel times for the No Build and build alternatives in the project's opening year of 2020. Table 3.4-11 shows estimated average automobile travel times in the p.m. peak hour for the No Build Alternative and the change in travel time for the build alternatives when compared with the No Build Alternative in 2020.

Table 3.4-12 shows estimated average travel time variation in the p.m. peak hour for the No Build and build alternatives in 2020. Estimated average travel time variation in the p.m. peak hour for the No Build and build alternatives in 2035 are displayed in Table 3.4-13. Figures 3.4-11 and 3.4-12 present this information graphically.

There are several factors that are responsible for variation in automobile travel times when compared by alternative, including, but not necessarily limited to the following factors:

- The amount of forecasted automobile traffic relative to the traffic-carrying capacity of the roadway segment;
- The distance between and level of coordination of the traffic signals;
- Whether the left-turn opportunities are controlled by traffic signals and whether the left-turn signal phases are permissive, permissive/protected, and/or protected; and
- Whether there are variations in the number of travel lanes within the segment i.e. lane additions or lane reductions.

3.4.4.9.1 2020 TRAVEL TIMES AND RELIABILITY

No Build Alternative (2020)

Total automobile travel times in the eastbound and westbound directions between Polk Street and 25th Avenue are both forecast to be about 24 minutes. Total westbound travel times would increase by seven minutes under No Build conditions as compared with existing conditions. Total eastbound travel times are projected to increase by 11 minutes under the No Build Alternative as compared with existing conditions (about a 74 percent increase). In the eastbound direction, all of the segments are relatively comparable regarding variations in travel time. In the westbound direction, the segments from Broderick Street to Stanyan Street and from Stanyan Street to Presidio Avenue are forecast to vary in travel time by about twice as much as the other segments.

Alternative 2 (2020)

Compared with the No Build Alternative, average automobile travel times are projected to decrease by about four minutes in the eastbound direction and one minute in the westbound direction. This equates to a 17 percent decrease in travel times in the eastbound direction and 6 percent decrease in the westbound direction. In the eastbound direction, all of the segments are relatively comparable regarding variations in travel time. In the westbound direction, the segment from Broderick Street to Stanyan Street is forecast to vary in travel time by about three to four times more than the other segments.

Alternative 3 (2020)

Compared with No Build conditions, average automobile travel times are expected to decrease by about three minutes in the eastbound direction and would increase by about one minute in the westbound direction. This equates to an 11 percent decrease in travel times in the eastbound direction and 4 percent increase in the westbound direction. In the eastbound direction, the segments from Stanyan Street to Broderick Street and from Laguna Street to Polk Street are forecast to vary in travel time by about twice as much as the other segments. In the westbound direction, the segments from Laguna Street to Broderick Street and Broderick Street to Stanyan Street are forecast to vary in travel time by about twice as much as other segments.

Alternative 3-Consolidated (2020)

Compared with the No Build Alternative, average automobile travel times are projected to decrease by about four minutes in the eastbound direction and three and a half minutes in the westbound direction. This equates to a 16 percent decrease in travel times in the eastbound direction and 15 percent decrease in the westbound direction. In the eastbound direction, all of the segments are relatively comparable regarding variations in travel time. In the westbound direction, the segment from Broderick Street to Stanyan Street is forecast to vary in travel time by about two to three times more than the other segments.

Hybrid Alternative/LPA (2020)

Compared with the No Build Alternative, average automobile travel times would decrease by about two and a half minutes in the eastbound direction and increase by about two minutes in the westbound direction. This equates to a 10 percent decrease in travel times in the eastbound direction and 7 percent increase in the westbound direction. In the eastbound direction, the segment from Laguna Street to Polk Street is forecast to vary in travel time by about twice as much than the other segments. In the westbound direction, the segment from Broderick Street to Stanyan Street is forecast to vary in travel time by about three to four times more than the other segments.

Table 3.4-11 Average Automobile Travel Times, Total Difference by Alternative vs. No-Build, P.M. Peak Hour (2020)

SEGMENT ALONG GEARY BOULEVARD	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE /LPA
WESTBOUND					
Polk Street to Laguna Street	2:20	+1:00	+0:40	0:00	+1:10
Laguna Street to Broderick Street	5:10	-1:30	-0:30	-2:20	-1:40
Broderick Street to Stanyan Street	6:10	+1:10	+1:50	-0:40	+2:30
Stanyan Street to Park Presidio	5:30	0:00	+0:20	+0:50	+1:00
Park Presidio Boulevard to 25th	4:10	-2:00	-1:30	-1:20	-1:10
Total (Polk Street to 25th Avenue)	23:30	-1:20	+1:00	-3:30	+1:40
EASTBOUND					
25th Avenue to Park Presidio Boulevard	5:10	-1:20	-1:20	-1:20	-1:10
Park Presidio Boulevard to Stanyan Street	6:40	-1:20	-0:50	-1:10	-1:00
Stanyan Street to Broderick Street	3:40	+0:40	+1:00	+0:30	+0:30
Broderick Street to Laguna Street	4:10	-0:50	-0:30	-0:40	-0:50
Laguna Street to Polk Street	4:30	-1:20	-0:50	-1:20	+0:10
Total (25th Avenue to Polk Street)	24:10	-4:10	-2:40	-3:50	-2:20

Travel time expressed in minutes and seconds for the section of Geary Boulevard between Polk Street and 25th Avenue. Travel time totals may not exactly match the sum of all segments, as segment results are rounded to the nearest ten second increments.

Source: Fehr & Peers, 2014

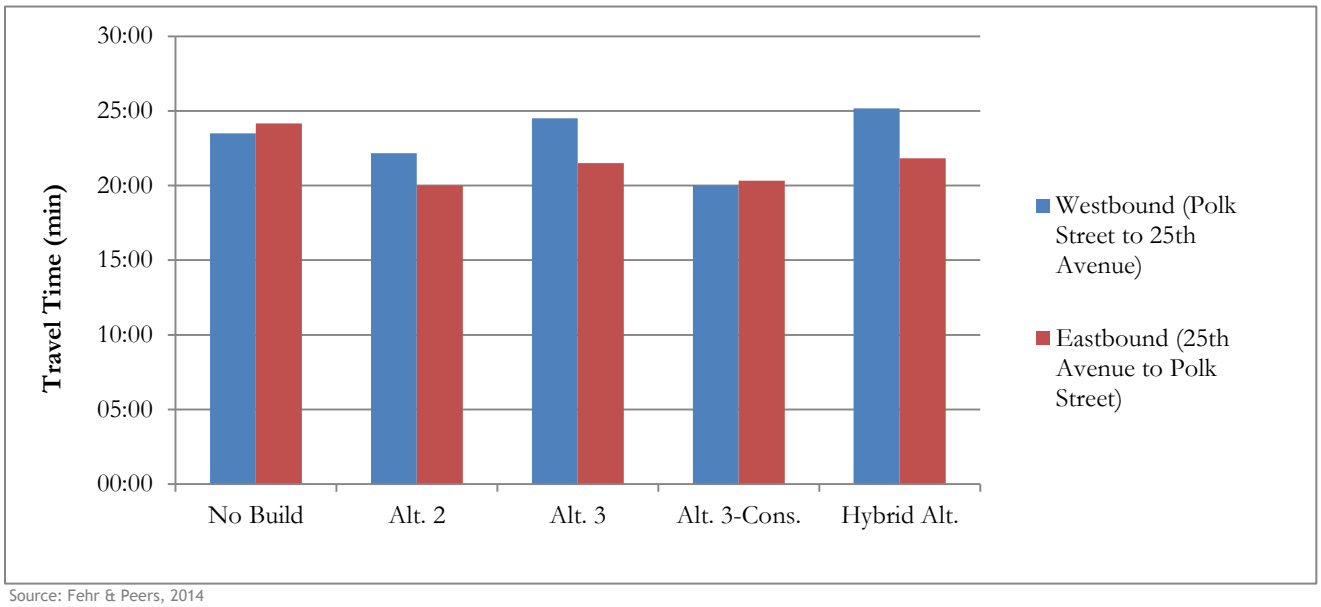
Table 3.4-12 Average Automobile Travel Time Variations, Total Difference by Alternative vs. No-Build, P.M. Peak Hour (2020)

SEGMENT ALONG GEARY BOULEVARD	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE /LPA
WESTBOUND					
Polk Street to Laguna Street	0:40	+0:10	+0:10	0:00	+0:10
Laguna Street to Broderick Street	1:30	-0:30	+0:50	-0:50	-0:20
Broderick Street to Stanyan Street	1:50	+1:30	+1:00	+0:40	+1:50
Stanyan Street to Park Presidio	0:50	0:00	+0:10	+0:20	+0:10
Park Presidio Boulevard to 25th	0:50	-0:10	-0:10	0:00	0:00
EASTBOUND					
25th Avenue to Park Presidio Boulevard	0:40	-0:10	-0:10	0:00	0:00
Park Presidio Boulevard to Stanyan Street	1:10	-0:30	-0:30	-0:20	-0:20
Stanyan Street to Broderick Street	0:50	0:00	0:20	0:00	+0:10
Broderick Street to Laguna Street	0:40	0:00	+0:10	0:00	0:00
Laguna Street to Polk Street	1:00	0:00	+0:10	-0:10	+0:30

Travel time expressed in minutes and seconds for the section of Geary Boulevard between Polk Street and 25th Avenue.

Source: Fehr & Peers, 2014

Figure 3.4-11 Average Automobile Travel Times, P.M. Peak Hour (2020)



Source: Fehr & Peers, 2014

3.4.4.9.2 2035 VEHICULAR TRAVEL TIMES AND RELIABILITY

This section presents automobile travel times for the No Build and build alternatives in the project horizon year of 2035. Average automobile travel times in the p.m. peak hour for the No Build and each build alternatives in 2035 are displayed in Table 3.4-13. Figure 3.4-12 presents this information graphically. The build alternatives would generally result in decreased automobile travel times along the Geary corridor relative to the No Build Alternative, with the few exceptions noted below. Westbound travel times are projected to be somewhat higher than eastbound travel times, corresponding to the peak travel direction during the p.m. peak hour.

No Build Alternative (2035)

Total travel times in the eastbound and westbound directions between Polk Street and 25th Avenue are forecast to be about 30 and 33 minutes, a 25 and 40 percent increase over 2020 with the No Build Alternative, respectively. In the eastbound direction, the segments from Park Presidio Boulevard to Stanyan Street and from Broderick Street to Laguna Street are forecast to vary in travel time the most out of all the segments. In the westbound direction, the segments from Laguna Street to Broderick Street and from Broderick Street to Stanyan Street are forecast to have the greatest variation in travel time among the segments.

Alternative 2 (2035)

Compared with the No Build Alternative, average automobile travel times would decrease by about nine minutes in the eastbound direction and four minutes in the westbound direction. This equates to a 30 percent decrease in travel times in the eastbound direction and 12 percent decrease in the westbound direction. In the eastbound direction, the segments from Stanyan Street to Broderick Street and from Laguna Street to Polk Street are forecast to have the greatest variation in travel times. In the westbound direction, the segments from Laguna Street to Broderick Street and from Broderick Street to Stanyan Street are forecast to vary in travel time by about three to four times more than the other segments.

Alternative 3

Compared with the No Build Alternative, average automobile travel times would decrease by about ten minutes in the eastbound direction and remain about the same in the westbound direction. This equates to a 34 percent decrease in travel times in the eastbound direction and a less than one percent increase in the westbound direction. In the eastbound direction, the segments from 25th Avenue to Park Presidio Boulevard, from Park Presidio Boulevard to Stanyan Street, and from Stanyan Street to Broderick Street are forecast to vary in travel time by about two to three times as much as the other segments. In the westbound direction, the segment from Broderick Street to Stanyan Street is forecast to vary in travel time by about three to four times as much than the other segments.

Alternative 3-Consolidated

Compared with the No Build Alternative, average automobile travel times would decrease by about nine minutes in the eastbound direction and eight and a half minutes in the westbound direction. This equates to a 29 percent decrease in travel times in the eastbound direction and 26 percent decrease in the westbound direction. In the eastbound direction, the segments from Park Presidio Boulevard to Stanyan Street and from Stanyan Street to Broderick Street are forecast to vary in travel time by about two to three times as much as the other segments. In the westbound direction all segments are forecast to vary in travel time by a comparable amount.

Hybrid Alternative/LPA

Compared with the No Build Alternative, average automobile travel times would decrease by about six minutes in the eastbound direction and about one minute in the westbound direction. This equates to a 20 percent decrease in travel times in the eastbound direction and 4 percent decrease in the westbound direction. In the eastbound direction, the segments from Park Presidio Boulevard to Stanyan Street and from Stanyan Street to Broderick Street are forecast to vary in travel time by the most of the segments. In the westbound direction, the segment from Park Presidio Boulevard to 25th Avenue is forecast have the greatest variation in travel time among the segments.

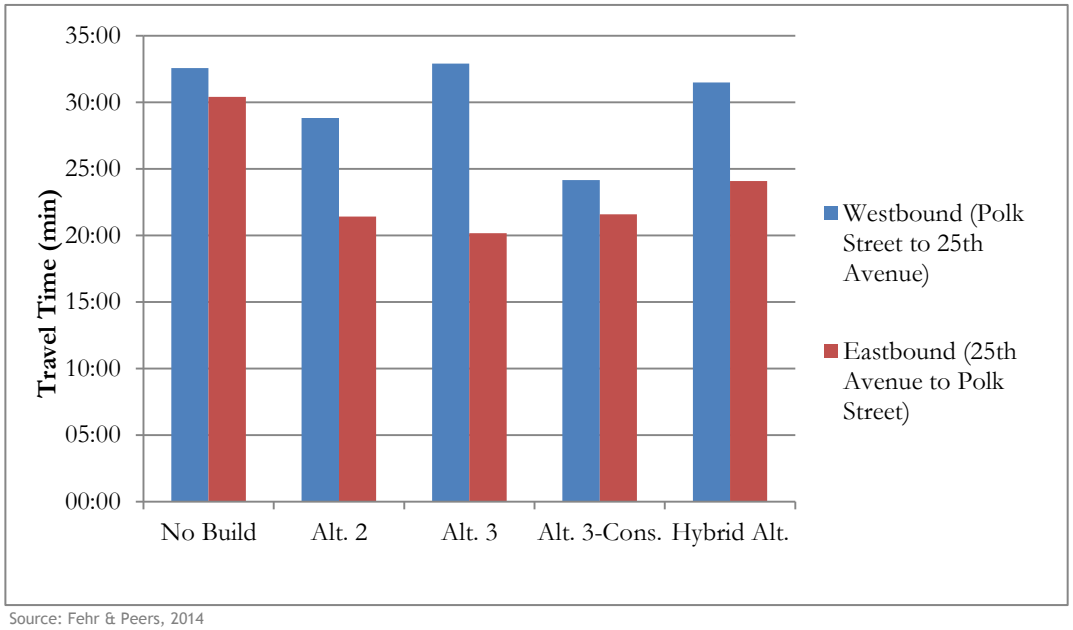
Table 3.4-13 Average Automobile Travel Times, Total Difference by Alternative vs. No-Build, P.M. Peak Hour (2035)

SEGMENT ALONG GEARY BOULEVARD	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE /LPA
WESTBOUND					
Polk Street to Laguna Street	4:10	-0:30	+1:50	-1:50	-0:30
Laguna Street to Broderick Street	8:10	-1:40	+3:30	-3:40	-3:30
Broderick Street to Stanyan Street	9:50	+1:10	-2:30	-1:40	+3:40
Stanyan Street to Park Presidio Boulevard	6:20	-0:40	-1:00	+0:10	+0:30
Park Presidio Boulevard to 25th	4:20	-2:00	+1:30	-1:30	-1:10
Total (Polk Street to 25th Avenue)	32:40	-3:50	+0:20	-8:30	-1:10
EASTBOUND					
25th Avenue to Park Presidio Boulevard	5:30	-1:40	-1:40	-1:30	-1:30
Park Presidio Boulevard to Stanyan Street	9:00	-3:20	-3:20	-3:10	-2:50
Stanyan Street to Broderick Street	4:20	+0:20	+0:10	0:00	+0:20
Broderick Street to Laguna Street	6:10	-2:50	-3:00	-2:40	-1:50
Laguna Street to Polk Street	5:30	-1:30	-2:10	-1:20	0:00
Total (25th Avenue to Polk Street)	30:30	-9:00	-10:20	-8:50	-6:20

Travel time expressed in minutes and seconds for the section of Geary Boulevard between Polk Street and 25th Avenue. Travel time totals may not exactly match the sum of all segments, as segment results are rounded to the nearest ten second increments.

Source: Fehr & Peers, 2014

Figure 3.4-12 Average Vehicular Travel Times, P.M. Peak Hour (2035)



Source: Fehr & Peers, 2014

3.4.4.10 | AUTOMOBILE DELAY – LEVEL OF SERVICE AT KEY INTERSECTIONS (2020)

This subsection reports projected traffic conditions in the opening year (2020) for the No Build Alternative and the build alternatives. Opening year (2020) traffic volume, assumptions used in traffic projects, future roadway performance, and a summary of the project impacts are presented. Figures 3.4-13 through 3.4-17 show 2020 LOS at study intersections for the No Build and build alternatives.

This subsection and the following (3.4.4.11) identify those intersections where the project would result in an adverse effect and intersections that operate at LOS E or F both with and without the project, but which are not adversely affected by the project. For purposes of the automobile delay and LOS analysis, the determination of whether the No Build Alternative or one of the build alternatives would result in an adverse effect under the National Environmental Policy Act (NEPA) was similar to the determination of whether an alternative would result in a significant impact under CEQA.

To see additional discussion of intersections that operate at LOS E or F under either the No Build Alternative or one of the build alternatives, as well as tables of all results in terms of LOS for all intersections included as part of the traffic modeling analysis, please refer to Appendix D-4.

An adverse effect would occur under one of the following circumstances:

1. Project-related changes would cause deterioration in the LOS at a signalized intersection from LOS D or better to LOS E or LOS F, or from LOS E to LOS F.

2. Project-related changes would cause the LOS at the worst approach of an unsignalized intersection to deteriorate from LOS D or better to LOS E or LOS F and Caltrans signal warrants would be met, or causes Caltrans signal warrants to be met when the worst approach is already at LOS E or LOS F.

For an intersection that operates at LOS E or LOS F under existing or in the No Build Alternative, there may be an adverse effect depending upon the magnitude of the project's contribution to the worsening of delay. In addition, a project would have an adverse effect if it would cause major traffic hazards, or would contribute considerably to the cumulative traffic increases that would cause the deterioration in LOS to unacceptable levels (i.e., to LOS E or LOS F).

Table 3.4-3 in Section 3.4.2.5 summarizes LOS thresholds for signalized intersections. LOS D occurs when motorists experience average intersection delays of between 35 and 55 seconds; LOS E means motorists are experiencing from 55 to 80 seconds, while LOS F, which indicates over-saturated conditions, occurs when motorists experience over 80 seconds of delay at an intersection.

Figure 3.4-13 2020 No Build Alternative LOS at Core Area and Off-Corridor Study Intersections

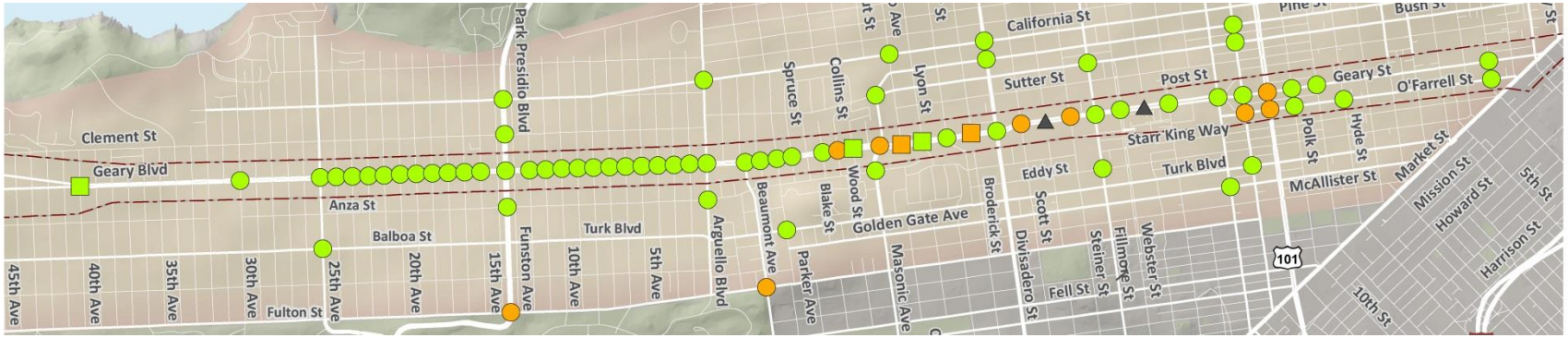


Figure 3.4-14 2020 Alternative 2 LOS at Core Area and Off-Corridor Study Intersections

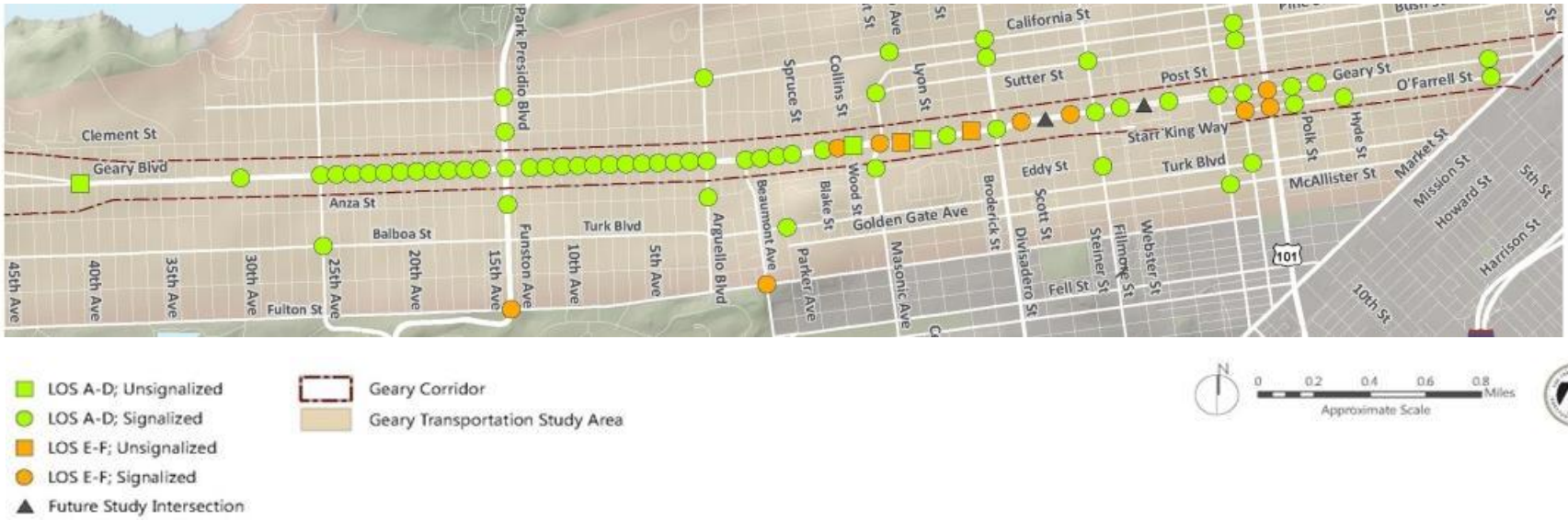


Figure 3.4-15 2020 Alternative 3 LOS at Core Area and Off-Corridor Study Intersections

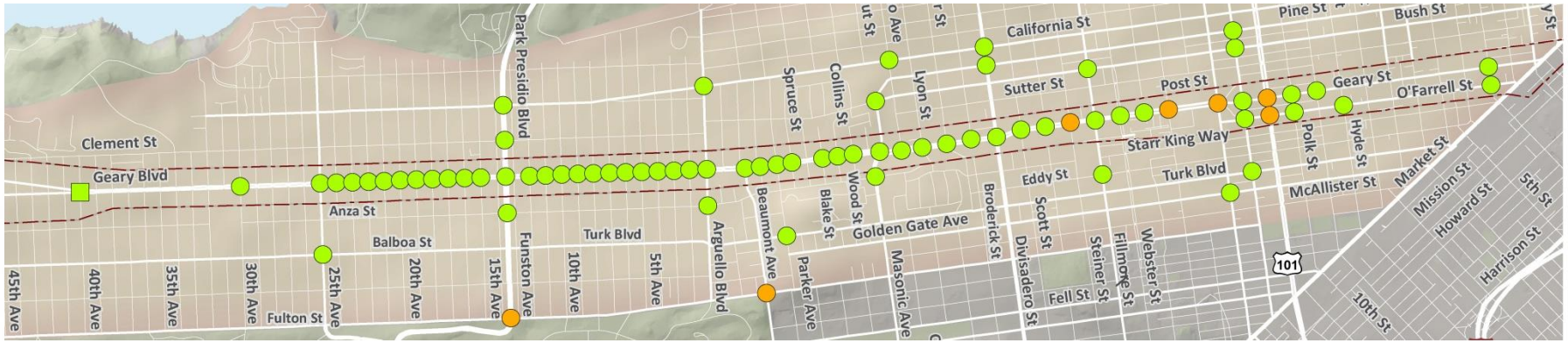


Figure 3.4-16 2020 Alternative 3-Consolidated LOS at Core Area and Off-Corridor Study Intersections

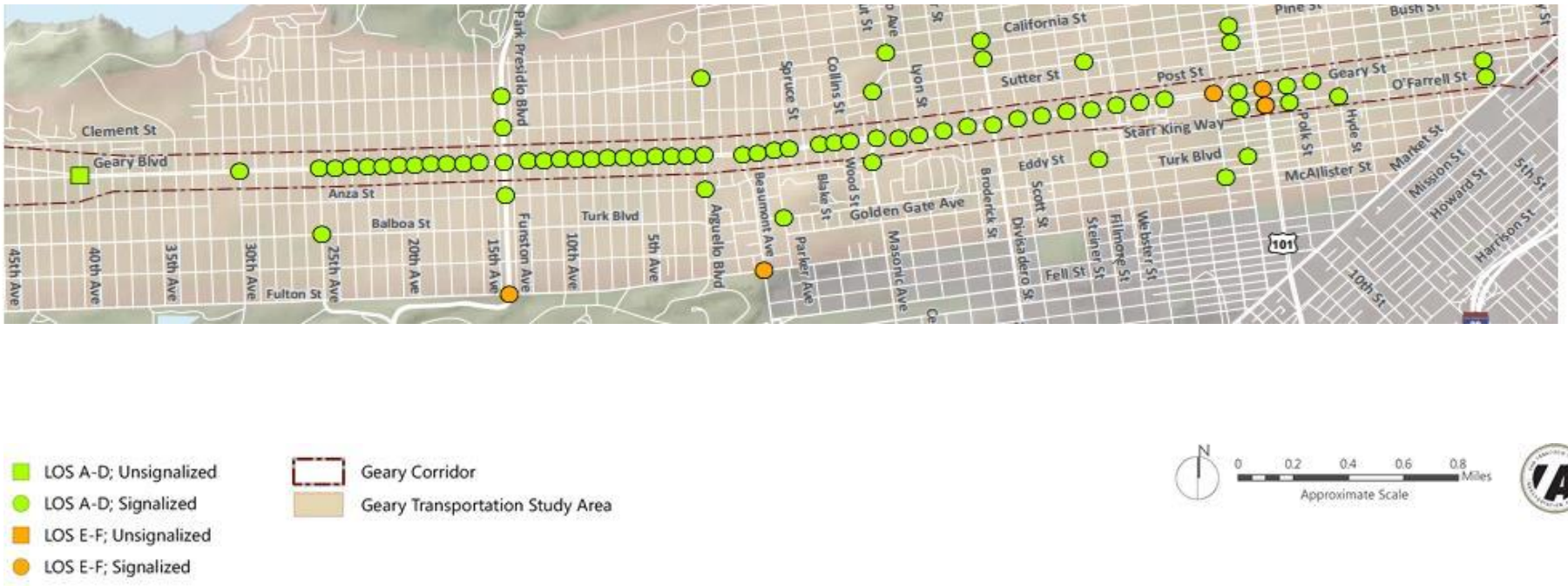


Figure 3.4-17 2020 Hybrid Alternative/LPA LOS at Core Area and Off-Corridor Study Intersections

No Build Alternative (2020)

The No Build Alternative would result in adverse effects at 10 study intersections in 2020; eight on-corridor intersections and two off-corridor intersections:

- **Collins Street and Geary Boulevard (signalized)**
  - **Existing Conditions**: LOS A
  - **Projected 2020 No Build Alternative Conditions**: LOS F
  - **Reason for adverse effect:** The No Build Alternative would result in increased volumes and subsequent delays on the westbound approach. Additionally, downstream vehicular queues would extend from the Blake Street and Geary Boulevard intersection where there would be substantially higher westbound left-turn demand.

- **Masonic Avenue and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS C
  - **Projected 2020 No Build Alternative Conditions**: LOS E
  - **Reason for adverse effect:** The No Build Alternative would result in increased volumes and subsequent delays on the northbound and southbound approaches at this intersection.

- **Broderick Street and Geary Boulevard (unsignalized**)
  - **Existing Conditions:** LOS A
  - **Projected 2020 No Build Alternative Conditions:** LOS E
  - **Reason for adverse effect:** The No Build Alternative would result in increased volumes and subsequent delays on the southbound movement at this intersection.

- **Scott Street and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS B
  - **Projected 2020 No Build Alternative Conditions:** LOS F
  - **Reason for adverse effect:** The No Build Alternative would result in increased traffic volumes and subsequent delays on the westbound approach. Additionally, downstream vehicular queue backups resulting from the lane reductions prior to Divisadero Street would contribute to some additional delay at this intersection.

- **Steiner Street and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS B
  - **Projected 2020 No Build Alternative Conditions:** LOS E
  - **Reason for adverse effect:** The No Build Alternative would result in increased volumes and subsequent delays on the northbound, westbound, and southbound left-turn movements. Additionally, downstream vehicular queue backups resulting from the lane reductions prior to Divisadero Street would contribute to some additional delay at this intersection.

- **Franklin Street and O'Farrell Street (signalized)**
  - **Existing Conditions:** LOS D
  - **Projected 2020 No Build Alternative Conditions:** LOS F
  - **Reason for adverse effect:** The No Build Alternative would result in increased volumes and subsequent delays on the northbound through movement at this intersection.

- **Van Ness Avenue and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS D
  - **Projected 2020 No Build Alternative Conditions:** LOS E
  - **Reason for adverse effect:** The No Build Alternative would result in increased volume and subsequent delays on the southbound and westbound movements. In addition, the construction of BRT service on Van Ness Avenue would result in the conversion of one southbound and northbound mixed-flow lane to a dedicated bus lane.

- **Van Ness Avenue and O'Farrell Street (signalized)**
  - **Existing Conditions:** LOS C
  - **Projected 2020 No Build Alternative Conditions:** LOS E
  - **Reason for adverse effect:** The No Build Alternative would result in increased volume and subsequent delays on all approaches, most notably the eastbound movement at this intersection.

- **Fulton Street and Park Presidio Boulevard (signalized)**
  - **Existing Conditions:** LOS D
  - **Projected 2020 No Build Alternative Conditions:** LOS E
  - **Reason for adverse effect:** The No Build Alternative would result in increased volumes and subsequent delays on the eastbound through and southbound through movements at this intersection.

- **Fulton Street and Stanyan Street (signalized)**
  - **Existing Conditions:** LOS E
  - **Projected 2020 No Build Alternative Conditions:** LOS F
  - **Reason for adverse effect:** The No Build Alternative would result in increased volumes and subsequent delays on three approaches: northbound and southbound through, and eastbound right-turn at this intersection.

Alternative 2 (2020)

Alternative 2 would cause adverse effects at two study intersections in 2020; one on-corridor intersection and one off-corridor intersection:

- **Gough Street and Geary Boulevard (signalized)**
  - **2020 No Build Alternative Conditions:** LOS C
  - **2020 Alternative 2 Conditions:** LOS E
  - **Reason for adverse effect:** Alternative 2 would reduce the number of east and westbound through lanes from three to two,

which would lessen the throughput at this intersection and increase traffic delays in the east and westbound directions, as well as the average intersection delay.

- **Fulton Street and Stanyan Street (signalized)**
  - **2020 No Build Alternative Conditions:** LOS F
  - **2020 Alternative 2 Conditions:** LOS F
  - **Reason for adverse effect:** The intersection would continue to operate at the same LOS with Alternative 2. Alternative 2 would not increase the overall intersection LOS to a significant degree, although it would contribute to the worsening of delay via an increase in traffic volumes to the southbound critical movement.

Additionally, the following four intersections would continue to operate at LOS E or F during the p.m. peak hour under Alternative 2, but would not be adversely affected by the project because the net addition of traffic as a result of Alternative 2 would not be substantial:

- Wood Street and Geary Boulevard
- Van Ness Avenue and Geary Boulevard
- Van Ness Avenue and O'Farrell Street
- Fulton Street and Park Presidio Boulevard

Alternative 3 (2020)

Alternative 3 would cause adverse effects at three study intersections in 2020; two on-corridor intersection and one off-corridor intersection:

- **Laguna Street and Geary Boulevard (signalized)**
  - **2020 No Build Alternative Conditions:** LOS C
  - **2020 Alternative 3 Conditions:** LOS E
  - **Reason for adverse effect:** Alternative 3 would reduce the number of east and westbound through lanes from four to two, which would lessen the throughput at this intersection and increase traffic delays in most directions, as well as the average intersection delay.

- **Gough Street and Geary Boulevard (signalized)**
  - **2020 No Build Alternative Conditions:** LOS C
  - **2020 Alternative 3 Conditions:** LOS E
  - **Reason for adverse effect:** Alternative 3 would reduce the number of east and westbound through lanes from four to two, which would lessen the throughput at this intersection and increase traffic delays in most directions, as well as the average intersection delay. This reduction in capacity would be coupled with a growth in peak-hour traffic demand on most movements.

- **Fulton Street and Stanyan Street (signalized)**
  - **2020 No Build Alternative Conditions:** LOS F
  - **2020 Alternative 3 Conditions:** LOS F

» **Reason for adverse effect:** The intersection would continue to operate at the same LOS with Alternative 3. Alternative 3 would not increase the overall intersection LOS to a significant degree, although it would contribute to the worsening of delay via an increase in traffic volumes to the southbound critical movement that would be considered significant.

Additionally the following four intersections would continue to operate at LOS E or F during the p.m. peak hour under Alternative 3, but would not be adversely affected by the project because the net addition of traffic as a result of Alternative 3 would not be substantial:

- Steiner Street and Geary Boulevard
- Van Ness Avenue and Geary Boulevard
- Van Ness Avenue and O'Farrell Street
- Fulton Street and Park Presidio Boulevard

Alternative 3-Consolidated (2020)

Alternative 3-Consolidated would cause adverse effects at two study intersections in 2020; one on-corridor intersection and one off-corridor intersection:

- **Gough Street and Geary Boulevard (signalized)**
  - » **2020 No Build Alternative Conditions:** LOS C
  - » **2020 Alternative 3-Consolidated Conditions:** LOS F
  - » **Reason for adverse effect:** Alternative 3-Consolidated would reduce the number of east and westbound through lanes from four to two, which would lessen the throughput at this intersection and increase traffic delays in most directions, as well as the average intersection delay. This reduction in capacity would be coupled with a growth in peak-hour traffic demand on most movements.

- **Fulton Street and Stanyan Street (signalized)**
  - » **2020 No Build Alternative Conditions:** LOS E
  - » **2020 Alternative 3-Consolidated Conditions:** LOS F
  - » **Reason for adverse effect:** The intersection would continue to operate at the same LOS with Alternative 3-Consolidated. Alternative 3-Consolidated would not increase the overall intersection LOS to a significant degree, although it would contribute to the worsening of delay via an increase in traffic volumes to the eastbound critical movement that would be considered significant.

Additionally the following three intersections would continue to operate at LOS E or F during the p.m. peak hour under Alternative 3-Consolidated, but would not be adversely affected by the project because the net addition of traffic as a result of Alternative 3-Consolidated would not be substantial:

- Van Ness Avenue and Geary Boulevard
- Van Ness Avenue and O'Farrell Street
- Fulton Street and Park Presidio Boulevard

Hybrid Alternative/LPA (2020)

The Hybrid Alternative/LPA would cause adverse effects at four study intersections in 2020; three on-corridor intersections and one off-corridor intersection:

- **Laguna Street and Geary Street (signalized)**
  - **2020 No Build Alternative Conditions:** LOS C
  - **2020 Hybrid Alternative/LPA Conditions:** LOS E
  - **Reason for adverse effect:** The Hybrid Alternative/LPA would reduce the number of east and westbound through lanes from four to two, which would lessen the throughput at this intersection and increase traffic delays in most directions, as well as the average intersection delay.

- **Gough Street and Geary Boulevard (signalized)**
  - **2020 No Build Alternative Conditions:** LOS C
  - **2020 Hybrid Alternative/LPA Conditions:** LOS F
  - **Reason for adverse effect:** The Hybrid Alternative/LPA would reduce the number of east and westbound through lanes from four to two, which would lessen the throughput at this intersection and increase traffic delays in most directions, as well as the average intersection delay. This reduction in capacity would be coupled with a growth in peak-hour traffic demand on most movements.

- **Van Ness Avenue and Geary Street (signalized)**
  - **2020 No Build Alternative Conditions:** LOS E
  - **2020 Hybrid Alternative/LPA Conditions:** LOS E
  - **Reason for adverse effect:** The intersection would continue to operate at the same LOS with the Hybrid Alternative/LPA, although the average intersection delay would increase by 10 seconds. This overall increase in delay is primarily attributable to an increase in delay in the westbound direction. The Hybrid Alternative/LPA would not increase the overall intersection LOS to a significant degree, although it would contribute substantially to the worsening of delay via an increase in traffic volumes to the northbound critical movement that would be considered significant.

- **Fulton Street and Stanyan Street (signalized)**
  - **2020 No Build Alternative Conditions:** LOS F
  - **2020 Hybrid Alternative/LPA Conditions:** LOS F
  - **Reason for adverse effect:** The intersection would continue to operate at the same LOS with the Hybrid Alternative/LPA. The Hybrid Alternative/LPA would not increase the overall

intersection LOS to a significant degree, although it would contribute substantially to the worsening of delay via an increase in traffic volumes to the eastbound critical movement.

Additionally the following three intersections would continue to operate at LOS E or F during the p.m. peak hour under the Hybrid Alternative/LPA, but would not be adversely affected by the project because the net addition of traffic as a result of the Hybrid Alternative/LPA would not be substantial:

- Wood Street and Geary Boulevard
- Van Ness Avenue and O'Farrell Street
- Fulton Street and Park Presidio Boulevard

3.4.4.11 | AUTOMOBILE DELAY – LONG-TERM HORIZON YEAR (CUMULATIVE) TRAFFIC CONDITIONS (2035)

This section discusses intersection operations at locations where the LOS is projected to be E or F under 2035 conditions. Detailed information on 2035 LOS and delay during the p.m. peak hour at on-corridor and off-corridor study intersections can be found in Appendix D-3 and D-4. Figures 3.4-18 through 3.4-22 show 2035 LOS at study intersections for the No Build and build alternatives.

Figure 3.4-18 2035 No Build Alternative LOS at Core Area and Off-Corridor Study Intersections

Figure 3.4-19 2035 Alternative 2 LOS at Core Area and Off-Corridor Study Intersections

Figure 3.4-20 2035 Alternative 3 LOS at Core Area and Off-Corridor Study Intersections

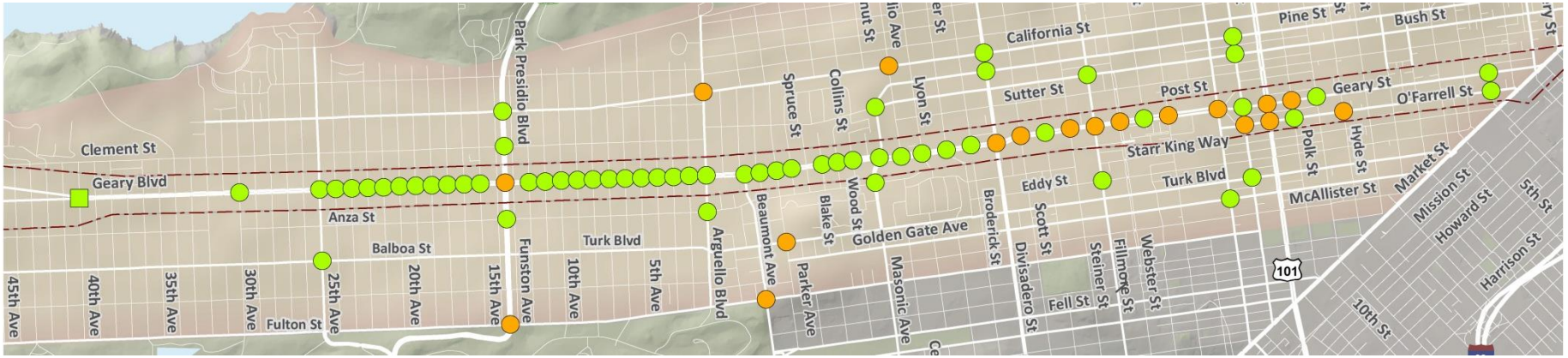


Figure 3.4-21 2035 Alternative 3-Consolidated LOS at Core Area and Off-Corridor Study Intersections

Figure 3.4-22 2035 Hybrid Alternative/LPA LOS at Core Area and Off-Corridor Study Intersections

No Build Alternative (2035)

The No Build Alternative would cause adverse effects at 21 study intersections in 2035; 17 on-corridor intersections and 4 off-corridor intersections:

- **Collins Street and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS A
  - **Projected 2035 No Build Alternative Conditions:** LOS F
  - **Reason for effect:** The effect of the No Build Alternative under 2020 Conditions would be considered an adverse effect. This would also be considered an adverse effect under 2035 Conditions.

- **Lyon Street and Geary Boulevard (unsignalized)**
  - **Existing Conditions:** LOS A
  - **Projected 2035 No Build Alternative Conditions:** LOS F
  - **Reason for effect:** The No Build Alternative would result in increased volumes and subsequent delays on the westbound through movement.

- **Masonic Avenue and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS C
  - **Projected 2035 No Build Alternative Conditions**: LOS D
  - **Reason for effect:** The effect of the No Build Alternative under 2020 Conditions would be considered an adverse effect (worsening from LOS C to LOS E). Although modeling shows this intersection improving to LOS D by 2035, the worsened LOS anticipated in 2020 would still be considered an adverse effect for 2035 Conditions (worsening from LOS C to D).

- **Park Presidio Boulevard and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS C
  - **Projected 2035 No Build Alternative Conditions:** LOS E
  - **Reason for effect:** The No Build Alternative would result in increased volumes and subsequent delays on the southbound through movement and downstream vehicular queuing in the westbound direction at 15th Avenue.

- **Second Avenue and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS A
  - **Projected 2035 No Build Alternative Conditions:** LOS E
  - **Reason for effect:** The No Build Alternative would result in increased traffic volumes on the southbound left-turn movement. Downstream queues at Arguello Boulevard would also contribute to delay at this intersection.

- **Broderick Street and Geary Boulevard (unsignalized)**
  - **Existing Conditions:** LOS A
  - **Projected 2035 No Build Alternative Conditions:** LOS F
  - **Reason for effect:** The No Build Alternative would result in increased volume and subsequent delays on the southbound approach. Westbound traffic would be impeded by downstream queues at Baker Street, which occasionally prevents motorists on the southbound approach from entering the intersection during the peak hour.

- **Divisadero Street and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS B
  - **Projected 2035 No Build Alternative Conditions:** LOS E
  - **Reason for effect:** The No Build Alternative would result in increased volumes and subsequent delays on the northbound through and southbound through movements, which would subsequently cause delays on all approaches at this intersection.

- **Scott Street and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS B
  - **Projected 2035 No Build Alternative Conditions:** LOS F
  - **Reason for effect:** The No Build Alternative would result in increased volumes on the northbound and westbound through movements; coupled with the decreased capacity along Geary Boulevard to the west at Divisadero Street would subsequently increase the average delay for the intersection.

- **Steiner Street and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS B
  - **Projected 2035 No Build Alternative Conditions:** LOS F
  - **Reason for effect:** The No Build Alternative would result in substantial increases in volumes, and subsequent delays on the northbound, westbound, and southbound left-turn movements. Additionally, downstream vehicular queue backups resulting from the lane reductions prior to Divisadero Street would contribute to some additional delay at this intersection.

- **Webster Street and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS B
  - **Projected 2035 No Build Alternative Conditions:** LOS F
  - **Reason for effect:** The No Build Alternative would result in increased volumes and subsequent delays on all approaches, most notably the eastbound and westbound movements.

- **Laguna Street and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS B
  - **Projected 2035 No Build Alternative Conditions:** LOS F
  - **Reason for effect:** The No Build Alternative would result in increased volumes and subsequent delays on all approaches, most notably the eastbound and westbound movements.

- **Gough Street and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS C
  - **Projected 2035 No Build Alternative Conditions:** LOS F
  - **Reason for effect:** The No Build Alternative would result in increased volumes and subsequent delays on all approaches, most notably the eastbound and westbound movements.

- **Franklin Street and O'Farrell Street (signalized)**
  - **Existing Conditions:** LOS D
  - **Projected 2035 No Build Alternative Conditions:** LOS D
  - **Reason for adverse effect:** The effect of the No Build Alternative under 2020 Conditions would be considered an adverse effect (worsening from LOS D to LOS E). Although modeling shows this intersection returning to LOS D by 2035, the worsened LOS anticipated in 2020 would be considered an adverse effect for 2035 Conditions.

- **Van Ness Avenue and Geary Boulevard (signalized)**
  - **Existing Conditions:** LOS D
  - **Projected 2035 No Build Alternative Conditions:** LOS F
  - **Reason for effect:** The No Build Alternative would result in increased volumes and subsequent delays on the southbound and westbound movements. In addition, the construction of BRT service on Van Ness Avenue would result in the conversion of one southbound and northbound mixed-flow lane to a dedicated bus lane.

- **Van Ness Avenue & O'Farrell Street (signalized)**
  - **Existing Conditions:** LOS C
  - **Projected 2035 No Build Alternative Conditions:** LOS E
  - **Reason for effect:** The No Build Alternative would result in increased volumes and subsequent delays on all approaches, most notably the southbound and eastbound movements.

- **Geary Street and Polk Street (signalized)**
  - **Existing Conditions:** LOS D
  - **Projected 2035 No Build Alternative Conditions:** LOS E
  - **Reason for effect:** The No Build Alternative would result in increased volumes and subsequent delays on the northbound through movement at this intersection.

- **O'Farrell Street and Hyde Street (signalized)**
  - **Existing Conditions:** LOS D
  - **Projected 2035 No Build Alternative Conditions:** LOS E
  - **Reason for effect:** The No Build Alternative would result in increased volumes and associated delays on the southbound through movement.

- **Anza Street and Park Presidio Boulevard (signalized)**
  - **Existing Conditions:** LOS D
  - **Projected 2035 No Build Alternative Conditions:** LOS E
  - **Reason for effect:** The No Build Alternative would result in increased volumes and subsequent delays on the southbound through and westbound left-turn movements
- **Fulton Street and Park Presidio Boulevard (signalized)**
  - **Existing Conditions:** LOS D
  - **Projected 2035 No Build Alternative Conditions:** LOS F
  - **Reason for adverse effect:** The effect of the No Build Alternative under 2020 Conditions would be considered an adverse effect. This would also be considered an adverse effect under 2035 Conditions.
- **Fulton Street and Stanyan Street (signalized)**
  - **Existing Conditions:** LOS E
  - **Projected 2035 No Build Alternative Conditions:** LOS F
  - **Reason for effect:** The No Build Alternative would result in increased volumes and subsequent delays on three approaches: northbound and southbound through, and eastbound right-turn.
- **Bush Street and Franklin Street (signalized)**
  - **Existing Conditions:** LOS C
  - **Projected 2035 No Build Alternative Conditions:** LOS E
  - **Reason for effect:** The No Build Alternative would result in increased volumes and subsequent delays on the northbound through movement at this intersection.

Alternative 2 (2035)

Alternative 2 would cause adverse effects at five study intersections in 2035; four on-corridor intersections and one off-corridor intersection:

- **Divisadero Street and Geary Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS E
  - **2035 Alternative 2 Conditions:** LOS F
  - **Reason for effect:** Alternative 2 would reduce the number of east and westbound through lanes from three to two, which would lessen the throughput at this intersection and increase traffic delays in the east and westbound directions, as well as the average intersection delay.
- **Laguna Street and Geary Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS F
  - **2035 Alternative 2 Conditions:** LOS F
  - **Reason for effect:** The intersection would continue to operate at the same delay and LOS with Alternative 2. Alternative 2 would not increase the overall intersection LOS to a significant degree, although it would contribute to the worsening of delay via an increase in traffic volumes to the northbound critical movement that would be considered significant.

- **Gough Street and Geary Boulevard (signalized)**
  - **» 2035 No Build Alternative Conditions:** LOS F
  - **» 2035 Alternative 2 Conditions:** LOS F
  - **» Reason for effect:** The effect of Alternative 2 under 2020 Conditions would be considered an adverse effect. This would also be considered an adverse effect under 2035 Conditions.
- **Van Ness Avenue and Geary Boulevard (signalized)**
  - **» 2035 No Build Alternative Conditions:** LOS F
  - **» 2035 Alternative 2 Conditions:** LOS E
  - **» Reason for effect:** The intersection LOS would improve under Alternative 2 conditions. This overall decrease in delay is primarily attributable to an increase in delay in the west and southbound directions. Alternative 2 would not increase the overall intersection LOS to a significant degree, although it would contribute substantially to the worsening of delay via an increase in traffic volumes to the southbound critical movement.
- **Fulton Street and Stanyan Street (signalized)**
  - **» 2035 No Build Alternative Conditions:** LOS F
  - **» 2035 Alternative 2 Conditions:** LOS F
  - **» Reason for effect:** The effect of Alternative 2 under 2020 Conditions would be considered an adverse effect. This would also be considered an adverse effect under 2035 Conditions.

Additionally the following 10 intersections would continue to operate at LOS E or F during the p.m. peak hour under Alternative 2, but would not be adversely affected by the project because the net addition of traffic as a result of Alternative 2 would not be substantial:

- Wood Street and Geary Boulevard
- Scott Street and Geary Boulevard
- Pierce Street and Geary Boulevard
- Steiner Street and Geary Boulevard
- Webster Street and Geary Boulevard
- Van Ness Avenue and O'Farrell Street
- Anza Street and Park Presidio Boulevard
- Fulton Street and Park Presidio Boulevard
- Polk Street and Geary Street
- O'Farrell Street and Hyde Street

Alternative 3 (2035)

Alternative 3 would cause adverse effects at nine study intersections in 2035; four on-corridor intersections and five off-corridor intersections:

- **Fillmore Street and Geary Boulevard (signalized)**
  - **» 2035 No Build Alternative Conditions:** LOS C
  - **» 2035 Alternative 3 Conditions:** LOS E
  - **» Reason for effect:** Alternative 3 would result in all traffic being brought to grade, increasing delay in the east- and westbound approaches since both directions would now be subject to a traffic signal, as well as the average intersection delay.

- **Laguna Street and Geary Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS F
  - **2035 Alternative 3 Conditions:** LOS F
  - **Reason for effect:** The effect of Alternative 3 under 2020 Conditions would be considered an adverse effect. This would also be considered an adverse effect under 2035 Conditions.

- **Gough Street and Geary Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS F
  - **2035 Alternative 3 Conditions:** LOS F
  - **Reason for effect:** The effect of Alternative 3 under 2020 Conditions would be considered an adverse effect. This would also be considered an adverse effect under 2035 Conditions.

- **Franklin Street and O'Farrell Street (signalized)**
  - **2035 No Build Alternative Conditions:** LOS D
  - **2035 Alternative 3 Conditions:** LOS F
  - **Reason for effect:** The intersection LOS would degrade under Alternative 3 conditions. This overall increase in delay is primarily attributable to an increase in delay in the northbound direction.

- **California Street and Arguello Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS D
  - **2035 Alternative 3 Conditions:** LOS E
  - **Reason for effect:** Alternative 3 would result in increased volumes and subsequent delays on the westbound through, eastbound through, and northbound left-turn movements.

- **Turk Street and Parker Street (signalized)**
  - **2035 No Build Alternative Conditions:** LOS C
  - **2035 Alternative 3 Conditions:** LOS E
  - **Reason for effect:** Alternative 3 would result in increased volumes and subsequent delays on the northbound through, eastbound through, and southbound through movements.

- **California Street and Presidio Avenue (signalized)**
  - **2035 No Build Alternative Conditions:** LOS D
  - **2035 Alternative 3 Conditions:** LOS E
  - **Reason for effect:** Alternative 3 would result in increased volumes and subsequent delays on the eastbound through, westbound through, and southbound through movements.

- **Fulton Street and Stanyan Street (signalized)**
  - **2035 No Build Alternative Conditions:** LOS F
  - **2035 Alternative 3 Conditions:** LOS F
  - **Reason for effect:** The effect of Alternative 3 under 2020 Conditions would be considered an adverse effect. This would also be considered an adverse effect under 2035 Conditions.

- **Fulton Street and Park Presidio Boulevard (signalized)**
  - **» 2035 No Build Alternative Conditions:** LOS F
  - **» 2035 Alternative 3 Conditions:** LOS F
  - **» Reason for effect:** The effect of Alternative 3 under 2020 Conditions would be considered an adverse effect. This would also be considered an adverse effect under 2035 Conditions.

Additionally, the following nine intersections would continue to operate at LOS E or F during the p.m. peak hour under Alternative 3, but would not be adversely affected by the project because the net addition of traffic as a result of Alternative 3 would not be substantial:

- Park Presidio Boulevard and Geary Boulevard
- Divisadero Street and Geary Boulevard
- Scott Street and Geary Boulevard
- Steiner Street and Geary Boulevard
- Webster Street and Geary Boulevard
- Van Ness Avenue and Geary Boulevard
- Van Ness Avenue and O'Farrell Street
- Polk Street and Geary Street
- O'Farrell Street and Hyde Street

Alternative 3-Consolidated (2035)

Alternative 3-Consolidated would cause adverse effects at nine study intersections in 2035; three on-corridor intersections and six off-corridor intersections:

- **Baker Street and Geary Boulevard (signalized)**
  - **» 2035 No Build Alternative Conditions:** LOS D
  - **» 2035 Alternative 3-Consolidated Conditions:** LOS E
  - **» Reason for effect:** Alternative 3-Consolidated would reduce the number of east and westbound through lanes from three to two, which would lessen the throughput at this intersection and increase traffic delays in the westbound direction, as well as the average intersection delay.
- **Gough Street and Geary Boulevard (signalized)**
  - **» 2035 No Build Alternative Conditions:** LOS F
  - **» 2035 Alternative 3-Consolidated Conditions:** LOS F
  - **» Reason for effect:** The effect of Alternative 3-Consolidated under 2020 Conditions would be considered an adverse effect. This would also be considered an adverse effect under 2035 Conditions.
- **Franklin Street and O'Farrell Street (signalized)**.
  - **» 2035 No Build Alternative Conditions:** LOS D
  - **» 2035 Alternative 3 Conditions:** LOS F
  - **» Reason for effect:** The intersection LOS would degrade under Alternative 3-Consolidated conditions. This overall decrease in delay is primarily attributable to an increase in delay in the northbound direction.

- **Clement Street and Park Presidio Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS D
  - **2035 Alternative 3-Consolidated Conditions:** LOS E
  - **Reason for effect:** The intersection LOS would degrade under Alternative 3-Consolidated conditions. This overall increase in delay is primarily attributable to increased volumes and subsequent delays on the eastbound and westbound through movements.

- **Turk Street and Parker Street (signalized)**
  - **2035 No Build Alternative Conditions:** LOS C
  - **2035 Alternative 3-Consolidated Conditions:** LOS E
  - **Reason for effect:** The intersection LOS would degrade under Alternative 3-Consolidated conditions. This overall increase in delay is primarily attributable to increased volumes and subsequent delays on the eastbound and southbound through movements.

- **California Street and Presidio Avenue (signalized)**
  - **2035 No Build Alternative Conditions:** LOS D
  - **2035 Alternative 3 Conditions:** LOS E
  - **Reason for effect:** The intersection LOS would degrade under Alternative 3-Consolidated conditions. This overall increase in delay is primarily attributable to increased volumes and subsequent delays on the westbound and northbound through movements.

- **Fulton Street and Stanyan Street (signalized)**
  - **2035 No Build Alternative Conditions:** LOS F
  - **2035 Alternative 3-Consolidated Conditions:** LOS F
  - **Reason for effect:** The effect of Alternative 3-Consolidated under 2020 Conditions would be considered an adverse effect. This would also be considered an adverse effect under 2035 Conditions.

- **Anza Street and Park Presidio Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS E
  - **2035 Alternative 3-Consolidated Conditions:** LOS E
  - **Reason for effect:** The intersection would continue to operate at the same LOS with Alternative 3-Consolidated. Alternative 3-Consolidated would not increase the overall intersection LOS to a significant degree, although it would contribute to the worsening of delay via an increase in traffic volumes to the westbound critical movement that would be considered significant.

- **Geary Street and Polk Street (signalized)**
  - **2035 No Build Alternative Conditions:** LOS E
  - **2035 Alternative 3-Consolidated Conditions:** LOS E
  - **Reason for effect:** The intersection would continue to operate at the same LOS with Alternative 3-Consolidated, although the

average intersection delay would increase by nine seconds. This overall increase in delay is primarily attributable to an increase in delay in the southbound direction. Alternative 3-Consolidated would not increase the overall intersection LOS to a significant degree, although it would contribute to the worsening of delay via an increase in traffic volumes to the southbound critical movement that would be considered significant.

Additionally, the following five intersections would continue to operate at LOS E or F during the p.m. peak hour under Alternative 3-Consolidated, but would not be adversely affected by the project because the net addition of traffic as a result of Alternative 3-Consolidated would not be substantial:

- Webster Street and Geary Boulevard
- Van Ness Avenue and Geary Boulevard
- Van Ness Avenue and O'Farrell Street
- Fulton Street and Park Presidio Boulevard
- O'Farrell Street and Hyde Street

Hybrid Alternative/LPA (2035)

The Hybrid Alternative/LPA would cause adverse effects at eight study intersections in 2035; four on-corridor intersections and four off-corridor intersections:

- **Parker Street and Geary Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS D
  - **2035 Hybrid Alternative/LPA Conditions:** LOS E
  - **Reason for effect:** The intersection LOS would degrade under Hybrid Alternative/LPA conditions. This overall decrease in delay is primarily attributable to an increase in delay in the north- and southbound directions.
- **Laguna Street and Geary Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS F
  - **2035 Hybrid Alternative/LPA Conditions:** LOS E
  - **Reason for effect:** This intersection would degrade from LOS C in 2020 No Build to LOS E under 2020 Hybrid Alternative/LPA conditions. No Build LOS is anticipated to worsen to LOS F by 2035. Although 2035 conditions under the Hybrid Alternative/LPA would be better than No Build (LOS E versus LOS F), the effect of the Hybrid Alternative/LPA under 2020 Conditions would still be considered an adverse effect under 2035 Conditions.
- **Gough Street and Geary Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS F
  - **2035 Hybrid Alternative/LPA Conditions:** LOS F
  - **Reason for effect:** This intersection would degrade from LOS C in 2020 No Build to LOS F under 2020 Hybrid Alternative/LPA conditions. No Build LOS is anticipated to worsen to LOS F by 2035. Although 2035 conditions under the Hybrid Alternative/LPA would be the same as No Build (both at LOS F), the effect of the Hybrid Alternative/LPA under 2020

Conditions would still be considered an adverse effect under 2035 Conditions.

- **Van Ness Avenue and Geary Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS F
  - **2035 Hybrid Alternative/LPA Conditions:** LOS E
  - **Reason for effect:** The Hybrid Alternative/LPA intersection would result in substantial delay at this intersection in 2020 (although LOS would remain unchanged at LOS E). The effect of the Hybrid Alternative/LPA under 2020 Conditions would be considered an adverse effect. While No Build LOS is anticipated to worsen to LOS F by 2035 (and the Hybrid Alternative/LPA would result in LOS E), the 2020 effect would also result in 2035 conditions being considered as an adverse effect.
- **California Street and Arguello Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS D
  - **2035 Hybrid Alternative/LPA Conditions:** LOS E
  - **Reason for effect:** The intersection LOS would degrade under Hybrid Alternative/LPA conditions. This overall decrease in delay is primarily attributable to an increase in delay in the east- and westbound directions.
- **California Street and Presidio Avenue (signalized)**
  - **2035 No Build Alternative Conditions:** LOS D
  - **2035 Hybrid Alternative/LPA Conditions:** LOS E
  - **Reason for effect:** The intersection LOS would degrade under Hybrid Alternative/LPA conditions. This overall increase in delay is primarily attributable to increased volumes and subsequent delays on the eastbound and westbound through movements.
- **Fulton Street and Stanyan Street (signalized)**
  - **2035 No Build Alternative Conditions:** LOS F
  - **2035 Hybrid Alternative/LPA Conditions:** LOS F
  - **Reason for effect:** The effect of the Hybrid Alternative/LPA under 2020 Conditions would be considered an adverse effect. This would also be considered an adverse effect under 2035 Conditions.
- **Anza Street and Park Presidio Boulevard (signalized)**
  - **2035 No Build Alternative Conditions:** LOS E
  - **2035 Hybrid Alternative/LPA Conditions:** LOS E

  Reason for effect: The intersection would continue to operate at the same LOS with the Hybrid Alternative/LPA. The Hybrid Alternative/LPA would not increase the overall intersection LOS to a significant degree, although it would contribute to the worsening of delay via an increase in traffic volumes to the westbound critical movement that would be considered significant.

Additionally, the following 11 intersections would continue to operate at LOS E or F during the p.m. peak hour under the Hybrid Alternative/LPA, but would not be adversely affected by the project because the net addition of traffic as a result of the Hybrid Alternative/LPA would not be substantial:

- Wood Street and Geary Boulevard
- Lyon Street and Geary Boulevard
- Divisadero Street and Geary Boulevard
- Scott Street and Geary Boulevard
- Steiner Street and Geary Boulevard
- Webster Street and Geary Boulevard
- Van Ness Avenue and O'Farrell Street
- Fulton Street and Park Presidio Boulevard
- Bush Street and Franklin Street
- Polk Street and Hyde Street
- O'Farrell Street and Hyde Street

3.4.4.12 | NEPA CONCLUSION OF EFFECTS ON AUTOMOBILE TRAFFIC

Traffic operations under any of the build alternatives would not severely inhibit circulation for automobiles in the Geary corridor in 2020 or 2035. Although levels of peak-hour traffic congestion would increase at some intersections by varying degrees depending on build alternative, the Geary corridor cannot be widened to accommodate higher automobile volumes without resulting in adverse effects. Additionally, overall corridor travel times for automobile traffic would not substantially change under any of the build alternatives relative to the No Build Alternative.

Increased traffic delay at some intersections would not adversely affect multimodal travel on the Geary corridor (as discussed in Section 3.3.4). Because traffic operations are evaluated during worst-case p.m. peak-hour conditions and because non-peak-hour traffic operations would be substantially better, the project's build alternatives would not create severely congested roadway operations throughout the day.

Each build alternative would incorporate features that would help avoid or minimize traffic congestion. These features include: optimized signal timing, signal priority for transit vehicles on the Geary corridor (benefitting east-west traffic movements), reduced left-turn movements along the Geary corridor, and the addition of new right-turn pockets at key locations. With these features, the overall travel times for automobile traffic along the corridor would not substantially change under the build alternatives relative to the No Build Alternative.

As a result, with the features included that would help minimize the negative effects of increased traffic congestion along the corridor, the build alternatives would enhance neighborhood livability and community vitality by maintaining a balanced roadway that travelers on all modes can use to access business, residences, and other points of interest in the Geary corridor.

3.4.4.13 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, over the long term (2035 conditions) Alternative 2 would adversely affect LOS at the fewest number of study

intersections (five), followed by the Hybrid Alternative/LPA (eight). Alternatives 3 and 3-Consolidated would both have adverse LOS effects at nine study intersections. The No Build Alternative would adversely affect LOS at more intersections than any of the build alternatives (21).

3.4.5 | Avoidance, Minimization and Mitigation Measures

Under the No Build Alternative, there would be adverse effects at 10 study intersections in 2020 and 21 study intersections in 2035:

- Collins Street and Geary Boulevard (2020, 2035)
- Lyon Street and Geary Boulevard (2035)
- Masonic Avenue and Geary Boulevard (2020, 2035)
- Park Presidio Boulevard and Geary Boulevard (2035)
- Second Avenue and Geary Boulevard (2035)
- Broderick Street and Geary Boulevard (2020, 2035)
- Divisadero Street and Geary Boulevard (2035)
- Scott Street and Geary Boulevard (2020, 2035)
- Steiner Street and Geary Boulevard (2020, 2035)
- Webster Street and Geary Boulevard (2035)
- Laguna Street and Geary Boulevard (2035)
- Gough Street and Geary Boulevard (2035)
- Franklin Street and O'Farrell Street (2020, 2035)
- Van Ness Avenue and Geary Boulevard (2020, 2035)
- Van Ness Avenue and O'Farrell Street (2020, 2035)
- Geary Street and Polk Street (2035)
- O'Farrell Street and Hyde Street (2035)
- Anza Street and Park Presidio Boulevard (2035)
- Fulton Street and Park Presidio Boulevard (2020, 2035)
- Fulton Street and Stanyan Street (2020, 2035)
- Bush Street and Franklin Street (2035)

Alternative 2 would result in adverse effects at two study intersections in 2020 and five study intersections in 2035:

- Divisadero Street and Geary Boulevard (2035)
- Laguna Street and Geary Boulevard (2035)
- Gough Street and Geary Boulevard (2020, 2035)
- Van Ness Avenue and Geary Boulevard (2035)
- Fulton Street and Stanyan Street (2020, 2035)

Alternative 3 would result in adverse effects at three study intersections in 2020 and nine study intersections in 2035:

- Fillmore Street and Geary Boulevard (2035)
- Laguna Street and Geary Boulevard (2020, 2035)
- Gough Street and Geary Boulevard (2020, 2035)
- Franklin Street and O'Farrell Street (2035)
- California Street and Arguello Boulevard (2035)
- Turk Street and Parker Street (2035)
- California Street and Presidio Avenue (2035)

- Fulton Street and Stanyan Street (2020, 2035)
- Fulton Street and Park Presidio Boulevard (2035)

Alternative 3-Consolidated would result in adverse effects at two study intersections in 2020 and nine study intersections in 2035:

- Baker Street and Geary Boulevard (2035)
- Gough Street and Geary Boulevard (2020, 2035)
- Franklin Street and O'Farrell Street (2035)
- Clement Street and Park Presidio Boulevard (2035)
- Turk Street and Parker Street (2035)
- California Street and Presidio Avenue (2035)
- Fulton Street and Stanyan Street (2020, 2035)
- Anza Street and Park Presidio Boulevard (2035)
- Geary Street and Polk Street (2035)

The Hybrid Alternative/LPA would result in adverse effects at four study intersections in 2020 and eight study intersections in 2035. As noted above, the Hybrid Alternative/LPA would improve 2035 LOS relative to the No Build Alternative at the Laguna and Van Ness intersections with Geary. However, given that the Hybrid Alternative/LPA would adversely affect these two intersections in 2020, these effects would still be considered as adverse for 2035.

- Parker Street and Geary Boulevard (2035)
- Laguna Street and Geary Boulevard (2020, 2035)
- Gough Street and Geary Boulevard (2020, 2035)
- Van Ness Avenue and Geary Boulevard (2020, 2035)
- California Street and Arguello Boulevard (2035)
- California Street and Presidio Avenue (2035)
- Fulton Street and Stanyan Street (2020, 2035)
- Anza Street and Park Presidio Boulevard (2035)

For all build alternatives, minimization measures and standard practices would be employed to reduce the need for mitigation measures. However, adverse effects were identified at the intersections listed above. At all intersections along Geary Boulevard, typical measures that could reduce automobile delay would include intersection widening, removal of parking lanes, addition of travel lanes or other strategies that increase intersection/vehicular capacity. Measures were identified and evaluated for each of the build alternatives under 2020 conditions. These are discussed below. Additional information on avoidance, minimization, and mitigation measures is included in Appendix D-4.

- **All Intersections on Geary Boulevard:** Along Geary Boulevard, providing additional travel lanes or otherwise increasing vehicular capacity would require removal of the proposed bus lanes, narrowing sidewalks and/or demolition of adjacent buildings due to the limited right-of-way. As a result, adverse effects could not be avoided.
- **Fulton Street and Park Presidio Boulevard:** At this intersection, providing additional travel lanes or otherwise increasing vehicular capacity would require narrowing sidewalks and/or demolition of adjacent buildings due to the limited right-of-way. As a result, adverse effects could not be avoided.
- **Fulton Street and Stanyan Street:** At this intersection, providing additional travel lanes or otherwise increasing vehicular capacity would require narrowing sidewalks and/or demolition of adjacent buildings due to the limited right-of-way. As a result, adverse effects could not be avoided.

Additionally, for build alternatives in 2035, the following intersection measures were identified and evaluated. These measures are discussed below:

- **All Intersections on Geary Boulevard:** Along Geary Boulevard, providing additional travel lanes or otherwise increasing vehicular capacity would require removal of the proposed bus lanes, narrowing sidewalks and/or demolition of adjacent buildings due to the limited right-of-way. As a result, adverse effects could not be avoided.
- **Clement Street and Park Presidio Boulevard:** At this intersection, providing an eastbound or westbound right turn pocket by removing three parking spaces from eastbound Clement Street or six spaces from westbound Clement Street travel lanes would avoid adverse effects.
- **California Street and Arguello Boulevard:** At this intersection, restricting eastbound, or eastbound and westbound left turns during peak hours would avoid adverse effects, but would also require those vehicles that need to travel in the north- or southbound direction to turn left either prior to the California/Arguello intersection, or by making a series of right turns. This would divert traffic onto smaller residential streets, which may not have sufficient capacity and would not be consistent with policies discouraging vehicle through-travel of smaller residential streets.
- **Turk Street and Parker Avenue:** At this intersection, restricting eastbound, or eastbound and westbound left turns during peak hours would avoid adverse effects.

- **California Street and Presidio Avenue:** At this intersection, increasing signal cycle lengths and optimizing the timing of each signal phase would avoid adverse effects to vehicular traffic, but would adversely impact pedestrian wait times, transit travel times, and traffic throughput at the intersection and at adjacent intersections and is therefore not considered feasible.
- **Fulton Street and Park Presidio Boulevard:** At this intersection, providing additional travel lanes or otherwise increasing vehicular capacity at these intersections would require narrowing sidewalks and/or demolition of adjacent buildings due to the limited right-of-way. As a result, adverse effects could not be avoided.
- **Fulton Street and Stanyan Street:** At this intersection, providing additional travel lanes or otherwise increasing vehicular capacity at these intersections would require narrowing sidewalks and/or demolition of adjacent buildings due to the limited right-of-way. As a result, adverse effects could not be avoided.
- **Anza Street and Park Presidio Boulevard:** At this intersection, providing additional eastbound and westbound travel lanes would be possible by reconfiguring the eastbound and westbound approaches, but would require removal of parking, reduction of sidewalk widths, and/or adding right-turn pockets directly adjacent to sidewalks. These side-effects render the potential mitigation treatments infeasible.

Providing additional travel lanes or otherwise increasing vehicular capacity at these intersections is not feasible because it would require narrowing sidewalks to deficient widths and/or demolition of adjacent buildings. Signal timing adjustments may improve intersection operations, but major timing changes would be infeasible due to traffic, transit, or pedestrian signal timing requirements. Other measures to increase capacity, such as the use of tow-away zones or other parking prohibitions to add through lanes or turn pockets, would worsen pedestrian conditions by eliminating the buffer between pedestrians and moving traffic that on-street parking provides. This would increase exposure of pedestrians at intersections that would not support project goals for pedestrian comfort and safety.

Therefore, because no feasible measures exist to reduce project impacts at the above-identified locations, traffic effects at these intersections under the associated build alternative would remain adverse.

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3.5 Pedestrian and Bicycle Transportation

3.5.1 | Regulatory Setting

Several policies and plans guide the development of non-motorized transportation environments on and around the Geary corridor.

3.5.1.1 | THE SAN FRANCISCO GENERAL PLAN

The San Francisco *General Plan* (*General Plan*) is discussed in Section 3.3.1.1. Key policies relating to pedestrian and bicycle circulation include:

- **Policy 1.2:** Ensure the safety and comfort of pedestrians throughout the City.
- **Policy 14.2:** Ensure that traffic signals are timed and phased to emphasize transit, pedestrian, and bicycle traffic as part of a balanced multi-modal transportation system.
- **Policy 21.9:** Improve pedestrian and bicycle access to transit facilities.
- **Policy 23.1:** Provide sufficient pedestrian movement space with a minimum of pedestrian congestion in accordance with a pedestrian street classification system.
- **Policy 23.6:** Ensure convenient and safe pedestrian crossings by minimizing the distance pedestrians must walk to cross a street.
- **Policy 25.5:** Where intersections are controlled with a left-turn only traffic signal phase for automobile traffic, encourage more efficient use of the phase for pedestrians where safety permits.
- **Policy 27.6:** Accommodate bicycles on local and regional transit facilities and important regional transportation links wherever and whenever feasible.
- **Policy 29.1:** Consider the needs of bicycling and the improvement of bicycle accommodations in all city decisions.

3.5.1.2 | SFGO

SFgo is a package of technology-based transportation management system tools being developed by San Francisco Municipal Transportation Agency (SFMTA). This package is comprised of several projects citywide that will affect non-motorized transportation infrastructure citywide including, but not limited to, the following:

- Installation of pedestrian countdown signals on all crosswalk legs at signalized intersections along the corridor.

Pedestrian countdown signals increase pedestrian safety by giving clear and accurate information about crossing time so that pedestrians can complete their crossing before cross traffic receives the green light

- In accordance with SFMTA's policy on accessible pedestrian signals (APS), evaluate APS needs at existing and proposed upgraded signalized intersections and install APS at highly ranked locations. APS uses audio technologies to assist people with visual impairments in safely crossing a street.
- Upgrade of curb ramps to meet current City standards and Americans with Disabilities Act (ADA) requirements to provide access to people in wheelchairs and overall improved pedestrian travel.

3.5.1.3 | EXECUTIVE DIRECTIVE 10-03 (2010) AND VISION ZERO RESOLUTION (2014)

Executive Directive 10-03 requires San Francisco agencies to reduce serious and fatal pedestrian collisions by 25 percent by 2016 and by 50 percent by 2020 relative to 2010 conditions. The Directive states that decreasing pedestrian collisions should align with the goal of increasing walking trips citywide. In March 2014, the Board of Supervisors adopted Resolution 140047, calling for an even more aggressive goal of zero traffic fatalities by all modes, including people walking and people bicycling, in ten years by 2024.

3.5.1.4 | MAYOR'S PEDESTRIAN STRATEGY AND WALKFIRST INVESTMENT PLAN

In response to Executive Directive 10-03, San Francisco agencies developed the Mayor's Pedestrian Strategy in 2013, which identifies the city's highest pedestrian injury corridors and describes solutions. The 2014 WalkFirst Investment Plan follows from this Strategy. The WalkFirst plan involves developing specific infrastructure-focused recommendations for improving the high-injury corridors. The plan identifies the Geary corridor as both a key walking street and a pedestrian high-injury corridor, especially for collision types involving left turns at signalized intersections, high speeds, and pedestrians crossing in areas without crosswalks.

3.5.1.5 | SAN FRANCISCO BETTER STREETS PLAN

The *Better Streets Plan* (2010) provides the vision to create an improved pedestrian environment. It sets broad guidelines around creating streets that are balanced and accessible to all users. It encourages streets to be responsive to the needs of all users while also addressing the City's ecological and infrastructure systems.

3.5.1.6 | SAN FRANCISCO BICYCLE PLAN AND MASONIC AVENUE STREETSCAPE IMPROVEMENT PROJECT

The *San Francisco Bicycle Plan* (2009) outlines bicycle related planning and policies for the future. Plans include the addition of 34 miles of bike lanes, marking of 75 miles of on-street bike routes with shared lane markings, and educational programs for cyclists and motorists. The plan does not include any projects within the Geary corridor; however the Geary BRT project would construct a Class II bicycle path between Masonic Avenue and Presidio Avenue consistent with the recommendations from SFMTA's Masonic Avenue Streetscape Improvement Project plan (2010).

3.5.2 | Affected Environment

This section describes existing pedestrian and bicycling conditions in the Geary corridor. Pedestrian trips make up about 26 percent of daily trips including trips to, from, and within the neighborhoods in the study area. This figure does not include walking trips to transit, which is the primary mode of access for all bus transit trips along the Geary corridor. Because transit trips account for about 32 percent of all daily trips in the study area, it can be approximated that up to 58 percent of all trips in the study area include a walking component.

3.5.2.1 | PEDESTRIAN CONDITIONS

3.5.2.1.1 EXISTING VOLUMES AND TRAVEL CHARACTERISTICS

The Geary corridor overall has frequent transit service, gentle grades, and short distances between destinations. These factors result in high pedestrian volumes on the entire corridor especially during peak commute hours. Though high pedestrian levels are observed throughout the corridor, pedestrian volumes are highest east of Van Ness Avenue. Based on existing counts and travel assumptions from the San Francisco Chained Activity Modeling Process (SF-CHAMP) model, there are over 38,000 walking trips along the Geary corridor during the evening peak hour.

The study area is also home to a significant population of seniors, as about 40 senior centers are located within one-quarter mile of the Geary corridor. The corridor is also heavily used by people with disabilities, including people who use wheelchairs, and people who are hearing-impaired or visually impaired. Infrastructure features integral to the mobility of these groups are included in Section 3.5.2.1.6.

On some segments of the corridor, such as the blocks between Masonic Avenue and Gough Street, long block lengths combined with long crossing distances restrict pedestrian connectivity. The build alternatives include pedestrian countdown signals, pedestrian crossing bulbs, and median nose cones (providing refuge from passing vehicles) to better accommodate pedestrians accessing transit, as further discussed in this section.

3.5.2.1.2 SIDEWALK CONDITIONS AND LIGHTING

Sidewalks exist on all blocks along the Geary corridor, with widths varying from as low as six feet to up to 25 feet along some blocks. Table 3.5-1 lists the ranges of sidewalk widths along various segments of the Geary corridor.

Streetlights illuminate the entire Geary corridor from 48th Avenue to Market Street. East of Gough Street, streetlights are located along sidewalks as standard-height luminaires that light the main roadway but generally do not provide direct pedestrian-scale sidewalk illumination. West of Gough Street, streetlights are located in center median areas.

Table 3.5-1 Existing Sidewalk Widths

SEGMENT	SIDEWALK WIDTH RANGE (FEET)
48th Avenue – 25th Avenue	6 – 25
25th Avenue – Arguello Boulevard	13 – 16
Arguello Boulevard – Divisadero Street	10 – 16
Divisadero Street – Gough Street	8 – 12
Gough Street – Market Street	8 – 16

Source: Fehr & Peers, 2014

3.5.2.1.3 PEDESTRIAN CROSSINGS

Crossing Distances

Pedestrian crossing distances, or the length across the roadway between curb ramps, vary along the Geary corridor. Eastbound from 48th Avenue to 40th Avenue, Geary Boulevard has parallel parking and some angled parking along both sides. Crossing distances gradually increase from about 50 feet near 48th Avenue to 100 feet east of 40th Avenue.

Between 40th Avenue and Divisadero Street, Geary Boulevard expands to between four and six lanes with center medians and on-street parking. Crossing distances in this area are typically between 80 and 100 feet.

From Divisadero Street to Gough Street, Geary Boulevard widens further to eight lanes, maintaining a center median and parallel parking. Crossing distances are about 125 feet between Divisadero Street and Gough Street. East of Gough Street, the Geary corridor splits into the one-way couplet of Geary and O'Farrell streets. Each has two mixed-flow travel lanes and one bus-only lane. Crossing distances on each street narrow from 45 feet to about 30 feet as they approach Market Street.

Crossing distances of side streets along the Geary corridor (i.e., the north and south legs of the intersections) also vary. The shortest crossing of 15 feet exists where Shannon Street meets Geary Street (located between Jones Street and Taylor Street) and O'Farrell Street near Union Square, while the longest crosswalk of about 97 feet spans the Webster Street intersection. More than 140 of the 202 (or 69 percent) side-street crossings along the corridor are between 30 feet and 45 feet long, a distance considered comfortable to cross by most pedestrians.

Most medians along the Geary corridor do not have nose cones. Median nose cones, or thumbnail islands, are occasionally placed on the intersection side of medians and provide a buffer between pedestrians in the median and automobile traffic. They provide refuge and increase visibility of crossing pedestrians. Although these treatments are beneficial for pedestrians, they may conflict with the turning movements of large vehicles.

Pedestrian crossing bulbs help reduce curb-to-curb crossing widths and the time needed to cross a roadway, especially for slower-moving pedestrians, through an extension of the sidewalk into the intersection. Additional benefits include increased pedestrian visibility, a larger pedestrian queuing area, traffic calming impacts by visually and physically narrowing the roadway, and extra space for curb ramps. A handful of such bulbs currently exist along the Geary corridor, such as those on Van Ness Avenue and Gough Street, ranging from an extension of between 7 feet and 10 feet into the street.

Pedestrian Overcrossings

Two pedestrian bridges span Geary Boulevard at the Webster Street and Steiner Street intersections. The grade-separated walkways allow pedestrians to cross over Geary Boulevard. However, these overcrossings are several decades old and are inconvenient for many users due to the long and indirect ramps, change in elevation required, and some users' sense of insecurity. Additionally, the pedestrian overcrossings are not compliant with the ADA due to their average inclines exceeding the ADA standard of a 5 percent maximum grade (i.e. a slope increasing in elevation by 5 feet for every 100 feet in length), which makes wheelchair crossings difficult.

At Steiner Street, an at-grade, marked crosswalk has been installed across the Geary corridor, reducing the need for all pedestrians to use the pedestrian bridge.

Pedestrian countdown signals have been installed at many intersections along the Geary corridor

3.5.2.1.4 CORRIDOR PERFORMANCE: SIGNAL TIMINGS

Pedestrian crossing times at signalized intersections are determined and influenced by several guidelines. Traffic signals are most commonly timed so that most pedestrians can cross the entire street before the green signal for opposing traffic begins. This time is referred to as the "walk split" and includes the "walk" signal, the "flashing don't walk" signal, yellow, and any all-red time before the opposing green. As recommended by the Federal Highway Administration's *Manual on Uniform Traffic Control Devices* (MUTCD), a pedestrian or wheelchair user starting 6 feet back from the curb face should be able to complete the intersection crossing at three feet per second within the given pedestrian crossing time. San Francisco strives for a longer crossing time wherever possible.

Additionally, pedestrian crossing times also need to consider allowing any pedestrian who begins crossing at any point during the "walk" signal to be able to complete their crossing before the opposing green signal begins. This is referred to as the "pedestrian clearance time." The MUTCD recommendation for the minimum pedestrian clearance time assumes a 3.5 feet per second with the pedestrian leaving the curb at the end of the "walk" signal. The MUTCD recommendation for elderly persons or locations where there exists a known concentration of people with disabilities is 2.5 feet per second.

Pedestrian Delay

Pedestrian delay reflects the average amount of time an approaching pedestrian must wait before crossing the street. The higher the amount of pedestrian delay, the more likely pedestrians are to disregard a traffic signal. Furthermore, a greater pedestrian delay reduces the efficiency of walking as a travel mode. The VISSIM micro simulation model was used to simulate systemwide pedestrian delay along the core Geary corridor, which includes the delay experienced by pedestrians when waiting at intersections between Van Ness and 25th avenues. The total existing pedestrian delay for all intersections on the Geary corridor is about 690 hours during the afternoon peak hour. Dividing total delay by the number of persons walking along the corridor allows one to summarize delay on a per-person basis. Therefore, the average pedestrian delay during the afternoon peak hour is about 50-60 seconds per person traversing the corridor.

Pedestrian Countdown Signals

Pedestrian countdown signals, which display the remaining seconds available for a pedestrian to traverse an intersection, can increase safety for pedestrians crossing the street. Most signalized intersections in the corridor have pedestrian countdown signals, with the exception of seven locations (Geary at Baker, Divisadero, Scott, Fillmore, and Laguna streets, and O'Farrell Street at Franklin and Leavenworth streets). All intersections on the Geary corridor are expected to have pedestrian countdown signals by 2020.

Besides countdown signals, some intersections on the Geary corridor also have APS pushbuttons that communicate non-visually when it is permissible to cross an intersection. Such media includes audible tones, speech messages, and vibrating surfaces. According to SFMTA's APS inventory, the following six study area intersections are equipped with APS on some or all crossing legs: Geary Boulevard at Sixth Avenue, 25th Avenue, Arguello Boulevard, and Divisadero Street; Geary Street at Kearny Street; and at the Grant Street/O'Farrell Street/Market Street intersection.

3.5.2.1.5 CORRIDOR PERFORMANCE: PEDESTRIAN COLLISION LOCATIONS

The Mayor's Pedestrian Strategy and WalkFirst Study identified the Geary corridor as a high pedestrian-injury corridor, especially for collision types involving a left-turning vehicle, high speeds, and pedestrians crossing without a crosswalk. Appendix D-8 (Pedestrian Safety Analysis and Recommendations) describes pedestrian collision characteristics and recommends countermeasures, including those recommended through the WalkFirst Investment Strategy.

Figure 3.5-1 displays pedestrian-automobile collisions along the Geary corridor from 2007-2011 (Statewide Integrated Traffic Records System, 2014). The figure illustrates that the majority of collisions occurred east of Divisadero Street, although some portions to the west also experienced high concentrations of pedestrian collisions. In particular, some intersections between Arguello Boulevard and 25th Avenue have higher than average numbers of pedestrian collisions.[1] The Geary Corridor Pedestrian Safety Analysis confirms that segments east of Divisadero Street

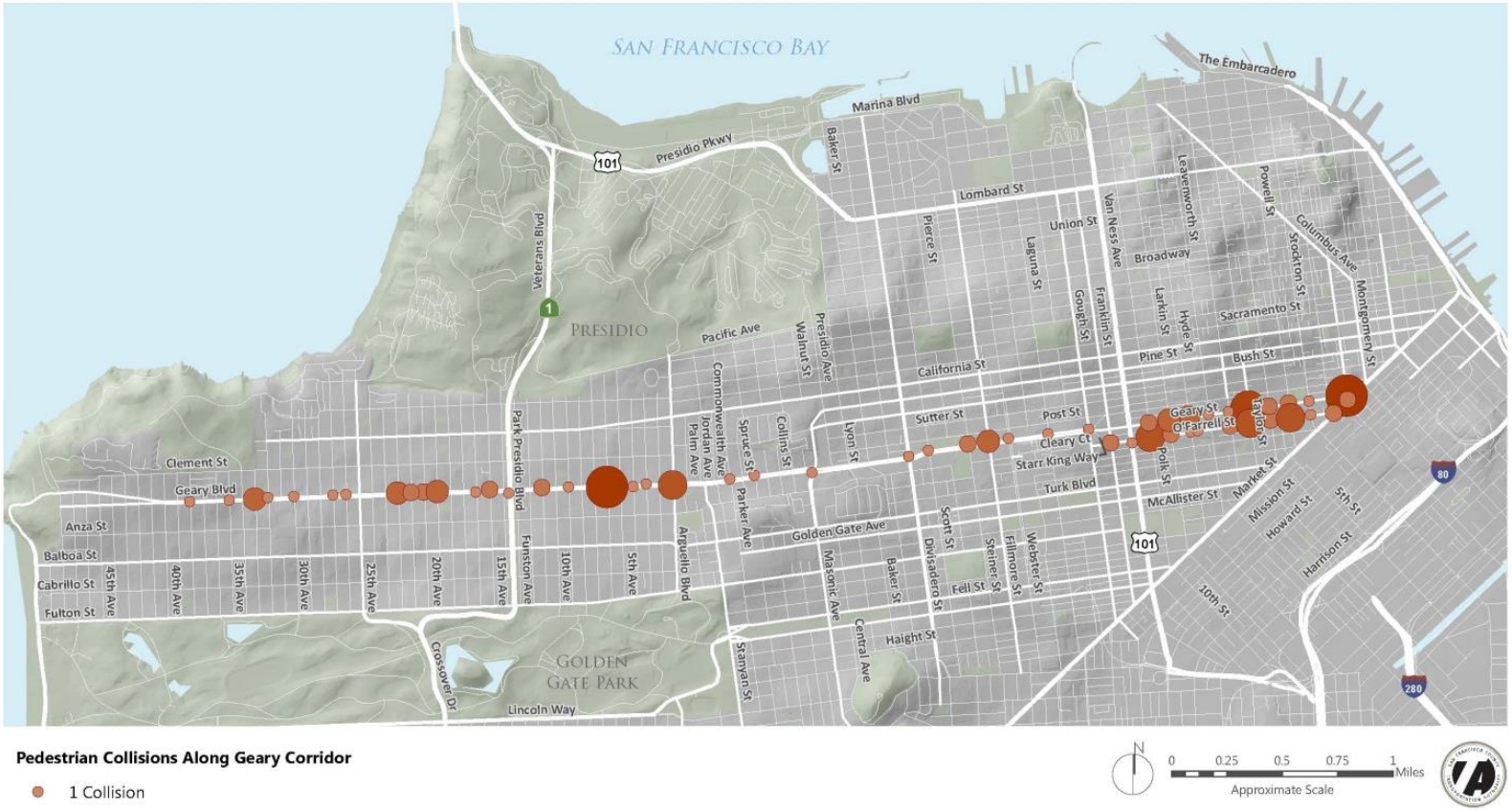
[1] Appendix D-8 provides more detail on the corridor collision history by breaking down the corridor into seven segments and comparing their collision history.

experienced the highest number of severity-weighted pedestrian injuries per mile along the Geary corridor, followed by the segment from Cook Street to 22nd Avenue. The latter segment also experienced overrepresented shares of collisions involving left-turning vehicles (about 40 percent versus 25 percent citywide) and involving seniors (about 30 percent compared with 14 percent citywide).

Left turns on the Geary corridor currently have permissive signal phasing, which allows vehicles to turn when there is no oncoming through traffic and when pedestrians are not crossing. In this situation, pedestrians may not be fully visible to turning vehicles because drivers may be distracted by other factors on the roadway, such as oncoming traffic and queuing vehicles behind them. As a result, drivers may be less aware of pedestrians in the crosswalk while executing a left turn.

Also, pedestrian crossing signals may not be timed appropriately for people with disabilities or those traversing crosswalks at slower speeds, meaning they spend a disproportionately longer time in a crosswalk than able-bodied pedestrians.

Figure 3.5-1 Pedestrian-Automobile Collisions on the Geary Corridor (2007-2011)



3.5.2.1.6 CORRIDOR PERFORMANCE: ACCESS FOR SENIORS AND PEOPLE WITH DISABILITIES

The Geary corridor is home to a large senior population; about 20 percent of pedestrians injured along the corridor are seniors (see Appendix D-8). Figure 3.5-2 shows existing senior centers and stop locations along the Geary corridor.

Infrastructure features integral to the mobility of these groups include pedestrian crossing bulbs and curb ramps. Currently all curb corners at intersections have ramps that permit crossing for wheelchair users. Ramps exist in two forms: diagonal and perpendicular. The diagonal design consists of a single curb ramp located at the apex of the curb corner, while the perpendicular one can have up to two ramps perpendicular to the curb usually in line with the crosswalk. The diagonal design is more compact and less costly, but the perpendicular design, when feasible, can provide alignment with the proper crossing direction, eliminating some difficulty for people with disabilities. Furthermore, diagonal ramps can direct people with visual impairments into the middle of intersections. Additionally, depending on when they were repaved, curb ramps may or may not have strips of detectable warnings, which are recognized by their truncated domes, or colored, bumpy surfaces. Recently repaved curbs all have these newer designs with detectable warning features. Ramps without detectable warning tiles are not ADA-compliant.

Pedestrian crossing bulbs reduce crossing distances and can provide additional space for access and maneuvering for seniors and people with disabilities. Audible pedestrian signals would also assist many seniors and people with disabilities in crossing the Geary corridor and its side-streets.

Finally, many of the infrastructure measures discussed previously can affect the mobility of seniors and people with disabilities. In particular, shorter crossing distances enabled by new pedestrian crossing bulbs and longer crossing "walk" times at signals benefit slower-moving pedestrians. Additionally, pedestrian crossing bulbs can improve visibility for seniors and people with disabilities, and they provide additional curb space for wheelchair maneuvering. These and the following guiding principles in pedestrian infrastructure enable the creation of an accessible pedestrian environment.

"Universal Design Principles" guide the design of facilities and environments that are broadly and easily accessible to all people, and they do not require separated or specialized facilities. The Universal Design Principles were reviewed in the design and analysis of the project build alternatives.[2] The Universal Design Principles include:

- **Equitable Use**: This principle refers to a design that is useful and marketable to people with diverse abilities.
- **Flexibility in Use**: This principle refers to a design that accommodates a wide range of individual preferences and abilities.
- **Simple and Intuitive Use**: This principle describes a design that is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

[2] The Center for Universal Design, 1997.

- **Perceptible Information**: This principle refers to a design that communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
- **Tolerance for Error**: This principle refers to design that minimizes hazards and the adverse consequences of accidental or unintended actions.
- **Low Physical Effort**: This principle refers to design that can be used efficiently and comfortably with a minimum of fatigue.
- **Size and Space for Approach and Use**: This principle refers to provision of appropriate size and space in design for approach, reach, manipulation, and use regardless of a user's body size, posture, or mobility.

3.5.2.2 | BICYCLE CONDITIONS

3.5.2.2.1 EXISTING BICYCLE ROUTES

Bicycle facilities are classified based on a standard typology:

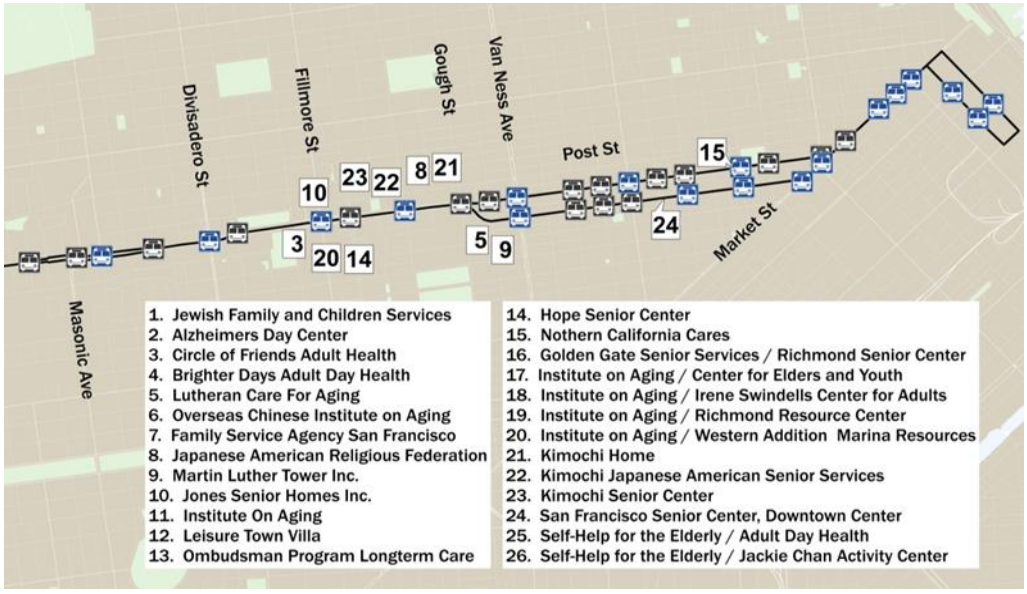
- **Class I Bikeway (Bike Path):** A separate right-of-way designated for the exclusive use of bicycles and pedestrians, with vehicle and pedestrian cross-flows minimized.
- **Class II Bikeway (Bike Lane):** A restricted right-of-way designated for the use of bicycles, with a striped lane on a street or highway. Bicycle lanes are generally 5 feet wide. Vehicle parking and vehicle and pedestrian cross-flows are permitted.
- **Class III Bikeway (Bike Route):** A right-of-way designated by signs or pavement markings for shared use with pedestrians or motor vehicles.
- **Class IV Bikeway (Protected Bike Lane):** Sometimes referred to as a "cycle track," an on-street bicycle lane (one way or two ways) that is physically separated from the vehicle travel lane. Separation methods can include permanent barriers, flexible bollards, and/or grade separation.[3]

Geary Boulevard currently has no designated bicycle facilities, except for one block between Presidio Avenue and Masonic Avenue (Class III). Cyclists must therefore share travel lanes with all other traffic. The San Francisco Bicycle Plan discusses future access within the Geary corridor, but does not recommend any specific bikeway alignment along the Geary corridor. Subsequent to the Bicycle Plan, SFCTA conducted the Geary Boulevard Bicycle Demand Study (2008) to identify a future bicycle route alignment parallel to the Geary corridor. The preferred alignment from that study included the addition of a Class II bikeway largely along Anza Street. The route would cross Geary Boulevard at Masonic Avenue to connect to existing bicycle lanes on Post Street.

Existing bicycle routes parallel to and crossing the Geary corridor are listed below. Figure 3.5-3 illustrates Class I, Class II, and Class III bicycle facilities in the northern part of San Francisco.

[3] California State Assembly Bill 1193 (signed into law September 2014) created this new class of bikeway facilities.

Figure 3.5-2 Senior Centers and Stop Locations along the Geary Corridor



Parallel routes with Class II bikeways include:

- Lake Street: 28th Avenue to Arguello Boulevard
- Post Street: Presidio Avenue to Steiner Street
- Turk Street: Arguello Boulevard to Masonic Avenue
- Golden Gate Avenue: Parker Avenue to Divisadero Street
- Cabrillo Street: La Playa Street to Arguello Boulevard
- Fulton Street: Baker Street to Octavia Street
- Grove Street: Baker Street to Scott Street and Van Ness Avenue to Hyde Street

Routes crossing the Geary corridor with Class II bikeways include:

- Arguello Boulevard: Fulton Street to Jackson Street.
- Webster Street: Hayes Street to Sutter Street
- Polk Street: Market Street to Post Street
- Stockton Street: Sacramento Street to Bush Street

The Masonic Avenue Streetscape Improvement Program, when complete in 2018, will extend a Class IV bikeway to meet the Geary corridor at Masonic Avenue.

3.5.2.2.2 EXISTING BICYCLE VOLUMES

The Geary corridor does not have a dedicated bicycle facility, and few bicyclists currently travel along the corridor – the Geary corridor carries the fewest bicyclists of all nearby parallel east-west streets, with less than five bicyclists per hour in the morning and afternoon peak periods.[4] However, many cyclists cross Geary Boulevard at various locations. Bicycle volumes on the Geary corridor are over 200 percent heavier east of Masonic Avenue than west of Masonic Avenue. See Appendix D-8 for additional information on existing bicycle volumes along the Geary corridor.

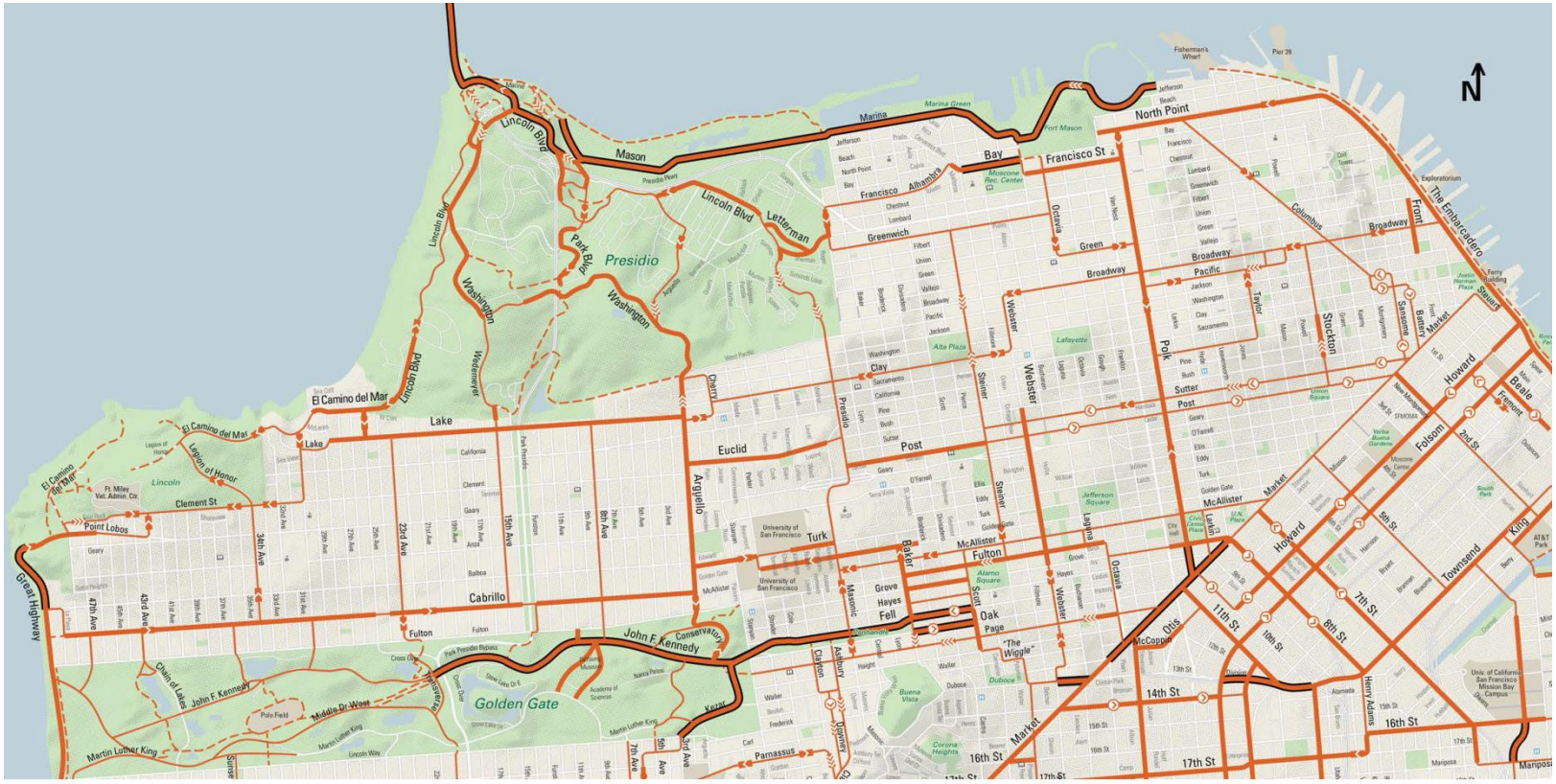
3.5.2.2.3 CORRIDOR PERFORMANCE: BICYCLE COLLISIONS

During a five-year period (2006-2010) there were 69 reported bicycle collisions in the Geary corridor, or about 14 per year. Bicycle collisions are more common east of Van Ness Avenue and on streets parallel to or crossing the Geary corridor rather than along the Geary corridor itself.

Figure 3.5-5 displays bicycle-automobile collisions for the most recently available five-year period: 2007-2011.[5]

[4] SFCTA & SFMTA. 2008. Bicycle Demand Study.
[5] Statewide Integrated Traffic Records System. 2014.

Figure 3.5-3 Existing Study Area Bicycle Network



Note: Figure has been updated since publication of the Draft EIS/EIR.

Source: Adapted from SFMTA, 2017

Figure 3.5-4 Bicycle-Automobile Collisions on Geary Corridor (2007-2011)

3.5.3 | Methodology

In order to assess potential pedestrian and bicycle transportation effects in the study area, this analysis considers future changes to pedestrian and cyclist circulation and activity along the Geary corridor. Anticipated growth in pedestrian activity and future bicycle volumes were modeled using SF-CHAMP. Pedestrian safety, including access for seniors and people with disabilities, was assessed by comparing the provision of safety features, such as pedestrian crossing bulbs, median nose cones, and new signalized intersections, across the No Build and build alternatives. Future pedestrian and bicycling delay were modeled in year 2020 for the No Build Alternative as the environmental baseline to compare all build alternatives.

3.5.4 | Environmental Consequences

This section describes potential impacts and benefits for pedestrian and bicycle transportation. The analysis compares each build alternative relative to the No Build Alternative.

The build alternatives are evaluated against applicable standards and, where no quantifiable standards apply, against the guidance and policies presented in this chapter. As set forth in Section 3.5.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding pedestrian and bicycle impacts in the Draft EIS/EIR.

3.5.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe effects to pedestrian and bicycle conditions during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe effects to pedestrian and bicycle conditions relative to what was disclosed in the Draft EIS/EIR.

SFMTA conducted supplemental transportation analyses of the modifications, documented in separate memoranda,[6,7,8] the results of which are discussed below.

[6] San Francisco Municipal Transportation Agency. *Geary Boulevard Bus Rapid Transit: Pedestrian Bulbout Parking Effects Analysis*. November 15, 2016. This memorandum is available for review at

Retention of the Webster Street Pedestrian Bridge

Construction: The proposed modification would eliminate demolition and excavation activities at this location. This would result in a reduced number of disruptions to pedestrians and bicyclists in the immediate area. Therefore, this modification would not result in any new or more severe pedestrian and bicycle impacts during construction.

Operation: Retention of the Webster Street bridge would enhance conditions for pedestrians by maintaining the existing overcrossing of Geary in addition to providing street-level pedestrian crossings on both sides of the Webster Street intersection with high-visibility crosswalks. Therefore, this modification would not result in any new or more severe pedestrian and bicycle impacts during operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: Given that a new BRT stop would not be built between Spruce and Cook streets, construction (and associated disruptions to pedestrians and bicyclists) would be reduced in this area. Therefore, this modification would not result in any new or more severe pedestrian and bicycle impacts during construction.

Operation: Removal of proposed BRT stops between Spruce and Cook streets would increase walking distance between BRT stops at this location; however, transit-riders would still have access to local service. This modification would not result in additional adverse effects on pedestrian delay, sidewalk conditions, pedestrian safety, access for seniors and persons with disabilities, or bicycle delay. Therefore, this modification would not result in any new or more severe pedestrian and bicycle impacts during operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: All pedestrian improvements would be constructed within existing transportation right-of-way and would not permanently change any lane configurations or turning movements. Construction-period disruptions, such as temporary lane closures around work areas, would be short in duration and similar to that which would occur for other previously proposed pedestrian improvements throughout the corridor. Because the pedestrian improvements are spread across the entire 6.5-mile Geary corridor and would be constructed over time, this modification would not result in any new or more severe pedestrian and bicycle impacts during construction.

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the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

[7] San Francisco Municipal Transportation Agency. *Geary Corridor Bus Rapid Transit Project – Possible Modifications to Staff Recommended Alternative Bus Stops at Laguna and Collins Streets – Supplemental Transportation Analysis Technical Memorandum.* January 4, 2017. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

[8] [8] San Francisco Municipal Transportation Agency. *Geary Boulevard Bus Rapid Transit: 27th Avenue Transition – Transportation Analysis Technical Memorandum*. April 18, 2017. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

Operation: Additional pedestrian crossing improvements would further enhance conditions for pedestrians. This modification would not result in additional adverse effects on pedestrian delay, sidewalk conditions, pedestrian safety, access for seniors and persons with disabilities, or bicycle delay. Therefore, this modification would not result in any new or more severe pedestrian and bicycle impacts during operation.

Addition of BRT Stops at Laguna Street

Construction: Construction of transit islands and reconfiguration of existing curbside bus lanes to accommodate a right-turn lane for vehicles adjacent to the curb at Laguna Street would increase construction-period disruptions to pedestrians and bicyclists. However, temporary disruptions to pedestrians and bicyclists would be short in duration and similar to that which would occur for other previously proposed BRT stops throughout the corridor. Therefore, this modification would not result in any new or more severe pedestrian and bicycle impacts during construction.

Operation: Addition of BRT stops at Laguna Street would decrease walking distance between BRT stops in this area. This modification would not result in additional adverse effects on pedestrian delay, sidewalk conditions, pedestrian safety, access for seniors and persons with disabilities, or bicycle delay. Therefore, this modification would not result in any new or more severe pedestrian and bicycle impacts during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: Given that existing bus stops would no longer be removed at Collins Street, construction (and associated disruptions to pedestrians and bicyclists) would be reduced in this area. Therefore, this modification would not result in any new or more severe pedestrian and bicycle impacts during construction.

Operation: Retention of local and express stops at Collins Street would decrease walking distance between local and express stops in this area. This modification would not result in additional adverse effects on pedestrian delay, sidewalk conditions, pedestrian safety, access for seniors and persons with disabilities, or bicycle delay. Therefore, this modification would not result in any new or more severe pedestrian and bicycle impacts during operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Given that this modification would not alter the total level of construction activities but would simply shift about half of it one block to the west, the nature of construction activities would remain the same – their location would remain in the center of the right-of-way. Therefore, this modification would not result in any new or more severe pedestrian and bicycle impacts during construction.

Operation: The 27th Avenue center-to-side-running transition-point relocation would not change conditions for pedestrians as no change to pedestrian facilities or pedestrian crossing signals would be included. Bicyclists along the corridor would experience the bus moving from the center- to the side-running lane one block farther west when traveling in the westbound direction. This change would not result in any new hazardous conditions for bicyclists. This modification would not result in additional adverse effects on pedestrian delay, sidewalk conditions, pedestrian safety, access for seniors and persons with disabilities, or bicycle delay.

Therefore, this modification would not result in any new or more severe pedestrian and bicycle impacts during operation.

3.5.4.2 | PEDESTRIAN DELAY

Growth in pedestrian activity is anticipated throughout the Geary corridor under both short- and long-term future scenarios. Increases in walking trips would result from new land uses in the corridor as well as higher bus ridership since riders are likely to access transit by walking. The anticipated growth in pedestrian activity shown below (Table 3.5-2) is from the SF-CHAMP model. Compared with existing volumes, overall pedestrian activity is expected to increase by between 9 percent and 30 percent by 2035. Due to variations in land use, density and transit ridership, pedestrian volumes are expected to increase at a higher rate in the eastern section of the corridor that in the west.

Table 3.5-2 Future Pedestrian Volumes

	YEAR	25TH TO BRODERICK	BRODERICK TO LAGUNA	LAGUNA TO VAN NESS
Forecast Volume Growth	2008-2020	2%	4%	20%
	2008-2035	9%	16%	30%

Source: SFCTA, 2013

Table 3.5-3 shows estimated future pedestrian delay by alternative for 2020 and 2035 conditions. Pedestrian delay is derived from the results of the microsimulation modeling analysis, and it includes the delay experienced by pedestrians when waiting at intersections along the Geary corridor between Van Ness and 25th avenues. Overall pedestrian delay is not expected to substantially change under Alternative 2 and the Hybrid Alternative/LPA relative to No Build Alternative conditions, as signal phasing would largely remain similar to existing conditions.

Dividing total delay by the number of persons walking along the corridor allows one to summarize delay on a per-person basis. For Alternative 2 and the Hybrid Alternative/LPA, the average amount of pedestrian delay per person during the p.m. peak hour would be roughly 25-30 seconds per person traversing the corridor. Alternatives 3 and 3-Consolidated would have slightly higher total pedestrian delay, which would be caused by differences in signal phasing for corridor intersections under these alternatives.

With Alternatives 3 and 3-Consolidated, intersections with left turns would function with protected left-turn signal phasing to eliminate conflicts with buses running in center lanes. While protected left turns are generally beneficial for pedestrian safety, they also can result in slight increases in average pedestrian delay at intersections with a protected left-turn signal phase. As a result, some pedestrians must wait a few seconds longer to cross side streets while the left-turn phase is active. Additionally, Alternatives 3 and 3-Consolidated have some "two-stage" pedestrian crossings where dedicated pedestrian signals are installed, which would result in some minor increases in pedestrian delay compared with Alternative 2 and the Hybrid Alternative/LPA. Two-stage pedestrian crossings are crossings where pedestrians cross to the median in one signal phase but then must wait until a walk signal is provided for crossing from the median to the far side of the street. Locations with

two-stage pedestrian crossings assumed include Wood Street, Lyon Street, Broderick Street, and Buchanan Street.

In total, average peak pedestrian delay per person would be about 35-40 seconds for Alternatives 3 and 3-Consolidated, or roughly 10-15 seconds greater per person than the No Build, Alternative 2, and the Hybrid Alternative/LPA.

Table 3.5-3 Future Pedestrian Delay during P.M. Peak Hour (2020 and 2035)

	YEAR	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE/ LPA
Total Peak-Hour Delay (hours of delay)	2020	280	280	470	480	290
	2035	320	300	510	510	320

Source: Fehr & Peers, 2014

3.5.4.3 | SIDEWALK CONDITIONS

The No Build and build alternatives include sidewalk improvements on various segments along the Geary corridor. Sidewalk widening, as well as streetscape elements that create a safer and more pleasant pedestrian experience would be implemented. Specific improvements would include new bus shelters, bus bulbs (curb extensions that provide additional space for bus stops and allow buses to stop without pulling out of traffic), pedestrian crossing bulbs (curb extensions at intersections that shorten crossing distances for pedestrians), upgraded curb ramps, increased pedestrian-scale lighting, and other urban design features. Many sidewalk improvements such as upgraded curb ramps would be completed along the entire Geary corridor. Other improvements, such as new pedestrian crossing bulbs, would be placed at specific locations based on various factors including proximity to high-ridership stops, proximity to senior centers, and feasibility. For more information on these improvements please refer to Chapter 2 (Descriptions of Project Alternatives).

3.5.4.4 | PEDESTRIAN SAFETY

3.5.4.4.1 PEDESTRIAN CROSSING DISTANCES

Pedestrian crossing bulbs and median nose cones reduce roadway crossing distances and provide refuge and improve visibility of the pedestrian to vehicle traffic, therefore reducing their exposure to traffic. As described in Chapter 2, the build alternatives include a provision of bus bulbs to enhance transit access. The build alternatives also include a provision for additional pedestrian crossing bulbs to improve pedestrian safety at high-priority locations (Appendix D-8 provides detail on the process for selecting high-priority locations for bulbouts). These bulbouts would add to the 14 pedestrian crossing bulbs already in process of implementation along the Geary corridor as part of the No Build Alternative, providing 51 more bulbs than the No Build for a total of 65 new bulbouts. The Hybrid Alternative/LPA as revised since the Draft EIS/EIR would provide 77 more bulbs than the No Build, which is 26 more than the other build alternatives and would result in a total of 91 bulbs.

Because of these treatments, the build alternatives would reduce crossing distances at several locations along the Geary corridor. Additional detail is listed below and described in Table 3.5-4.

3.5.4.4.2 NO BUILD ALTERNATIVE

In the No Build Alternative, the crossing distances at most intersections would be similar to those in existing conditions. Exceptions include slight reductions in crossing distance in instances in which a pedestrian crossing bulb is planned. The No Build Alternative would do the least to improve pedestrian safety relative to all of the build alternatives.

3.5.4.4.3 BUILD ALTERNATIVES

Curb-to-curb crossing distance would vary between the No Build and build alternatives. The addition of pedestrian crossing bulbs would reduce curb-to-curb crossing distances for the build alternatives relative to the No Build Alternative. This reduction would be greatest for the Hybrid Alternative/LPA, with 91 pedestrian crossing bulbs at select locations along the Geary corridor (relative to 65 bulbs under Alternatives 2, 3, and 3-Consolidated; see Chapter 2 for further details). In Alternatives 3, 3-Consolidated, and center-running segments of the Hybrid Alternative/LPA, curb-to-curb crossing distances would be divided by a center median and signal. Therefore the total crossing distance would not increase, and the center median would provide refuge for pedestrians not able cross both segments in one signal length.

Under all build alternatives, some segments would have reduced crossing distances due to reductions in the number of lanes, which would result in increased sidewalk widths, reduced pedestrian exposure to vehicle traffic, and opportunities for pedestrian crossing bulbs.

Reductions in the number of lanes would also contribute to reduced traffic speeds, providing some additional benefit to pedestrian safety.

Table 3.5-4 Number of Additional Pedestrian Crossing Bulbs by Alternative

	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE /LPA
Number of Pedestrian Crossing Bulbs Provided to Improve Pedestrian Safety (compared with existing conditions)	14	65	65	65	91
Pedestrian Refuges Added to Medians	No	Yes	Yes	Yes	Yes

Source: Fehr & Peers, 2014, SFCTA/SFMTA 2016

NEW PEDESTRIAN CROSSINGS AND COUNTDOWN SIGNALS

The build alternatives would provide new crosswalks at four locations on the Geary corridor, as listed in Table 3.5-5.

Table 3.5-5 Crosswalk Locations – All Build Alternatives

LOCATION	DESCRIPTION
Buchanan	New signalized crossing for pedestrians
Webster	New crosswalk across Geary Boulevard on eastern and western legs of existing signalized intersection
Steiner	New crosswalk across Geary Boulevard on eastern leg of existing signalized intersection
Broderick	New signalized crossing for pedestrians

Source: Fehr & Peers, 2014

Pedestrian countdown signals reduce the likelihood of pedestrian presence in the crosswalk after the walk phase has ended. New traffic signals installed under the build alternatives would include pedestrian countdown capabilities, which can be an effective pedestrian safety measure. Additionally, all new pedestrian signals described in Table 3.5-5 above would be required to have pedestrian countdown capabilities.

All of the build alternatives would help address the major pedestrian collision types identified in the WalkFirst analysis, including speeding, crossing outside the crosswalk, and left-turn conflicts at signalized intersections. Speeding will be addressed in part by reducing crossing distances (Table 3.5-4); research indicates narrower roadways and fewer travel lanes reduce driver speeding behavior. Fewer travel lanes will also reduce the amount of time pedestrians are exposed to automobile traffic when crossing the Geary corridor, thereby providing additional safety benefits. High contrast colors would be used to denote where the transit islands are located.

Pedestrians crossing outside the crosswalk will be addressed through provision of new signalized crosswalks at locations where none existed previously (Table 3.5-5). The build alternatives would also result in some changes to the location of on-street parking at intersections. Where existing parking spaces decrease pedestrian visibility approaching intersections, removal or "daylighting" of parking has been shown to have resulting benefits to pedestrian safety.[9] Specific locations of parking changes are discussed in greater detail in Section 3.6.

3.5.4.4.4 LEFT- AND RIGHT-TURN CONFLICTS

Left-Turn Conflicts

In addition to the measures listed above, some types of pedestrian collisions could be reduced through the restriction of non-protected or permissive left-turns. A permissive left-turn does not accommodate left-turning vehicles through a left-turn arrow, therefore permitting vehicles to turn as traffic allows and yield to pedestrians. As described above, pedestrians at permitted left-turn locations may not be fully visible to turning vehicles because drivers may be distracted by other factors on the roadway. Therefore, reducing the number of permitted left turns would contribute to improved pedestrian safety on the Geary corridor.

[9] "Daylighting" means improving visibility of and by pedestrians attempting to cross a street, typically by reducing visual obstructions, such as on-street parking, immediately adjacent to intersections.

Also, where left-turns remain, pedestrian access across side streets would be improved for alternatives that would provide a dedicated left-turn signal phase for automobiles. This would mean that pedestrians could cross side streets without potential conflicts from left-turning vehicles. Table 3.5-6 shows the number of protected and permissive left turns by alternative.

All build alternatives include multiple left-turn restrictions. In general, the presence of protected left-turn signal phasing would help reduce the likelihood of pedestrian conflicts with turning vehicles. Collisions involving left turns occur disproportionately along the Geary corridor relative to the citywide average. Protected left-turn signal phasing would be present in Alternatives 3 and 3-Consolidated between Webster and 33rd Avenues, and in the Hybrid Alternative/LPA from Palm Avenue to 33rd Avenue.

Table 3.5-6 Number of Protected and Permissive Left Turns by Alternative

LEFT-TURN TYPE ON GEARY BOULEVARD	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE/ LPA
Protected Left Turns (between Polk Street and 25th Avenue)	3	5	15	16	18
Permissive Left Turns (between Polk Street and 25th Avenue)	37*	31	5	5	10

*Note: After preparation of the traffic study for the Draft EIS/EIR, SFMTA removed left turns at Third and Seventh avenues. See Section 3.4.2.1 for further detail.
Source: Fehr & Peers, 2014

Right-Turn Conflicts

Adequate space for right-turning vehicles can ensure motorists do not encroach into crosswalks while waiting to turn right. Under the build alternatives, several locations with heavy expected right-turn volumes would be designed to include right-turn lanes for automobiles. Due to comparatively increased visibility of pedestrians to drivers, right turns generally result in fewer pedestrian collisions than left turns.

As described in Chapter 2, the locations of right-turn lanes are based on where there are expected to be the heaviest right-turning volumes in the future. In the study area, there would be about nine dedicated right-turn lanes in Alternative 2, eight in Alternative 3, nine in Alternative 3-Consolidated, and seven in the Hybrid Alternative/LPA.

3.5.4.5 | ACCESS FOR SENIORS AND PEOPLE WITH DISABILITIES

The build alternatives would provide improved access for seniors and people with disabilities in several ways. All build alternatives would add new crosswalks at intersections where crossings are restricted today, which would benefit seniors and pedestrians with disabilities by providing more frequent crossing opportunities. Several new landscaping and urban design features, such as new ADA-compliant curb ramps, improved bus waiting areas, and new pedestrian crossing bulbs, nose cones, and pedestrian-scale lighting, would all improve comfort and have potential safety benefits for seniors and people with disabilities. Proximity to senior high-injury-density corridors was considered in the selection of proposed pedestrian crossing bulb locations (see Appendix D-8).

Alternatives 3 and 3-Consolidated, and the section of the Hybrid Alternative/LPA west of Palm Avenue would have center-running transit operations. In these locations, protected left-turn signal phasing for automobiles would be provided, thus reducing potential vehicle-pedestrian conflicts at intersections with left turns from Geary Boulevard to side streets. People with visual impairments may have difficulty identifying locations of bus stops in sections of the corridor with center-running transit operations, but design features such as tactile cues on signal posts would provide wayfinding information to people with visual impairments.

Seniors and people with disabilities would be affected by changes in walking distances to transit stops. Some of the existing bus stops along the Geary corridor would be relocated or removed with the project. Where this occurs, such removal or relocation would make accessing a stop more challenging for some seniors and people with disabilities. Corridorwide, the average distance between bus stops with each alternative is presented above in Section 3.3.3.4 (Future Geary Corridor Ridership). Between any two stops, the maximum distance a passenger would need to walk to reach the closest stop would be half the distance between the stops, while the average passenger would need to walk only one-quarter the distance. In general, average walking distances to the nearest bus stop would increase corridorwide, but not substantially.

According to SFCTA's estimates, the maximum projected increase in average walking distance in any alternative would be about 360 feet with Alternative 3-Consolidated in two locations: between Fillmore Street and Divisadero Street due to the elimination of the local stop at Scott Street; and between Van Ness Avenue and Laguna Street due to the elimination of the local stops at Franklin Street and Gough Street. This equates to an increase of less than one-tenth of a mile and would not result in an adverse effect. The maximum estimated increase in average walking distance would be less for the other build alternatives; the Hybrid Alternative/LPA would have the second-largest increase of about 280 feet between 12th Avenue and 17th Avenue due to the relocation of the Park Presidio stop.

In specific locations where stop changes would occur, walking distances would increase measurably. For example, Alternatives 3 and 3-Consolidated, and the Hybrid Alternative/LPA include the proposed elimination of the local stop at Third Avenue and the retention of the adjacent stops at Arguello Boulevard and Sixth Avenue. The distances between local stops in this area are about 640 feet between Arguello and Third Avenue, and 930 feet between Third Avenue and Sixth Avenue, resulting in average walk distances of 160 feet and 230 feet, respectively. With elimination of the Third Avenue stop, the distance between the remaining stops would increase to 1,560 feet, resulting in an average walk distance for passengers between the stops of about 390 feet.

Proposed stop locations for the build alternatives have been evaluated relative to the locations of senior centers along the Geary corridor. Most senior-living facilities would be located closer or about the same distance away from a stop with the build alternatives. The project team has also conducted outreach to senior centers along the Geary corridor to identify any access issues and refine stop locations as needed.

Although access to stops would be more challenging for some seniors and people with disabilities, the project would include significant improvements to pedestrian conditions and safety. As a result, the project is expected to have an overall neutral to positive effect on access for seniors and people with disabilities.

3.5.4.6 | BICYCLE DELAY

3.5.4.6.1 FUTURE BICYCLE ROUTES

Currently, most planned additions to the San Francisco bicycle network in the Geary corridor from the most recent Bicycle Plan (2009) have been completed. The current bicycle network is shown in Figure 3.5-4.

The Geary Boulevard Bicycle Demand Study (2008) was conducted by SFCTA to identify a bicycle route alignment parallel to the Geary corridor. The preferred alignment that emerged from that study included the addition of a Class II (designated bike lanes) bicycle facility on Anza Street from 23rd Avenue to Masonic Avenue that crossed Geary Boulevard and connected to existing bicycle lanes on Post Street. Existing bicycle lanes on Post Street extend east to Steiner Street. The connection between Anza Street and Post Street would be comprised of Class II accommodations on Masonic Boulevard from Anza Street to Geary Boulevard. Additionally, Class II block-long connector lanes would be installed on Geary Boulevard from Masonic Boulevard to Presidio Avenue and from Presidio Avenue to Post Street.

While the planned bicycle lanes on Anza Boulevard are not included in the build alternatives, the bicycle connection from Anza Street to Post Street across Geary Boulevard would be an element of the build alternatives. It is recommended that a Class II bike lane on Anza Street from 23rd Avenue to Masonic Avenue be included in the next update to the San Francisco Bicycle Strategy (currently underway).

3.5.4.6.2 FUTURE BICYCLE VOLUMES

Bicycle volumes on the Geary corridor are expected to increase from existing conditions in all future scenarios. Table 3.5-7 shows the anticipated growth in bicycling activity, based on SF-CHAMP model results. Compared with existing volumes, overall bicycling activity is expected to increase by about 20 percent by 2020 and by 30 percent by 2035.

In all build alternatives enhanced bicycle accommodations would be added on Geary Boulevard on the one block between Presidio Avenue and Masonic Avenue. This includes designated bicycle lanes in both directions as well as enhanced treatments to promote cyclist visibility.

Table 3.5-7 Future Geary Corridor Bicycle Volumes

	YEAR	25TH TO BRODERICK	BRODERICK TO LAGUNA	LAGUNA TO VAN NESS
Volume Estimated Growth	2008-2020	20%	20%	20%
	2008-2035	30%	30%	30%

Source: SFCTA, 2013

Table 3.5-8 displays bicycling delay in the p.m. peak hour. Bicycle delay is the total amount of time cyclists on the corridor spend slowing down for and speeding up at stop signs or lights as well as time spent idling. Bicycle delay is derived from the results of the VISSIM microsimulation modeling analysis, and it includes the delay experienced by bicyclists when waiting at intersections along the Geary corridor between Van Ness and 25th avenues. Total bicycling delay would be relatively small compared with the delay experienced by pedestrians crossing intersection or buses traveling along the Geary corridor and would not substantially vary among alternatives.

Dividing total delay by the number of persons bicycling along the corridor allows one to summarize delay on a per-person basis. For all build alternatives, the average bicycle delay per person during the p.m. peak hour would be roughly 60-80 seconds per person bicycling along the corridor. As a result, the proposed project is not expected to adversely affect bicycling delays in the corridor.

Table 3.5-8 Future Bicycling Delay during P.M. Peak Hour (2020 and 2035)

	YEAR	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-C	HYBRID ALTERNATIVE/ LPA
Total Peak-Hour Delay (hours of delay)	2020	16	13	18	18	16
	2035	22	19	21	21	19

Source: Fehr & Peers, 2014

3.5.4.6.3 BAY AREA BIKE SHARE (FORD GOBIKE)

The Bay Area Bike Share is a regional bike sharing program with current locations in San Francisco, Redwood City, Palo Alto, Mountain View and San Jose. Bay Area bikes can be rented from and returned to any station within the same city. Bike sharing stations in San Francisco allow for multiple combinations of start and end points, enhancing the existing transportation network. As of winter 2017, the program has been retitled "Ford GoBike." As of winter 2017, numerous "GoBike" stations have been installed within one block of the Geary corridor, including at Raymond Kimbell Playground (Geary Boulevard at Steiner Street) and Webster Street and O'Farrell Street.

3.5.4.7 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, the Hybrid Alternative/LPA would implement the greatest number of pedestrian safety improvements, followed by the other three build alternatives, which would be equal to one another. The No Build Alternative would have the fewest pedestrian and bicycle safety improvements.

3.5.5 | Avoidance, Minimization, and Mitigation Measures

There would be no adverse effects to pedestrian and bicycle circulation along the Geary corridor as a result of the project. The following improvement measures would be useful strategies to allow pedestrian and bicycle travel and access to and from BRT stops and would enhance overall project performance:

- **I-PED-1.** Include WalkFirst pedestrian safety recommendations where possible as part of project design (WalkFirst recommendations described in detail in Appendix D-8).
- **I-PED-2.** Use Universal Design Principles to inform detailed engineering design of pedestrian and station facilities to enhance access for disabled persons.
- **I-PED-3.** Include state of the practice bicycle safety and design treatments for the Masonic-to-Presidio bicycle connection, including current design guidance from the City's Bicycle Plan and other state and national sources.
- **I-PED-4.** Monitor pedestrian safety on parallel streets to assess if and how changes in traffic volumes affect pedestrian safety, and identify improvements to address safety issues if necessary.

3.6 Parking and Loading Conditions

This section presents vehicle parking and loading supply and demand conditions for the Geary corridor. The primary study area for this parking and loading analysis includes on-street spaces on the Geary corridor (as defined in Section 3.2) between 34th Avenue and Market Street. The estimated changes in on-street parking and loading supply under each alternative are discussed.

In order to evaluate how changes to parking in the Geary corridor affect the overall parking supply in the area, this analysis also describes the supply of parking on streets surrounding the Geary corridor and nearby publicly-accessible off-street parking. However, the build alternatives would not involve changes to parking and loading spaces on surrounding streets or in off-street facilities.

3.6.1 | Regulatory Setting

Several plans and policies guide the parking and loading environment on and around the Geary corridor.

3.6.1.1 | THE SAN FRANCISCO GENERAL PLAN

Key policies relating to the provision of on-street parking and loading spaces in the San Francisco *General Plan* include:

- Policy 16.4: Manage parking demand through appropriate pricing policies including the use of premium rates near employment centers well-served by transit, walking and bicycling, and progressive rate structures to encourage turnover and the efficient use of parking.
- Policy 16.5: Reduce parking demand through limiting the absolute amount of spaces and prioritizing the spaces for short-term and ride share uses.
- Policy 33.2: Protect residential neighborhoods from the parking impacts of nearby traffic generators.
- Policy 34.2: Use existing street space to increase residential parking where off-street facilities are inadequate.
- Policy 35.1: Provide convenient on-street parking specifically designed to meet the needs of shoppers dependent upon automobiles.

3.6.1.2 | SAN FRANCISCO BETTER STREETS PLAN (2010)

The *Better Streets Plan* (2010) provides the citywide vision for an improved public right-of-way. The plan sets broad guidelines around creating streets that are balanced and accessible to all users. It encourages streets to be responsive to the needs of all users while also addressing the City's ecological and infrastructure systems. The plan promotes creative use of parking lanes including "permanent curb extensions with seating and landscaping; landscape planters in the parking lane; [and] flexible, temporary use of the parking lane for restaurant seating or other uses."

3.6.1.3 | SAN FRANCISCO TRANSPORTATION CODE

The San Francisco Transportation Code contains ordinances relevant to the provision of on-street parking and loading spaces. In particular, the Code defines parking meter zones and rates; designates residential parking permit zones; and regulates parking signage.

3.6.1.4 | AMERICANS WITH DISABILITIES ACT

The Americans with Disabilities Act regulates the provision of accessible parking spaces and corresponding signage.

3.6.2 | Affected Environment

The Geary corridor currently provides a diverse supply of on-street parking and loading facilities, including metered and unmetered general parking spaces, residential parking permit zones, commercial and passenger loading zones, and parking spaces for persons with disabilities. The composition of land uses and corresponding parking types varies from block to block. The majority of on-street parking spaces along the Geary corridor are oriented parallel to the street; however, in the Richmond District, particularly between 15th and 27th Avenues, many blocks have front-in angled parking.

As further detailed in Section 3.6.3 below, in late 2013, SFCTA conducted detailed parking studies in the two areas in which the build alternatives would potentially result in the highest levels of parking supply loss. These study areas are in the vicinity of Masonic Avenue and Fillmore Street. SFCTA collected parking occupancy data in these areas to serve as the basis for the analysis of build alternatives' potential effects parking supply.

Types of parking and loading spaces in the Geary corridor include:

- **Metered spaces:** Most on-street parking spaces in commercial areas are metered and typically subject to time limits. In addition, demand-responsive pricing was instituted along certain blocks in the Union Square and Fillmore neighborhoods as part of the SFpark Pilot program.[1]
- **Residential Parking Permit (RPP) spaces:** On-street parking in some residential areas is controlled through SFMTA's Residential Permit Parking (RPP) program, which limits long-term parking in designated RPP zones, except for RPP permit holders.
- **Parking for people with disabilities (blue-colored curbs):** These spaces are generally located in close proximity to uses that are frequently accessed by people with disabilities and are close to a nearby curb ramp.
- **Unrestricted parking:** Some block faces, typically in residential areas, do not have meters, time limits, or other restrictions.

[1] For more information, see www.sfpark.org.

- **Commercial loading spaces (yellow-colored curbs):** Freight delivery and service vehicle demand in San Francisco is served via off-street facilities within buildings, as well as via on-street commercial loading spaces. On-street commercial loading spaces are provided to allow commercial vehicles (typically trucks and service vehicles) to park along the curb to load and/or unload goods. These spaces are frequently used by building service vehicles, contractors, and delivery vehicles for buildings with no supply of off-street parking.
- **Passenger loading zones (white-colored curbs):** Passenger loading zones provide places to load and unload passengers for adjacent businesses and residences, and are intended for quick passenger drop-off and pick-up. Within the Geary corridor, passenger loading zones serve a wide variety of different uses, including hotels, theaters, tour bus operators, churches, medical centers, and senior living facilities. These zones require a permit from SFMTA that must be renewed biennially.
- **Short-term parking spaces (green-colored curbs):** Green curbs are for short-term parking and are generally located in close proximity to commercial businesses with brief customer transactions, such as post offices, dry cleaners, and ATM machines. In unmetered areas, green curbs typically have a 10-minute time limit, while green space meters have either a 15- or 30-minute time limit.

SFCTA counted the existing on-street parking and loading supply in the study area in 2013. On-street parking has not changed substantially corridor-wide since 2013. Therefore, the 2013 estimates are still valid and relevant to this Final EIS, except between Van Ness Avenue and Market Street, for which this Final EIS presents updated counts of on-street parking spaces. Where individual parallel spaces were not demarcated by pavement markings or meters, the number was estimated based on a typical parking stall length of 18 to 20 feet, per SFMTA standards. Table 3.6-1 summarizes the number and type of existing on-street spaces along the Geary corridor. There are an estimated total of 1,682 parking and loading spaces along the Geary corridor between 34th Avenue and Market Street. Most of the spaces identified (74 percent) are metered or non-metered general parking spaces, including spaces in RPP zones. Fourteen percent of the spaces are designated for commercial loading at some or all times, 11 percent are for passenger loading, and about one percent is parking for people with disabilities.

Individual on-street spaces often vary in use between times of day and days of the week. For example, many spaces are designated for loading activities only during specified daytime hours but become general parking spaces in the evening and overnight. Therefore, the supply of loading spaces substantially overlaps with the supply of parking spaces.

Table 3.6-1 provides the parking and loading space supply by segment of the corridor. The general characteristics of parking in the Geary corridor generally vary by segment, as follows:

- **34th Avenue to 25th Avenue**. West of 28th Avenue, the land uses along Geary Boulevard are mostly residential with unmetered and unrestricted parallel parking along the curb. East of 28th Avenue, many buildings include

retail businesses; parking is metered. Several block faces at the eastern end of this segment have angled parking.

- **25th Avenue to Park Presidio**. This segment passes through the center of the Richmond retail district, with metered parking on all blocks and angled parking on all blocks except those at the east and west ends of the segment. Few retail businesses in this segment of the corridor provide off-street parking, although there are several privately-operated public parking facilities.
- **Park Presidio to Palm Avenue**. Much of this segment is lined with retail, although many businesses are auto-oriented (e.g. drive-through restaurants, auto sales and repair) and/or have off-street parking. On-street parking throughout this segment consists of metered parallel spaces.
- **Palm Avenue to Broderick Street**. West of Masonic Avenue, this segment is lined with retail, including some that are auto-oriented or have off-street parking supplies. All on-street parking is metered and parallel. There are no on-street parking spaces between Masonic and Presidio Avenues, but the major retailers nearby have off-street parking. Several block faces between Presidio Avenue and Broderick Street are primarily residential and have unmetered parking, some of which is time-restricted and/or part of an RPP district, and some of which is unregulated. Other block faces at the west end of the segment are metered.
- **Broderick Street to Laguna Street**. Parking supply and restrictions in this segment vary according to the adjacent land uses. The block faces with office and medical uses at the western end of this segment, as well as those with adjacent retail in the Fillmore and Japantown neighborhoods, have metered on-street spaces, and are also proximate to large supplies of public and private off-street parking. Several residential block faces in this segment are part of RPP districts. Some parking is unmetered and unregulated, particularly adjacent to the educational and recreational facilities between Scott and Steiner Streets.
- **Laguna Street to Van Ness Avenue**. Given primarily residential, religious, and office uses in this segment, only the on-street parking between Franklin Street and Van Ness Avenue is metered. No on-street parking is provided on Starr King Way between Franklin and Gough Streets or adjacent to the Chinese consulate between Laguna Street and Cleary Court. The remainder of the on-street parallel parking within this segment is part of an RPP district or unregulated.
- **Van Ness Avenue to Market Street**. There is a lower level of dependency upon on-street parking spaces in this segment of the corridor, due to a combination of factors including very high population density, a high proportion of households that do not own a vehicle, and access to off-street parking garages.[2] Most on-street spaces are designated for commercial or passenger loading during certain times, as shown in Table 3.6-1. In addition, parking and loading is prohibited along many block faces during peak hours to facilitate transit and vehicle movement.

[2] San Francisco Planning Department, 2011. San Francisco Neighborhoods Socio-Economic Profiles. http://www.sf-planning.org/Modules/ShowDocument.aspx?documentid=8501

Table 3.6-1 Existing On-street Parking and Loading Supply along Geary Boulevard, Geary Street, and O'Farrell Street (2017)

SEGMENT NAME	GENERAL PARKING SPACES	LOADING SPACES*		SPACES FOR PEOPLE W/DISABILITIES	TOTAL NUMBER OF SPACES
		COMMERCIAL	PASSENGER		
34th Ave. – 25th Ave.	118	3	9	3	133
25th Ave. – Park Presidio	218	10	0	4	232
Park Presidio – Palm Avenue	202	7	22	4	235
Palm Avenue – Broderick	208	2	12	2	224
Broderick – Laguna	231	8	17	4	260
Laguna – Van Ness	102	2	15	3	122
Van Ness – Market	165	205	106	0	476
Corridor total	1,244	237	181	20	1,682

* Loading space counts include all spaces that are designated for loading at any time. Many serve as parking spaces outside designated loading hours.

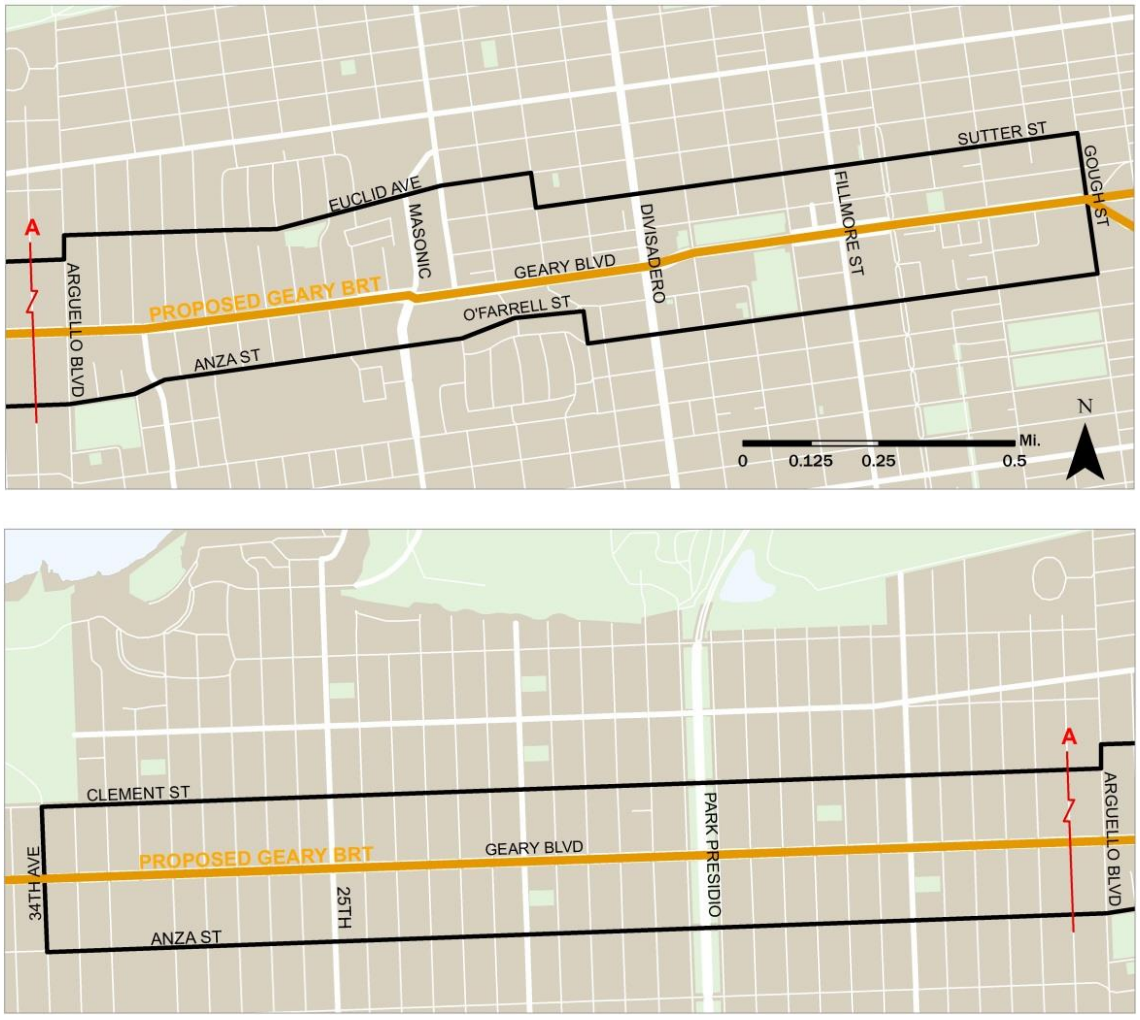
3.6.3 | Methodology

This parking analysis assesses the change in supply that would result from implementation of the build alternatives both in the Geary corridor as a whole as well as for identified segments of the Geary corridor. Counts of spaces along the streets comprising the Geary corridor were completed from 34th Avenue to Market Street. In addition, in order to evaluate whether parking demand could be met by anticipated future parking supply in the area, the number of nearby and convenient public parking spaces was estimated for the segments of the corridor between 34th Avenue and Gough Street (refer to Figure 3.6-1). These area-wide estimates included on-street parking on side streets and publicly-accessible off-street parking. The area-wide analysis terminates at Gough Street because none of the build alternatives would result in substantial changes to the net supply of parking east of Gough.[3]

To quantify the total parking supply available, all parking and loading spaces are considered together, including unrestricted parking spaces, metered spaces, short-term spaces, and RPP zone spaces, since many users could use one or more types of spaces. Given the need to locate spaces designated for persons with disabilities as close as possible to their users' destinations, a separate analysis was conducted of needed space relocations (refer to Section 3.6.4.5). The supplies of parking and loading spaces in the corridor are largely interchangeable. Much of the loading zone supply consists of spaces that are designated for loading at certain hours of the day but become general parking spaces in the evening and overnight. In addition, spaces for passenger loading require permits that applicants must regularly renew; without permits, they revert to parking spaces. Therefore, the parking supply analysis does not distinguish between parking and loading spaces, but considers them together. Since spaces that serve loading needs are of higher priority to locate near their users (e.g. businesses receiving deliveries), a separate analysis of loading spaces alone was conducted to identify where spaces could not be relocated within an acceptable distance of users (refer to Section 3.6.4.6).

[3] Each build alternative would result in the removal of 30 on-street parking spaces in the Geary corridor east of Gough Street. See Table 3.6-3.

Figure 3.6-1 Area-wide Parking Study Area



Area-wide parking estimates are conservative in that they do not include parking spaces in off-street lots or garages that are not accessible to the public, such spaces add to the total parking supply available in a given area. None of the build alternatives would remove any off-street spaces in garages or lots. Outside the Masonic and Japantown/Fillmore study areas, which are defined and discussed in detail below, the corridor-wide counts also do not include public off-street lots or garages.

Since transit riders often need to walk at least a block or two from a bus stop in order to reach a destination, drivers can be expected to walk a similar distance from a parking spot to a destination. Thus, the analysis includes the area shown in Figure 3.6-1, encompassing about 700 feet north and south of Geary Boulevard, or one block in the western portion of the corridor and two blocks in the eastern portion of the corridor where blocks are smaller. The analysis is conservative (i.e., "worst-case"), as the selected distance is well within the accepted significance criterion of one-quarter to one-half mile. Outside the Masonic and Fillmore study areas, counts of parking spaces on sample blocks were used to develop typical ratios of the number of spaces per block, accounting for unusable curb space dedicated to curb

cuts/driveways, red curbs, and other purposes. Different ratios were developed for areas with different parking patterns (e.g., angled parking). These typical ratios were used to estimate the existing on-street parking supply for the area.

Anticipated changes to parking and loading are approximate. Estimates are based on preliminary project design conducted to date. Future parking supply was estimated by identifying losses and gains in on-street parking for each Geary corridor segment under each build alternative.

On-street parking loss could result from construction of new station platforms, pedestrian crossing bulbs, travel lane striping to accommodate bus-only lanes, or exclusive right- and left-turn pockets. Parking gains could result from bus stop consolidation, relocation of curb bus stop locations, restriping of existing curb lanes for parking, or addition of parking spaces through restriping of existing parking.

SFCTA and SFMTA have worked to minimize parking loss through the following project design principles, wherever feasible:

- Replacement of on-street parking where bus stops would be consolidated or moved to the center of the street.
- Addition of new on-street parking, including conversion of parallel parking to back-in angled parking, where possible as a result of travel lane restriping.
- Provision of additional infill spaces.

3.6.4 | Environmental Consequences

This section describes potential impacts and benefits related to parking and loading. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 3.6.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding parking impacts in the Draft EIS/EIR.

3.6.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe effects to parking and loading conditions during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe effects to parking and loading conditions relative to what was disclosed in the Draft EIS/EIR.

SFMTA conducted supplemental transportation/parking analyses of the modifications, documented in separate memoranda,[4,5,6] the results of which are discussed below.

The modifications to the Hybrid Alternative/LPA would result in a net decrease in area-wide and on-street public parking supply relative to what was disclosed in the Draft EIS/EIR. Specifically, and as further described below, the Draft EIS/EIR estimated that the Hybrid Alternative would reduce area-wide parking supply from about 9,800 spaces to about 9,500 spaces – removing about 370 spaces on the corridor. The changes to the Hybrid Alternative/LPA would reduce area-wide supply by about another 35 spaces (leaving about 9,470 spaces area-wide and removing about 410 spaces on the corridor). The change in parking supply is due to project changes dispersed throughout the corridor, including the additional pedestrian improvements (daylighting at intersections, pedestrian bulbs) and the addition of a Laguna Street BRT stop. The net change in on-street parking spaces associated with each minor modification would be as follows:

1) Retention of the Webster Street pedestrian bridge: 0 spaces
2) Removal of proposed BRT stops between Spruce and Cook streets: +10 spaces
3) Addition of more pedestrian crossing and safety improvements: -25 spaces
4) Addition of BRT stops at Laguna Street: -14 spaces
5) Retention of existing local and express stops at Collins Street: -8 spaces
6) Relocation of the westbound center- to side-running bus lane transition: +2 spaces

As further detailed below, the net decrease in on-street parking spaces as a result of modifications to the Hybrid Alternative would constitute a negligible portion of overall parking loss and would not result in any new or more severe parking effects relative to what was described in the Draft EIS/EIR.

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[4] San Francisco Municipal Transportation Agency. *Geary Boulevard Bus Rapid Transit: Pedestrian Bulbout Parking Effects Analysis.* November 15, 2016. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

[5] San Francisco Municipal Transportation Agency. *Geary Corridor Bus Rapid Transit Project – Possible Modifications to Staff Recommended Alternative Bus Stops at Laguna and Collins Streets – Supplemental Transportation Analysis Technical Memorandum.* January 4, 2017. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

[6] [6] San Francisco Municipal Transportation Agency. *Geary Boulevard Bus Rapid Transit: 27th Avenue Transition – Transportation Analysis Technical Memorandum*. April 18, 2017. This memorandum is available for review at the San Francisco County Transportation Authority, 1455 Market Street, 22nd Floor, San Francisco, CA 94103.

Retention of the Webster Street Pedestrian Bridge

Construction and Operation: This modification would result in no change in parking supply and no change in loading supply relative to what was described in the Draft EIS/EIR.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction and Operation: Because no new side-running BRT stops would be constructed here, this modification would retain 10 on-street parking spaces and result in no change in loading space supply relative to what was described in the Draft EIS/EIR.

Addition of More Pedestrian Crossing and Safety Improvements

Construction and Operation: Since several of these improvements, particularly daylighting, require clear curb areas, this modification as a whole would further reduce on-street parking by about 25 spaces relative to what was described in the Draft EIS/EIR. These improvements would further require relocation of two loading spaces (at Mason/Geary and Hyde/O'Farrell), but no net loss in on-street loading spaces relative to what was described in the Draft EIS/EIR.

Addition of BRT Stops at Laguna Street

Construction and Operation: Because this change would result in the need to construct BRT stops, this modification would further reduce on-street parking by about 14 spaces relative to what was described in the Draft EIS/EIR. This modification would not alter on-street loading in this location.

Retention of Existing Local and Express Stops at Collins Street

Construction and Operation: Because this change would retain existing bus stops (rather than remove such stops and open the curb space for additional on-street parking), this modification would further reduce on-street parking by eight spaces relative to what was described in the Draft EIS/EIR. This modification would not alter on-street loading in this location.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction and Operation: The relocation of the transition would lessen the reduction in on-street parking supply relative to what was described in the Draft EIS/EIR. Specifically, this modification would increase on-street parking by two spaces relative to what was described in the Draft EIS/EIR. This modification would have no change to on-street loading supply in this location.

3.6.4.2 | AREA-WIDE PARKING SUPPLY

Table 3.6-2 shows estimates of the existing area-wide public parking supply by segment, including the on-street supply in the Geary corridor as a whole and public off-street supplies in the Masonic and Japantown/Fillmore areas, as well as the percentage change in area-wide supply resulting from each alternative. Depending on the alternative, the project would remove two percent (Alternative 3-Consolidated) to four percent (Alternative 2 and Alternative 3) of the area-wide public parking supply along the corridor. The highest parking losses in a single segment would be with Alternative 3 in the 25th Avenue to Park Presidio and Palm Avenue to Broderick segments, where the loss of parking would comprise seven percent of the total area-wide public parking supply.

No major changes to the parking supply would occur in the No Build Alternative because it does not include significant changes to the street configuration, although the several proposed pedestrian crossing bulbs could result in the loss of one or two spaces each, depending on location and design. In addition, the No Build Alternative assumes that on-street parking will be removed along Masonic Avenue south of Geary Boulevard as part of the planned Masonic Avenue Streetscape Improvement Project.

Table 3.6-2 Change in Area-wide Public Parking Supply in the Geary Corridor, by Alternative and Corridor Segment (2017)

		AREA-WIDE PUBLIC PARKING SUPPLY (WITH % CHANGE)			
CORRIDOR SEGMENT	ESTIMATED PUBLIC PARKING SPACES IN AREA	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/ LPA
34th Avenue – 25th Avenue	1,000	950 (-6%)	960 (-4%)	960 (-4%)	960 (-4%)
25th Avenue – Park Presidio	1,430	1,380 (-4%)	1,320 (-7%)	1,410 (-1%)	1,410 (-1%)
Park Presidio – Palm Avenue	1,750	1,710 (-2%)	1,740 (-1%)	1,770 (+1%)	1,750 (0%)
Palm Avenue – Broderick	1,830	1,740 (-5%)	1,710 (-7%)	1,760 (-4%)	1,730 (-5%)
Broderick – Gough	3,790	3,630 (-4%)	3,700 (-2%)	3,730 (-1%)	3,650 (-4%)
Corridor (34th – Gough) total	9,800	9,400 (-4%)	9,430 (-4%)	9,630 (-2%)	9,470 (-3%)

Note: SFCTA rounded to nearest ten. Not all numbers sum correctly due to rounding. This table has been revised to reflect the on-street parking changes associated with the minor modifications to the Hybrid Alternative since the publication of the Draft EIS/EIR.

3.6.4.3 | CORRIDOR PARKING SUPPLY

The previous section focused on area-wide parking effects, inclusive of both on- and off-street parking spaces, both public and private. This section considers just on-street parking along the streets comprising the Geary corridor. Table 3.6-3 shows the supply of on-street spaces under the build alternatives by segment and the anticipated changes in this supply. These changes in supply are most appropriately considered in relation to the area-wide supply shown above because motorists can park either on the Geary corridor itself or on surrounding streets.

Table 3.6-3 On-Street Parking Spaces in the Geary Corridor

CORRIDOR SEGMENT	NUMBER OF ON-STREET PARKING SPACES IN GEARY CORRIDOR (WITH CHANGE)				
	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/LPA
34th Avenue – 25th Avenue	130	80 (-60)	100 (-40)	90 (-40)	90 (-40)
25th Avenue – Park Presidio	230	180 (-50)	130 (-110)	210 (-20)	210 (-20)
Park Presidio – Palm Avenue	240	190 (-40)	220 (-10)	250 (+20)	240 (0)
Palm Avenue – Broderick	220	140 (-90)	100 (-120)	160 (-70)	120 (-100)
CORRIDOR SEGMENT	NUMBER OF ON-STREET PARKING SPACES IN GEARY CORRIDOR (WITH CHANGE)				
	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/LPA
Broderick – Laguna	260	120 (-140)	200 (-60)	230 (-30)	130 (-130)
Laguna – Van Ness	120	60 (-60)	70 (-50)	80 (-40)	50 (-70)
Van Ness – Market	480	450 (-30)	450 (-30)	450 (-30)	440 (-40)
Corridor total	1,680	1,220 (-460)	1,260 (-430)	1,470 (-210)	1,280 (-410)

Note: SFCTA rounded to nearest ten. Not all numbers sum correctly due to rounding. This table has been revised to reflect the on-street parking changes associated with the minor modifications to the Hybrid Alternative since the publication of the Draft EIS/EIR as well as changes in existing conditions between Van Ness – Market following publication of the Draft EIS/EIR.

All build alternatives would result in net parking losses in the Geary corridor as a whole. Alternative 2 is expected to result in a net loss of approximately 460 spaces along the Geary corridor. The other alternatives would result in less parking loss, from between 210 and 430 spaces.

Changes in the location and amount of parking supply would vary by alternative. For example, the Hybrid Alternative/LPA would not result in the net loss of parking between Park Presidio Boulevard and Palm Avenue (center-running bus-only lane), but would result in parking losses in other corridor segments. The largest amount of parking supply loss in a single segment (120 or more spaces) would occur in the following locations:[7]

- In the Broderick to Laguna segment, which includes the Fillmore underpass; in **Alternative 2**.
- In the Palm Avenue to Broderick segment (including the Masonic underpass) in **Alternative 3**.
- In the Broderick to Laguna segment in the **Hybrid Alternative/LPA**.

These segments encompass the business districts surrounding Masonic Avenue and within the Fillmore and Japantown neighborhoods. A more detailed parking analysis (described below in Section 3.6.4.4) was undertaken for these areas in order to assess the availability of alternate parking supplies.

Table 3.6-3 has been revised to reflect the on-street parking changes associated with the minor modifications to the Hybrid Alternative since the publication of the Draft EIS/EIR (see Section 3.6.4.1 above).

[7] Parking losses would not exceed 70 spaces for any segment within Alternative 3-Consolidated.

The build alternatives are not expected to increase parking demand in the Geary corridor. Parking demand is expected to decrease as a result of the proposed transit improvements, which are projected to increase transit ridership partly by diverting some auto trips in the Geary corridor to transit trips.

3.6.4.4 | ON STREET PARKING SUPPLY IN MASONIC AND FILLMORE AREAS

A more detailed parking analysis was undertaken for the two areas that would have the highest levels parking supply loss under certain project alternatives – the Masonic and Fillmore study areas, defined below. Parking occupancy data was collected for these areas in order to determine whether the demand for parking along Geary Boulevard could be accommodated with a reduced area-wide public parking supply. The results of this effort are described below.

3.6.4.4.1 MASONIC STUDY AREA

The Masonic study area, shown in Figure 3.6-2, is bounded by Collins Street to the west, Euclid Avenue/Bush Street to the north, Baker Street to the east, and O'Farrell Street to the south. This area is intended to encompass the retail district surrounding the intersection of Geary Boulevard and Masonic Avenue as one of the areas that could be most affected by parking losses with the project, depending on the alternative selected. Table 3.6-4 shows the total number of existing public parking spaces in the Masonic study area, including on-street parking spaces located both on and off of Geary Boulevard. Although there are large supplies of private off-street parking for retail customers in the Masonic study area, there is no public off-street parking. Field data for on-street parking occupancy in the area was collected from 2:00 PM to 8:00 PM on Tuesday, November 23 and Saturday, December 3, 2013. These survey periods were selected to mirror the highest-occupancy time periods in the Japantown/Fillmore area during a typical week with no special events, excluding the Saturday late-night period because the Masonic study area does not have a similar concentration of nightlife-oriented land uses. Both survey days also had fair weather (no precipitation). Not all streets within the study area were surveyed, as shown in Figure 3.6-2.

Figure 3.6-2 Masonic Study Area

During the data collection period, a maximum of 73 percent of area parking spaces in the Masonic study area were occupied, as shown in Table 3.6-4. There was a higher parking occupancy rate for parking off of Geary Boulevard than parking on Geary Boulevard, potentially because many side streets are not metered.

Table 3.6-4 Parking Supply and Occupancy in the Masonic Study Area

	EXISTING SPACES	PEAK OCCUPANCY TIME PERIOD	PEAK OCCUPANCY
On-street, on Geary	109	Sat. 5 PM – 8 PM	68%
On-street, off Geary[8]	885[9]	Sat. 2 PM – 5 PM	78%
Total Area Parking Supply	994	Sat. 2 PM – 5 PM	73%

Table 3.6-5 shows the projected parking loss in the Masonic study area for each alternative. Although the project would result in the loss of seven to nine percent of the area parking supply, the number of spaces eliminated would be substantially fewer than the number of spaces currently unoccupied at peak times, indicating that sufficient parking capacity would remain to accommodate demand.

[8] The Masonic study area is bounded by Collins Street to the west, Euclid Avenue/Bush Street to the north, Baker Street to the east, and O'Farrell Street to the south; however, not all streets within the study area were surveyed in order to calculate peak occupancy. The study area and streets surveyed are depicted in Figure 3.6-2.

[9] Existing space count has been revised to account for spaces on Masonic Avenue eliminated in 2017 as part of the Masonic Avenue Streetscape Improvements Project. The peak occupancy rate has not been reassessed. See also Section 5.5.3 for considerations of cumulative impacts related to parking and loading.

Table 3.6-5 Change in Parking Supply in the Masonic Study Area

ALTERNATIVE	NUMBER OF PARKING SPACES ON GEARY	PERCENT CHANGE IN AREA PUBLIC PARKING SUPPLY
No Build Alternative	109	N/A
Alternative 2	32	-8%
Alternative 3	16	-9%
Alternative 3-Consolidated	36	-7%
Hybrid Alternative/LPA	23*	-9%

Note: *One parking space was removed due to a text correction; eight spaces were removed due to the Collins Street bus stop changes.

3.6.4.4.2 JAPANTOWN/FILLMORE STUDY AREA

The Japantown/Fillmore study area, shown in Figure 3.6-3, is bounded by Sutter Street to the north, Gough Street to the east, Ellis Street to the south, and Steiner Street to the west. This area is intended to encompass the retail districts of the Fillmore and Japantown neighborhoods as some of the areas that could be most affected by parking losses with the build alternatives, depending on the alternative selected. Table 3.6-6 shows the total number of existing public parking spaces in the Japantown/Fillmore area, including on-street parking spaces located both on and off Geary Boulevard as well as off-street publicly-accessible parking facilities (both publicly- and privately-operated). Occupancy data was collected for all on-street spaces and, where available, for public off-street spaces. The SFpark program provided parking occupancy data for monitored on-street spaces and the Japantown Center and Japantown Center Annex garages recorded from Sunday, September 29, 2013 to Saturday, October 5, 2013. A field survey of the remaining on-street spaces in the area was conducted on November 14 and 16, 2013 from 5:00 PM to 8:00 PM to coincide with the peak demand hours identified in the SFpark data. The survey was conducted on typical days with fair weather and no special events. Occupancy data was not available for privately owned and operated off-street garages in the Japantown/Fillmore area.

Figure 3.6-3 Japantown/Fillmore Parking Study Area

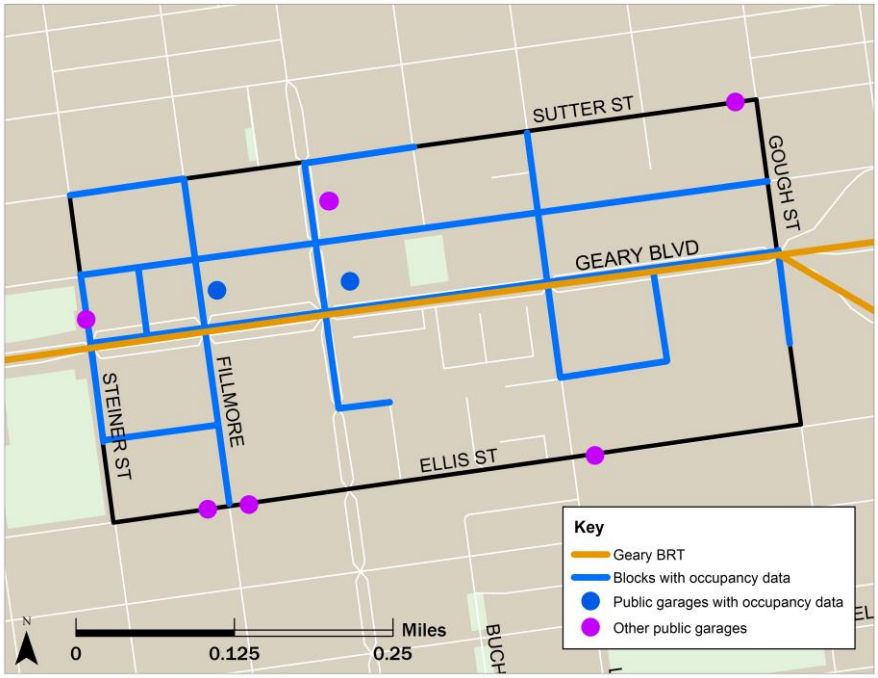

Table 3.6-6 shows that a maximum of 80 percent of area parking spaces were occupied during the data collection period. Although spaces on Geary Boulevard were 89 percent occupied during the peak period, off-street spaces had lower occupancy rates.

Table 3.6-6 Parking Supply and Occupancy Data in the Japantown/Fillmore Study Area

	EXISTING SPACES	PEAK OCCUPANCY TIME PERIOD	PEAK OCCUPANCY
On-street, on Geary	154	Sat. 8 PM – 12 AM	89%
On-street, off Geary	1,097	Sat. 8 PM – 12 AM	86%
Off-street	1,678	Sat. 12 PM – 5 PM; Sat. 5 PM – 8 PM	75%*
Total Parking Supply	2,929	Sat. 5 PM – 8 PM	80%

*Off-street parking occupancy data includes only publicly operated garages.

Table 3.6-7 shows the projected parking loss in the Japantown/Fillmore study area for each alternative. The build alternatives would result in the loss of two to four percent of parking spaces in the area, and the number of spaces eliminated would be substantially fewer than the number of spaces currently unoccupied at peak times, indicating that sufficient parking capacity would remain to accommodate demand.

Table 3.6-7 Change in Parking Supply in the Japantown/Fillmore Study Area

ALTERNATIVE	NUMBER OF PARKING SPACES ON GEARY	PERCENT CHANGE IN AREA PUBLIC PARKING SUPPLY
No Build Alternative	154	N/A
Alternative 2	60	-3%
Alternative 3	105	-2%
Alternative 3-Consolidated	105	-2%
Hybrid Alternative/LPA	45*	-4%

*Note: One parking space was removed due to a text correction; 14 spaces were removed due to the Laguna Street bus stop changes.

3.6.4.5 | PARKING FOR PEOPLE WITH DISABILITIES

No major changes to the supply or locations of parking spaces designated for persons with disabilities would occur in the No Build Alternative. Under the build alternatives, where removal of curb spaces is necessary, the project would prioritize retention and replacement of parking spaces for people with disabilities above all other types of parking spaces.

The parking analysis identifies potential locations to replace all parking spaces reserved for people with disabilities that would be affected by the build alternatives. Where possible, spaces would be relocated on the same block face. The analysis seeks to minimize walking distances and street crossings between existing spaces to be removed and new replacement spaces. Where spaces could not be relocated on the same block face, they typically would be moved to the nearest cross street close to its intersection with Geary Boulevard. Relocated spaces on side streets would be placed along commercial or mixed-use building frontages, and would not extend into residential areas. In some cases, there are multiple options available to relocate lost spaces within a reasonable distance, and the project team would work with affected land uses to identify which location best meets the needs of users and the project.

Table 3.6-8 shows the number of parking spaces for people with disabilities that would be relocated with each alternative. All build alternatives, except for Alternative 2, would be able to retain all such spaces on the same block face. Alternative 2 would entail the relocation of four spaces in the corridor to nearby blocks. In the case of Alternative 2, existing spaces could be replaced in close proximity to their current locations, within a distance of 250 feet. Across all build alternatives, the supply of parking spaces for people with disabilities would remain constant.

Table 3.6-8 Change in Supply of Parking Spaces for People with Disabilities, by Build Alternative and Corridor Segment

CORRIDOR SEGMENT	NUMBER OF SPACES FOR PEOPLE W/DISABILITIES: NO BUILD ALTERNATIVE	CHANGE IN NUMBER OF SPACES IN GEARY CORRIDOR							
		ALTERNATIVE 2		ALTERNATIVE 3		ALTERNATIVE 3C		HYBRID ALTERNATIVE/LPA	
		SPACES RE-LOCATED TO NEARBY BLOCKS	CHANGE IN TOTAL SUPPLY OF SPACES	SPACES RE-LOCATED TO NEARBY BLOCKS	CHANGE IN TOTAL SUPPLY OF SPACES	SPACES RE-LOCATED TO NEARBY BLOCKS	CHANGE IN TOTAL SUPPLY OF SPACES	SPACES RE-LOCATED TO NEARBY BLOCKS	CHANGE IN TOTAL SUPPLY OF SPACES
34th Avenue – 25th Avenue	3	1	0	0	0	0	0	0	0
25th Avenue – Park Presidio	4	0	0	0	0	0	0	0	0
Park Presidio- Palm Avenue	4	3	0	0	0	0	0	0	0
Palm Avenue – Broderick	2	0	0	0	0	0	0	0	0
Broderick – Laguna	4	0	0	0	0	0	0	0	0
Laguna – Van Ness	3	0	0	0	0	0	0	0	0
Van Ness – Market	0	0	0	0	0	0	0	0	0
Corridor Total	20	4	0	0	0	0	0	0	0

3.6.4.6 | LOADING ZONE SUPPLY

No major changes to the supply or locations of loading zones would occur in the No Build Alternative, but the build alternatives would each entail the relocation or removal of some commercial and passenger loading zones in the study area. However, with all build alternatives all existing loading spaces would be replaced in close proximity to their current locations or their demand could be served with existing nearby loading zones.

While demand for parking is variable and drivers can switch travel patterns or modes if parking is not readily available, commercial loading demand is more likely to remain constant regardless of the supply of loading zones because few alternatives exist to truck or other deliveries. Therefore, if sufficient loading zones are not provided, commercial delivery vehicles are more likely to double park or otherwise park illegally, potentially creating hazards and adversely affecting traffic and transit performance.

The loading analysis identifies potential locations to replace nearly all commercial and passenger loading spaces that would be affected by the project, with the exceptions described below. All other spaces could be replaced within the accepted threshold distance of 250 feet. Tables 3.6-9 and 3.6-10 show the number of commercial and passenger loading spaces, respectively, that would be consolidated or replaced with each alternative.

Relocated commercial loading spaces on side streets would be located along commercial or mixed-use building frontages, and would not extend into residential areas. In some cases, obstacles (e.g., bus stops) prevent relocation of loading zones on the nearest cross street, so replacement loading zones would be created on other nearby cross streets or the opposite side of Geary Boulevard.

With Alternative 3 on Geary Boulevard between 10th and 9th Avenues, not all loading spaces could be replaced. Currently, there are six passenger loading spaces on the south side of the block that serve a funeral home. In addition to the six spaces on Geary Boulevard, the funeral home currently has four passenger loading spaces on 10th Avenue and an off-street parking lot. Under Alternative 3, the six passenger loading spaces on Geary Boulevard would be eliminated, and four of them could be relocated to 10th Avenue, replacing existing metered parking. The funeral home would have a total of eight passenger loading spaces, a net reduction of two spaces, which could create an inconvenience for the home's operator and customers.

In one case, a passenger loading space could be relocated but the proposed relocation presents challenges. On Geary Boulevard between Lyon and Baker Streets, there is currently one passenger loading space along the service road on the north side of the block. The space serves Providence Place, a senior assisted living facility that does not have off-street parking or loading spaces. The parking lane along this block face is proposed for elimination with all build alternatives. With Alternatives 3 and 3-Consolidated, the parking lane would be converted to an additional mixed-flow traffic lane. With Alternative 2 and the Hybrid Alternative/LPA, parking would be eliminated to accommodate a single, wider mixed-flow lane that would provide more spaces for buses to maneuver in the narrow service road. Although the existing passenger loading space could be relocated to Lyon Street, it would be located approximately 180 feet uphill from the residence and could potentially create access challenges for the facility's senior residents. Instead, the project proposes to designate the curb lane along this block as an "active loading zone," which would prohibit parking but allow standing. This modification would allow passenger loading to continue along the facility's frontage but still provide most of the benefits to traffic and transit associated with parking lane removal.

In the Union Square area, included in the "Van Ness – Market" segment shown in the following tables, approximately five commercial spaces and one passenger loading space would be removed and could not be relocated in the nearby area. Most nearby curb space is already designated for loading and general parking in the area is very scarce, resulting in few opportunities to convert parking spaces to loading spaces. Consolidation of loading zones in this area would occur in the following blocks:

- Geary Street between Mason and Powell Streets on the north side (net loss of one passenger loading space and one commercial loading space).
- Geary Street between Grant and Kearny Streets on the north side (net loss of three commercial loading spaces).
- O'Farrell Street between Stockton and Market Streets on the south side (net loss of one commercial loading space).

However, eliminating these loading spaces would have a minimal effect on the total loading space supply in the Union Square portion of the corridor. In the section of the Geary corridor between Mason and Market Streets, 94 existing spaces (70 percent) are dedicated to commercial loading and 38 existing spaces (28 percent) are dedicated to passenger loading. A loss of six loading spaces would equate to less than 5 percent of total loading spaces in this section of Geary Street and O'Farrell

Street. Most perpendicular streets in this area also have large supplies of loading spaces. The remaining loading spaces are expected to accommodate loading demand. The project team would work with affected land uses (including local business owners) to try to minimize any negative effects of loading space consolidation.

3.6.4.7 PROJECT EFFECTS ON PARKING AND LOADING

The net loss of parking in the Geary corridor under the build alternatives would not inhibit multimodal access in the corridor because a sufficient parking supply would remain to accommodate automobile access while improvements to pedestrian, bicycle, and transit travel would enhance access by alternative modes. The build alternatives are designed to minimize the number of parking spaces removed, and additional parking spaces cannot be accommodated along the Geary corridor without reducing the pedestrian and transit performance benefits of the project. With the build alternatives, all loading spaces removed would be relocated within close proximity or would be consolidated because loading demand could be accommodated with existing nearby loading zones. No adverse effect on parking or loading would result.

In addition, NEPA guidance encourages a discussion of the human environment and social and economic impacts of a project. Thus, the social and economic effects of parking changes are also discussed in Section 4.2 (Community Impacts).

3.6.4.8 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, the No Build Alternative would have the greatest number of preserved parking spaces throughout the corridor, followed by Alternative 3-Consolidated, the Hybrid Alternative/LPA, then Alternative 2. Alternative 3 would preserve the least amount of parking spaces throughout the corridor.

Table 3.6-9 Change in Supply of Commercial Loading Spaces

CORRIDOR SEGMENT	# SPACES: NO BUILD ALTERNATIVE	CHANGE IN NUMBER OF COMMERCIAL LOADING SPACES IN GEARY CORRIDOR							
		ALTERNATIVE 2		ALTERNATIVE 3		ALTERNATIVE 3-CONSOLIDATED		HYBRID ALTERNATIVE/LPA	
		SPACES RELOCATED	CHANGE IN TOTAL SUPPLY	SPACES RELOCATED	CHANGE IN TOTAL SUPPLY	SPACES RELOCATED	CHANGE IN TOTAL SUPPLY	SPACES RELOCATED	CHANGE IN TOTAL SUPPLY
34th Avenue – 25th Avenue	3	1	0	2	0	2	0	2	0
25th Avenue – Park Presidio	10	0	0	3	0	0	0	0	0
Park Presidio – Palm Avenue	7	0	0	1	0	0	0	0	0
Palm Avenue – Broderick	2	0	0	1	0	0	0	0	0
Broderick – Laguna	8	4	0	2	0	2	0	4	0
Laguna – Van Ness	2	0	0	0	0	0	0	0	0
Van Ness – Market	205	6	-5	6	-5	6	-5	8	-5
Corridor Total	237	11	-5	15	-5	10	-5	14	-5

Table 3.6-10 Change in Supply of Passenger Loading Spaces

CORRIDOR SEGMENT	# SPACES: NO BUILD ALTERNATIVE	CHANGE IN NUMBER OF PASSENGER LOADING SPACES IN GEARY CORRIDOR							
		ALTERNATIVE 2		ALTERNATIVE 3		ALTERNATIVE 3-CONSOLIDATED		HYBRID ALTERNATIVE/LPA	
		SPACES RE-LOCATED	CHANGE IN TOTAL SUPPLY	SPACES RE-LOCATED	CHANGE IN TOTAL SUPPLY	SPACES RE-LOCATED	CHANGE IN TOTAL SUPPLY	SPACES RE-LOCATED	CHANGE IN TOTAL SUPPLY
34th Avenue – 25th Avenue	9	0	0	0	0	0	0	0	0
25th Avenue – Park Presidio	0	0	0	0	0	0	0	0	0
Park Presidio – Palm Avenue	22	2	0	4	-2	0	0	0	0
Palm Avenue – Broderick	12	1	0	2	0	1	0	2	0
Broderick – Laguna	17	0	0	0	0	0	0	0	0
Laguna – Van Ness	15	6	0	6	0	6	0	6	0
Van Ness – Market	106	0	-1	0	-1	0	-1	0	-1
Corridor Total	181	9	-1	12	-3	7	-1	8	-1

3.6.5 | Avoidance, Minimization, and Mitigation Measures

The build alternatives are currently designed to minimize the estimated loss of parking and loading spaces while meeting the project purpose and need. None of the impacts associated with the net loss of parking and loading spaces would be adverse.

During the final design phase, refinement of the design and configuration of the preferred alternative may result in changes to the number of parking spaces lost along the Geary corridor. The following improvement measures would be incorporated into the project design and implemented during construction and operation of the preferred alternative to ensure that the loss of parking and loading spaces is minimized and to further reduce the project's parking and loading effects.

Implementation of the following improvement and avoidance measures would further reduce parking and loading effects:

I-PRK-1. On-street parking should be created where bus stops are consolidated or relocated, as feasible.

I-PRK-2. Additional on-street parking should be provided from lane striping and infill spaces where feasible. With reconfiguration of the street, opportunities would exist to create additional parking spaces, for example by converting parallel spaces to back-in angled spaces where a reduction in the number of travel lanes allows.

I-PRK-3. Where removal of curb spaces is necessary, retention and replacement of parking spaces for people with disabilities should be prioritized over retention of all other spaces. Among remaining spaces, retention and replacement of loading spaces shall be prioritized over retention of general and short-term parking spaces. Where feasible, parking spaces for people with disabilities and loading spaces shall be relocated on the same block face as they currently exist. In locations where this is not feasible, such parking spaces and loading spaces should be relocated to the nearest cross street close to its intersection with Geary Boulevard.

A-PRK-4. Where there are multiple options available to relocate lost loading spaces, the project team shall work with affected land uses, including businesses owners, to identify which location best meets local loading needs and the purpose and need of the project. If space is not available to relocate loading spaces, then loading spaces shall be consolidated with existing nearby loading zones that have additional capacity.

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CHAPTER 4.0 AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND AVOIDANCE, MINIMIZATION AND/OR MITIGATION MEASURES

This chapter describes existing conditions and evaluates the potential environmental impacts that would occur with implementation of the No Build and build alternatives. This chapter also includes analyses of the potential impacts of the Hybrid Alternative/Locally Preferred Alternative (LPA) as modified following publication of the Draft EIS/EIR. Section 2.2.7 includes a detailed description of the Hybrid Alternative as modified. Chapter 4 is divided into 17 sections covering different resource topics that could potentially be affected by the project. The typical section format includes a description of the environmental setting as it relates to the specific resource topic; a discussion of the impacts that could result from implementation of the project; and a list of measures that would avoid, minimize, or mitigate/compensate for any adverse effects of the project. A series of technical studies, prepared for the Geary BRT project, informed the environmental analyses presented in several sections of this chapter. Such sections are denoted with an asterisk below. These technical studies are incorporated by reference and are available on SFCTA's website or upon request to SFCTA through the following contact:

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Topics Addressed in the Draft EIS/EIR

- 4.1 Land Use
- 4.2 Community Impacts
- 4.3 Growth
- 4.4 Visual Resources
- 4.5 Cultural Resources*
- 4.6 Utilities
- 4.7 Geology/Soils/Seismic/ Topography
- 4.8 Hazards and Hazardous Materials*
- 4.9 Hydrology and Water Quality
- 4.10 Air Quality/Greenhouse Gases*
- 4.11 Noise and Vibration*
- 4.12 Energy
- 4.13 Biological Resources*
- 4.14 Environmental Justice
- 4.15 Construction Impacts
- 4.16 Irreversible and Irretrievable Commitment of Resources
- 4.17 Relationship between Local Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity

*Separate technical report(s) was/were prepared for these resource topics and are included as appendices to this Final EIS and/or are on file with SFCTA.

How this Chapter is Organized

Sections 4.1 through 4.15 analyze the potential effects of the proposed project on the human environment, physical environment, and natural environment. Information presented in these discussions closely follow the outline listed below.

- **Regulatory Setting**
    - This discussion outlines federal, state, and local policies relevant to the Geary corridor.
- **Affected Environment**
    - This discussion provides background information on the specific resource topic and discusses existing conditions in the Geary corridor.
- **Environmental Consequences**
    - This discussion compares the existing conditions of each resource topic to the No Build and build alternatives. The discussion is divided into *operational* effects and *construction* effects.
- **Avoidance, Minimization, and/or Mitigation Measures**
    - This discussion defines the measures to avoid, minimize, or compensate for potential direct or indirect adverse effects of the project. The discussion is divided into *operational* measures and *construction* measures.

Characterizing Baseline Conditions

According to Section 15125(a) of the CEQA Guidelines, existing conditions are normally the physical environmental conditions in the vicinity of the project at the time the Notice of Preparation (NOP) is published. The NOP for the project was published in November 2008.

Given the amount of time that has passed since the publication of the NOP, some of the descriptions of existing conditions have been updated where new, more relevant information is available (including traffic data) and/or recent site visits identified altered conditions from the date of NOP issuance. However, this does not form a reasonable basis for comparison, since none of the build alternatives would foreseeably be constructed before the year 2020. As noted in Chapter 2, many land development and transportation related projects are expected to be open and operational in or near the Geary corridor by that time and are expected to influence existing conditions in several environmental resource areas (including but not limited to traffic, air quality, noise, and visual conditions). Therefore, unless otherwise noted, this Final EIS uses projected year 2020 conditions for the No Build Alternative as the environmental baseline for many topic areas. This future baseline is intended to better represent anticipated corridor conditions at the time the project may open.

All of the environmental resource areas also evaluate horizon year (2035) effects. The lead agency allows project sponsors, to calculate evaluation criteria using horizon year-based estimates as well as current year estimates. As previously discussed, year 2020 conditions for the No Build Alternative has been selected as the environmental baseline against which to compare the opening and horizon year build alternatives. SFCTA and SFMTA have selected year 2035 as the project's horizon year.

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4.1 Land Use

This section describes the land use setting, including existing and planned land uses surrounding the Geary corridor, as well as the potential effects of the project alternatives to land use. An overview of applicable land use policies is also provided.

4.1.1 | Regulatory Setting

4.1.1.1 | SAN FRANCISCO GENERAL PLAN (OCTOBER 2000)

The San Francisco *General Plan* guides city land use and transportation related decision making processes for the City and County of San Francisco (City).[1] The *General Plan* outlines objectives, policies, and guidelines relevant to the Geary corridor within ten elements as well as within a number of area plans.

Goals and policies identified within the Transportation Element encourage initiatives that provide safe and convenient travel within the City that is well-planned and coordinated with existing land uses. The Transportation Element supports multi-modal transit strategies as a top priority to facilitate and prioritize transit vehicle movement and lessen congestion on major roadways. Policy 20.13, in particular, states that "dedicated bus lanes and Bus Rapid Transit lanes should be installed to expedite transit travel times and improve transit reliability."[2]

Additionally, Housing Element goals and policies encourage adequate infrastructure and services to accommodate San Francisco's growing population. Thus, the Housing Element includes policies to ensure new housing is sustainably supported by the City's public infrastructure systems and transportation infrastructure.[3]

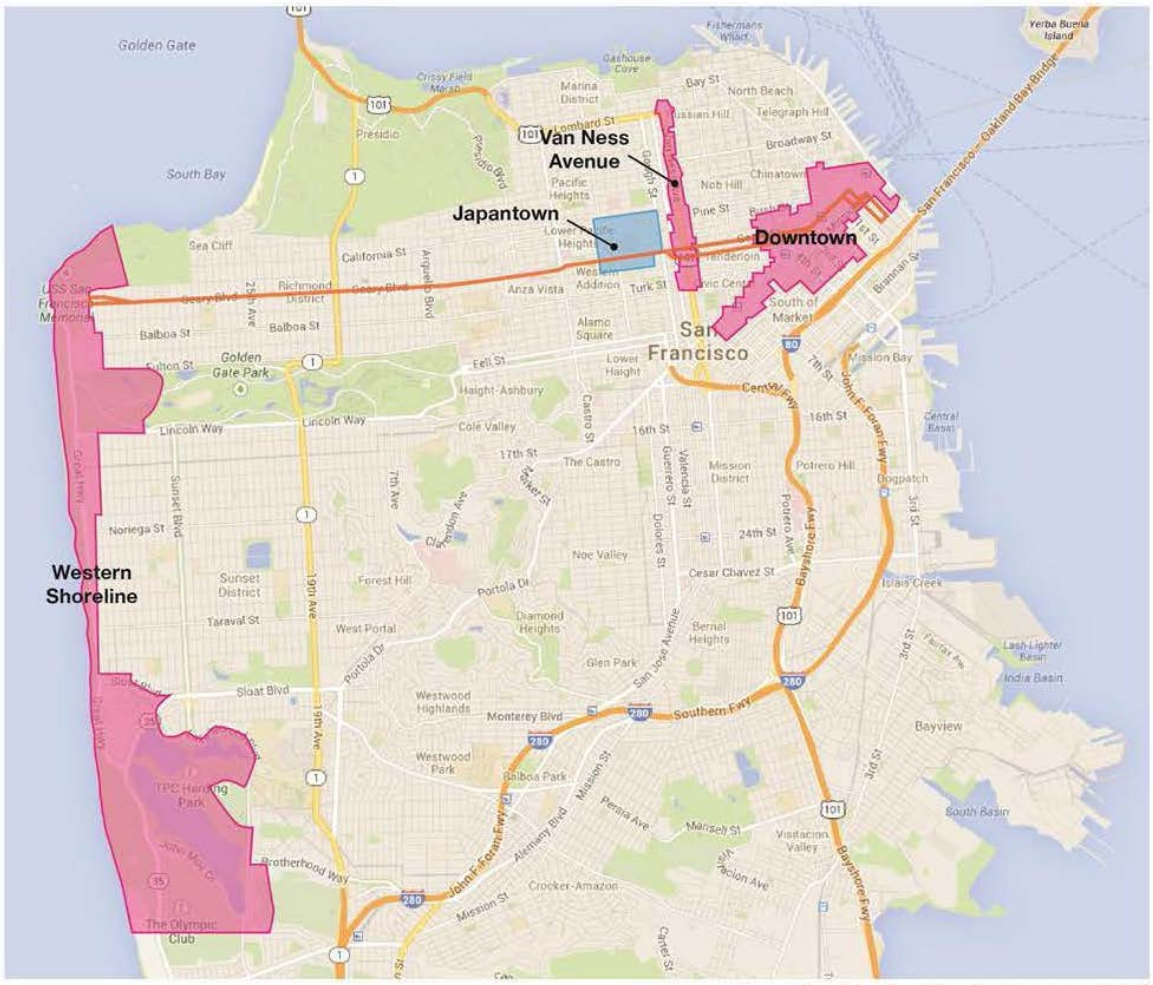
San Francisco Charter Section 4.105 and Sections 2A.52 and 2A.53 of the San Francisco Administrative Code establish a requirement for General Plan Referrals for certain types of projects. Such projects include any that would modify City-owned structures, or programs that would involve the extension, widening or narrowing of any public way or transportation route. A General Plan Referral is required to evaluate whether such projects would be consistent with the *General Plan*.

4.1.1.2 | SAN FRANCISCO AREA PLANS

The San Francisco *General Plan* also contains several Area Plans which cover different areas of the City. The Area Plans are consistent with the general overview policies of the *General Plan*, but provide specific, localized policies. Area plans within the Geary corridor are shown in Figure 4.1-1 and described below.

[1] City and County of San Francisco General Plan. 2000.
[2] City and County of San Francisco General Plan. 2000. Transportation Element, Policies 1.4, 11.1, 11.3, 14.3, 14.4, 20.7, 20.13, 21.1.
[3] City and County of San Francisco General Plan. 2000. Housing Element, Policy 12.3.

Figure 4.1-1 San Francisco Area Plans within the Geary Corridor



Source: San Francisco Planning Department, 2012

4.1.1.2.1 VAN NESS AVENUE AREA PLAN (JULY 1995)

The Van Ness Avenue Area Plan applies to Van Ness Avenue, which intersects the Geary corridor. The City adopted the Van Ness Area Plan in 1986 to promote the avenue as one of the City's most prominent north-south corridors. Van Ness Avenue is lined with high-density mixed-use development, including design features that support a transit-served pedestrian promenade. The plan identifies objectives and policies that support enhanced transit service and pedestrian circulation.[4]

The *Van Ness Avenue Area Plan* is an area plan of the San Francisco *General Plan* and applies to Van Ness Avenue, which intersects the Geary corridor

4.1.1.2.2 DOWNTOWN AREA PLAN (JULY 1995)

The Downtown Area Plan (DAP) is an area plan of the *General Plan* for Downtown San Francisco. The DAP seeks to foster a vital economy while retaining and enhancing existing urban patterns and structures that embody the essence of downtown San Francisco. While the DAP focuses predominantly on economic development, it includes objectives seeking to provide for the efficient movement of people and goods, transit vehicles, and automobiles; to develop transit as the primary mode of travel; and to implement a downtown streetscape plan as a means of enhancing the pedestrian circulation experience.

***The Downtown Area Plan* (DAP) seeks to foster a vital economy while retaining and enhancing existing urban patterns and structures that embody the essence of downtown San Francisco**

4.1.1.2.3 WESTERN SHORELINE AREA PLAN (1980)

The Western Shoreline Area Plan applies to the San Francisco Coastal Zone, which extends approximately six miles in length from the Fort Funston cliffs in the south to the Point Lobos recreational area in the north. The plan combines the policies of the Local Coastal Program and other plans with the *General Plan*. Transportation-related objectives and policies seek to improve public transit access to the coast by focusing on improving crosstown public transit connections to the coastal areas.

4.1.1.3 | SAN FRANCISCO TRANSPORTATION PLAN (SFTP) (2013 AND 2017)

The San Francisco Transportation Plan acknowledged the potential for the inclusion of a bus rapid transit or fixed light rail system on Geary

The SFTP is the City's blueprint to guide transportation development and investment over the next 30 years and is consistent with the broader policy framework of the *General Plan*, particularly its transportation element (San Francisco County Transportation Authority, 2013). The SFTP supports community and economic vitality by investing in the County's multi-modal transportation network. The SFTP also supports enhanced pedestrian safety and access and wise investment the City's transportation system by maintaining the City's transportation infrastructure through financially sustainable means. The SFTP identified dedicated bus-only lanes and other transit priority treatments on Geary corridor and acknowledged the potential for the inclusion of a bus rapid transit.

In 2017, SFCTA adopted SFTP 2040, an update to the 2013 SFTP. SFTP 2040 reaffirmed the 2013 plan's goals, investment plan, and supporting policy recommendations. SFTP 2040 provided an update on existing and future conditions impacting the San Francisco transportation system, revised transportation funding revenue forecasts, updated project costs, and reassessed projects previously identified for funding in the 2013 plan. SFTP 2040 included the Geary BRT project in its Investment Plan.

[4] Van Ness Area Plan Land Use Element. 1995. Policies 9.1-9.2, 9.5-9.8, 9.10-9.12.

4.1.1.4 | JAPANTOWN CULTURAL HERITAGE AND ECONOMIC SUSTAINABILITY STRATEGY (JCHESS)

The Japantown Cultural Heritage and Economic Sustainability Strategy (JCHESS) focuses City efforts on economic development and cultural preservation in the Japantown neighborhood. The strategy aims to secure the future of Japantown as a thriving commercial and retail district that remains the historical and cultural heart of the City's Japanese and Japanese-American communities. Components of the strategy include identification of Japantown's important social heritage resources, identification of economic and regulatory tools to enhance the area's economic wellbeing, and implementation recommendations to help new buildings and additions to support the community's architectural heritage.[5]

4.1.1.5 | TRANSBAY REDEVELOPMENT PLAN (2005)

The Transbay Redevelopment Plan guides the Transbay Transit Center Project (San Francisco Redevelopment Agency 2005). The Transbay Transit Center project consists of three major elements: replacing the Transbay Terminal at 1st Street and Mission Street; extending Caltrain (and California High-Speed Rail) from 4th Street and King Street into the new Transit Center; and creating a new neighborhood with homes, offices, parks and shops surrounding the new Transit Center.

The Transbay Redevelopment Plan seeks to encourage the use of alternative modes of transportation by future area residents, workers, and visitors and support the new Transbay Transit Center, while still providing local vehicular access. The Redevelopment Plan supports coordinated efforts with other regional transit agencies to enhance the availability of public transportation to and from the Transbay area and promote car sharing, shuttles, carpooling, public transit, car rental services, taxi service and other alternatives to the privately-owned automobile.

Transbay Transit Center rendering. Source: TransbayCenter.org

4.1.1.6 | TRANSIT CENTER DISTRICT PLAN (2009)

The Transit Center District Plan builds on earlier efforts to improve the area around the Transbay Transit Center. Consistent with the Transbay Redevelopment Plan, which focuses mostly on public properties south of the Transit Center along Folsom Street, the District Plan focuses on both private properties and properties owned or to be owned by the Transbay Joint Powers Authority around the Transit Center itself.

The District Plan supports an enhanced and prioritized public transit system and an enhanced pedestrian experience to accommodate anticipated growth in travel to and through the district in 2030 and beyond.

4.1.1.7 | EASTERN NEIGHBORHOODS TRANSPORTATION IMPLEMENTATION PLANNING STUDY (EN TRIPS) (2009)

The Eastern Neighborhoods Transportation Implementation Planning Study (EN TRIPS) identified key transportation corridors and developed conceptual corridor designs for corridors within the Eastern Neighborhoods. Mission Street between 20th Street and The Embarcadero was identified as a High Priority Corridor as part of a technical evaluation and a public engagement process. Mission Street was

[5] San Francisco Planning Department. 2013. Japantown Cultural Heritage and Economic Sustainability Strategy (JCHESS). Accessed April 21, 2014 from http://www.sf-planning.org/index.aspx?page=1692.

recognized as a vital east-west transit corridor through the South of Market neighborhood, used by a number of transit routes and pedestrians. The EN TRIPS study recommended that future transportation improvement projects include investments in pedestrian facilities as well as transit priority treatments.

4.1.1.8 | BETTER MARKET STREET (2011)

The Better Market Street project is intended to revitalize Market Street and reestablish the street as the premier cultural, civic, and economic center of San Francisco and the Bay Area. The project focuses on improving mobility and economic development.

4.1.1.9 | TENDERLOIN-LITTLE SAIGON NEIGHBORHOOD TRANSPORTATION PLAN FINAL REPORT (MARCH 2007)

The Tenderloin-Little Saigon Neighborhood Transportation Plan is a community-based transportation plan that identifies area needs and related improvements. The plan supports neighborhood-wide pedestrian safety, traffic calming, improved transit service, and enhanced streetscapes as priority projects.

4.1.1.10 | GOLDEN GATE NATIONAL RECREATION AREA GENERAL MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT (APRIL 2014)

The Golden Gate National Recreation Area General Management Plan (Management Plan) is applicable to National Park Service lands, which include Park Presidio, perpendicular to the Geary corridor. Relevant Management Plan goals include: the creation of equitable and convenient multimodal transportation options to and within the park; optimization of park transportation system management through coordinated planning, programming, management, and maintenance; and the employment of tools for congestion management (including transit).

4.1.2 | Affected Environment

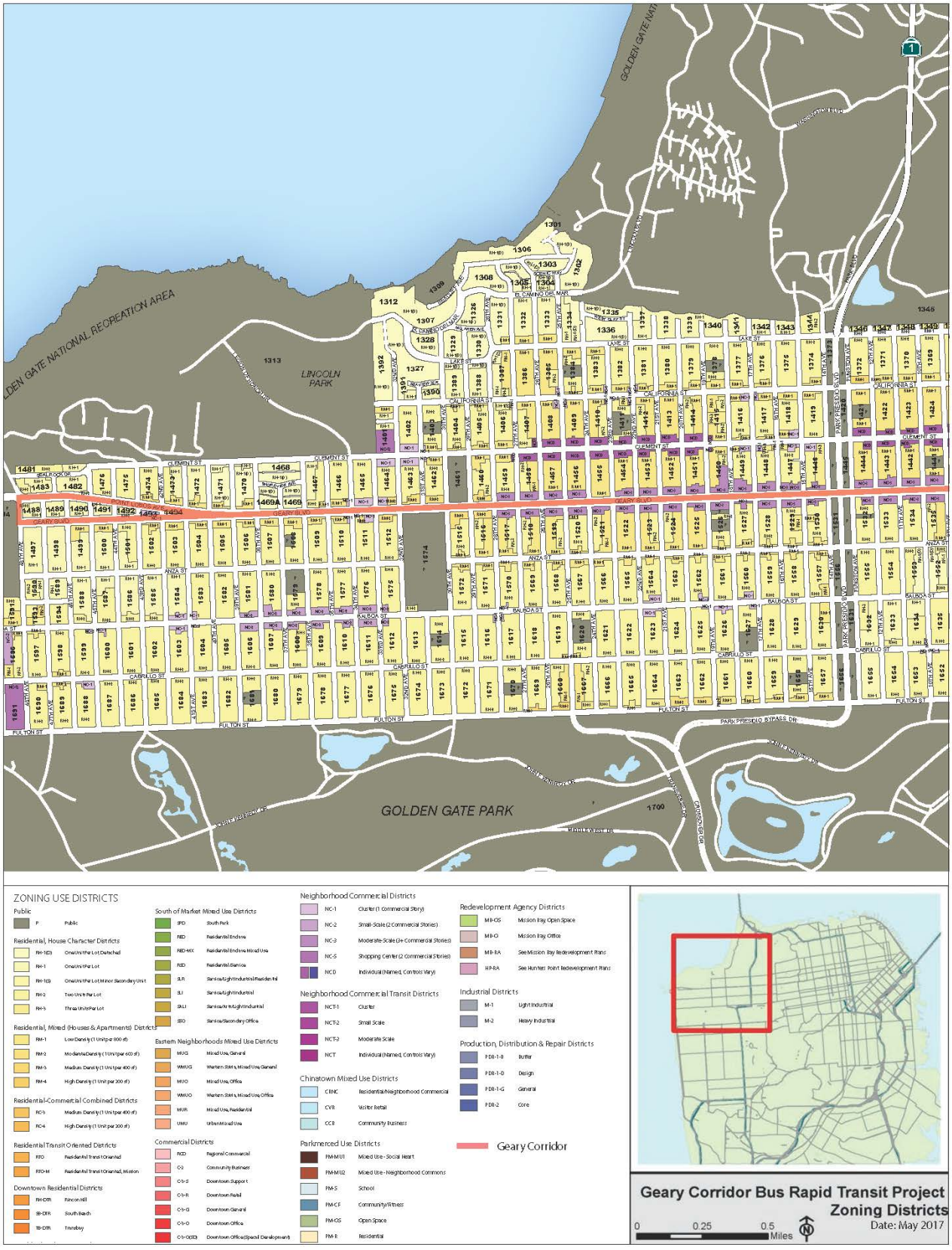
4.1.2.1 | EXISTING AND PLANNED LAND USES

Predominant land uses within the Geary corridor vary from primarily residential and neighborhood-scale commercial uses in the west (roughly 48th Avenue to Masonic Avenue), to higher-density residential, office, and commercial land uses in the central portion (Masonic Avenue to Van Ness Avenue), transitioning to high density, high intensity residential commercial, and office uses east of Van Ness.

Existing land uses in the vicinity of the Geary corridor include residential, commercial, transportation, public/institutional, recreational, and mixed-uses. Existing and planned land uses within the vicinity of the Geary corridor are described below in groupings from west to east. Figures 4.1-2 through 4.1-4 show permitted land uses in the Geary corridor, as expressed through zoning designations (as of May 2017).

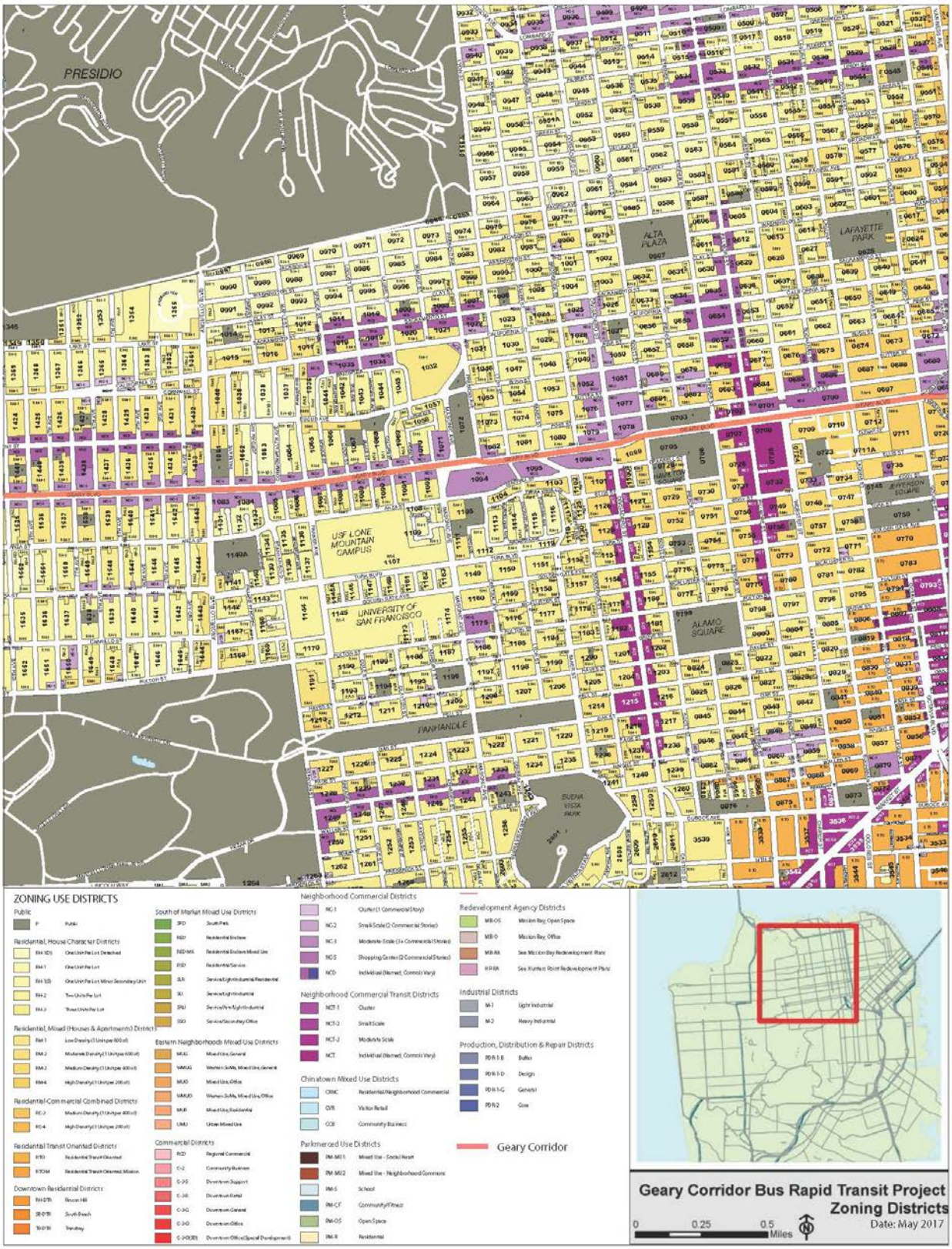
48th Avenue to 34th Avenue. Between 48th Avenue and 34th Avenue, Geary corridor land uses are primarily low-density residential (single-family houses and small apartment buildings). Lincoln Park, the Legion of Honor, and the Veterans Administration Hospital are located within a block north of Geary Boulevard; Golden Gate Park is located four blocks south.

Figure 4.1-2 Existing Zoning – 48th Ave to Park Presidio



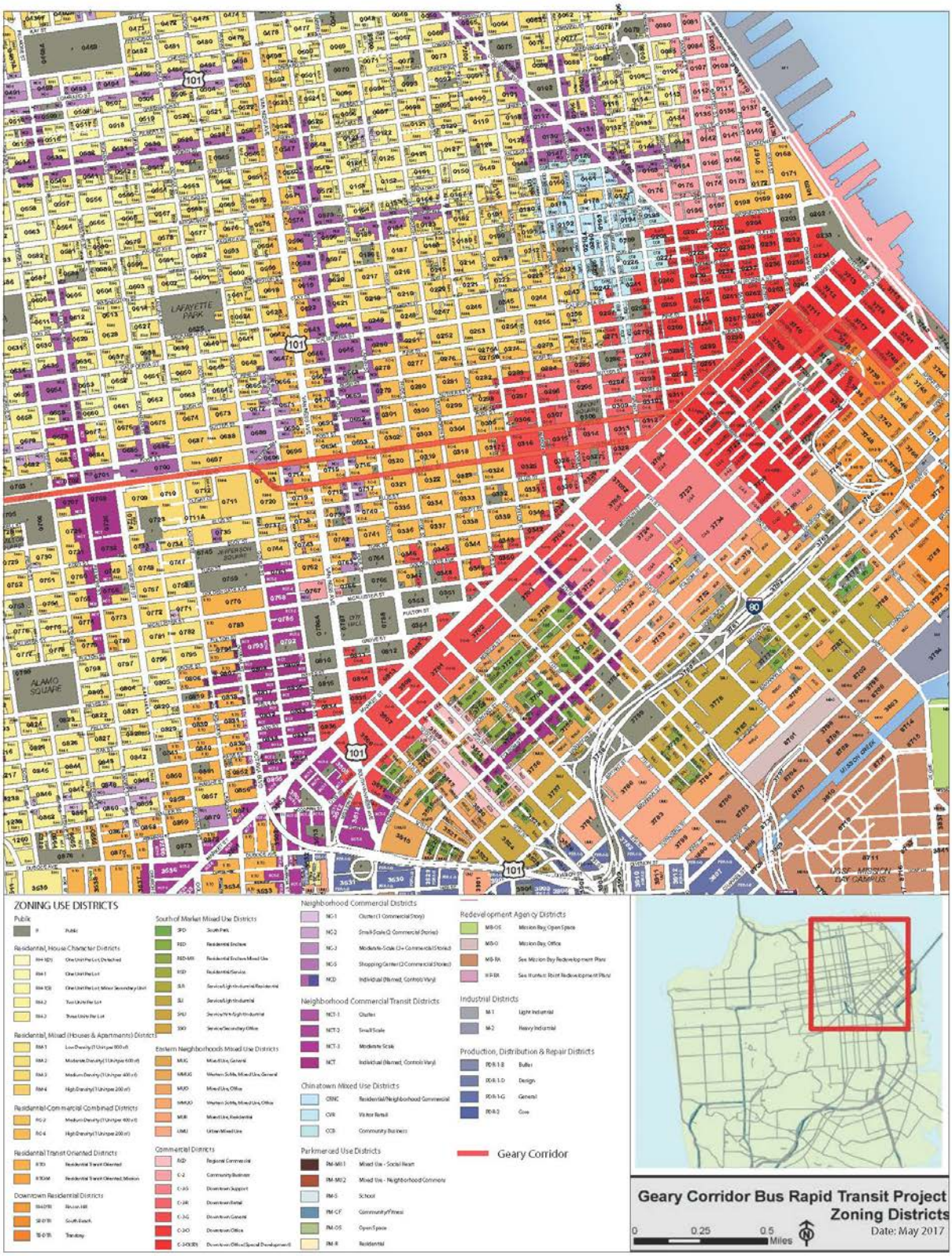
Source: San Francisco Planning Department, 2017

Figure 4.1-3 Existing Zoning – Park Presidio to Fillmore Street



Source: San Francisco Planning Department, 2017

Figure 4.1-4 Existing Zoning – Fillmore Street to the Embarcadero



Source: San Francisco Planning Department, 2017

Zoning in this area is primarily *Single and Double Unit Lot Residential (RH-1,2), Low-Density, Mixed Residential (Houses & Apartments) (RM-1),* and *Neighborhood Commercial Districts (one commercial story) (NC-1).*

Predominant land uses within the Geary corridor vary from primarily residential and neighborhood-scale commercial uses in the west to higher-density, office and commercial land uses in the east

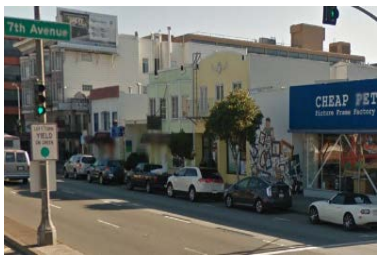
34th Avenue to 27th Avenue. Land uses between 34th Avenue and 27th Avenue are primarily residential; neighborhood-serving commercial uses are centered at the intersections of 34th Avenue and 27th Avenue. George Washington High School is located between 32nd Avenue and 30th Avenue along Geary Boulevard.

Zoning in this area is mainly *Single and Double Unit Lot Residential (RH-1,2), Moderate-Density, Mixed Residential (Houses & Apartments) (RM-2), Public Uses (P),* and *Cluster and Moderate-Scale Neighborhood Commercial (NC-1 and NC-3).*

27th Avenue to Palm Avenue. Residential and commercial land uses predominate, with notable public facilities. Small, neighborhood-scale commercial and retail businesses line first floors of buildings along Geary Boulevard; residential land uses are present on Geary-fronting upper floors as well as along intersecting streets. The Kaiser Permanente French Campus fills a block on the south side of Geary Boulevard between 6th and 5th Avenues.

Markets, shops, restaurants, and churches occupy the first floor of buildings along Clement Street, located one block north of Geary Boulevard, roughly from 11th Avenue east to Arguello Street. Most of the ground floor businesses opening to Clement Street have upper floor apartments. A variety of public institutions, medical facilities and parks are located in the surrounding neighborhoods.

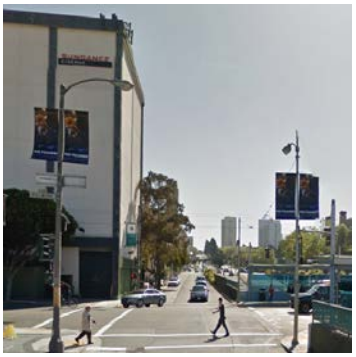
This area is zoned *Single, Double and Triple Unit Lot Residential (RH-1,2,3), Low-Density, Low, Moderate and Medium-Density, Mixed Residential (Houses & Apartments) (RM-1; 2; 3), Cluster* and *Moderate-Scale Neighborhood Commercial (NC-1 and NC-3)*, and *Public Uses* (P).



Geary Boulevard – heading eastbound from Palm Avenue

Palm Avenue to Broderick Street. Land uses between Palm Avenue and Broderick Street along Geary Boulevard are dominated by neighborhood-scale commercial uses. Residential uses surround neighborhood-serving retail businesses west of Masonic Avenue. Facilities associated with the University of San Francisco are located south of Geary Boulevard. At Geary and Masonic, larger-scale commercial uses (Trader Joe's, Target, and Best Buy) are present with surface and structured parking. The area also includes an SFMTA Muni maintenance and storage facility (Presidio Yard). Several buildings of the Kaiser Permanente Geary Campus are in this area.

This area is zoned primarily *Moderate-Scale Neighborhood Commercial (NC-3)* with pockets of *Double and Triple Unit Lot Residential (RH- 2, 3)* and *Low and Moderate Density, Mixed Residential (Houses & Apartments) (RM-1; 2).*



Japantown – views of the Kabuki Theater and other commercial and retail uses along this segment of the Geary corridor

Broderick Street to Laguna Street. The area between Broderick Street and Laguna Street features major commercial/retail uses, as well as pockets of higher-density residential apartments and public places (mostly between Broderick and Scott Street). Higher intensity retail and commercial uses are found north and south of Geary Boulevard along Fillmore Street. The Japan Center includes a cluster of retail, entertainment, and restaurant uses long identified with San Francisco's Japanese-American community. These uses extend northerly-southerly across Post Street.

The area also includes a cluster of nightlife oriented uses such as the Kabuki Cinema, the Fillmore auditorium, and the Boom Boom Room. Public and institutional uses include Gateway High School, the Hamilton Recreation Center and Playground, the Raymond Kimbell Playground, and the Japan Center Peace Plaza. Higher density residential uses include the St. Francis Square Cooperative, the Fillmore Center, and various buildings along Post Street.

This area is zoned *Moderate-Scale Neighborhood Commercial (NC-3), Medium-Density, Mixed Residential (Houses & Apartments) (RM-3)* and *Public Uses (P).*

Laguna Street to Van Ness Avenue. Apartment buildings dominate this small, half-block area between Laguna Street and Cleary Court along Geary Boulevard. The Consulate General of China is located on Laguna Street at Geary Boulevard as well. Geary Boulevard splits at Gough Street, near St. Mary's Cathedral, into eastbound O'Farrell Street (and for one block, Starr King Way) and westbound Geary Boulevard/Street. Within this area, the Geary corridor enters the outskirts of downtown San Francisco and passes through predominately high-density residential, moderate-scale neighborhood commercial. The area includes automobile distribution centers, furniture stores, and fast food restaurants. The AMC Van Ness 14 Movie Theater is located between just south of Geary Boulevard on Van Ness Avenue.

St. Mary's Cathedral is located on Geary Boulevard at Gough Street

This area is zoned *High-density, Residential-Commercial Combined (RC-4), Medium and High-density, Mixed Residential (Houses & Apartments) (RM-3 and RM-4*), *Moderate-scale Neighborhood Commercial (NC-3)*, and *Public Uses (P).*

Van Ness Avenue to Market Street. Land uses within this area transition from a high-density residential-commercial mixed-use area to an office and retail sector, near the heart of downtown San Francisco. The Tenderloin District is located between Larkin Street and Hyde Street and has maintained single room occupancy (SRO) boarding houses, popular from century-old architectural styles (with a single room and shared bathroom). Geary Street passes through Union Square, which is a public plaza bordered by shopping, hotels, and theaters such as the American Conservatory Theater near Mason Street. Union Square is a destination for visiting tourists and residents alike.

This area is zoned *High-density, Residential-Commercial Combined (RC-4), High-density, Mixed Residential (Houses & Apartments) (RM-4), Moderate-scale Neighborhood Commercial (NC-3), Downtown General Commercial (C-3-G), Downtown Retail Commercial (C-3-R), Downtown Office (C-3-O),* and *Public Uses (P).*

Market Street to Transbay Transit Center. This area of the Geary corridor is located in the heart of downtown San Francisco. Downtown commercial uses, including office and retail dominate this area. Large, multi-story buildings line the corridor, including several high-density residential properties (including the Millennium) and high-rise office buildings.

This area is zoned *Downtown Retail Commercial (C-3-R), Downtown Office Commercial (Special Development) (C-3-O(SD)), Downtown Office Commercial (C-3-O) and Transbay Downtown Residential (TB-DTR), High-density, Residential-Commercial Combined (RC-4)* and *Public Uses (P).*

4.1.3 | Methodology

The alternatives were evaluated for potential land use effects in terms of consistency with existing and future planned land uses, consistency with applicable land use policies, and the potential to create new physical divisions within a community. This analysis considers land uses existing in the Geary corridor as of 2014 and therefore uses 2014 as the environmental baseline with which to compare future conditions with the implementation of any of the build alternatives. As part of this Final EIS, permitted future land uses (as expressed through the City's zoning map) were reviewed; specifically, the zoning map as of 2017 was reviewed. No substantial zoning changes occurred between 2014 and 2017 that would change the conclusions regarding proposed future land uses. In addition, the Planning Department reviewed land use projections used in transportation modeling efforts. The Planning Department's review, included in Appendix D2-1, indicates that growth projections used in the transportation analysis have not been mooted by actual changes in land use patterns since publication of the Draft EIS/EIR.

The alternatives have the potential to result in construction period and/or operational period effects as noted below.

Construction-Related Effects

Operational-Related Effects

- Consistency with Plans and Policies
- Consistency with existing/planned land uses
- Creation of a physical division within a community

4.1.4 | Environmental Consequences

This Section describes the potential impacts and benefits for land use. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 4.1.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR does not change the conclusions regarding land use impacts in the Draft EIS/EIR.

4.1.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: ANALYSIS OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe land use effects during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe land use effects relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: Retention of the existing Webster Street pedestrian bridge would reduce the extent of construction (i.e., demolition) activities at this location, including temporary sidewalk closures, detours, and associated parking and traffic difficulties. Therefore, this modification would not result in new or more severe land use effects during construction.

Operation: Retention of the Webster Street bridge would further improve pedestrian access across Geary Boulevard (during both construction and operation) and thereby have beneficial (i.e., lessening) effects with regard to existing physical divisions in the community. Therefore, retention of the existing Webster Street bridge would not result in any new or more severe land use effects during operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: The removal of proposed BRT stops between Spruce and Cook streets would eliminate construction activity outside the curb-to-curb portion of the right-of-way in this area. Therefore, no longer adding BRT stops would lessen construction-related land use effects on this block relative to what was described in the Draft EIS/EIR.

Operation: Operationally, although BRT service would not be provided at Spruce Street as a result of the modification, the immediate area would still be served by local and express bus services. The change would meet localized business needs for multimodal access by preserving parking and loading. Therefore, no new or more severe land use effects would occur as a result of this modification during project operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: Implementation of additional pedestrian enhancements throughout the corridor would entail localized construction activities where new pedestrian crossing bulbs would be constructed. This would occur entirely within the existing transportation right-of-way. While short-term effects during construction such as temporary sidewalk narrowing, relocations, or closures may occur, these would be similar to other short-term construction effects described in this section and would not result in long-term adverse change to existing or planned land uses or any new physical division within a community. Therefore, this modification would not result in new or more severe land use effects during construction.

Operation: Once operational, additional pedestrian enhancements would further improve pedestrian access across the Geary corridor and thereby have beneficial (i.e., lessening) effects with regard to existing physical divisions in the community. Therefore, this modification would not result in new or more severe land use effects during operation.

Addition of BRT Stops at Laguna Street

Construction: Construction of transit islands would occur entirely within the existing transportation right-of-way. While short-term effects during construction (2-3 weeks) such as temporary sidewalk closures and detours may occur, these would be similar to other short-term construction effects described in this section and would not result in long-term adverse changes to existing or planned land uses or any new physical division within a community. Therefore, this modification would not result in new or more severe land use effects during construction.

Operation: Similar to other components of the corridor-wide project, operation of BRT service at Laguna Street would be consistent with the City's plans and policies to increase and improve transit capacity and operations more generally. This would enhance multimodal accessibility at Laguna Street, thereby maintaining and enhancing existing land uses, and would contribute to pedestrian enhancements that would increase connectivity along the corridor. Therefore, this modification would not result in new or more severe land use effects during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: As this modification would retain existing bus stops, it would eliminate construction activity outside the curb-to-curb portion of the right-of-way in this location and no change to existing or planned land uses would result. Therefore, this modification would not result in new or more severe land use effects during construction.

Operation: Similar to other components of the corridor-wide project, retention of Collins Street local and express bus stops would be consistent with the City's plans and policies to increase and improve transit capacity and operations more generally. This would enhance multimodal accessibility at Collins Street, thereby maintaining and enhancing existing land uses, and would contribute to pedestrian enhancements that would increase connectivity along the corridor. Therefore, this modification would not result in new or more severe land use effects during operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities but would simply shift about half of it one block to the west. As with other aspects of the project, construction would occur entirely within the existing transportation right-of-way and no change to existing or planned land uses would result. Therefore, this modification would not result in new or more severe land use effects during construction.

Operation: Similarly, this modification would not change the nature of bus operations, but would shift the location of the transition from center- to side-running bus lanes one block to the west. Therefore, this modification would not result in new or more severe land use effects during operation.

4.1.4.2 | CONSTRUCTION EFFECTS - NO BUILD ALTERNATIVE

Construction and implementation of the transportation and streetscape improvements proposed under the No Build Alternative would occur within the existing transportation right-of-way. Construction of these improvements would have some adverse effects related to land use; however, they would be temporary and limited in nature. Vehicular traffic and pedestrian movement could be

temporarily impacted during construction of these improvements resulting from short-term sidewalk and roadway closures and associated detours. Measures to minimize these adverse effects would be implemented during construction. Therefore, construction effects resulting from the No Build Alternative associated with land use would be minimal, and there would be no long-term affects to land uses in the Geary corridor.

DEFINITION

RIGHT-OF-WAY (ROW): A general term denoting land, property, or interest therein (usually in a strip) acquired for or devoted to transportation uses

4.1.4.3 | CONSTRUCTION EFFECTS - BUILD ALTERNATIVES

Implementation of the build alternatives would occur entirely within the existing transportation right-of-way, with no additional right-of-way required. Temporary construction laydown areas would occur entirely within public right-of-way. No acquisitions of any private land or use of other public land would be needed during construction. Short-term sidewalk closures, detours, conversion of parking lanes to travel lanes, and removal of loading zones would likely increase traffic and parking difficulties. However, these adverse effects would be temporary in nature and would adhere to applicable City policies for minimizing street disruption (described in Section 4.6.1.3). These temporary construction effects would not result in long-term adverse change to existing or planned land uses or any new physical division within a community.

4.1.4.4 | OPERATIONAL EFFECTS - NO BUILD ALTERNATIVE

The No Build Alternative consists of a number of transportation service and infrastructure improvements that various City agencies have previously approved. Any environmental effects of these improvements have been disclosed in previously completed environmental reviews. The No Build Alternative would continue transit service along the Geary corridor as well as previously approved physical improvements as upgraded traffic signals, additional pedestrian countdown signals, new low-floor buses, and other elements as described in Section 2.3.1.1. Overall, however, the No Build Alternative would result in fewer transit-related enhancements than any of the build alternatives.

Consistency with plans and policies: The No Build Alternative would be consistent with some objectives of relevant plans (the Transportation Element within the San Francisco *General Plan*, the Downtown Area Plan, Transit Center District Plan, and SFTP 2040). The improvements comprising the No Build Alternative would offer a degree of support towards improved transit operations and enhanced pedestrian facilities. Transit operations would improve with completion of replacement of Geary buses with low-floor buses, and with new real-time arrival information displays. Pedestrian facilities would be enhanced through the installation of accessible pedestrian countdown signals. However, the No Build Alternative would not include BRT service or as extensive of a set of pedestrian and mobility improvements as the build alternatives and would thus not be as directly consistent with several key objectives of the General Plan and SFTP 2040.

Consistency with existing/planned land uses: The No Build Alternative would not result in any immediate or direct conflicts with existing land uses in the corridor. Rather, the program of previously approved physical improvements would help maintain and enhance existing land uses. While the No Build Alternative would not directly conflict with any planned land uses within or outside the Geary corridor, it would be less robust than any of the build alternatives in making substantial transit improvements as a means of supporting both existing and planned land uses.

Creation of a physical division: Each of the No Build Alternative physical improvements would be constructed within the existing right-of-way. None of these improvements include any elements that would result in the creation of a new physical division or barrier, so no physical division of any community would result.

4.1.4.5 | OPERATIONAL EFFECTS - BUILD ALTERNATIVES

Consistency with plans and policies: Each of the build alternatives would substantially increase/improve transit capacity and operations and thus would be highly consistent with the City's objectives, goals, and policies as expressed in the *General Plan*, SFTP 2040, and the Transit Center District Plan. More specifically, the build alternatives would be consistent with the objectives of the *General Plan* (Transportation Element policies 1.3 and 20.13) and SFTP 2040, as well as the Downtown Area Plan, the Transbay Redevelopment Plan, the Tenderloin-Little Saigon Neighborhood Transportation Plan, the East SoMa Plan, Rincon Hill Area Plan, Eastern Neighborhoods Transportation Implementation Planning Study, and the Transit Center District Plan by increasing transit capacity and reliability, and creating BRT lanes to meet future public transit demands.

The build alternatives would further support *General Plan* objectives to maintain and enhance local and regional accessibility to key employment and commercial centers provided in the Downtown San Francisco vicinity; increase the capacity and priority of transit during off-peak hours and reduce traffic congestion.

The build alternatives are also consistent with land use planning goals in the Transit Center District Plan and the *General Plan* to encourage future development that efficiently coordinates land use with transit service. Land use plans applicable to the project alternatives are supportive of transit use. The build alternatives would provide rapid transit service that would accommodate the development trends and projected travel demand for the corridor.

Finally, the build alternatives are consistent with the pedestrian and streetscape improvement objectives and policies in numerous adopted plans (the *General Plan*, Downtown Area Plan, Transit Center District Plan, Eastern Neighborhoods Transportation Implementation Planning Study, Transit Center District Plan and the San Francisco Transportation Plan). Enhanced pedestrian facilities and streetscapes under the build alternatives include pedestrian-scale lighting, landscaping, real-time passenger information, high quality bus stations, pedestrian crossing bulbs and pedestrian countdown signals. These features would provide a higher quality pedestrian environment by improving pedestrian safety and a consistent sidewalk aesthetic.

A General Plan Referral would be required from the City Planning Department to permit any change in existing sidewalk width, as anticipated under the build alternatives

Because each of the build alternatives would result in some changes to the existing curb-to-curb roadway width, each would trigger the need for a General Plan Referral. SFMTA would prepare the General Plan Referral for approval by the San Francisco Planning Department and the Planning Commission.

Consistency with existing/planned land uses: Under the build alternatives, no permanent adverse effects to existing or proposed land uses would occur. The proposed transit service and streetscape improvements would ease multimodal accessibility along the corridor, which would help to maintain and enhance existing land uses. Existing City plans provide for increased development in the eastern portion of the corridor, particularly in the Tenderloin, Financial District, and SOMA areas. The build alternatives would be consistent with existing City plans by increasing the speed, reliability, and capacity of transit along the Geary corridor, linking planned land uses with existing neighborhoods and regional transit connections. Existing zoning allows for increased capacity east of Van Ness Avenue but limits new growth in the Richmond District. The project is therefore consistent with existing zoning for the area.

Creation of a physical division: Owing to its width and heavy travel usage, portions of the Geary corridor have characteristics of a barrier between communities, particularly in the expressway portion between Gough and Scott streets. The Build Alternatives would include elements such as improved pedestrian facilities and crossings that would facilitate walking across the corridor, particularly in areas where existing pedestrian bridges are proposed to be removed. In addition, Alternatives 3 and 3-Consolidated would each remove the Fillmore Street underpass and create a conventional intersection. This would remove an existing barrier between the Japantown and Western Addition neighborhoods.

4.1.4.6 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, all build alternatives would improve physical connectivity throughout the Geary corridor and are consistent with existing and planned land uses. The Hybrid Alternative/LPA and Alternatives 3 and 3-Consolidated would have more beneficial impacts than Alternative 2. The No Build Alternative would have the fewest improvements to physical connectivity.

4.1.5 | Avoidance, Minimization, and/or Mitigation Measures

No avoidance, minimization, or mitigation measures would be required for any of the build alternatives

Temporary construction effects would not result in long-term adverse change to existing or planned land uses or any new physical division within a community. Adherence to the avoidance, minimization, and mitigation measures proposed for Community Impacts (see Section 4.2.3.1, as well as applicable City policies for minimizing street disruption (described in Section 4.6.1.3) would avoid and minimize potential effects.

During operation, none of the build alternatives would result in any adverse effects related to land use. Therefore, no operational period avoidance, minimization, or mitigation measures would be necessary.

4.2 Community Impacts

This section describes the social and community characteristics of the Geary corridor and the effects of project alternatives on community facilities and related factors.

The community impacts study area (study area) encompasses a half-mile radius along the Geary corridor. The study area is comprised of a number of "traffic analysis zones" (TAZs) and 2010 U.S. Census (US Census) block groups. TAZs are geographic units defined and developed for the purposes of traffic modeling. TAZs in the Bay Area are set forth in countywide transportation models. TAZs incorporate both existing population and demographic data along with related projections.[1] See Section 4.3 (Growth) for more information regarding the study area and TAZs.

Other data in this section (demographic, housing occupancy, labor force, and income information) were derived from the U.S. Census, the 2007-2011 5-year American Community Survey (ACS) estimates, and from the Association of Bay Area Governments' *Projections 2013*. The use of data from multiple sources provides a more thorough and accurate description of the study area's character.

4.2.1 | Regulatory Requirements

There are no federal or state regulations related to community impacts.

4.2.2 | Affected Environment

4.2.2.1 | SOCIAL AND COMMUNITY CHARACTERISTICS

This section evaluates the social characteristics of the study area by analyzing population, income and ethnicity, household size and composition, community/neighborhood characteristics, and public services and facilities.

4.2.2.1.1 DEMOGRAPHIC CHARACTERISTICS

The study area is comprised of about 162 U.S. Census block groups and 315 TAZs. Figures 4.2-1 and 4.2-2 show the overall study areas aggregated from both Census block groups as well as TAZs.

[1] The community impact study area is essentially similar in geography to the study area defined in Section 4.3 (Growth). The two study areas are comprised of different units. The community impacts study area is composed of both TAZs and U.S. Census block groups, whereas TAZs are used exclusively in defining the growth study area.

Table 4.2-1 displays comparative population data for the study area and San Francisco as a whole. The study area is home to about 30 percent of the total San Francisco population. The study area has a lower percentage of people under the age of 18 and a higher percentage of people over the age of 65 than the rest of San Francisco.

Table 4.2-1 Population and Age

	UNDER 18 YEARS		65 YEARS AND OLDER		TOTAL POPULATION
	NUMBER OF PERSONS	PERCENT OF POPULATION	NUMBER OF PERSONS	PERCENT OF POPULATION	
Within Study Area	23,200	10%	36,900	16%	233,800
San Francisco	124,600	15.5%	109,800	13.6%	805,200

Note: Numbers are rounded to the nearest hundred.

Source: United States Census Bureau, 2010a

Racial and Ethnic Composition

53 percent of all study area residents are members of minority groups, as defined by this analysis: 33 percent are Asian, 10 percent are Hispanic or Latino, 9 percent are two or more races, and 6 percent are black or African American

U.S. Census data provide information on the racial composition of the study area.[2] Per Table 4.2-2, the racial composition of the study area is similar to San Francisco. Overall, about 53 percent of all study area residents and 58 percent of San Francisco residents are members of minority groups. The study area contains slightly higher percentages of individuals self-identifying as white, black or African-American, or as being of more than one race, and a lower percentage of individuals self-identifying as Hispanic.

Table 4.2-2 Racial and Ethnic Composition

	WHITE	%	BLACK OR AFRICAN AMERICAN	%	AMERICAN INDIAN/ ALASKA NATIVE	%	ASIAN	%
Study Area	109,100	46.7	14,400	6.2	665	0.3	76,800	32.8
San Francisco	337,500	41.9	48,800	5.8	1,800	0.2	265,700	33.0

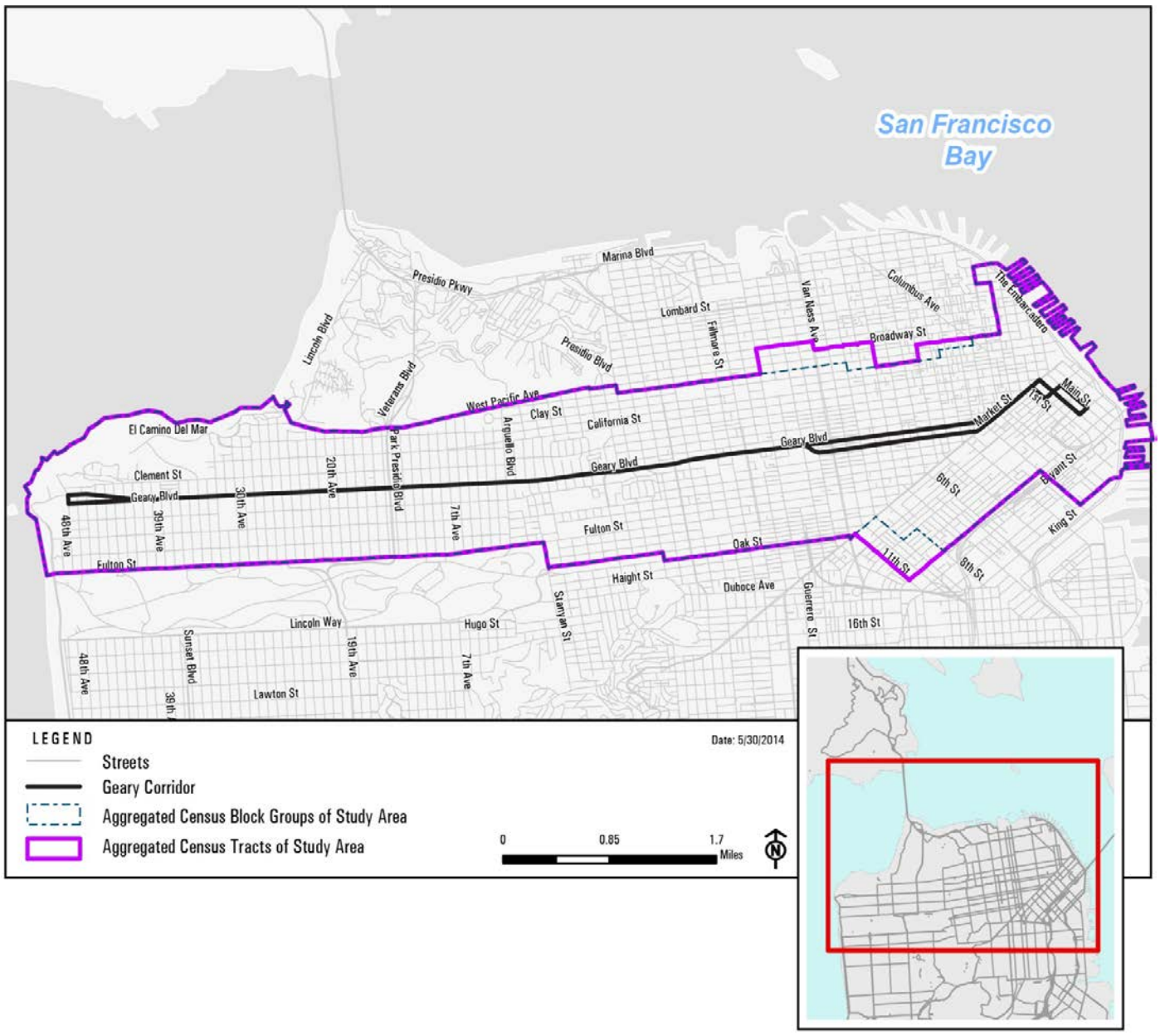
	NATIVE HAWAIIAN / OTHER PACIFIC ISLANDER	%	SOME OTHER RACE/ TWO OR MORE	%	HISPANIC OR LATINO	%	TOTAL PERSONS
Study Area	477	0.2	9,200	8.5	23,100	9.9	233,800
San Francisco	3,100	0.4	28,600	3.5	121,800	15.1	805,200

Note: Numbers are rounded to the nearest hundred.

Source: United States Census Bureau, 2010b

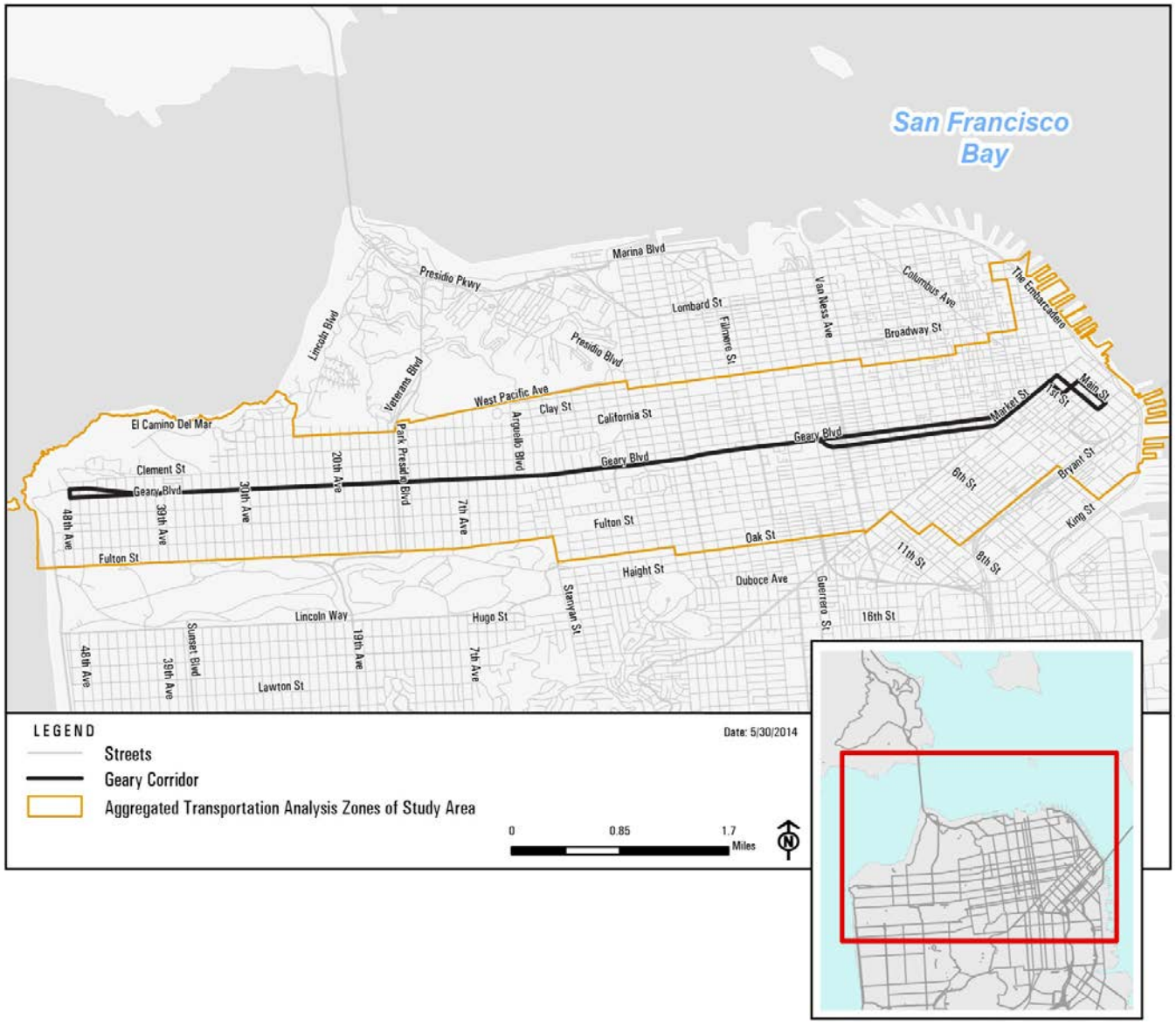
[2] The racial categories include white, black (African-American), American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, Some Other Race/Two or More Races, and Hispanic origin. Hispanic includes people of any race that self-identify as Hispanic.

Figure 4.2-1 U.S. Census Tracts and Block Groups Within the Study Area



Source: U.S. Census, 2010

Figure 4.2-2 Traffic Analysis Zones Within the Study Area



Source: U.S. Census, 2010

Household and Housing Characteristics

Household characteristics in the study area and in San Francisco are shown in Table 4.2-3. According to U.S. Census data, the total number of households in the study area is 118,500, comprising about 34 percent of all households in San Francisco. The study area has about 1.88 persons per household, relative to the San Francisco average of 2.26 persons per household.

Table 4.2-3 Household Characteristics

	NUMBER OF HOUSEHOLDS	AVERAGE HOUSEHOLD SIZE	TOTAL NUMBER OF FAMILIES
Within Study Area	118,500	1.88	40,200
San Francisco	345,800	2.26	151,000

Note: Numbers are rounded to the nearest hundred.

Source: United States Census Bureau, 2011d

Table 4.2-4 shows housing occupancy characteristics. According to ACS data, the study area has a slightly lower proportion of occupied housing units than San Francisco, with 87 percent occupied and about 13 percent vacant. About 23 percent of occupied housing units in the study area are owner-occupied; 77 percent are renter-occupied, compared with about 37 percent owner-occupied and 62 percent renter-occupied in San Francisco.

Table 4.2-4 Housing Occupancy

	OCCUPIED HOUSING UNITS	OCCUPIED (#/%)	VACANT (#/%)	OWNER-OCCUPIED (#/%)	RENTER-OCCUPIED (#/%)
Within Study Area	130,200	113,700/87%	16,600/13%	26,000/23%	87,600/77%
San Francisco	374,900	338,400/90%	36,600/10%	125,500/37%	212,900/63%

Note: Percentages have been rounded to the nearest ten; numbers have been rounded to the nearest hundred.

Source: United States Census Bureau, 2011b

Households without Automobiles

Transit-dependent populations are defined as people without private automobiles, the elderly (over 65), youths (under age 18), and persons below poverty or median income levels defined by the U.S. Census. These individuals are more likely to rely on public transportation services for general mobility. Table 4.2-5 shows the approximate number of transit-dependent households[3] in the study area. About 46 percent of the households in the study area are without private automobiles, about 15 percent greater than the overall population of San Francisco.

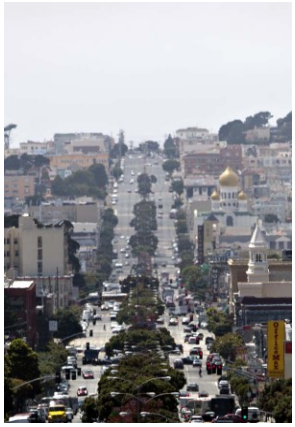
Approximately 46 percent of the households in the study area are without a private automobile compared to approximately 30 percent in San Francisco as a whole

[3] For this analysis, transit-dependent households are the total number of households (rather than individuals) without access to private automobiles.

Table 4.2-5 Transit-Dependent Populations

STUDY AREA	TOTAL HOUSEHOLDS	HOUSEHOLDS WITHOUT PRIVATE AUTOS	% OF HOUSEHOLDS WITHOUT PRIVATE AUTOS
Within Study Area	118,650	55,209	46.5%
San Francisco	338,366	101,938	30.1%

Source: United States Census Bureau, 2011c



The Geary corridor extends through portions of neighborhoods as diverse as the residential and commercial uses of the Inner and Outer Richmond (above), Pacific Heights (below), and downtown San Francisco on Market Street (bottom)

4.2.2.1.2 COMMUNITY AND NEIGHBORHOOD CHARACTERISTICS

The Geary corridor extends through portions of both formal and informal neighborhoods. *Formal* neighborhoods are those that are defined by the San Francisco Planning Department; *informal* neighborhoods include those neighborhoods known for historically significant traits. Formal and some informal neighborhoods in the Geary corridor are described below from west to east. Figures 4.2-3 and 4.2-4 depict formal neighborhoods relative to the study area. Descriptions of boundaries for each neighborhood are approximate; some neighborhoods overlap others.

Seacliff

The affluent, mainly residential Seacliff neighborhood is located in the northwest corner of San Francisco, north of the Outer Richmond and west of the Presidio. The neighborhood includes substantial recreational and open space areas, including Sutro Heights Park, portions of the Golden Gate Natural Recreation Area, Lincoln Park Golf Club, and China Beach.

Outer Richmond

The Outer Richmond is located southeast of Seacliff between Ocean Beach to the west, 19th Avenue to the east, generally Clement Street to the north and Fulton Street to the south. The area is predominantly residential, with neighborhood-serving commercial and retail uses centered largely along Geary Boulevard. The neighborhood is the informal center of San Francisco's Russian-American community, and also contains East Asian businesses, both on Geary Boulevard and Clement Street. Golden Gate Park is located directly south of the neighborhood.

Inner Richmond

The Inner Richmond is a mainly low- to medium-density neighborhood generally bordered by 19th Avenue to the west, Arguello Boulevard to the east, Lake Street to the north and Fulton Street to the south. Most of the neighborhood's businesses include neighborhood-serving stores and restaurants located along Clement Street. The University of San Francisco and Park Presidio Boulevard are located within the neighborhood.

Presidio Heights

The Presidio Heights neighborhood is bounded by Presidio Avenue to the east, Geary Boulevard to the south, Arguello Boulevard to the west, and West Pacific Avenue (and the Presidio) to the north. Presidio Heights is a primarily residential area of low- to medium-density housing with medical and commercial uses generally centered around California Street, such as the California Pacific Medical Center (CPMC) California Campus.

Pacific Heights

This neighborhood extends from Presidio Avenue in the west to Van Ness Avenue in the east and from Green Street in the north to California Street in the south. The neighborhood is primarily residential; however, neighborhood boutiques and restaurants are located along Fillmore Street, south of Pacific Avenue.

Japantown

San Francisco's informal Japantown neighborhood is the historic center of San Francisco's Japanese-American community. Japantown is generally located north of Geary Boulevard between California, Laguna, and Fillmore Streets. Historically it was part of the larger Western Addition neighborhood, but widening of Geary Boulevard and construction of the Fillmore Street underpass that took place during the 1950s divided the community. Japantown today is a relatively high-density residential and commercial area that contains single- and multiple-family homes as well as shops, restaurants, hotels, and a movie theater.

Western Addition/Fillmore District

The Western Addition/Fillmore District neighborhood is located south of Pacific Heights and is generally situated between Masonic Avenue to the west, Van Ness Avenue to the east, California Street to the north, and Duboce Avenue to the south. This area has historically served as a population base and cultural center for San Francisco's African-American community. The Fillmore District is perpendicular to Geary Boulevard, lying generally on Fillmore Street between California Street and Golden Gate Avenue. "The Fillmore" is mostly a commercial area with entertainment venues, bars, restaurants, cafes, and some apartment complexes.

Nob Hill

This neighborhood lies just north of Downtown between Van Ness Avenue on the west, Powell Street to the east, Broadway Street to the north and Bush Street to the south. The neighborhood includes a mix of high-density residential and commercial uses and well-known for having some of the most famous hotels in San Francisco, including the Fairmont and the Mark Hopkins. Nob Hill also includes civic and institutional uses like the Nob Hill Masonic Auditorium and Grace Cathedral.

Downtown/Civic Center

The Civic Center is situated between Van Ness Avenue to the west, Stockton Street to the east, Market Street to the south, and Bush Street to the north. The Civic Center is the primary center of government and civic institutions within San Francisco, including City Hall and the main branch of the San Francisco Public Library. Several other cultural venues are located here, including museums, theaters, and performance halls. In addition to the Tenderloin (described below), the Civic Center neighborhood also includes the informally recognized Little Saigon area, generally centered around lower Larkin Street.

Tenderloin

The Tenderloin is not a formally recognized neighborhood, but is one of San Francisco's historically lower-income areas. Within the Downtown/Civic Center neighborhood, the Tenderloin is generally bordered by Van Ness Avenue to the west, Powell Street to the east, Geary Street to the north, and McAllister Street to the south. A substantial component of the Tenderloin housing stock consists of single-room occupancy (SRO)[4] housing units and as such, the neighborhood contains a large complement of the City's affordable housing supply. The Tenderloin also contains numerous hotels, as well as commercial establishments such as restaurants, bars, and entertainment venues.

Chinatown

The Chinatown neighborhood is located east of Nob Hill and north of Downtown/Civic Center. It is bounded by Powell Street to the west, Kearny Street to the east, Broadway Street to the north, and Bush Street to the south. For well over a century, Chinatown has been the historic and cultural center of the Chinese/Chinese-American community. Chinatown includes iconic commercial and civic spaces like the Grant Avenue shopping district and the Dragon's Gate at Grant and Bush. Chinatown is among the most densely populated neighborhoods in San Francisco (and the western United States as a whole). The Chinatown neighborhood is not to be confused with three other areas of San Francisco sometimes referred to by the same name: Irving Street in the Outer Sunset, Taraval Street in the Parkside, and Clement Street in the Inner Richmond.

Union Square

The Union Square area includes several blocks in each direction surrounding the square itself and is adjacent to both the Tenderloin and the Financial District. Union Square is an urban park located on the north side of Geary Street between Stockton Street to the east and Powell Street to the west. The surrounding area is a frequented shopping district surrounded by an extensive collection of luxury retail shops, hotels, cafes, restaurants, bars, and theaters. Union Square Park hosts live music, movie screenings, cultural celebrations, and other special events and is a premiere destination for both visitors and locals.

[4] SROs are small, single-room living spaces, generally with no kitchen and shared bathrooms.

Figure 4.2-3 Formally Recognized Neighborhoods Within the Study Area

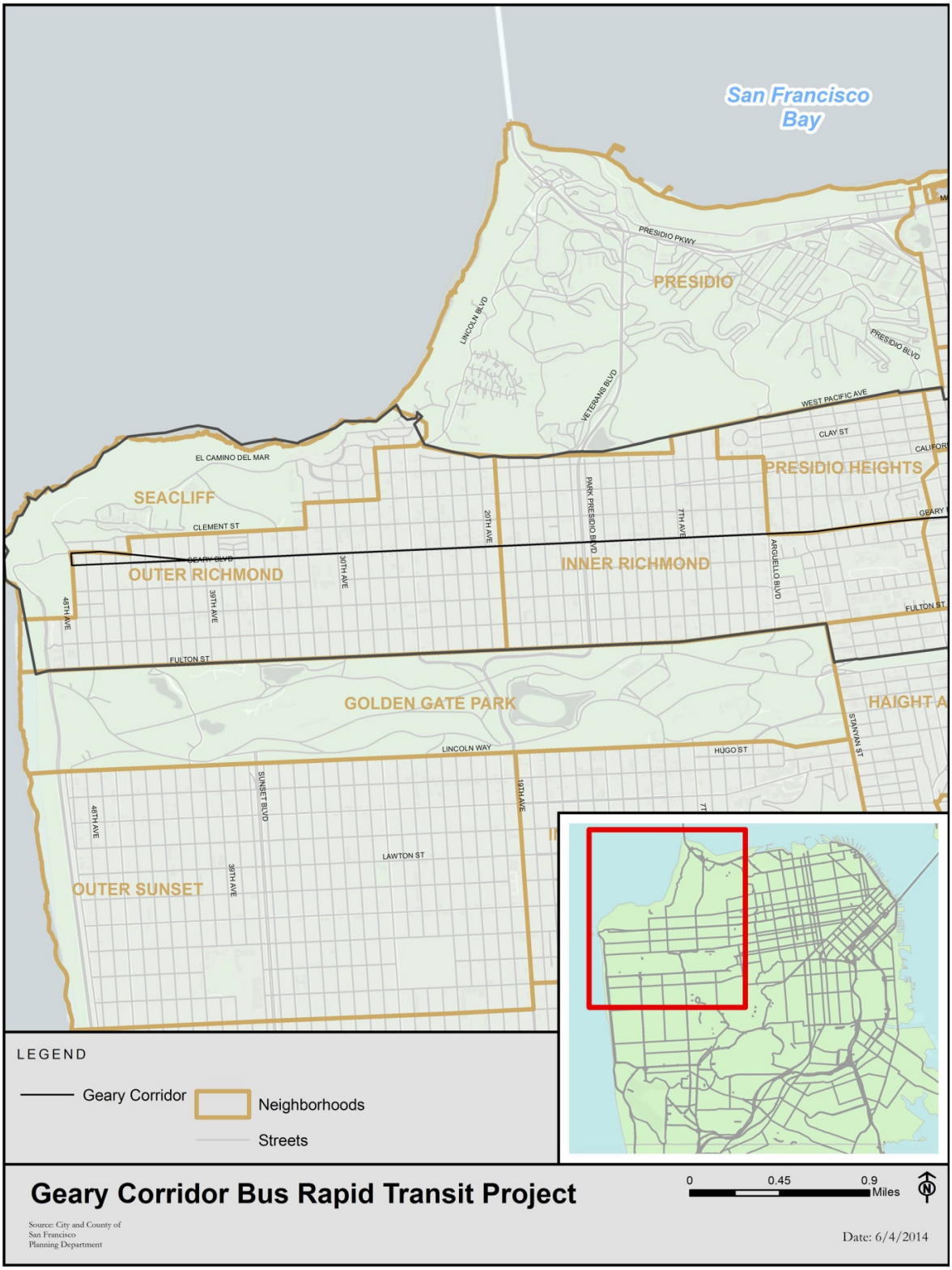


Figure 4.2-4 Formally Recognized Neighborhoods Within the Study Area (2)

Financial District

The Financial District is the central business district of San Francisco, encompassing areas on both sides of Market Street roughly between the Montgomery Street and Embarcadero Bay Area Rapid Transit station areas. The Financial District consists of predominantly commercial offices and business firms housed in skyscrapers and towers. Small businesses in this area provide services such as restaurants, cafes, dry cleaners, printers, office supplies stores, and the like.

South of Market (SoMa)

The SoMa neighborhood is generally bounded by Market Street, San Francisco Bay/Folsom Street to the northeast, 16th Street to the southeast and 13th Street to the southwest. Once largely given to manufacturing, industrial, and warehousing uses, SoMa has evolved in the last several decades to include a mix of high-density residential uses (particularly along the neighborhood's many alley streets), hotels, warehouses, nightclubs, high-technology/research and development spaces, and big-box retail uses. A few compact micro-neighborhoods exist within SoMa, including Rincon Hill located immediately south of the Transbay Transit Center development area.

North Beach

Somewhat removed from the Geary corridor but within the study area is part of the North Beach neighborhood. North Beach is north of the Financial District and Chinatown in the northwest corner of the City. The area is home to "Little Italy," the iconic Washington Square Park, and sites associated with the "Beat" generation of the 1940s - 1960s. The area contains a mix of high-density residential and commercial uses with restaurants, cafes, clubs, and small retail businesses.

4.2.2.1.3 COMMUNITY COHESION

Community cohesion is generally defined as the degree to which residents have a sense of belonging to their neighborhood or experience attachment to community groups and institutions because of continued association over time.

Most neighborhoods discussed previously are recognized by the San Francisco Planning Department and have active neighborhood associations and coalitions, merchant and business associations, and other community organizations (see Table 4.2-6). In addition, as outlined in Section 4.1.1.2, many of the project-relevant land use planning documents and planning efforts include local and neighborhood-level plans. The wide presence of neighborhood groups and plans reflects active community participation and engagement.

Table 4.2-6 Neighborhood Organizations

NEIGHBORHOOD	NEIGHBORHOOD ORGANIZATION
Seacliff	Seacliff Properties Association
Outer Richmond	Clement Street Merchants Association Lincoln Park Homeowners Association Planning Association for the Richmond(PAR) Save Our Richmond Environment Russian American Community Services Richmond Community Coalition Richmond District Neighborhood Center Washington High School PTSA Greater Geary Merchants and Property Owners Association
Inner Richmond	Lake Street Residents Association Jordan Park Improvement Association Ewing Terrace Neighborhood Association Richmond District Democratic Club
Presidio Heights	San Franciscans For Neighborhood Enterprise Presidio Heights Association of Neighbors Laurel Heights Improvement Association
Pacific Heights	Cow Hollow Association HERE Local 2 Marina/Cow Hollow Neighborhood & Merchants Association Pacific Heights Residents Association Planning Association of Divisadero Street Union Street Association
Western Addition/Fillmore District	Alamo Square Association Alliance for a Better District 6 Anza Vista Civic Improvement Club Booker T. Washington Community Center Cathedral Hill/Van Ness Neighborhood Association Duboce Triangle Neighborhood Association Fillmore/Lower Fillmore Neighborhood Association Fillmore Merchants & Imp. Association Hayes Valley Merchants Association Hayes Valley Neighborhood Association Japanese Community & Cultural Center Japantown Merchants Association Japantown Organizing Committee Japantown Task Force Western Addition Neighborhood Association Planning Association of Divisadero Street North of Panhandle Neighborhood Association
Nob Hill Neighborhood	Nob Hill Association Pacific Avenue Neighborhood Association Liberty Hill Neighborhood Association HERE Local 2 Middle Polk Neighborhood Association Russian Hill Community Association

NEIGHBORHOOD	NEIGHBORHOOD ORGANIZATION
Civic Center/Civic Center	Alliance for a Better District 6 Civic Center Stakeholder Group Lower Polk Neighborhood Association Polk District Merchants Association Market/Octavia Community Advisory Committee SEIU-USWW San Francisco Apartment Association Save Our Streets Tenderloin Futures Collaborator Tenderloin Housing Clinic Tenderloin Neighborhood Development Corp. Vietnamese Community Center Central City SRO Collaborative/Tenderloin Housing Clinic
Chinatown	Ah Hoo Association Asian Neighborhood Design Bow On Association Chinatown COC Chinatown Community Development Center Chinese Chamber of Commerce Chinese Newcomers Service Center Ho Ping Benevolent Association Friends of Appleton-Wolfard Libraries Hoy Ping Benevolent Association Ka Yin Benevolent Association SoTel Neighbors Yee Ying Association
Downtown/Financial District	Union Square BID North of Market Planning Coalition Telegraph Hill Dwellers SoTel Neighbors Union Square Association Theatre Row Business Association
South of Market District	Alliance for a Better District 6 Chinatown Community Development Center Market Street Association Mission Creek Harbor Association South Beach-Rincon Rincon Hill Residents Association

Source: San Francisco Planning Department, 2013.

4.2.2.1.4 PUBLIC SERVICES AND COMMUNITY FACILITIES

Public services and community facilities located within the study area include schools and universities, libraries, police and fire, hospital and medical, post offices, cultural facilities, and houses of worship. These facilities are listed in Tables 4.2-7 and 4.2-8 and displayed in Figures 4.2-5 through 4.2-7.

Schools and Universities

Nine primary public schools and four secondary public schools are located within the study area. Public schools are within the jurisdiction of the San Francisco Unified School District. Other educational facilities located within the study area include 27 private schools and four different college campuses.

Libraries

Three branches of the San Francisco Public Library are within the study area: the Western Addition, Richmond, and Anza libraries. No other public library branches are located within the study area.

San Francisco Fire Station #14

Police and Fire

The San Francisco Police Department and the San Francisco County Sheriff provide police protection and traffic enforcement in the study area. The San Francisco Fire Department (SFFD) provides fire protection services. Emergency medical services are provided by the SFFD. The study area includes eight fire stations and three police stations, including Tenderloin, Northern, and Richmond. The San Francisco Department of Emergency Management helps coordinate the activities of these providers in preparing for and responding to major emergencies.

Hospital and Medical Facilities

There are five medical facilities located within the study area: the University of California San Francisco Mount Zion Medical Center and Laurel Heights Medical Centers, two campuses of the Kaiser Permanente Medical Center (known as the Geary and French campuses), and the U.S. Veterans Administration Hospital at Fort Miley. California Pacific Medical Center is constructing a new campus on Van Ness Avenue between Geary Street and Post Street; construction began in 2013 and is expected to continue until 2019.[5]

[5] Sutter Health CPMC: Van Ness & Geary Campus. Newsletter. January-March 2017. Accessed April 19, 2017 at http://www.cpmc2020.org/sites/default/files/newsletter/VNGC%20Newsletter%20Winter%202016.compressed.pdf.

Figure 4.2-5 Public Services and Community Facilities Within the Study Area – 48th Avenue to Park Presidio

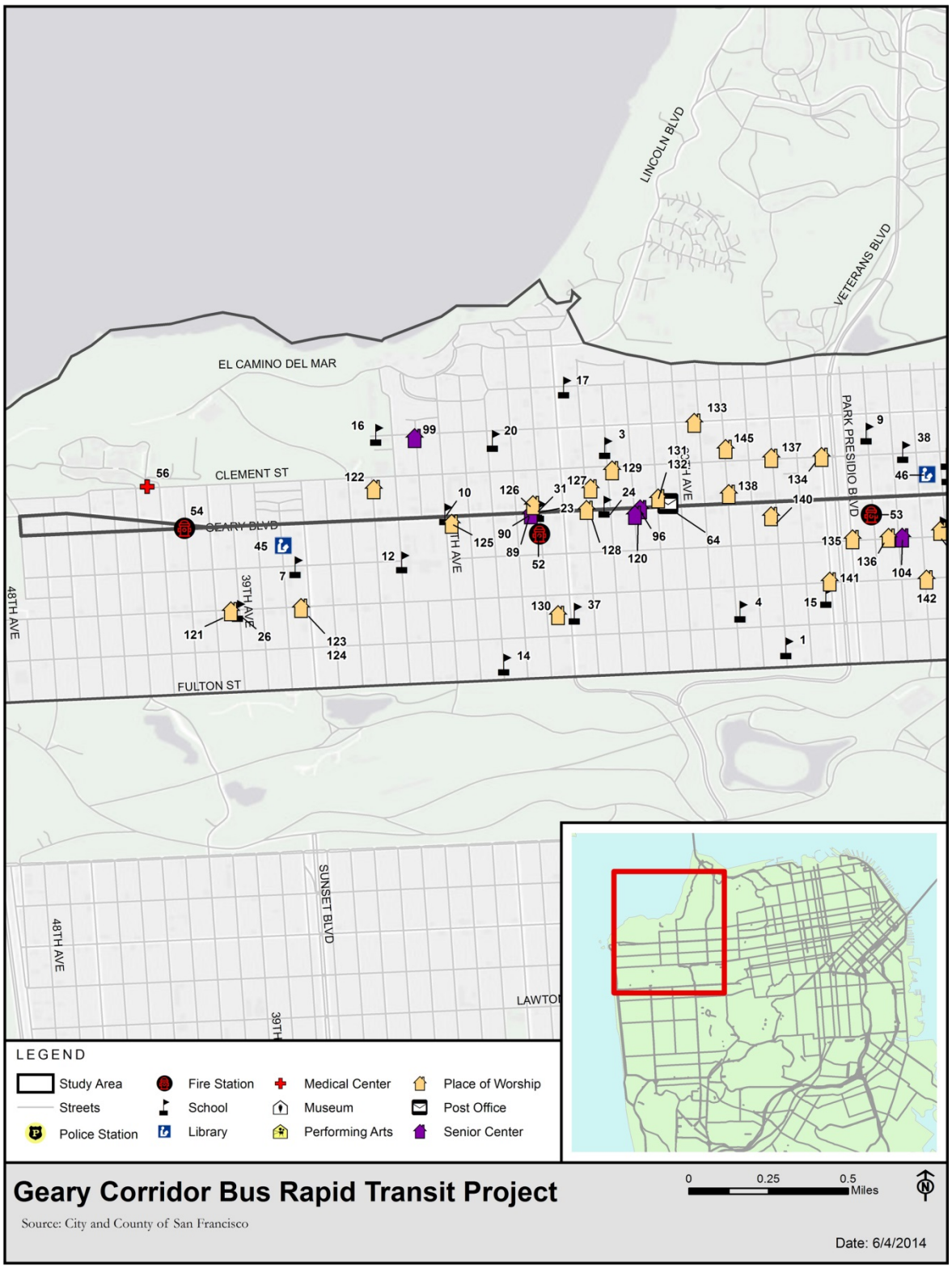


Figure 4.2-6 **Public Services and Community Facilities Within the Study Area – Park Presidio to Fillmore Street**

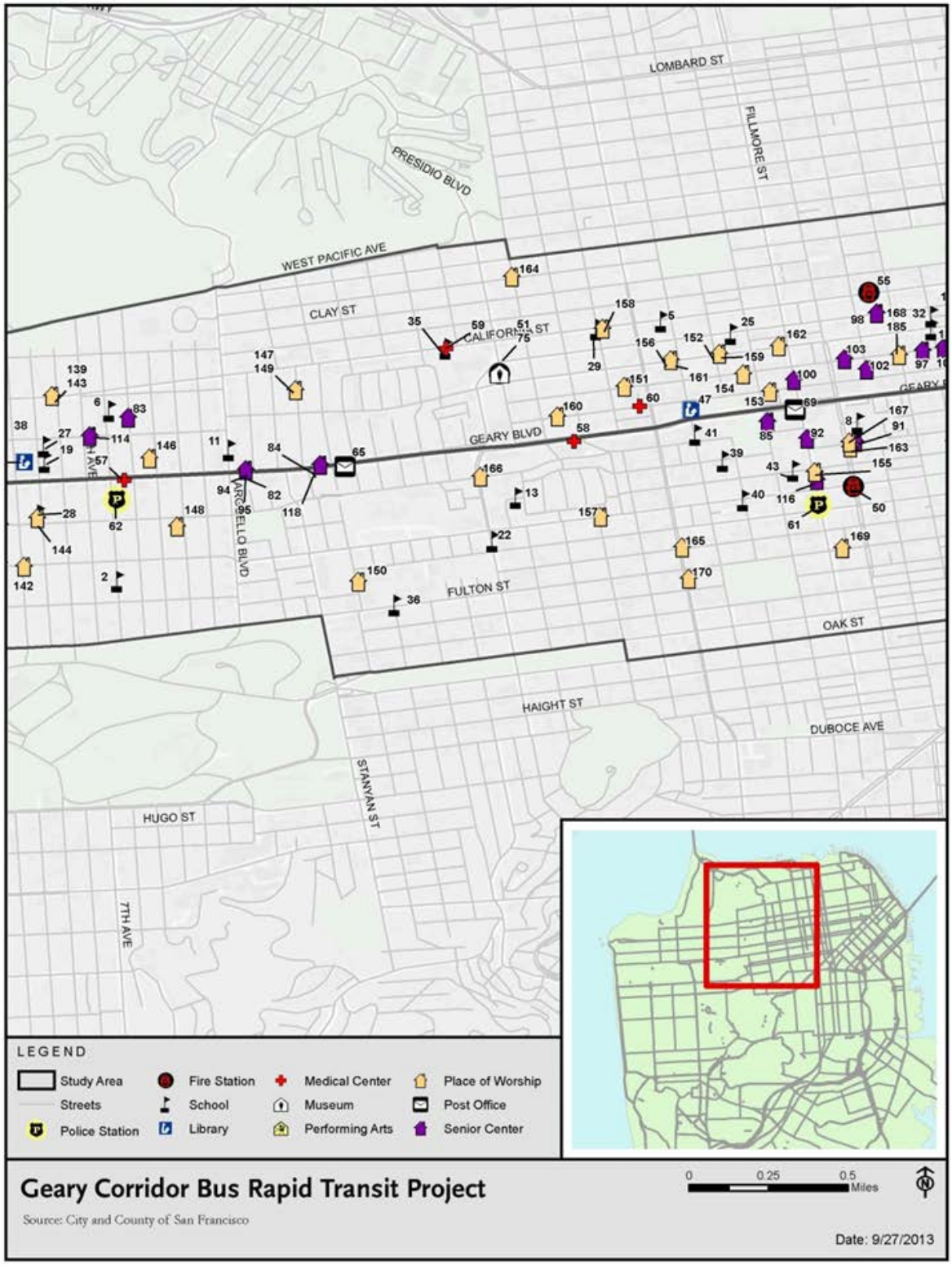
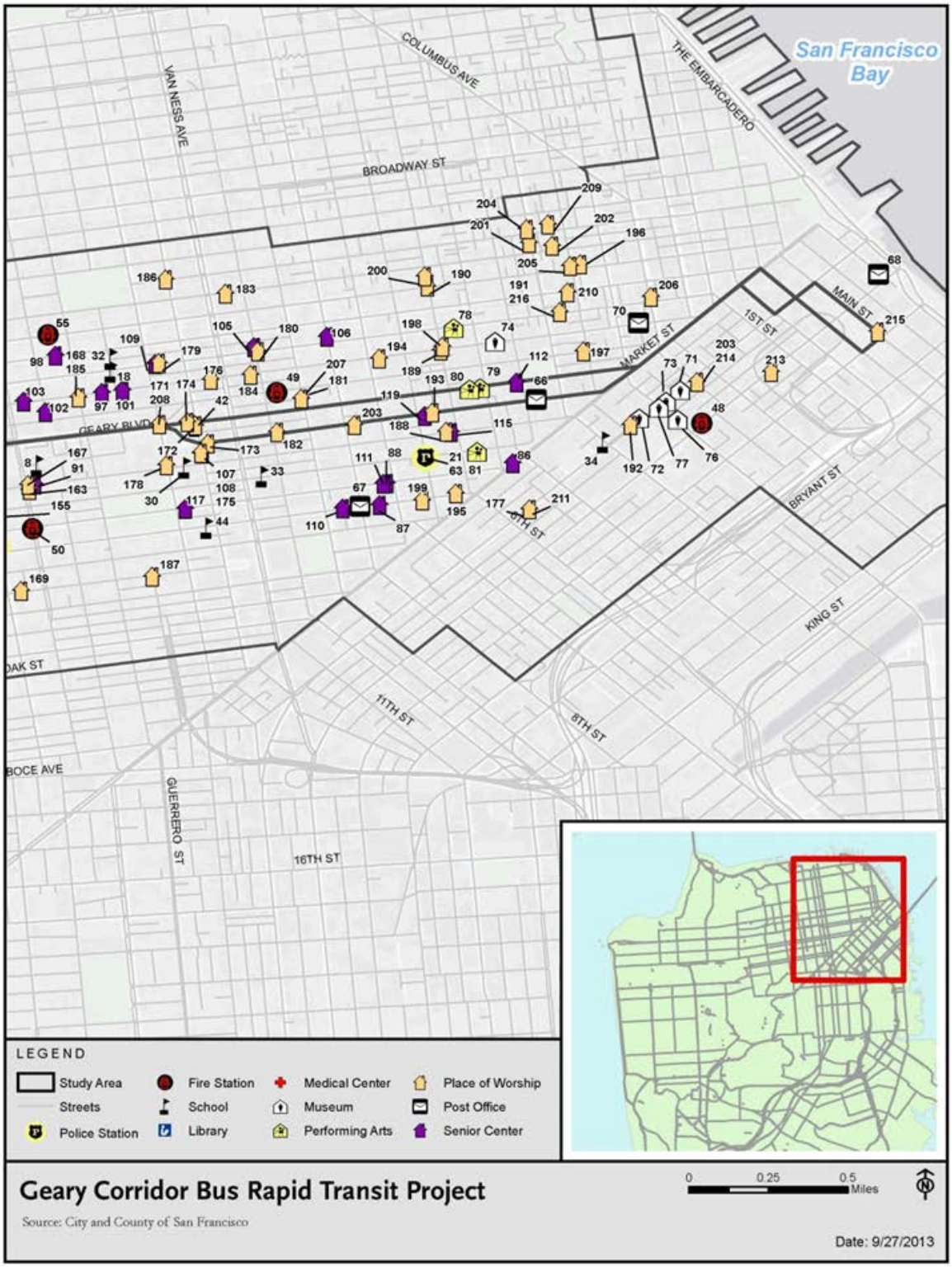


Figure 4.2-7 Public Services and Community Facilities Within the Study Area – Fillmore Street to The Embarcadero



Post Offices

Six branches of the U.S. Postal Service and one P.O. Box Unit are located within the study area, including a large branch on Geary Boulevard at Fillmore Street.

Cultural Facilities

Numerous cultural facilities are located throughout the study area, but are generally concentrated in the Downtown/Civic Center and South of Market neighborhoods. These facilities include the San Francisco Museum of Modern Art (MOMA), the Museum of Craft and Design, the Contemporary Jewish Museum, the San Francisco Fire Department Museum, the Yerba Buena Center for the Arts, the Museum of African Diaspora, and the California Crafts Museum. A cluster of performance venues are on or near Geary Street near Union Square, including the American Conservatory Theater, Curran Theatre, Post Street Theatre, Stage Werx Theatre, Actors Theatre of San Francisco, and EXIT Theatre.

The Holy Virgin Cathedral located at 6210 Geary Boulevard.

Senior Facilities

Thirty-eight senior facilities are located within the study area. These facilities include day centers, senior living facilities, resource centers and organizations geared toward senior support.

Houses of Worship

Many houses of worship of various denominations are within the study area. These facilities, which serve as community focal points, are listed in Table 4.2-8 and shown in Figures 4.2-5 through 4.2-7.

Table 4.2-7 Public and Community Facilities

ID	NAME	LOCATION
EDUCATIONAL FACILITIES		
1	Argonne Alt. Child Development Center	750 16th Ave.
2	Frank McCoppin School and Child Care Center	651 6th Ave.
3	Alamo Elementary School	250 23rd Ave.
4	Argonne Elementary School	680 18th Ave.
5	Dr. William Cobb Elementary School	2725 California St.
6	George Peabody Elementary School	251 6th Ave.
7	Lafayette Elementary School	4545 Anza St.
8	Rosa Parks Elementary School	1501 O'Farrell St.
9	Sutro Elementary School	235 12th Ave.
10	Presidio Junior High School	450 30th Ave.
11	Roosevelt Middle High School	460 Arguello Blvd.
12	George Washington Senior High School	600 32nd Ave.
13	Raul Wallenberg High School	40 Vega St.
14	Freeman School	862 28th Ave.
15	Hebrew Academy San Francisco	645 14th Ave.
16	Katherine Delmar Burke School	7070 California St.

ID	NAME	LOCATION
17	Kittredge School	2355 Lake St.
18	La Mel School	1801 Bush St.
19	Laurel School	350 9th Ave.
20	Mother Goose School	334 28th Ave.
21	San Francisco Christian Academy	302 Eddy St.
22	San Francisco Day School	350 Masonic Ave.
23	St. John of SF Orthodox Academy	6210 Geary Blvd.
24	St Monica School	5920 Geary Blvd.
25	St. Dominic's School	2445 Pine St.
26	St. Thomas the Apostle School	3801 Balboa St.
27	Star of the Sea Elementary School	360 9th Ave.
28	Zion Lutheran School	495 9th Ave.
29	Drew College Preparatory School	2901 California St.
30	Sacred Heart Cathedral Preparatory	1055 Ellis St.
31	Sisters Cyril and Mehodius High School	6200 Geary Blvd.
32	Stuart Hall High School	1714 Octavia St.
33	CCSF Alemany	750 Eddy St.
34	CCSF Downtown	88 4th St.
35	UCSF Laurel Heights	3333 California St.
36	University of San Francisco	2130 Fulton St.
37	SF County Special Education School	750 25th Ave.
38	Olympia Institute	950 Clement St.
39	Jewish Community High School of the Bay	1835 Ellis St.
40	Creative Arts Charter School	1601 Turk St.
41	Gateway High School/KIPP SF Bay Academy	1430 Scott St.
42	Montessori House of Children	1187 Franklin St.
43	Montessori School of the Bay Area	1550 Eddy St.
44	Civic Center Secondary School	727 Golden Gate Ave.
LIBRARIES		
45	Anza Library	550 37th Ave.
46	Richmond Library	351 9th Ave.
47	Western Addition Library	1550 Scott St.
EMERGENCY FACILITIES		
48	Fire Station #1	676 Howard St.
49	Fire Station #3	1067 Post St.
50	Fire Station #5	1301 Turk St.
51	Fire Station #10	655 Presidio Ave.
52	Fire Station #14	551 26th Ave.
53	Fire Station #31	441 12th Ave.

ID	NAME	LOCATION
54	Fire Station #34	499 41st Ave.
55	Fire Station #38	2150 California St.
56	Fort Miley VA Hospital	4150 Clement St.
57	Kaiser Permanente Medical Center – French Campus	4141 Geary Blvd.
58	Kaiser Permanente Medical Center – Geary Campus	2425 Geary Blvd.
59	UCSF Laurel Heights	3333 California St.
60	UCSF Medical Center (Mount Zion)	2330 Post St.
61	SFPD Northern Station	1125 Fillmore St.
62	SFPD Richmond Station	461 6th Ave.
63	SFPD Tenderloin Station	301 Eddy St.
POST OFFICES		
64	USPS Geary Station	5654 Geary Blvd.
65	USPS Golden Gate Station	3245 Geary Blvd.
66	USPS Macy's Station	170 O'Farrell St.
67	USPS PO Box Unit	101 Hyde St.
68	USPS Rincon Center Post Office	180 Steuart St.
69	USPS Steiner Street Station	1849 Geary Blvd.
70	USPS Sutter Street Station	150 Sutter St.
MUSEUM AND CULTURAL FACILITIES		
71	Cartoon Art Museum	655 Mission St.
72	Contemporary Jewish Museum	736 Mission St.
73	Museum of African Diaspora	685 Mission St.
74	Museum of Craft and Design	550 Sutter St.
75	SF Fire Department Museum	655 Presidio Ave.
76	SF Museum of Modern Art	151 Third St.
77	Yerba Buena Center for the Arts	701 Mission St.
78	Actors Theatre of SF	855 Bush St.
79	American Conservatory Theater	415 Geary St.
80	Curran Theatre	445 Geary St.
81	EXIT Theatre	156 Eddy St.
SENIOR CENTERS AND FACILITIES		
82	Alzheimers Day Center	3600 Geary Blvd.
83	Brighter Days Adult Day Health	259 5th Ave.
84	Center for Elders & Youth	3330 Geary Blvd.
85	Circle of Friends Adult Health	1550 Steiner St.
86	Compass Family Center	942 Market St. 600
87	Continuum HIV Day Services	255 Golden Gate Ave.
88	Curry Senior Center	315 Turk St.

ID	NAME	LOCATION
89	Family Service Agency SF	6221 Geary Blvd. #3
90	Golden Gate Senior Services	6221 Geary Blvd.
91	Hope Senior Center	1480 Ellis St.
92	Institute on Aging/Western Addition/Marina Resource	1426 Fillmore St.
93	(not used)	NA
94	Institute on Aging	3626 Geary Blvd.
95	(not used)	NA
96	Jackie Chan Activity Center	5757 Geary Blvd.
97	Japanese American Religious Federation	1615 Sutter St.
98	Japanese American Religious Federation	2016 Pine St.
99	Jewish Family & Children Services	303 31st Ave.
100	Jones Senior Homes Inc.	1727 Fillmore St.
101	Kimochi Home	1531 Sutter St.
102	Kimochi Japanese American Senior Services	1715 Buchanan St.
103	Kimochi Senior Center	1840 Sutter St.
104	Leisure Town Villa	1950 Anza St.
105	Leland Polk Senior Community	1315 Polk St.
106	Little Bros Friends of Elderly	909 Hyde St. 628
107	Lutheran Care for Aging	1031 Franklin St.
108	Martin Luther Tower Inc.	1001 Franklin St. 9b
109	Meals on Wheels, Dorrin Jones Senior Center	1668 Bush St.
110	N&S of Market Adult Day Health 350 Golden Gate Avenue	350 Golden Gate Ave.
111	North Market Senior Services	333 Turk St.
112	Northern California Cares	323 Geary St. 818
113	Golden Gate Senior Services/Richmond Senior Center	6221 Geary Blvd.
114	Overseas Chinese Institute on Aging	546 Clement St. C
115	Presentation Senior Community	301 Ellis St.
116	Resource Center for Senior Adults	1246 Fillmore St.
117	Retired Senior Volunteer Program	881 Turk St.
118	Richmond Resource Center	3330 Geary Blvd.
119	San Francisco Senior Center	481 O'Farrell St.
120	Self-Help for the Elderly	408 22nd Ave.

Source: San Francisco GIS Service

Table 4.2-8 Houses of Worship

ID	NAME	LOCATION
121	St. Thomas the Apostle Church	3835 Balboa St.
122	Pine United Methodist Church	426 33rd Ave.
123	Zion Mission Korean Baptist Church	3535 Balboa St.
124	Assemblies of God Full Life	3535 Balboa St.
125	First United Lutheran Church	6555 Geary Blvd.
126	Holy Virgin Cathedral	6210 Geary Blvd.
127	St. Monica's Rectory	470 24th Ave.
128	Our Lady Of Fatima Byzantine Catholic Church	5920 Geary Blvd.
129	Rabbi Isaac Fineman	322 23rd Ave.
130	Congregation Chevra Thilim – Modern Orthodox Shul	751 25th Ave.
131	First Burmese Baptist Church	380 21st Ave.
132	Formosan Christian Church of San Francisco	380 21st Ave.
133	Russian Orthodox Church of Our Lady of Kazan	5717 California St.
134	Congregation Beth Sholom	301 14th Ave.
135	San Francisco Bible Church	498 Funston Ave.
136	Christ the Saviour Church	2040 Anza St.
137	Congregation Anshey Sfard	1500 Clement St.
138	Golden Gate Christian Reformed	378 18th Ave.
139	St. James Episcopal Church and Community Learning Center	4620 California St.
140	Shih Liao Ching	431 16th Ave.
141	FSBC of SF	1300 Balboa St.
142	Chinese Grace Baptist Church	600 10th Ave.
143	(not used)	NA
144	Canaan Lutheran Church	495 9th Ave.
145	San Francisco Independent Church	270 18th Ave.
146	Magain David Sephardim Congregation	351 4th Ave.
147	St. Gregory Armenian Apostolic	51 Commonwealth Ave.
148	Shean-Mih-Yuan-Tung Temple	501 3rd Ave.
149	(not used)	NA
150	St. Ignatius Church	650 Parker Ave.
151	City Church San Francisco	2460 Sutter St.
152	St. Dominic's Catholic Church	2390 Bush St.
153	Jones Memorial United Methodist	1975 Post St.
154	Macedonia Missionary Baptist Church	2135 Sutter St.
155	St. John Coltrane African Orthodox Church	1286 Fillmore St.

ID	NAME	LOCATION
156	Philadelphian SDA Church	2520 Bush St.
157	St. John the Baptist Serbian Orthodox Church	900 Baker St.
158	Central Seventh-Day Adventist Church	2889 California St.
159	Shrine of Saint Jude Thaddeus	2390 Bush St.
160	Hokkeshu Buddhist Church	2556 Post St.
161	Imani Center For Edu & Wellness	2520 Bush St.
162	Unity San Francisco	2222 Bush St.
163	Glad Tidings Church	1280 Webster St.
164	Swedenborgian Church	2107 Lyon St.
165	Christian Community	906 Divisadero St.
166	Epiphany Center	100 Masonic Ave.
167	Full Gospel San Francisco English Ministry	1480 Ellis St.
168	Soto Zen Mission of San Francisco	1691 Laguna St.
169	Old Holy Virgin Russian Orthodox Cathedral	864 Fulton St.
170	Universal Life Church	752 Divisadero St.
171	Archdiocese of San Francisco	1 Peter Yorke Wy.
172	First Unitarian Universalist Church & Center	1187 Franklin St.
173	St. Mark's Lutheran Church	1111 O'Farrell St.
174	Hamilton Square Baptist Church	1212 Geary Blvd.
175	First United Lutheran Church	1031 Franklin St.
176	San Francisco Lighthouse Church	1337 Sutter St.
177	Journey Church of San Francisco	965 Mission St.
178	The Cathedral Event Center	1111 Gough St.
179	Trinity + St. Peter's Episcopal Church	1668 Bush St.
180	First Congregational Church of San Francisco, UCC	1300 Polk St.
181	Chinese Grace Church	931 Larkin St.
182	Life Begins With Motion, Inc.	888 O'Farrell St.
183	Old First Presbyterian Church	1751 Sacramento St.
184	Masjid al-Tawheed	1227 Sutter St.
185	Soto Zen Mission of San Francisco	1691 Laguna St.
186	Golden Gate Spiritualist Church	1901 Franklin St.
187	Jehovah's Witnesses	501 Fulton St.
188	Glide Memorial Church	330 Ellis St.
189	Church of Scientology Mission of San Francisco	701 Sutter St.
190	Grace Cathedral	1100 California St.
191	Notre Dame Des Victoires Church and School	566 Bush St.
192	St. Patrick Church	756 Mission St.

ID	NAME	LOCATION
193	Christian Science Church	450 O'Farrell St.
194	Congregation Keneseth Israel	873 Sutter St.
195	Al Sabeel Masjid Noor al-Islam	48 Golden Gate Ave.
196	Old Saint Mary's Church	660 California St.
197	Christian Science Practitioners	210 Post St.
198	Metaphysical Church & Group	710 Taylor St.
199	St. Boniface Catholic Church	133 Golden Gate Ave.
200	Episcopal Diocese-California	1055 Taylor St.
201	Kong Chow Temple	855 Stockton St.
202	First Chinese Baptist Church	15 Waverly Place
203	Burnham Praise	675 O'Farrell St.
204	Presbyterian Church-Chinatown	925 Stockton St.
205	Ching Chung Taoist Association	615 Grant Ave.
206	Lifelong Education Institute	220 Montgomery St.
207	Chinese Grace Church	931 Larkin St.
208	Archdiocese of San Francisco	1 Peter York Wy.
209	Buddhist Association-America	109 Waverly Place
210	Marist Center-The West	625 Pine St.
211	Journey Church of San Francisco	965 Mission St.
212	Rigpa San Francisco Center	111 New Montgomery St.
213	Epic Church	543 Howard St.
214	(not used)	NA
215	Eucharist SF	285 Main St.
216	Notre Dame Des Victoires Church and School	566 Bush St.

Parks and Recreation Areas

As listed in Table 4.2-9 and shown in Figure 4.2-8, the study area has more than 30 parks, recreational facilities, and other public spaces.[6]

[6] The study area used to capture parks and recreation facilities with proximity to the Geary corridor is this chapter is the same as that used for Chapter 6.

Table 4.2-9 Parks and Recreational Facilities

ID	NAME	LOCATION
1	Angelo J. Rossi Playground	2 Willard North St.
2	Argonne Playground	18th Ave. & Geary Blvd.
3	Cabrillo Playground	858 38th Ave.
4	Dupont Tennis Courts	336 31st Ave.
5	Fulton Playground	855 27th Ave.
6	Hamilton Playground	1900 Geary Blvd.
7	Laurel Hill Playground	251 Euclid Ave.
8	Margaret S Hayward Playground	1016 Laguna St.
9	Raymond Kimbell Playground	Geary Blvd. & Steiner St.
10	Embarcadero Plaza	Steuart St. & Market St.
11	Richmond Recreation Center	251 18th Ave.
12	Rochambeau Playground	238 25th Ave.
13	Rossi Swimming Pool	600 Arguello Blvd.
14	Sue Bierman Park	Washington St. & Drumm St.
15	Tenderloin Recreation Center	570 Ellis St.
16	Buchanan Street Mall	Buchanan b/t Eddy & Grove St.
17	Japantown Peace Plaza And Pagoda	Post St. & Buchanan St.
18	Balboa Natural Area	Balboa St. at Great Highway
19	Union Square	Post St. & Stockton St.
20	Cottage Row Mini Park	Sutter St. & Fillmore St.
21	Father Alfred E. Boeddeker Park	295 Eddy St.
22	Jefferson Square	Eddy St. & Gough St.
23	Sergeant John Macaulay Park	Larkin St. & O'Farrell St.
24	Lincoln Park	34th Ave. & Clement St.
25	Mini Park at 10th & Clement	351 9th Ave.
26	Mini Park at Fillmore & Turk Sts.	Fillmore St. & Turk St.
27	Mini Park at Bush & Baker Sts.	Bush St. & Baker St.

ID	NAME	LOCATION
28	Mini Park at O'Farrell & Beideman Sts.	O'Farrell St. & Beideman St.
29	Mini Park at Steiner & Golden Gate Sts.	Steiner St. & Golden Gate Ave.
30	Mountain Lake Park	One 11th Ave.
31	Muriel Leff ("Arguello") Mini Park	419-435 7th Ave.
32	Path/Greenway along Park Presidio Blvd.	Park Presidio Blvd.
33	Lands End	680 Point Lobos Ave.
34	Seal Rocks	Offshore
35	Richmond Playground	149 18th Ave.
36	Yerba Buena Gardens	Mission St. and 3rd St.
37	St. Mary's Square	Pine St. and Quincy St.
38	Willie "Woo Woo" Wong Playground	853 Sacramento St.

The ID numbers in the table correspond to those shown in figure 4.2-8.

Source: Review of San Francisco Recreation and Parks data, aerial maps

Figure 4.2-8 Parks and Recreational Facilities Within the Study Area

Source: Jacobs, 2014 and Circlepoint, 2015

4.2.2.2 | ECONOMIC AND BUSINESS ENVIRONMENT

This section describes the economic and business environment within the study area

4.2.2.2.1 MEDIAN HOUSEHOLD INCOME

According to ACS data median household income in the study area in 2011 was $66,661, whereas it was $72,947 within San Francisco as a whole

According to ACS data, study area median household income in the year 2011 was $66,661, lower than the San Francisco median ($72,947). Six U.S. Census block groups within the study area had a median household income below the poverty line as defined by the U.S. Department of Health and Human Services. All six block groups are located within or near the Tenderloin neighborhood. For further information regarding low-income block groups within the study area, see Section 4.14 (Environmental Justice).

4.2.2.2.2 EMPLOYMENT BY SECTOR/LABOR FORCE CHARACTERISTICS

San Francisco is a major employment center within the Bay Area. Several commercial, retail, medical, and other businesses exist within the study area, providing jobs for people living within as well as outside of the Geary corridor. The highest concentrations of employment, retail, commercial, and tourist activity are centered near the Financial District, Downtown/Civic Center, and SoMa areas. However, large employment areas also exist in other parts of the study area, specifically around universities and medical centers, including the University of San Francisco, the Kaiser Permanente Medical Center campuses, and the St. Francis Memorial Hospital. Major retail areas within the study area are located near Union Square, along Market Street (including the Westfield Centre), and Chinatown. Smaller, generally neighborhood-serving retail areas are located along Fillmore Street, California Street, Sacramento Street, Clement Street, and within Japantown.

Table 4.2-10 describes the distribution of employment by sector in the study area and San Francisco employment in 2011.

Table 4.2-10 Employment Sector Distribution

EMPLOYMENT SECTOR	JOBS IN THE STUDY AREA		JOBS IN SAN FRANCISCO	
	NUMBER OF JOBS	% OF JOBS	NUMBER OF JOBS	% OF JOBS
Cultural, Institutional, and Educational Service (CIE)	15,700	6.0%	58,300	10.2%
Medical and Health Services (MED)	6,000	2.3%	37,600	6.6%
Management, Information, and Professional Services (MIPS)	186,600	71.1%	293,700	51.5%
Production/Distribution/Repair (PDR)	5,000	1.9%	64,300	11.3%
Retail/Entertainment (RET)	33,300	12.7%	96,000	16.8%

EMPLOYMENT SECTOR	JOBS IN THE STUDY AREA		JOBS IN SAN FRANCISCO	
	NUMBER OF JOBS	% OF JOBS	NUMBER OF JOBS	% OF JOBS
Visitor Lodging (VIS)	15,800	6.0%	20,100	3.5%
TOTAL	262,400		570,000	

Numbers rounded to nearest hundred.

Cultural/Institutional/Educational Services (CIE) educational services, social services, museums and zoos, membership organizations, and private household services located throughout the City.

Medical and Health Services (MED) health services offices and hospitals and laboratories located throughout the City.

Management, Information, and Professional Services (MIPS) finance, insurance, and real estate (FIRE), business, legal, and professional services, and public administration activity located throughout the City; plus construction, transportation, communications, and utilities, agriculture, mining, manufacturing, wholesale trade, and motion picture production, distribution, and services located in the downtown area (defined to include the Financial District, Union Square/Yerba Buena, Civic Center), and adjacent districts B Transbay/Rincon Hill, South Beach (south of downtown) and Northeast (north of downtown).

Production/Distribution/Repair (PDR) automobile and other repair services located throughout the City, plus construction, transportation, communications, and utilities, agriculture, mining, manufacturing, wholesale trade, and motion picture production, distribution, and services in all parts of the City outside the Downtown, Transbay, and Northeast districts.

Retail/Entertainment (Retail/ENT) retail trade, amusement and recreation services, and personal services located throughout the City.

Visitor Lodging (VISITOR) hotels and other lodging located throughout the City.

Source: ABAG Projections 2013 (TAZ Level)

As shown in Table 4.2-10, a total of 262,400 jobs originate in the study area, accounting for about 46 percent of employment in San Francisco. The Management, Information, and Professional Services sector accounts for more than 70 percent of the jobs within the study area, with most of the jobs located at the east end of the Geary corridor near Market Street.[7]

Retail accounts for 12 percent of the jobs within the study area. Medical and Educational facilities located in the Geary corridor in Presidio Heights area also provide a significant numbers of jobs.

Retail and service businesses are the most widely distributed along the corridor and are most affected by changes to transportation in the corridor because they depend on accessibility for their customers as well as employees and deliveries. The project team conducted a door-to-door outreach and survey effort to all retail and service businesses along Geary Boulevard between 33rd Avenue and Gough Street[8] to collect information on the businesses present and input from their owners and managers. There are about 570 retail and service businesses along this portion of Geary Boulevard, of which about 35 percent completed the survey. Most of these businesses are small, with over 70 percent reporting having five or fewer employees working on a typical day and most stating they have 50 or fewer daily customers. Retail stores represent almost 40 percent of surveyed businesses, while services represent another 40 percent, restaurants and cafes 15 percent, and other business types the remaining 5 percent.

As shown in Table 4.2-11, an estimated 141,678 civilians, age 16 and older, comprise the study area labor force. Of this total, about 93 percent (131,163 persons) were employed and 7 percent (10,515 persons) were unemployed, similar to citywide levels.

[7] Association of Bay Area Governments. 2013.

[8] The survey was conducted in this area since major physical improvements associated with all of the build alternatives would occur within this portion of the Geary corridor.

The professional, scientific, management, administrative, and waste management occupations represented 21 percent of the labor force in the study area, followed by the educational, health, and social services occupations (18 percent) and the arts, entertainment, recreation, accommodation, and food services (13 percent of the labor force). About 12 percent of the labor force works in the finance, insurance, real estate, rental, and leasing sectors.

Table 4.2-11 Labor Force by Industry, 2011

INDUSTRY	STUDY AREA		SAN FRANCISCO	
	NUMBER OFPERSONS	%	NUMBER OF PERSONS	%
Employed labor force	131,163	92.58%	447,467	92.48%
Unemployed labor force	10,515	7.42%	36,368	7.52%
Professional, scientific, management, administrative, and waste management	28,187	21.49%	88,339	19.70%
Educational, health, and social services	24,359	18.57%	88,415	19.80%
Arts, entertainment, recreation, accommodation, and food services	17,631	13.44%	54,804	12.20%
Finance, insurance, real estate, and rental and leasing	14,814	11.29%	41,850	9.40%
Retail trade	12,692	9.68%	42,440	9.50%
Manufacturing	7,006	5.34%	26,510	5.90%
Other services (except public administration)	6,685	5.10%	23,616	5.30%
Information	5,598	4.27%	20,638	4.60%
Public administration	4,150	3.16%	16,516	3.70%
Transportation and warehousing, and utilities	3,780	2.88%	15,599	3.50%
Construction	3,707	2.83%	18,775	4.20%
Wholesale trade	2,434	1.86%	8,948	2.00%
Agriculture, forestry, fishing and hunting, and mining	120	0.09%	1,017	0.20%
Total Labor Force	141,678	100%	483,835	100%

Source: ACS, 2011

4.2.3 | Methodology

The lead agency has not adopted its own guidance for evaluating community impacts. In the absence of FTA guidance, SFCTA and SFMTA looked to other sources for guidance on evaluating community impacts. SFCTA and SFMTA selected guidance prepared by the California Department of Transportation (Caltrans) in its *Community Impact Analysis Handbook* (2011). Caltrans' rigorous methodology was developed to assess the effects of proposed transportation projects on communities and neighborhoods via a

number of metrics and indicators, including some factors evaluated elsewhere in this document. Metrics and factors include effects on parks and recreation facilities, demographic factors, and several transportation-related considerations. The rigorous structure of the Caltrans methodology offers a conservative basis for the determination of potential community impacts.

Community and social effects are generally classified as affecting social characteristics or community character of an area and/or the economic and business environment of an area. The alternatives have the potential to result in construction-period and/or operational-period effects as noted below.

Construction- and Operational-Period Effects

- Disruption and/or displacement of or limitation of access to businesses, residences, community facilities, and other land uses
- Changes to community character

To utilize a wide range of available data and more accurately characterize potential effects of the build alternatives, this analysis considers social and community characteristics, community and neighborhood characteristics, and the economic and business environment along the Geary corridor as of 2010, though more current baseline information is provided where available.

4.2.4 | Environmental Consequences

This section describes how the alternatives could affect social and community characteristics in the vicinity of the Geary corridor.

For most sub-topics included in this section, the build alternatives would have similar effects. Differences in potential effects from individual alternatives are described where applicable. As set forth in Section 4.2.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding community impacts in the Draft EIS/EIR.

4.2.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: ANALYSIS OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe community effects during construction or

operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe community effects relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: Retention of the Webster Street pedestrian bridge would lessen localized construction-period impacts in the immediate vicinity (particularly noise), as the bridge would no longer be demolished. Therefore, this modification would not result in new or more severe community impacts during construction.

Operation: Retention of the bridge would also improve pedestrian conditions during construction and operation of the project by retaining this existing connection across Geary Boulevard. Retention of the bridge would also maintain existing on-street parking in the Webster Street vicinity. Therefore, this modification would not result in new or more severe community impacts during operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: The removal of proposed BRT stops between Spruce and Cook streets would eliminate construction activity outside the curb-to-curb portion of the right-of-way in this area. Therefore, construction-related community effects would be reduced at this location relative to what was described in the Draft EIS/EIR.

Operation: Although this change would mean BRT service would not be provided at Spruce Street, the immediate area would still be served by local and express bus services. This modification would increase the walking distance between BRT stops in the Spruce/Cook area, but this increase would be offset by the retention of local and express service here. Retaining the existing bus stops on this block would also preserve 10 on-street parking spaces. Therefore, the change to remove proposed BRT stops here (and retain local/express stops) would not create any new or more severe community impacts during operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: Implementation of additional pedestrian enhancements throughout the corridor would entail localized construction activities where new pedestrian crossing bulbs would be constructed. Additional pedestrian bulbs, a painted safety zone at Taylor and O'Farrell streets and daylighting at intersections throughout the Geary corridor would be located entirely within the existing transportation right-of-way. While the additions would increase the absolute number of pedestrian enhancements relative to what was analyzed in the Draft EIS/EIR, each additional enhancement would have a short construction duration and thus minimal to negligible capacity to increase construction impacts so considerably that new or more severe construction-related air quality, noise, traffic, and mobility effects would result.

Operation: Once operational, additional pedestrian improvements would enhance multimodal accessibility at these locations, increasing pedestrian safety and connectivity along the corridor and promoting greater community

cohesion, thereby resulting in beneficial community impacts. The additional pedestrian improvements would remove an additional 25 on-street parking spaces at locations dispersed throughout the entire 6.5-mile Geary corridor. This would constitute a negligible portion of overall parking loss in the corridor (which has 1,680 on-street parking spaces). The dispersal of such additional parking loss would not unduly affect any individual community or neighborhood along the Geary corridor. Therefore, this modification would not result in new or more severe community impacts during operation.

Addition of BRT Stops at Laguna Street

Construction: While localized construction activities would increase at Laguna Street to construct transit islands, construction would occur entirely within the existing transportation right-of-way and would be short (2-3 weeks) in duration, with minimal excavation and short-term traffic lane closures. These minor modifications would have minimal to negligible capacity to increase construction activities so substantially that new or more severe construction-related air quality, noise, traffic, and mobility effects would result.

Operation: Longer-term, the addition of BRT stops at Laguna Street would remove an additional 14 parking spaces at this location; however, the addition of these stops would decrease walking distances between BRT stops in the immediate area. This would enhance multimodal accessibility at Laguna Street, contributing to a beneficial change in community impacts during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: Similar to retaining the Spruce/Cook local and express stops, retention of the Collins Street local and express bus stops would eliminate construction activity outside the curb-to-curb portion of the right-of-way in this location. This would reduce localized construction effects to the community. Therefore, this modification would not result in new or more severe community impacts during construction.

Operation: Once operational, retention of existing local and express stops at Collins Street would result in decreased walking distances between local and express stops in the area, though eight parking spaces which would have been created by the bus stop removal as proposed in the Draft EIS/EIR would no longer be added at this location. As this modification would retain existing conditions at Collins Street, no new or more severe worsened community impacts would occur during operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities but would simply shift about half of it one block to the west, thus, reducing construction activities directly in front of the Holy Virgin Cathedral (6210 Geary Boulevard), a religious and community facility. As with other aspects of the project, construction would occur entirely within the existing transportation right-of-way. The level of construction would be the same as

previously proposed, but would be located one block to the west and no new or more severe community impacts would occur.

Operation: Once operational, this relocation would better accommodate parking and loading concerns for the Cathedral, and provide a net reduction in construction and operations impacts for the community. No parking buffer areas would be installed on the north side of Geary (immediately adjacent to the Cathedral) between 26th and 27th avenues, thus preserving two additional parking spaces (retaining 11 of the existing 18 spaces) relative to what was described in the Draft EIS/EIR. Therefore, no new or more severe community impacts would occur during project operation as a result of this modification.

4.2.4.2 | CONSTRUCTION EFFECTS

4.2.4.2.1 | NO BUILD ALTERNATIVE – CONSTRUCTION EFFECTS

Construction of the anticipated transportation related improvements associated with the No Build Alternative would occur within the existing transportation right-of-way. No additional right-of-way or any displacement of residences, businesses, or community facilities would be required.

Construction of these improvements could temporarily affect both vehicular traffic and pedestrian movement to the extent construction would require short-term vehicle or bike lane reductions, and/or closure or detours of sidewalks. Project sponsors would be expected to implement typical/standard City and County of San Francisco mitigation practices and measures to minimize community impacts. Such practices and measures may include but would not be limited to advance notification to affected communities and businesses; signage advising drivers, cyclists, and walkers of potential detours/construction activity; and other similar measures commonly used in the City for infrastructure improvement projects to maintain paths of access during construction, including San Francisco Public Works' Director's Order 176,707, and San Francisco Municipal Transportation Agency's (SFMTA) "Blue Book." Given the anticipated implementation of such standard practices and measures, construction-related community effects of the No Build Alternative would be negligible.

4.2.4.2.2 | BUILD ALTERNATIVES – CONSTRUCTION EFFECTS

Social and Community Characteristics – Construction Effects

None of the build alternatives would require any temporary or permanent displacement of any residence, community facility, park, or business. Construction would follow the "staggered multiple block segment" approach, which – as further discussed in Section 2.3.2.3 and Section 4.15.2.1 – is intended to minimize the length of disruption to the corridor as a whole.

Construction related traffic and mobility effects would be similar in nature to those described for the No Build Alternative. In locations where new bus stops or bus-only lanes would be constructed, the build alternatives could result in short-term sidewalk closures, detours, conversion of parking lanes to travel lanes, and removal of loading zones. These could individually or collectively increase traffic and parking difficulties, which could disrupt

access to public facilities, parks, businesses, and residences within the Geary corridor (shown in Table 4.2-7 through Table 4.2-9). The severity of these effects would be reduced by adherence to City regulations for work conducted in public rights-of-way (see discussion in Section 4.6.1.2). Please also see Section 4.15 (Construction Impacts) for more discussion of construction-period transportation-related effects and pertinent avoidance, minimization, and mitigation measures.

Construction of the build alternatives would result in short-term emissions of air pollutants and increases in noise and vibration directly associated with construction activity, which could affect community facilities, parks, businesses, and residences along the Geary corridor. As documented in Section 4.10 and 4.11 of this document, none of these short-term effects would be adverse, so no adverse social or community effects are anticipated.

Similarly, short-term changes to the visual environment of various locations in the Geary corridor would be expected as a result of construction activity, which would temporarily affect community and neighborhood characteristics (refer to Section 4.2.2.1.2). However, such effects would be lessened by measures noted in Section 4.4 of this document and would also be relatively short-term in nature. Therefore, none of the construction-related visual effects would result in adverse effects to social or community character.

Economic and Business Environment – Construction Effects

Construction of the build alternatives would not result in the displacement of any business, residence, or community facility as all work would take place in public rights-of-way. The potential for economic or business effects relating to traffic and mobility disruption, as well as to the visual, air, and noise environment would be as described above with regard to potential social and community effects. Because none of the short-term traffic and mobility, visual, air quality, or noise/vibration effects would be adverse, none would result in adverse effects to the economic and business environment. Although pedestrian access would be preserved during construction, detours and temporary closures of portions of the sidewalk would occur during construction, adversely affecting patrons and employees of businesses along the Geary corridor. The severity of these effects would be reduced by adherence to City regulations for work conducted in public rights-of-way (see discussion in Section 4.6.1.2). Please also see Section 4.15 (Construction Impacts) for more discussion of construction-period transportation-related effects and pertinent avoidance, minimization, and mitigation measures.

4.2.4.3 | OPERATIONAL EFFECTS

4.2.4.3.1 | NO BUILD ALTERNATIVE – OPERATIONAL EFFECTS

Overall the transit and streetscape improvements of the No Build Alternative would enhance existing transit access and potentially increase transit ridership as compared to existing conditions; however, these benefits would be less than under the build alternatives

The No Build Alternative would perpetuate existing transit service along the Geary corridor. However, opening of the new Transbay Transit Center in 2017 would result in some changes to the current routing of bus lines along Market Street. The No Build Alternative also assumes improvements to traffic signal infrastructure in select locations, the operation of new buses, among other features (see Chapter 2 for a complete list of anticipated

elements of the No Build Alternative). No residential, business, or community facility displacement would be anticipated.

The noise and visual environments of the Geary corridor would not substantially change owing to the modest nature of proposed improvements. However, air pollutant emissions of the No Build Alternative would be greater than any of the build alternatives, because the No Build Alternative would have the least potential to convert auto trips to transit trips. Notwithstanding, the transportation infrastructure improvements of the No Build Alternative could result in increases in average transit vehicle speed which could in turn result in modest increases in transit ridership. Such changes could result in increased mobility and pedestrian activity along the Geary corridor that could enhance the business environment. The No Build Alternative improvements would not be expected to result in adverse changes to existing transit, auto, bike, or pedestrian circulation along the Geary corridor.

Given the modest nature of these long-term effects, the No Build Alternative would not be anticipated to result in any adverse direct effects to the social community characteristics or the economic and business environment of the Geary corridor. However, as described below, the No Build Alternative would not result in some of the beneficial community-related effects of the various build alternatives.

4.2.4.4 | BUILD ALTERNATIVES – OPERATIONAL EFFECTS

Social and Community Characteristics – Operational Effects

None of the build alternatives would result in any permanent or temporary displacements of housing or community facilities, since all proposed activity would be within existing public right-of-way areas.

The build alternatives would result in some minor changes in noise, air quality, and the visual environment. By 2035, implementation of any of the build alternatives would result in decreased emissions and overall improved air quality relative to the No Build Alternative (see Table 4.10-5 in Section 4.10, Air Quality). Thus, all of the build alternatives would result in a beneficial effect to the community character of the Geary corridor.

Furthermore, none of the build alternatives would result in project-related noise levels that would exceed FTA's significance criteria, thus there would be no adverse noise related effects to community facilities and characteristics in the area. With regard to visual effects, all of the build alternatives would generally result in negligible, neutral, or beneficial visual effects throughout the Geary corridor.

Implementation of any of the build alternatives would result in improved transit travel times and thus enhanced connectivity between residential, commercial, and community facilities within the study area. Such enhanced transit services would provide for a more efficient and reliable bus service to the various community facilities in the study area. With a higher proportion of transit-dependent residents than San Francisco as a whole, study area residents would benefit from increased transit capacity, reliability, and

efficiency, all of which would in turn increase the level of connectivity between residential areas and community facilities and services.

Chapter 3 identifies a number of transportation-related effects that can affect social and community characteristics. These effects (pedestrian and bicycle enhancements, changes in bus stops, change in left turn lanes, changes in on-street parking, emergency vehicle access) are summarized below in terms of their community effects potential. Please see Chapter 3 (Transportation) for a complete discussion of all transportation-related effects of the build alternatives.

Pedestrian and Bicycle Enhancements: The build alternatives would result in beneficial effects to pedestrian and cyclist mobility, which would benefit the community by providing enhanced amenities and infrastructure along the Geary corridor. In addition, Alternatives 3 and 3-Consolidated would remove the Fillmore Street underpass, which residents perceive as a barrier between communities. All build alternatives would provide several pedestrian enhancements, which would benefit the community by providing enhanced pedestrian safety. Alternatives 2, 3, and 3-Consolidated would provide 65 new pedestrian crossing bulbs, and the Hybrid Alternative/LPA would provide 91 new pedestrian crossing bulbs. The enhanced pedestrian facilities proposed under the build alternatives are detailed in Section 2.2. The build alternatives also include a bicycle lane connection across Geary Boulevard at Masonic Avenue; this would also foster connectivity to east-west bike routes along Anza and Post streets, thus providing enhanced community connectivity.

Bus Stop Changes: As a means of improving overall transit system performance, the project proposes consolidation of bus stops which could increase walking distances to bus stops relative to existing conditions. SFCTA estimated both existing and projected future walking distances to bus stops for each alternative for various segments of the Geary corridor (Market Street to Van Ness, Van Ness to Broderick, Broderick to Palm Avenue, Palm Avenue to Park Presidio, Park Presidio to 25th Avenue, and 25th Avenue to 34th Avenue). The build alternatives would both increase and decrease estimated average walking distances to bus stops at various locations along the Geary corridor. According to SFCTA's estimates, the maximum projected increase in walking distance in any alternative would be about 360 feet in Alternative 3-Consolidated in two locations: between Fillmore and Divisadero streets due to the elimination of the local stop at Scott Street, and between Van Ness Avenue and Laguna Street due to the elimination of the local stops at Franklin and Gough streets. This minor increase in walking distance (up to 360 feet) would not result in an adverse effect. Additionally, the project's transit service and system improvements would benefit the community and help offset any negligible effects related to increased walking distances.

Changes to Left Turns: Due to the reconfiguration of Geary Boulevard that would occur as a result of any of the build alternatives, motorists would experience a reduction in left-turn opportunities along Geary Boulevard. This could make accessing community facilities, residences, parks, and businesses more difficult for motorists.

Left-turn locations on Geary Boulevard are shown on Figures 2-9, 2-13, 2-17, and 2-20. As shown in Figures 2-9, 2-13, 2-17, and 2-20, the build alternatives would result in a reduction in some of the left-turn lanes on the Geary corridor, depending on the build alternative. The left-turn locations that would be eliminated with project implementation are generally located in close proximity to other left-turn opportunities. Overall, the transportation analysis (see Chapter 3) finds that the future reduction in left-turn locations would not be expected to adversely affect auto circulation in the corridor. Additionally, access to community facilities along the Geary corridor would remain despite left-turn reductions due to presence of several alternate route options. Thus, drivers traveling to specific community facilities along the Geary corridor would still be able to access such facilities with little disruption, notwithstanding the proposed removal of left-turn lanes.

Changes to Parking and Loading: Changes to parking and loading along the Geary corridor could result in adverse effects to social and community characteristics by reducing the ease of access to community facilities, businesses, etc. along the Geary corridor.

The build alternatives would result in no net loss of loading spaces, though as noted in Section 3.6, some loading spaces would be relocated generally within the same block to accommodate proposed physical improvements associated with each of the build alternatives.

Also as further detailed in Section 3.6, each of the build alternatives would result in the loss of some on-street public parking. Alternative 2 would result in the greatest potential loss of parking spaces and reduce publicly available parking spaces areawide by about 4 percent between 34th Avenue and Gough Street, including side streets. Alternative 2's largest absolute number of parking space loss would occur near the Fillmore/Japantown areas. However, this area also has the largest existing supply of nearby publicly available parking, thus the community would remain accessible to motorists.

Parking losses would be offset by new and improved transit service along the corridor; thus the community would not be substantially affected by a loss of available parking. Furthermore, parking demand is expected to decrease in the Geary corridor as a result of the transit improvements and subsequent conversion of auto trips to transit trips. Additionally, the parking supply analysis (see Section 3.6, Parking and Loading Conditions) revealed that the loss of parking spaces along Geary corridor would not result in an adverse effect; parking demand could be accommodated by remaining parking capacity in areas adjacent to the Geary corridor. It should be noted that the Geary Boulevard *Customer Intercept Survey* conducted by SFCTA found 76 percent of Geary Boulevard visitors within the Outer and Inner Richmond arrive by walking, biking, or public transit.[9] Therefore, there

[9] SFCTA's Customer Intercept Survey was conducted in March, 2013 on 7 midweek days (11am to 3pm or 3pm to 7pm), and on 3 Saturdays (11am to 3pm). A total of 589 responses were gathered. The survey results are in line with similar studies conducted in other neighborhoods Citywide (e.g. Polk St and Inner Sunset surveys). Therefore, the results are likely to be representative of the rest of the Geary corridor.

would be no adverse community impacts as a result of parking loss along the Geary corridor.

Emergency Vehicle Access: Emergency vehicle access is important for communities and ensures emergency services can be provided if needed. The build alternatives would have minimal effects to emergency service routes along the Geary corridor. Emergency vehicles would be able to enter and use bus-only lanes in the event of an emergency. Moreover, the project would have minimal access disruptions to existing and planned medical facilities along the Geary corridor. Ingress and egress to and from the Kaiser garages and surface lot located between Divisadero Street and Baker Street (for parking and storage of paratransit vehicles) would remain, as well as access to the existing medical office near Baker Street and associated handicapped parking and access ramp. Plans for all build alternatives are designed to accommodate proposed driveways for the future CPMC hospital at Geary Boulevard and Van Ness Avenue, expected to open in 2019. Overall, the project would not have adverse environmental effects related to social and community characteristics.

Economic and Business Environment – Operational Effects

None of the build alternatives would result in any permanent or temporary business displacements, since all proposed activity would be within existing public right-of-way areas. The operational effects discussed previously for social and community characteristics would be the same for the economic and business environment along the Geary corridor.

Implementation of any of the build alternatives would result in decreased levels of air pollutant emissions, improved transit amenities, and improved transit travel times and thus enhanced connectivity that would translate to benefits to businesses and economic activity within the study area.

Pedestrian and Bicycle Enhancements of the build alternatives would likely result in increased business activity in the study area, provide greater access for the hospitals and medical centers, offices, government centers, and educational institutions within the study area.

Bus Stop Changes would result in minor increases in average walking distances as noted in the discussion of social and community characteristics. In terms of the business and economic environment, these minor increases would not result in adverse effects upon businesses. Moreover, these minor increases in walking distance would be offset by both improved transit access and the pedestrian and bicycle enhancements of the build alternatives.

Changes in Left Turns could make accessing some businesses along the Geary corridor more difficult for autos. The transportation analysis (see Section 3.4) finds that the reduction in left-turn locations would not be expected to adversely affect auto circulation along the Geary corridor. Additionally, access to businesses along the Geary corridor would remain despite left-turn reductions due to presence of alternate route options. Thus, drivers would still have access to specific businesses along the Geary corridor with little disruption.

Overall, effects from vehicular lane reductions and turning restrictions along the Geary corridor are not anticipated to substantially affect local businesses within the project area

The removal of on-street parking associated with each build alternative is not expected to create an adverse effect to local businesses in the area

Parking losses could also make accessing businesses along the Geary corridor more difficult for autos. As previously discussed, the overall percentage of parking reduction corridorwide is small and the area with the greatest estimated loss of on-street parking (the area of Fillmore Street/Japantown) is also the area with the largest absolute number of publicly available parking spaces (on- and off-corridor). Any mobility or business access effects associated with changes in parking would be offset by new and improved transit service along the corridor as well as by the aforementioned pedestrian and bicycle enhancements. Furthermore, the estimated loss of parking supply is less than the overall number of spaces available during the highest-demand time, as found by the parking occupancy study described in Section 3.6.3. Based on the foregoing, the changes in on-street parking associated with the build alternatives would not result in adverse effects to the economic and business environment.

Business Ingress/Egress: Access into and out of businesses along the Geary corridor would be generally unchanged for all build alternatives, with minor exceptions noted here. Specifically, Alternative 2 and the Hybrid Alternative/LPA may require the relocation of a driveway providing vehicle ingress/egress for a parking lot serving (non-emergency) medical office buildings at 2186 Geary Boulevard and 2299 Post Street. Construction work would be scheduled to avoid/minimize adverse effects to driveway access.

4.2.4.5 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, all build alternatives would result in generally similar types of construction-period impacts, with the exception of Alternatives 3 and 3-Consolidated, which would require more intensive street reconstruction, particularly in the Fillmore and Masonic areas. None of the build alternatives would result in any permanent or temporary displacements. Alternative 3 and the Hybrid Alternative/LPA would have the greatest benefits to community character, transit connectivity, and pedestrian and cyclist mobility throughout the Geary corridor, followed by Alternative 3-Consolidated and Alternative 2. The No Build Alternative would have the least beneficial community effects as it would feature marginal transit improvements relative to the build alternatives.

4.2.5 | Avoidance, Minimization, and/or Mitigation Measures

4.2.5.1 | CONSTRUCTION MEASURES

Avoidance, minimization, and/or mitigation measures related to air quality and noise and vibration impacts during construction phases are described in Sections 4.10 and 4.11, respectively. The following additional measure will be implemented to reduce construction-related impacts to local businesses and residents:

M-CI-C1. A transportation management plan (TMP) that includes traffic rerouting, a detour plan, and public information procedures shall be developed during the design phase with participation from local agencies, other major project proponents in the area, local communities, business

associations, and affected drivers. Early and well-publicized announcements and other public information measures would be implemented prior to and during construction to minimize confusion, inconvenience, and traffic congestion. The TMP shall include at minimum the following provisions:

- Construction planning shall seek to minimize nighttime construction in residential areas and minimize daytime construction impacts on retail and commercial areas.
- As part of the TMP public information program, SFMTA shall coordinate with adjacent properties along the Geary corridor to determine the need for colored parking spaces (i.e., loading zones) and work to identify locations for replacement spaces or plan construction activities to minimize impacts from the loss of these spaces. SFMTA shall also coordinate with adjacent properties along the Geary corridor to ensure that pedestrian access to these properties is maintained.
- The TMP shall incorporate SFMTA's process for accepting and addressing complaints. This includes provision of contact information for the project manager, resident engineer, and contractor on project signage with direction to call if there are any concerns. Complaints would be logged and tracked to ensure they are addressed.
- The TMP shall identify or otherwise designate adequate passenger and truck loading zones to be maintained for adjacent land uses, including maintaining access to driveways and providing adequate loading zones on the same or adjoining street block face.

4.2.5.2 | OPERATIONAL MEASURES

As described above, the proposed Geary corridor build alternatives would not have adverse operational period effects on noise or air quality, so no related adverse effects to community character would be expected and thus no avoidance, minimization, or mitigation measures would be required. Similarly, no adverse effects are anticipated to commercial and residential properties resulting from the displacement of on-street parking. However, as set forth in Section 3.6.5, adherence to several improvement measures could be of benefit.

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4.3 Growth

This section describes potential for the build alternatives to induce or otherwise affect population growth in and around the Geary corridor in excess of relevant planned growth (as expressed through zoning). Changes in population growth are dependent on many factors, including economics, land use patterns, and the availability/adequacy of developable sites, infrastructure, and utilities.

4.3.1 | Regulatory Setting

4.3.1.1 | REGIONAL/LOCAL REGULATIONS

DEFINITION

PRIORITY DEVELOPMENT AREA (PDA): Locally identified areas with potential to accommodate new housing and/or employment opportunities in close proximity to existing or planned transit lines.

Plan Bay Area 2040, a joint effort of the Association of Bay Governments (ABAG) and the Metropolitan Transportation Commission (MTC) identified "Priority Development Areas" (PDAs) throughout the nine-county Bay Area region. PDAs are areas identified as having the potential to accommodate new housing and/or employment opportunities near existing or planned transit lines. Within San Francisco, 15 PDAs were identified, generally comprising much of the eastern half of San Francisco, including the downtown area, transit corridors, and eastern neighborhoods.

At the local level, growth is most directly managed by the San Francisco *General Plan*. As set forth in Section 4.1, the *General Plan* includes a number of area plans, the majority of which are located in or near the Downtown/Civic Center, Financial District, and South of Market neighborhoods.

4.3.2 | Affected Environment

4.3.2.1 | GROWTH STUDY AREA DEFINED

The build alternatives have the potential to affect population and job growth throughout the immediate Geary corridor, but also to areas in close proximity to the corridor. A substantial transportation investment like bus rapid transit service would be expected to have a "catchment area" extending at least a quarter mile on either side of the corridor. Therefore, for the purposes of studying potential growth related effects, this analysis uses a specific study area. The growth study area (study area) extends about one-half mile on either side of the Geary corridor. The study area is comprised of a number of traffic analysis zones (TAZs).[1] TAZs are geographic units defined and developed for the purposes of traffic modeling. TAZs in the Bay Area are set forth in countywide transportation models. TAZs incorporate both existing population and demographic information along with similar projections. The projections inherent in the affected TAZs are derived from ABAG's *Projections 2013*. ABAG prepares its forecasts from a variety of sources, including adopted local plans, interviews with local planning officials, and state/regional/national demographic data.

The growth study area extends about one-half mile on either side of the Geary corridor

The Geary corridor (looking east)

[1] The growth study area is essentially similar in geography to the study area defined in Section 4.2 (Community Impacts). The two study areas are comprised of different units. The community impacts study area is composed of both TAZs and U.S. census block groups, whereas TAZs are used exclusively in defining the growth study area.

4.3.2.2 | DEMOGRAPHIC TRENDS

Between 2010 and 2035, San Francisco is expected to gain more than 210,000 people and more than 80,000 new households

Projected population, housing, and employment within the study area and San Francisco are described below and shown in Table 4.3-1. Robust growth is anticipated for San Francisco. Between 2010 and 2035, San Francisco is expected to gain more than 210,000 residents and more than 80,000 new households. These figures represent increases exceeding 20 percent of the 2010 population and number of housing units. Comparable rates of growth are projected for the study area.

Table 4.3-1 Population and Housing Projections; 2010-2035

	POPULATION				
	2010	2015	2025	2035	PERCENT CHANGE, 2010-2035
Study Area	222,473	232,185	253,265	274,637	23%
San Francisco	781,531	821,171	906,223	992,192	27%
	HOUSING (HOUSEHOLDS) (PERCENT CHANGE)				
	2010	2015	2025	2035	PERCENT CHANGE, 2010-2035
Study Area	118,722	124,099	135,388	145,675	23%
San Francisco	345,936	362,095	395,691	426,508	23%

Source: ABAG Projections, 2013. See also 2010 U.S. Census data in Table 4.2.1.

As shown in Table 4.3-2, employment in the study area is anticipated to increase by 16 percent between 2010 and 2035, compared with a projected 30 percent increase for San Francisco as a whole. Most of the growth in the study area is projected to occur east of Masonic Avenue; relatively little growth is expected in the Richmond District.

Table 4.3-2 Employment Projections; 2010-2035

	2010	2015	2025	2035	PERCENT CHANGE 2010-2035
Study Area	341,869	354,926	380,315	397,351	16%
San Francisco	569,926	612,028	695,718	741,374	30%

Source: 2013 ABAG Projections as distributed with the City and County of San Francisco by the San Francisco Planning Department

4.3.2.3 | DEVELOPMENT TRENDS

The Geary corridor is located within a developed urban environment with extensive supporting infrastructure and utilities (discussed in detail in Section 4.6, Utilities).

Several regional projections anticipate a large increase in employment in San Francisco; both in the number of jobs and the number of employed San Francisco residents. Increases in both the total number of San Francisco residents and the total number of employed residents increase the demands placed on housing and the transportation system.

Multiple transportation and residential and commercial development projects are planned or are underway within the study area. Table 4.3-3 lists major planned, approved, and reasonably foreseeable projects within this area. For more detailed information about these projects, refer to Chapter 2, Section 2.7 (Related and

Planned Projects). The list of projects below, which was updated in April 2017, includes transportation and development projects that would be expected to directly increase population or employment (through the construction of new housing, office/commercial space, or improve transportation infrastructure and/or capacity). This list, though not exhaustive, is representative of the types of development and magnitude projected.

For more detailed information on other projects within the study area, refer to Chapter 2, Section 2.7 (Related and Planned Projects)

Table 4.3-3 Major Planned and Reasonably Foreseeable Projects

PROJECT NAME	ADDRESS/LOCATION	PROJECT TYPE	DESCRIPTION
Van Ness Avenue Bus Rapid Transit (BRT)	Van Ness Avenue between Lombard Street and Mission Street	Transportation	San Francisco Municipal Transportation Agency (SFMTA) proposes to implement BRT improvements along Van Ness Avenue from Lombard Street to Mission Street. Project under construction as of 2016 through 2020.
19th Avenue/Park Presidio Transportation Plan	19th Avenue/Park Presidio	Transportation	Street modifications to improve multimodal conditions.
Central Subway Project	Central San Francisco between Chinatown and 4th and King Street	Transportation	The second phase of San Francisco's Third Street Light Rail Project that will link the Little Hollywood and Visitacion Valley communities with Union Square and Chinatown.
Masonic Avenue Streetscape Improvement Project	Along Masonic Avenue between Geary Blvd and Fell Street	Transportation	Street modifications to improve multimodal conditions.
Polk Street Improvement Project	Along Polk Street between Market and Union Street	Transportation	Bicycle route relocation and street improvements.
Muni Forward (formerly known as the Transit Effectiveness Project or TEP)	Citywide	Transportation	SFMTA's program to enhance safety for people walking, create a Rapid Network, and improve Muni reliability through two key programs: service changes and transit priority projects that redesign streets to reduce transit delay.
Better Market Street Project	Market Street between Octavia Boulevard and The Embarcadero	Transportation/Place Making	A SFPW public visioning and revitalization project along Market Street.
WalkFirst/Vision Zero: San Francisco Pedestrian Safety Improvement Program	170 San Francisco intersections, including 25 located in the Geary corridor	Transportation	Pedestrian safety upgrades: bulb-outs, signal timing changes, continental crosswalks, and roadway striping changes.
SFgo	Citywide	Transportation Infrastructure	An advanced traffic signal management program that would interconnect traffic signals and thus better coordinate traffic queuing.
Doyle Drive / Presidio Parkway Project	Doyle Drive/US 101	Transportation	Replacement of Doyle Drive and Highway 1 approaches to the Golden Gate Bridge.

PROJECT NAME	ADDRESS/LOCATION	PROJECT TYPE	DESCRIPTION
Transbay Transit Center	Mission and 1st Street	Transportation	New five-story transit center for bus, Caltrain, and future California High-Speed Rail Service; 5.4 acres of park space.
California Pacific Medical Center (CPMC) Cathedral Hill Campus	Intersection of Geary Street and Van Ness Avenue	Commercial/ Medical	Construction of a new 730,888-gross square foot (gsf) medical campus at Geary Street and Van Ness Avenue.
Japantown Cultural Heritage and Economic Sustainability Strategy (JCHESS)	22 Peace Plaza	Community and Economic Development	An SF Planning economic development and cultural heritage preservation program.
350 Mission Street Office Tower	350 Mission Street	Commercial Development	Construction of a 30-story, 455-foot tall office tower occupying about 420,000 gsf. The ground floor would provide retail and restaurant space as well as publically accessible indoor and outdoor open space.
344 Fulton Street – Central Freeway Parcel F	344 Fulton Street	Commercial / Nonprofit development	Removal of the surface parking lot and construction of two new buildings; one 58-foot Boys & Girls Club of San Francisco clubhouse and office headquarters and an 81-foot mixed-use residential/retail building (56,320 gsf).
400 Grove Street – Central Freeway Parcel H	400 Grove Street	Residential/ Commercial Mixed Use	Construction of a 40,695 gsf. mixed-use building providing 33 residential units and 2,000 gsf of retail space.
SKS Freemont, LLC – 181 Fremont Street	181 Fremont Street	Residential/ Commercial Mixed Use	Demolition of two existing structures and construction of one 700-foot tall tower located on two lots. The tower would be about 15,310 gsf and provide a mix of office, residential and retail uses.
PPF Paramount Group – 75 Howard Street Project	75 Howard Street	Residential/ Commercial Mixed Use	Demolition of existing parking garage and construction of a 31-story, 348-foot building with about 432,253 gsf residential and 5,658 gsf retail.
Oyster Development Corp., 1634 Pine Street, LLC	1634 Pine Street	Residential/ Commercial Mixed Use	Demolition of five existing buildings and construction of two 13-story residential towers with ground floor commercial use.
The Mexican Museum and Residential Tower	706 Mission Street	Residential/ Commercial Mixed Use	Construction of a 47-story, 550-foot tall tower and renovation of the existing Aronson Building. Up to 43 floors of residential space and 4 floors of museum/retail space.
200-214 6th Street	6th Street	Residential/ Commercial Mixed Use	Demolition of existing building and construction of 9-story, 85-foot tall, 68,450 gsf building with 67 affordable housing units, about 47,710 square feet of residential space, and 2,845 gsf of ground-floor commercial space.

PROJECT NAME	ADDRESS/LOCATION	PROJECT TYPE	DESCRIPTION
465 Tehama Street LLC.	465 Tehama Street and 468 Clementina Street	Residential	Construction of a four-story, 9,762 gsf residential building at 468 Clementina with access from 465 Tehama Street.
248-252 9th Street	248-252 9th Street	Residential/ Commercial Mixed Use	Demolition of the existing buildings and merger of the two lots on the project site, and construction of a five-story, 50-foot-tall, 18,697 gsf mixed-use residential-commercial building.
5M Project	925-967 Mission Street	Residential/ Commercial Mixed Use	Retention and rehabilitation of two historic buildings, demolition of six buildings and construction of five buildings ranging in height between 50 to 400 feet. Total square footage would include about 1.85 million gsf of new and existing uses: 1,132,200 gsf of office uses, (814,500 gsf of net new office space), 552,800 gsf of residential uses (about 748 dwelling units), up to 146,900 gsf of active ground floor retail/office/cultural/education uses, and 18,200 gsf of arts/cultural/education uses.
Booker T. Washington Community Center Mixed Use Project	800 Presidio Avenue	Residential/ Commercial Mixed Use	Demolition of the Booker T. Washington Community Center building and construction of about 70,000 gsf of community center and residential uses.
PPF Paramount Group – 75 Howard Street Project	75 Howard Street	Residential/ Commercial Mixed Use	New 31-story residential building with ground floor retail.
1634-1690 Pine Street	1634-1690 Pine Street	Residential/ Commercial Mixed Use	Demolition of existing five buildings and construction of one building with two 13-story residential towers with commercial use on the ground and second floors. 353,360 gsf and would include about 262 new for-sale residential units. About 221,760 total gsf 5,600 gsf of commercial space.
Salesforce Tower	Mission and 1st Street	Office/Commercial	New 61-story office adjacent to new Transbay Transit Center.
Octavia Boulevard Enhancement Project	Octavia Boulevard between Market Street and Hayes Street, as well as from intersecting corridors	Transportation	Sidewalk bulbouts, extended center medians and landscape, and other traffic safety and streetscape upgrades.
Central SoMa Plan	Area bounded by Market Street, Townsend Street, 2nd Street, and 6th Street	Residential/ Commercial Mixed Use	The Plan seeks to encourage and accommodate housing and employment growth within the Plan area, including transit-oriented development and new/improved open spaces.
Market Street Hub Project	Area surrounding intersection of Market Street and Van Ness Avenue	Residential/ Commercial Mixed Use	The Hub Project seeks to increase affordable housing, support transit enhancements, improve the urban form, enhance the public realm, and encourage the arts.

PROJECT NAME	ADDRESS/LOCATION	PROJECT TYPE	DESCRIPTION
Powell Streetscape Project	Powell Street, between Geary and Ellis streets	Transportation	Design and construction of a new streetscape layout for Powell Street between Geary and Ellis streets

Source: City and County of San Francisco Planning Department 2013-2017.

4.3.3 | Methodology

Transportation projects, such as the proposed build alternatives, can influence population growth, along with regulatory and economic conditions, as well as the availability of developable sites and necessary public services.

The alternatives were evaluated for potential growth-related effects in terms of the project's consistency with existing and planned land uses, planned growth, and San Francisco's adopted plans and policies related to planned land uses and transportation investments. The alternatives have the potential to result in construction-period and/or operational-period effects as noted below.

Construction-Period Effects

- Temporary employment opportunities
- Sidewalk closures, detours, and other temporary construction measures

Operational-Period Effects

- Consistency with planned development/planned land uses
- Changes to existing development patterns, population, housing, or employment densities

Potential growth-related effects listed above were evaluated in terms of changes in transit capacity, land use, and ability to serve future anticipated growth.

This analysis considered demographic and development trends existing in the Geary corridor as of 2010, although more current information was also used when available. For the purposes of evaluating future conditions, however, 2010 served as the environmental baseline.

4.3.4 | Environmental Consequences

This section describes potential impacts and benefits for growth. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 4.3.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding growth impacts in the Draft EIS/EIR.

4.3.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: ANALYSIS OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);

3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe growth impacts during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe growth impacts relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: As demolition of the existing Webster Street pedestrian bridge would no longer occur, this would require less construction activity at this location, thereby reducing short-term disruptions that could influence population or job growth. Therefore, this modification would not result in new or more severe growth impacts during construction.

Operation: During operation, retention of the Webster Street bridge would maintain the existing pedestrian overcrossing of Geary. As this modification would retain the existing bridge, no changes to development patterns, population, housing, or employment densities would result. Therefore, this modification would not result in new or more severe growth impacts during operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: The removal of proposed BRT stops between Spruce and Cook streets would eliminate construction activity outside the curb-to-curb portion of the right-of-way in this area. This would reduce short-term disruptions that could influence population or job growth. Therefore, this modification would not result in new or more severe growth impacts during construction.

Operation: Operationally, although BRT service would not be provided at Spruce Street as a result of the modification, the immediate area would still be served by local and express bus services. Retention of the existing stops would not change existing development patterns, population, housing, or employment densities and would remain consistent with planned development and planned land uses. Therefore, no adverse effects to growth would result and this modification would not result in new or more severe growth impacts during operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: Implementation of additional pedestrian enhancements throughout the corridor would entail localized construction activities where new pedestrian crossing bulbs would be constructed. As with other project components, construction of additional pedestrian improvements would occur entirely within the public right of way, limiting the ability of construction to result in adverse short-term disruptions that could influence population or job growth. While the additions would increase the absolute number of pedestrian enhancements relative to what was analyzed in the Draft EIS/EIR, each additional enhancement would have a short construction duration and thus minimal to negligible capacity to change existing development patterns, population, housing, or employment densities.

Therefore, this modification would not result in new or more severe growth impacts during construction.

Operation: Once operational, additional pedestrian enhancements would further improve pedestrian access along the Geary corridor, complementing existing and planned land uses. Therefore, this modification would not result in new or more severe growth impacts during operation.

Addition of BRT Stops at Laguna Street

Construction: Construction of transit islands would occur entirely within the existing transportation right-of-way and would be short (2-3 weeks) in duration, with minimal excavation and short-term traffic lane and/or sidewalk closures, limiting the potential for disruptions of such magnitude that they could influence population or job growth. Construction-period impacts would be similar to other short-term construction effects described in this section and would not change existing development patterns, population, housing, or employment densities. Therefore, this modification would not result in new or more severe growth impacts during construction.

Operation: Similar to other components of the corridor-wide project, operation of BRT service at Laguna Street would be consistent with planned development and improve transit capacity and operations in the area. This would enhance transit service at Laguna Street, but the addition of a single set of BRT stops would not be expected to substantially change anticipated growth in this area. Therefore, this modification would not result in new or more severe growth impacts during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: As this modification would retain existing bus stops, it would eliminate construction activity outside the curb-to-curb portion of the right-of-way in this location. This would have no foreseeable effect on existing development patterns, population, housing, or employment densities in the immediate area. Therefore, this modification would not result in new or more severe growth impacts during construction.

Operation: Similar to other components of the corridor-wide project, retention of the Collins Street local and express bus stops would be consistent with planned development and planned land uses and would not change existing development patterns, population, housing, or employment densities. This would enhance transit service at Collins Street, thereby maintaining and enhancing existing land uses, and would not result in adverse growth effects. As this modification would retain existing bus stops/existing transit conditions in this area, no new or more severe growth impacts would be expected to occur during operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the level of construction activities but would simply shift about half of it one block to the west. Therefore, this modification would not result in any new or more severe construction effects that could affect population or job growth.

Operation: Similarly, shifting the location of the transition one block to the west would not change the nature of bus operations. The project would remain consistent with planned development and planned land uses and would not change existing development patterns, population, housing, or employment densities. Thus, this modification would not result in new or more severe impacts to growth during project operation.

4.3.4.2 | NO BUILD ALTERNATIVE – CONSTRUCTION EFFECTS

The No Build Alternative includes the construction of several previously approved transit and streetscape improvements. Given the nature of these improvements and their anticipated construction between 2015 and 2020, their construction would be unlikely to have any measurable effect on local employment and thus would not lead to substantial local population growth. Adherence to City regulations for work conducted in public rights-of-way (see discussion in Section 4.6.1.3) would limit the ability of such construction work to result in adverse short-term disruptions that could influence population or job growth. Finally, the proposed improvements would not substantially increase transit capacity on the Geary corridor. Based on the foregoing, the No Build Alternative would not have an adverse effect related to growth.

4.3.4.3 | BUILD ALTERNATIVES – CONSTRUCTION EFFECTS

Adherence to City regulations for work conducted in public rights-of-way (see discussion in Section 4.6.1.3) would limit the ability of construction of any of the build alternatives to result in adverse short term disruptions that could influence population or job growth. Further, construction of the build alternatives would be of relatively short duration. Refined construction information for the Hybrid Alternative/LPA is discussed at Section 2.2.7.5.7 as well as within Section 4.15. As set forth in these sections, construction activity would not be expected to exceed 12 months at any given location along the corridor, inclusive of any coordinated utility work. The other build alternatives, with some exceptions, would likely result in similar construction durations, although the extensive activity associated with the Fillmore Street underpass filling (Alternatives 3 and 3-Consolidated) would require much more extensive construction efforts (street reconstruction) than the Hybrid Alternative/LPA or Alternative 2.

Moreover, potential adverse effects to land use would be successfully avoided or minimized through adherence to the avoidance, minimization, and mitigation measures proposed for Community Impacts (see Section 4.2.3.1). In all, there would be no adverse effects to growth during construction of any of the build alternatives.

4.3.4.4 | NO BUILD ALTERNATIVE – OPERATIONAL EFFECTS

The transit and streetscape improvements comprising the No Build Alternative would provide modest streetscape enhancements of particular benefit to pedestrians and transit riders. However, these improvements would not substantially increase transit capacity, a key element of the project's overall purpose. Because the No Build Alternative would not substantially increase transit capacity, the No Build Alternative would not result in adverse effects to growth.

4.3.4.5 | BUILD ALTERNATIVES – OPERATIONAL EFFECTS

A key purpose of the build alternatives is to improve transit capacity as a means of better accommodating existing and projected transit needs. Such needs stem from the substantial increases in population, housing, and employment anticipated to occur in the eastern portion of the study area and in San Francisco as a whole by the year 2035.

Any of the build alternatives would complement both existing and planned land uses in the study area by providing improved transit service to existing and potential future riders. Notably, existing zoning in the western portion of the Geary corridor generally precludes the potential for substantial increases in development and in turn substantial population growth. In the eastern portion of the corridor, which includes areas designated as PDAs, the build alternatives would be consistent with underlying planning and zoning, which support anticipated job and population growth.

None of the build alternatives would substantially change existing development patterns, population, housing, or employment densities beyond what is projected for the study area, San Francisco, and the greater Bay Area region. As noted in Section 4.1 (Land Use), the build alternatives are directly consistent with numerous San Francisco adopted plans and policies related to planned land uses and transportation investments.

4.3.4.6 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, Alternatives 3 and 3-Consolidated would have the highest potential for short-term disruptions to influence population and job growth, followed by the Hybrid Alternative/LPA and Alternative 2. Once operational, all build alternatives would complement existing and planned land uses throughout the Geary corridor.

4.3.5 | Avoidance, Minimization, and/or Mitigation Measures

Implementation of the proposed build alternatives would support existing and planned growth and development within the study area and San Francisco and would not result in growth-related effects. Therefore, no specific avoidance, minimization or mitigation measures related to growth would be required.

4.4 Visual Resources

This section summarizes the regulatory setting, affected environment, and environmental consequences of the project alternatives on visual resources and visual quality in the Geary corridor. The analysis is based on review of preliminary project design documents and relevant citywide policy documents, such as the City of San Francisco *Better Streets Plan* (BSP) and the City of San Francisco *General Plan*.

RESOURCE

To see the San Francisco *Better Streets Plan*, go to: http://sfbetterstreets.sfplanning.org

4.4.1 | Regulatory Setting

4.4.1.1 STATE REGULATIONS

The California Environmental Quality Act (CEQA) establishes that it is the policy of the State to take all action necessary to provide the people of the State "with … enjoyment of aesthetic, natural, scenic and historic environmental qualities."[1]

4.4.1.2 REGIONAL/LOCAL REGULATIONS

At the local level, the City and County of San Francisco has established policies and regulations regarding visual resources in the following planning documents applicable to the Geary corridor: the San Francisco *General Plan*, the BSP, the Masonic Avenue Street Design Study, and the Japantown Cultural Heritage and Economic Sustainability Strategy (JCHESS).

4.4.1.2.1 SAN FRANCISCO GENERAL PLAN AND URBAN DESIGN ELEMENT (CITY OF SAN FRANCISCO, 1990)

Land use planning goals and policies are guided by the San Francisco *General Plan*. The Urban Design Element (UDE) of the *General Plan* concerns the physical character and order of the City, and the relationship between people and their environment. The UDE sets forth objectives and supporting policies that cover the following major areas relevant to the proposed project: City pattern, conservation, major new development, and neighborhood environment.

The Urban Design Element of the San Francisco *General Plan* concerns the physical character and order of the City, and the relationship between people and their environment

The Conservation section within the UDE includes two maps relevant to the project alternatives: 1) *Street Areas Important to Urban Design and Views* and 2) *Quality of Street Views*.

The *Street Areas Important to Urban Design and Views* map identifies the east-facing slope of Anza Vista Hill and the portion of Geary Boulevard near St. Mary's Cathedral Hill as "important street views for orientation." The map also identifies the Cathedral Hill section of O'Farrell Street and the entire downtown portion of O'Farrell Street as "street views of an important building." The entire downtown section of Geary is identified as a portion of the City's 49-mile Scenic Drive.

[1] California Public Resources Code Section 20110(b).

The *Quality of Street Vie*ws map identifies the elevated views eastward from roughly 37th Avenue to 32nd Avenue (sometimes referred to as Washington Heights) and the elevated eastward views of downtown from Anza Vista Hill (Masonic to Divisadero) as "excellent."

Motorists and bus passengers in particular would thus be considered to have higher visual sensitivity in these designated areas.

Certain types of projects, including those that would modify the curb-to-curb width of City streets are subject to approvals related to the *General Plan*. See discussion at Section 4.1.1.1 regarding *General Plan* referrals.

4.4.1.2.2 | SAN FRANCISCO BETTER STREETS PLAN (BSP, 2011)

The San Francisco Better Streets Plan provides a comprehensive set of guidelines to improve San Francisco's streetscapes to make them universally accessible, safe, and comfortable

The San Francisco BSP was adopted by the Mayor and the Board of Supervisors in December 2010, and took effect on January 16, 2011. The BSP provides a comprehensive set of guidelines to improve San Francisco's streetscapes to make them universally accessible to all, more attractive, safe, and comfortable. The BSP describes a vision, provides design guidelines, and identifies next steps to create streets that are publicly accessible and support multi-modal use with a particular emphasis on pedestrians and transit. The BSP calls for a comfortable pedestrian realm with significant pedestrian amenities and public spaces that include the following elements: curb ramps, marked crosswalks, pedestrian signals, pedestrian crossing bulbs, street trees, tree grates, sidewalk planters, storm water controls, pedestrian lighting, special paving, and site furnishings. The BSP explains that streetscapes should be designed to encompass a wide range of features and amenities. However, this does not mean that projects should contain all potential elements or not be built at all. Rather, the BSP suggests coordination of streetscape-related projects to make improvements simultaneously and look for opportunities to build additional low-cost elements into existing capital projects.

Numerous policies of the BSP set forth specific guidance for the design and appearance of streetscape features and would thus be applicable to the project alternatives.

4.4.1.2.3 | MASONIC AVENUE STREETSCAPE PROJECT

Masonic Avenue Streetscape Project area

This San Francisco Municipal Transportation Agency (SFMTA) project proposes a series of improvements on Masonic Avenue between Geary Boulevard and Fell Street to more safely and efficiently accommodate the needs of all users. Major improvements include the addition of a landscaped median, raised cycle tracks, bus bulbs, and creation of a public plaza at the southwest corner of the Geary-Masonic Avenue intersection. San Francisco Public Works began construction on this project in July 2016 with completion expected by spring 2018.

4.4.1.2.4 | JCHESS (2013)

Building off its *Draft Japantown Better Neighborhood Plan* (2009), the San Francisco Planning Department completed a process in 2013 to support economic development in this area, preserve and enhance its historic and cultural uses and buildings, and make physical enhancements within the study area. Focused on the neighborhood's cultural heritage, strategies identified include creating a community development corporation, land trust, or community benefits district; implementing physical improvements to Peace Plaza and Buchanan Mall; and others. The JCHESS

identified specific concerns regarding landscaping, lighting, street furnishings, and wayfinding signage.[2]

The JCHESS identified implementation of the BSP as the primary vehicle for addressing the above streetscape concerns. The BSP provides guidance on how streets should be designed such as for the residential and commercial streets that comprise Japantown. The BSP guides the design of the streets, curb alignments, crosswalks, and parking lanes. The BSP also offers guidance for the use of the sidewalks and makes allowances for street trees and plantings, lighting, paving, site furnishings, and wayfinding signage. As part of the adoption of the BSP, the City completed an environmental review that enables streetscape and pedestrian improvements in conformance with the BSP to be implemented. The JCHESS also states that Geary corridor improvements could include safer and more attractive pedestrian crossings of Geary Boulevard in Japantown.

The Japantown Cultural Heritage and Economic Sustainability Strategy is focused on supporting economic development in this area, preserving and enhancing its historic and cultural uses and buildings

4.4.1.2.5 SAN FRANCISCO PLANNING CODE

Under Article 10 of the San Francisco Planning Code, a Certificate of Appropriateness is required from the Planning Department for projects located within any landmark site. This process requires a hearing with and approval from the Planning Commission. As needed, the Planning Commission may consult with civic groups, public agencies, and interested citizens in consideration of a Certificate of Appropriateness application. The design, architectural style, arrangement, texture, materials, and color of project features are considered.

Similarly, under Article 11 of the planning code, alterations to significant or contributory buildings in designated conservation districts, such as the Kearny-Market-Mason-Sutter (KMMS) Conservation District, are subject to review and approval by the Planning Department and Historic Preservation Commission. The Architectural Review Committee of the San Francisco Historic Preservation Commission is responsible for review and approval of the architectural design of structures located within a historic district.

4.4.1.2.6 SAN FRANCISCO PUBLIC WORKS CODE

Various provisions of the San Francisco Municipal Code, including Public Works Code Section 798.5, establish a role for the Civic Design Review Committee (Committee) within the San Francisco Arts Commission (SFAC) as responsible for reviewing and approving the architectural design of structures on City property. Committee review is required for any structure or landscaping on or over City property, including transit structures such as station platforms, bus shelters and station canopies, landscaped medians and planters. The committee has previously reviewed and approved SFMTA's standard shelter design, which would be used as part of each of the build alternatives.

[2] The JCHESS defined the term "streetscape" to include "all those things that influence a pedestrian's experience, including landscaping, lighting, sidewalk, furnishings, and upkeep."

4.4.2 | Affected Environment

4.4.2.1 | OVERVIEW

The project setting consists of the Geary corridor, extending from the westernmost portion of the Richmond district to the west, to Market Street in downtown to the east. The Geary corridor comprises largely level-to-rolling topography, with notable hills in the outer Richmond District, at Masonic Avenue/Anza Vista Hill, and at Cathedral Hill between Laguna Street and Van Ness Avenue.

The Geary corridor is the principal east-west corridor of the City, extending from downtown nearly to the beach in the west. Geary is the City's only major boulevard to do so. Between 37th Avenue and Van Ness Avenue, Geary Boulevard is among the widest streets in the City, with a curb-to-curb width ranging from 90 feet to 100 feet.

4.4.2.1.1 VIEWSHED AND LANDSCAPE UNITS

DEFINITION

VIEWSHED: An area of land, water, or other environmental element that is visible to the human eye from a fixed vantage point

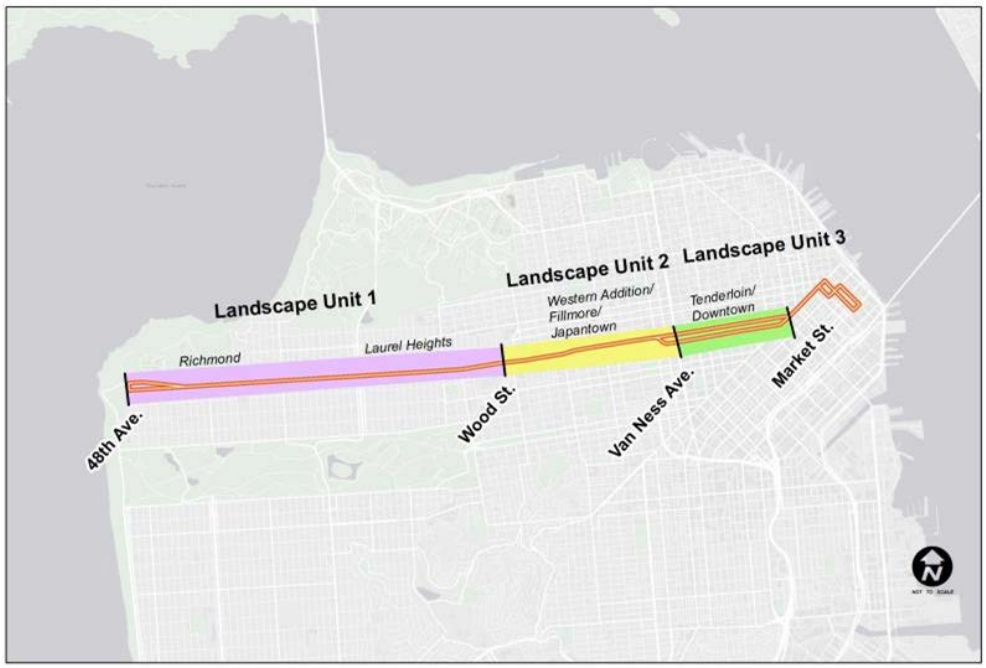
The viewshed or area within which the project alternatives would be visible was defined as the area on or directly adjoining Geary Boulevard. This is because Geary Boulevard is predominantly lined by buildings which limit views into and out of the corridor. The streetscape is intermittently visible from nearby higher elevation areas.

The project viewshed consists of the actual area in which the project would be visible, including the Geary corridor and its adjacent land uses

Consistent with applicable methods (described in Section 4.4.3), the Geary corridor was subdivided into large-scale landscape units, based on broadly common visual character. These units provide a framework to contextualize the setting and effects.

Figure 4.4-2 depicts a map of landscape units or segments in the Geary corridor. The map also depicts locations of key representative viewpoints within the landscape units, which are used to focus the discussion below.

Figure 4.4-1 Landscape Units Map



Source: WKA, 2013

4.4.2.1.2 LANDSCAPE UNIT 1: 48TH AVENUE (RICHMOND DISTRICT) TO WOOD STREET (LAUREL HEIGHTS/ANZA VISTA HILL)

LANDSCAPE UNIT 1

Landscape Unit 1 extends from 48th Avenue to Wood Street. Two 'excellent' quality views were identified; these include a segment between 48th and 45th Avenue with westward views of the Pacific Ocean; and the segment between roughly 37th and 30th Avenues with elevated views eastward of the Richmond District, Lone Mountain, and portions of the downtown skyline

Landscape Unit 1 is roughly defined as the Geary corridor segment extending from (48th) Avenue to Wood Street, just west of Masonic Avenue. The segment traverses several neighborhoods, including the Richmond District, the University of San Francisco (USF)/Lone Mountain area, Laurel Heights and the west slope of Anza Vista Hill. However, the visual character of the Geary corridor throughout this segment is substantially similar, typified by architecturally heterogeneous, low-rise (1 to 6 stories) residential and street-front commercial uses. Figure 4.4-3 depicts typical images of Landscape Unit 1.

Between 48th Avenue and 28th Avenue, land uses adjacent to the Geary corridor are predominantly low-rise residential. In this segment, particularly between 37th and 30th avenues, the elevated topography creates scenic eastward views identified in the UDE *Quality of Street Views Map* as "excellent." East of 30th Avenue, the Geary corridor descends slightly and remains level to gently rolling throughout the Richmond District.

From 28th Avenue eastward, the Geary corridor changes to a predominantly commercial but still largely low-rise street-front, remaining so throughout the remainder of this landscape unit. East of Arguello Boulevard, the topography rises gently toward the east, but the overall character of the entire segment between 30th Avenue and Wood Street is substantially similar. The overall character is thus of a predominantly low-rise commercial street front, with diagonal street-front parking between 28th and 15th avenues. Geary Boulevard widens from two lanes to four lanes from 39th Avenue through the Richmond District to Park Presidio Boulevard, widening to 6 lanes from that point eastward.

Westbound view of the existing Masonic tunnel.

Center medians are present from 39th Avenue eastward; from 33rd Avenue eastward these are landscaped to varying degrees. Both median and sidewalk street tree plantings are found through most of the segment. Tree and landscape planting is highly variable however, ranging from highly intact, continuously planted blocks to sparsely planted ones, as depicted in Figure 4.4-3c.

The predominant street tree species is the New Zealand Christmas tree (*Metrosideros excels*; hereinafter *Metrosideros*), a low- to medium-height, broad-canopy tree with red blossoms. These are largely mature plantings with typical canopy heights of between 8 feet to 20-plus feet. These plantings can be quite attractive with sufficient regularity and continuity. Center median tree plantings, however, are spotty and isolated throughout much of the Geary corridor. As a result of spotty, discontinuous center median planting and low to moderate canopy height, the character of the boulevard is improved but not dominated or strongly unified by the tree plantings, which remain visually subordinate in scale to the auto-dominated streetscape.

Scenic Vistas. The UDE *Quality of Street Views* map identifies two segments of Geary Boulevard within Landscape Unit 1 as "excellent" quality views (others are identified in Landscape Unit 2, discussed below). These include a segment between 48th and 45th avenues with westward views of the Pacific Ocean; and the previously discussed segment between roughly 37th and 30th avenues with elevated views eastward of the Richmond District, Lone Mountain, and portions of the downtown skyline. Elsewhere, long-distance and skyline views are very limited due to the generally low-lying topography. Other notable visual landmarks in this unit include the Holy Virgin Cathedral at 26th Avenue, and views of Lone Mountain and the USF campus, which provide a scenic and vivid natural landmark between Arguello Boulevard and Masonic Avenue. Occasional glimpses of wooded hills of the Presidio and Golden Gate Park are also visible through perpendicular streets.

LANDSCAPE UNIT 2

Landscape Unit 2 extends from Anza Vista Hill near Masonic Avenue to the bottom of Cathedral Hill at Van Ness Avenue. Views of downtown from this segment are considered 'excellent' and should be preserved

4.4.2.1.3 LANDSCAPE UNIT 2: WOOD STREET (LAUREL/ANZA VISTA HILLS) TO VAN NESS AVENUE (CATHEDRAL HILL)

Landscape Unit 2 is defined as the Geary corridor segment extending from Anza Vista Hill near Masonic Avenue to the bottom of Cathedral Hill at Van Ness Avenue. In contrast to the relatively consistent character of Unit 1, for convenience of discussion this segment groups several contiguous sub-units with distinctive visual characteristics. These include: the Masonic Avenue/Anza Vista Hill area, Kaiser/Western Addition (Broderick to Fillmore); Japantown (Steiner to Laguna); and Cathedral Hill (Laguna to Van Ness). Figure 4.4-4 depicts typical image types.

Masonic Avenue/Anza Vista Hill. At Wood Street, the 4 inner lanes of Geary Boulevard enter the tunnel below Masonic Avenue through Anza Vista Hill, and the two outer lanes climb the hill to intersect with Masonic Avenue. East of Wood Street adjoining buildings become taller, up to 7 stories. The top of the hill is dominated by a tall, large-scale Best Buy store and a lower but large Muni bus barn, which enclose Geary Boulevard to the north and south. A large landscaped center island is prominent in this block, visually separating the sides of the street and reducing the scale of auto-dominated travel lanes for pedestrians at the existing bus stops. However, the tunnel entrances and retaining walls give the slopes of the hilltop area a spatially fragmented, disjointed quality. The historic SFMTA car barn to the north is partly obscured by a foreground of employee parking that gives the streetscape a cluttered utilitarian character, and contributes to compromised

Looking west from atop the Masonic tunnel.

intactness and unity of the hilltop streetscape. The streetscape thus lacks visual unity and coherence, and remains auto-dominated, with a shortage of pedestrian space. Intactness, unity and overall visual quality are moderate, though improved by the high vividness of scenic east-facing views.

Scenic Vistas. Views of downtown from this elevated location are noted on the UDE *Quality of Street Views* Map as a location with "excellent" views to be preserved. Similarly, the UDE *Street Areas* Map identifies this segment as an important street view for orientation. The streetscape at Masonic Avenue has moderately high vividness due to these outstanding elevated views eastward of the downtown skyline, as well as the substantial center-median landscaping (Figure 4.4-4).

Kaiser Permanente/Western Addition. West of the Target parking lots and Masonic tunnel, a series of 5-to-9 story buildings of Kaiser Permanente's main Geary medical campus dominate the boulevard for three blocks. Between St. Joseph's Avenue and Divisadero, large-scale London plane trees on the south side help screen otherwise unsightly street-front parking and delivery areas, adding intactness to the streetscape. Street tree planting in this area is heterogeneous and spotty however, including a wide and formally disparate assortment of tree types. This section has moderate visual quality, with moderate vividness from tall street facades, moderate intactness from street tree plantings, and moderate unity, compromised by disparate tree plantings and parking and loading areas facing the street. Continuing east, adjoining uses from Divisadero to Fillmore are highly heterogeneous, including office buildings, a recreation center and playfields, a park, a high school and apartments. This section, however, displays a moderately high degree of visual unity from regular, fairly continuous plantings of approximately 30-foot tall plane trees on both sides of the street (Figure 4.4-4b). Spotty, discontinuous plantings of miscellaneous species in the center median detract from the visual unity, but the overall effect of adjoining open spaces and continuous tall plane tree canopy on the sides is of moderately high visual quality.

Fillmore/Japantown. At Steiner Street, the center lanes of Geary Boulevard descend into the Fillmore undercrossing, while outside lanes meet with Fillmore Street to the east. Tall buildings at Fillmore Street mark the entry into the visually distinct Fillmore/Japantown area, characterized by a greater predominance of taller buildings and the larger-scale, uniform facades of the Japan Center. The Fillmore Street grade separation segregates traffic-dominated and more pedestrian scale environments. The effect of the undercrossing is to fragment the streetscape into visually and functionally disjointed, spatially isolated pedestrian and auto-oriented spaces so that the area around the intersection of Geary and Fillmore lacks visual coherence or unity. The bus stops atop the undercrossing are distinguished by the "Blue" art work on the structure's glass panels, but are otherwise utilitarian, unadorned, and undistinguished in character. The undercrossing structure is decorated with sculptures on its retaining walls and identifying signage on the Fillmore Street bridge. Some street tree plantings line Geary Boulevard along the above-tunnel segment. However, street-level pedestrian access and entry to buildings in this section of Geary Boulevard is very limited. Overall, existing visual quality within the Geary corridor in the vicinity of Fillmore Street is moderately low.

The Japan Center occupies three blocks of the Geary street frontage to the north between Fillmore and Laguna streets. However, between Fillmore and Webster streets, the tunnel structure fragments the above-ground street frontages as

described above, and viewer use and sensitivity in the area is minimal. East of Webster Street, the Japantown Peace Plaza, with its highly distinctive pagoda structure, is a vivid landmark, and the street-front adjoining it is marked by landscaping, including very recently planted street trees, and distinctive Japanese-style sidewalk light fixtures. The exterior design of the high-rise Hotel Kabuki reflects a modicum of Japanese architectural style, lending further visual coherence to the area. Visual quality in the vicinity of the plaza is thus moderately high, and viewer sensitivity and exposure would also be high. Elsewhere in this section, visual quality and viewer sensitivity are moderate. Tree planting in this section between Webster and Laguna streets is uncoordinated, with continuous, mature plane trees contributing considerable visual intactness and unity along the entire south side of the street, but with both Canary Island pines and Monterey cypress in the center median, and varied types, mostly of small stature, on the north side (Figure 4.4-4c).

Cathedral Hill. The segment roughly from Laguna Street to Van Ness Avenue comprises Cathedral Hill, a tall promontory visually dominated by St. Mary's Cathedral, several buildings of the Chinese Consulate, and nearby high-rise residences. The cathedral is striking in form and visible from both nearby and more distant neighborhoods. The wide plaza between Geary and the cathedral creates large open views of the sky and cathedral. Nearby mid- to high-rise residential buildings (including the circular shaped Carillon Tower and the Joseph Eichler-designed Cleary Court) add to vividness of the hilltop area without detracting or encroaching on the unique form of the cathedral structure. Visual quality is thus high in this area (Figure 4.4-4d).

4.4.2.1.4 LANDSCAPE UNIT 3: VAN NESS AVENUE (TENDERLOIN) TO MARKET STREET (DOWNTOWN)

LANDSCAPE UNIT 3

Landscape Unit 3 extends from Van Ness to Market Street, and includes the Tenderloin and Downtown districts, comprising portions of two designated historic districts. The Geary portion of this segment is a portion of the city 49-Mile scenic drive; and the O'Farrell portion is considered a 'street' view of important buildings

Landscape Unit 3, extending from Van Ness Avenue to Market Street, includes the Tenderloin (Figure 4.4-5) and Downtown (Figure 4.4-6) districts, comprising portions of two designated historic districts: the Uptown Tenderloin National Historic District; and the KMMS Conservation District. Although this analysis is not specifically concerned with these areas as historic resources per se, both districts are recognized and protected in part for their distinctive architectural, visual, and scenic character. As high-density downtown urban environments, their primary distinctive visual characteristics derive from their architectural forms and styles. The formal visual characteristics and features of buildings in these areas (e.g., massing, composition, scale, materials, colors, details, and ornamentation) are subject to review and approval under federal, state and local guidelines. In some instances, visual effects to historic properties and districts may represent an adverse effect if they adversely affect the historic integrity of those properties. See Section 4.5.5 for an evaluation of such potential effects.

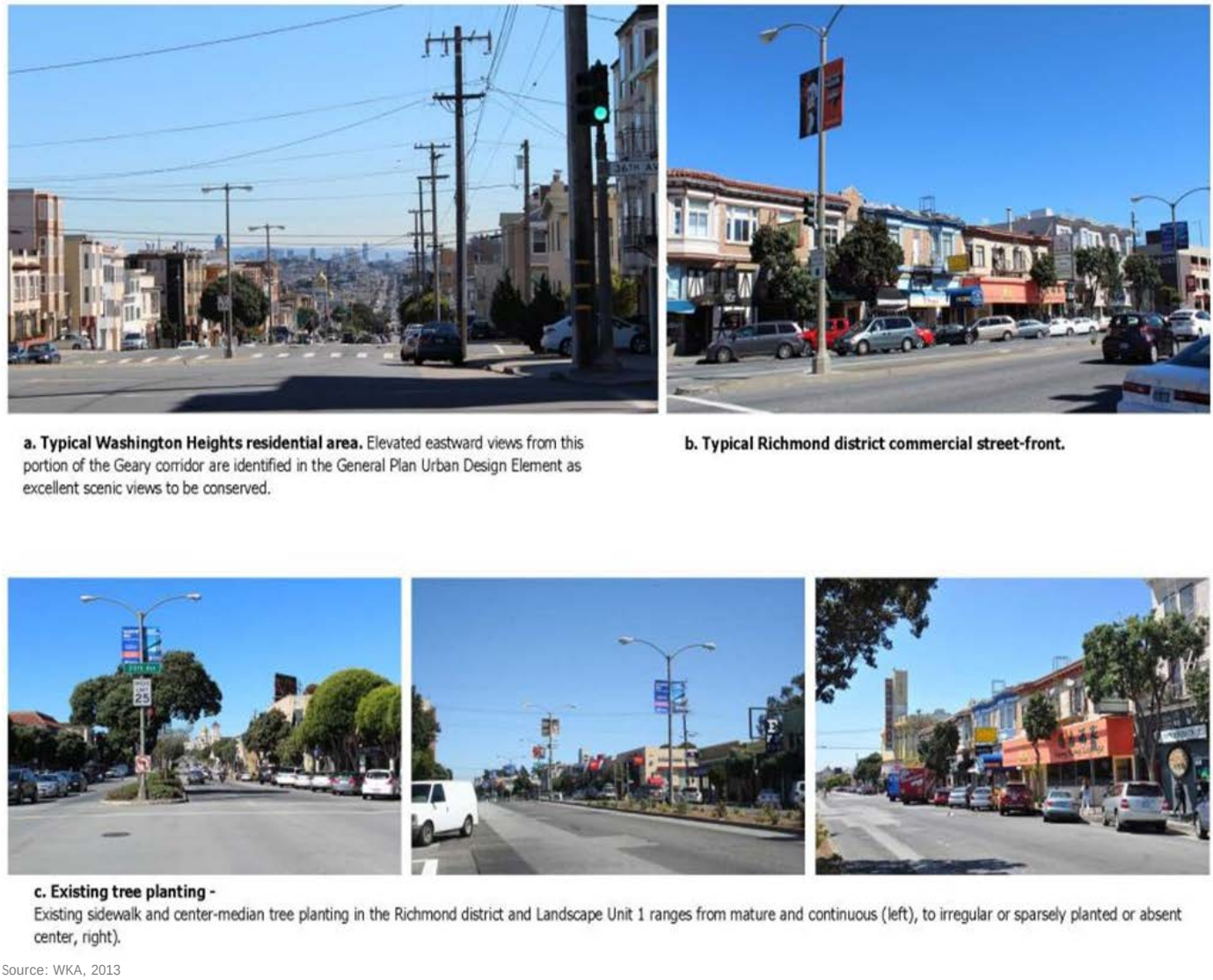
The Tenderloin section of the Geary corridor is an architecturally consistent, primarily residential area comprising predominantly of 3-to-7 story multi-unit buildings, mainly of brick, masonry or concrete, built between 1906 and the early 1930s. 380 buildings in the district are listed on the National Register (Figure 4.4-5b). The portion of the Geary corridor within the Tenderloin National Historic District extends roughly from Polk Street to Taylor Street (State of California, 2008). Visually, the Geary corridor in this section is typified by a street level often visually cluttered by disparate and chaotic store-front signage, juxtaposed with distinctive, often remarkable historic architecture. Scattered street tree groupings are found

along the Geary corridor, although of heterogeneous, uncoordinated patterns and types. Despite some visual disunity, the area is characterized by an evident overall stylistic, historic and formal continuity. Vivid elements include examples of outstanding historic architecture, and scenic view corridors eastward towards the downtown high-rise skyline.

The *Street Areas Map* of the UDE identifies the Geary portion of this segment as a portion of the 49-Mile Scenic Drive; and the O'Farrell Street portion as a "street view of important buildings."

Vividness and unity in the Tenderloin is moderate; intactness is moderately high. Overall, visual quality was considered moderate. Viewer sensitivity and response are considered to be high due to the segment's many special scenic and historic designations and its importance to tourism.

Figure 4.4-2 Typical Image Types, Landscape Unit 1



a. Typical Washington Heights residential area. Elevated eastward views from this portion of the Geary corridor are identified in the General Plan Urban Design Element as excellent scenic views to be conserved.

b. Typical Richmond district commercial street-front.

c. Existing tree planting -
Existing sidewalk and center-median tree planting in the Richmond district and Landscape Unit 1 ranges from mature and continuous (left), to irregular or sparsely planted or absent center, right).

Source: WKA, 2013

Figure 4.4-3 Typical Image Types, Landscape Unit 2

a. View from Geary east of Masonic Avenue (Anza Vista Hill). The elevated eastward view from this portion of the Geary corridor is identified in the General Plan Urban Design Element as an excellent scenic view to be conserved.

b. Plane tree, cypress plantings in Western Addition/Kaiser campus area.

c. Geary corridor in vicinity of Japantown Peace Plaza.

d. St. Mary's Cathedral

Source: WKA, 2013

From Taylor Street to Market Street, the Geary corridor enters the downtown area, and the KMMS Conservation District (Figure 4.4-6). The conservation district designates and protects significant and contributory buildings based on architectural quality and their contribution to the downtown environment, and includes Union Square, 114 architecturally significant and 140 contributory buildings. Potential visual effects to such properties are thus a paramount concern. Scale and height of buildings in this district becomes higher and larger than in the Tenderloin, and visual unity of the streetscape also increases. The visual environment of this area is characterized by predominantly moderate-scaled, light-colored buildings, generally four to eight stories in height, contributing to a streetscape of comfortable scale and sunlit sidewalks. The area experiences extremely heavy pedestrian and auto traffic and is the epicenter of downtown tourist visitation. Both Geary and O'Farrell east of Mason Street are distinguished by distinctive historic streetlights, known as the Golden Triangle Light Standards or Streetlights.

Golden Triangle Streetlights

For more information regarding the Golden Triangle Streetlights, please see Section 4.5.2.3.2

Figure 4.4-4 Typical Image Types, Landscape Unit 3 – Tenderloin

a. Typical Tenderloin 2 – 5-story masonry residential streetscape.

b. Alcazar Theater. There are numerous examples of outstanding architecture in the Tenderloin portion of the corridor, including 380 National Register properties in the Uptown Tenderloin District.

c. Scenic views eastward from Tenderloin toward Market Street, downtown skyline.

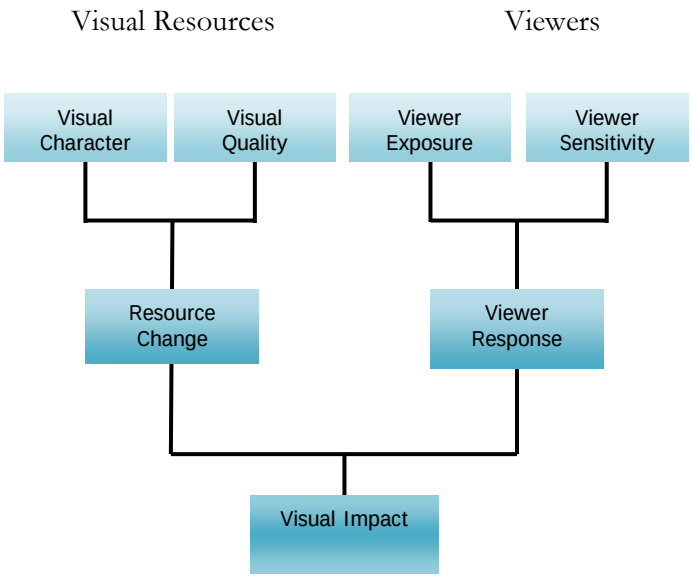
d. Visual clutter of first-floor store-front signage is a typical visual feature of the Tenderloin streetscape.

Source: WKA, 2013

Figure 4.4-5 Typical Image Types, Landscape Unit 3 – Downtown

Source: WKA, 2013

Figure 4.4-6 FHWA Visual Assessment Model



Source: FHWA, 1988

4.4.3 | Methodology

4.4.3.1 VISUAL ASSESSMENT METHOD

The lead agency has not developed any procedures related to visual resources. In the absence of defined standards, the alternatives were evaluated for potential visual effects using the Federal Highway Administration (FHWA) Visual Impact Assessment method, which has remained the most widely used approach for visual assessment of transportation projects of all kinds nationally for the past three decades. FHWA Visual Impact Assessment is the method followed by many transportation agencies for conducting assessments of transportation projects. The conceptual framework of the FHWA methodology is depicted in Figure 4.4-6.[3]

Under the FHWA method, a project's visual environment or setting is characterized in terms of two principal components: the study area's **visual resources**; and its potentially sensitive **viewers**. Visual resources are, in turn, described in terms of their **visual character**, and evaluated in terms of their existing **visual quality**. Viewers are characterized in terms of their **viewer sensitivity** – their potential level of concern with changes to visual quality – and their **viewer exposure**, that is, their degree of exposure to views of the project.

The Geary corridor is divided into linear segments called *Landscape Units*, which are used to describe the visual character and to provide the context and baseline for evaluating visual effects of the project

Visual Character: Landscape Units. For the purposes of this analysis, the Geary corridor was divided into landscape units, defined in terms of their broad shared visual character. Visual and landscape characteristics are described for each unit to provide the context and baseline for evaluating visual effects of the project. Notable or important features of the visual setting are also described. The project's visual effects are, in the broadest sense, determined by their compatibility with the visual character of the setting. Because the study area is considered mainly to be limited to

[3] FWHA. 1988.

the Geary corridor, these units are essentially linear segments or lengths of the street corridor.

Visual Quality. The assessment of the project's setting and potential effects is conducted in terms of three criteria, vividness, intactness, and unity. As described in the FHWA guidelines:

- Vividness is the visual power or memorability of landscape components as they combine in distinctive visual patterns.
- Intactness is the visual integrity of the natural and man-built landscape and its freedom from encroaching elements. It can be present in well-kept urban and rural landscapes, as well as in natural settings.
- Unity is the visual coherence and compositional harmony of the landscape considered as a whole. It frequently attests to the careful design of individual manmade components in the landscape.[4]

The project's effects on the visual resource is measured in terms of its change to the setting's existing visual quality, as rated according to these three criteria.

Viewer Response, Sensitivity and Exposure. Viewer sensitivity is evaluated according to *viewer activity type, viewer awareness as affected by the visual setting, and local values and goals*. Typically, recreational and residential viewers are assumed to have higher levels of viewer sensitivity to changes in visual quality than people working or passing through a viewshed. In contrast, viewers at their place of work are generally assumed to have lower levels of sensitivity, particularly in industrial settings. Motorists are generally assumed to have moderate levels of sensitivity, unless they are on scenic roadways or corridors identified in public plans or policies.

Viewer response **is composed of viewer sensitivity and viewer exposure**

Viewer sensitivity **is evaluated according to viewer activity, viewer awareness as affected by the visual setting, and local values and goals**

Viewer exposure **is defined as the viewer's degree of exposure to views of the project**

Viewer exposure may also strongly influence viewers' response to project effects, and includes consideration of the presence or absence of screening or filtering of project features; number of viewers; the distance at which the project would be seen; the extent, frequency, and duration of viewer exposure; and other relevant viewing conditions.

Viewer Groups. Viewers of features of the Geary corridor can be categorized into the following groups:

- **Pedestrians**: People walking to/from and along the Geary corridor or on other streets that offer views of the Geary corridor.
- **Cyclists**: People riding to/from and along the Geary corridor or on other streets that offer views of the Geary corridor.
- **Transit patrons**: People waiting at bus stops and traveling on buses along the Geary corridor or on other streets that offer views of the Geary corridor.
- **Motorists**: People traveling via automobile through and along the Geary corridor or on other streets that offer views of the Geary corridor.
- **Residents**: People who live along Geary Boulevard or on other streets that offer views of the Geary corridor.

[4] FHWA. 1988. Visual Impact Assessment for Highway Projects. Available: http://www.dot.ca.gov/ser/downloads/visual/FHWAVisualImpactAssmt.pdf.

- **Commuters**: People who commute to jobs located along the Geary corridor or on other streets that offer views of the Geary corridor.
- **Tourists**: People who have traveled to and through the Geary corridor or on other streets that offer views of the Geary corridor with the intention of experiencing and viewing the many cultural and visual resources of citywide importance.
- **Commercial patrons**: People who shop along the Geary corridor or on other streets that offer views of the Geary corridor.
- **Adjacent business owners**: People who own businesses along the Geary corridor or on other streets that offer views of the Geary corridor.

Under the FHWA method each viewer group is evaluated for its anticipated viewer sensitivity, viewer exposure to the project features, and anticipated overall viewer response. The significance of adverse effects to visual quality is evaluated within the context of the level of anticipated viewer response.

Typically, among the groups listed above, *residents* and *tourists* would be considered to have a high sensitivity to changes in visual quality. Adjacent residents would experience frequent, extended views and generally place a high level of importance on the quality of their living environment. For tourists and recreationists, scenic values and sight-seeing are of primary importance. Bus patrons are also considered to have moderately high sensitivity because of their close, extended, and repeated exposure to the project and its environments. While the primary focus of riders may not be on visual quality, their extended, immediate exposure to this setting is apt to heighten sensitivity.

While pedestrians, cyclists and motorists may include residents, in their capacity as street occupants it is presumed that their focus is on travel, not scenic quality, and sensitivity is considered moderate. However, where it can be assumed that such travelers are tourists or recreationists, sensitivity would be assumed to be high.

These ratings are assumed for viewer groups throughout the Geary corridor unless specified otherwise.

4.4.3.2 KEY VIEWPOINTS

Key viewpoints were selected within each Landscape Unit and represent locations where the project would have the most pronounced visual effects on key sensitive viewer groups

Within each landscape unit, key representative viewpoints were selected for locations where the project could have the most pronounced visual effects on key sensitive viewer groups, and may differ between the various build alternatives. For each key viewpoint, viewer response, characterized in terms of viewer sensitivity and viewer exposure to the project, is summarized. Next, each viewpoint is characterized in terms of the visual quality of the existing view. While there is always variation in viewer response and visual quality throughout a landscape unit, the assessment of key viewpoints is meant to capture representative instances of the most relevant viewers, project features, viewing conditions and potential project-related issues.

Figures are included to illustrate the key viewpoints. The figures depict the key viewpoints as they currently stand, and photo-realistic simulations of future conditions under a given build alternative. The simulations were developed to communicate the long-term design *intent* along the Geary corridor. The simulations include the following assumptions:

- Bus-only lanes and other streetscape improvements are consistent with the project plans (Appendix A) and the project's Urban Design Memorandum (March 2014)
- The height of simulated trees is typical for a five- to 10-year growth time frame, depending upon the container size and site conditions

4.4.3.3 DETERMINATION OF VISUAL EFFECTS

As illustrated in Figure 4.4-1 above, the description of visual character and quality; and the assessment of viewer sensitivity and viewer exposure, together constitute the visual resource baseline under the FHWA assessment method. The change in visual quality due to the project is then assessed in Section 4.4.3 (Environmental Consequences) in the context of viewer response to identify the level and significance of effects. The conclusions of this analysis are subsequently used to assess the project's impacts under CEQA, using the criteria of CEQA Guidelines Appendix G.

The alternatives have the potential to result in construction- and/or operational-period effects as noted below.

Construction-Period Effects

- Use of construction equipment, stockpiling of materials, and other visual signs of construction
- Tree removal
- Artificial lighting during nighttime construction work

Operational-Period Effects

- Visual changes to the streetscape, including colorized new bus-only lanes, new or relocated bus stops, and associated physical improvements.
- Filling of the Fillmore Street underpass (Alternatives 3 and 3-Consolidated)

The activities and components of the alternatives listed above were evaluated in terms how they would affect the visual character, visual quality, and viewer response within the Geary corridor. The analysis considered the visual landscape in the Geary corridor as of 2013.

4.4.4 | Environmental Consequences

This section describes potential impacts and benefits for visual quality. The analysis compares each alternative relative to the No Build Alternative.

As set forth in Section 4.4.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding visual impacts in the Draft EIS/EIR.

4.4.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe visual effects during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe visual effects relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: Retention of the Webster Street pedestrian bridge would reduce short-term visual disruptions and visual evidence of construction in the immediate vicinity, as the bridge would no longer be demolished. Therefore, the scale of construction-period visual effects would be reduced in this location relative to what was described in the Draft EIS/EIR.

Operation: During project operation, retention of the existing Webster Street pedestrian bridge would reduce the degree of visual change at this location. Therefore, no new or more severe visual impacts would result during project operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: The removal of proposed BRT stops between Spruce and Cook streets would eliminate construction activity outside the curb-to-curb portion of the right-of-way in this area. This would reduce short-term visual disruptions and visual evidence of construction in the immediate vicinity. Therefore, construction-related visual impacts would be reduced relative to what was described in the Draft EIS/EIR.

Operation: During project operation, retention of the existing local and express stops between Spruce and Cook streets would reduce the degree of visual change at this location. Therefore, no new or more severe visual impacts would result during project operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: Implementation of additional pedestrian enhancements throughout the corridor would entail localized construction activities where new pedestrian crossing bulbs would be constructed. While visual disruptions associated with construction would be noticeable, they are a common feature of the urban environment, would occur entirely within the existing transportation right of way, would be short in duration, and would be similar to construction of other pedestrian

improvements described in the Draft EIS/EIR. Therefore, no new or more severe visual effects would occur due to construction of additional pedestrian enhancements.

Operation: Once operational, like the pedestrian enhancements analyzed in the Draft EIS/EIR, the additional pedestrian crossing facilities added to the Hybrid Alternative/LPA would further enhance streetscape visual unity and quality, similar to other streetscape elements included within the Hybrid Alternative/LPA. Therefore, this modification would not result in new or more severe visual impacts during construction.

Addition of BRT Stops at Laguna Street

Construction: Addition of BRT stops at Laguna Street would include construction of transit islands that would separate right-turning vehicles from the bus lanes. While visual disruptions associated with construction would be noticeable, they are a common feature of the urban environment, would occur entirely within the existing transportation right of way, would be short in duration (2-3 weeks), and would be similar to construction of other BRT stops described in the Draft EIS/EIR. Therefore, no new or more severe visual effects would occur due to construction of BRT stops at Laguna Street.

Operation: Once operational, this modification would ultimately enhance visual quality by reducing the width and dominance of auto travel lanes. In addition to the visual narrowing of paved roadway area, the transit islands would also provide an opportunity for other aesthetic improvements such as pavement patterns. Therefore, this modification would result in a beneficial change in visual quality at Laguna Street and no new or more severe visual impacts would occur.

Retention of Existing Local and Express Stops at Collins Street

Construction: Similar to retaining the Spruce and Cook local and express stops, retention of the Collins Street bus stops would eliminate construction activity outside the curb-to-curb portion of the right-of-way in this location. Therefore, the scale of construction-period visual effects would be reduced in this location relative to what was described in the Draft EIS/EIR.

Operation: One operational, this modification would retain the existing bus stops, which would reduce the degree of visual change at this location. Therefore, no new or more severe visual impacts would result from this modification.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities and associated visual change, but would simply shift about half of it one block to the west. The 27th Avenue transition shift would not require removal of the median or its landscaping between 27th and 28th avenues and would have similar visual effects to those described in the Draft EIS/EIR. Therefore, this modification would not result in any new or more severe construction-period visual effects relative to what was described in the Draft EIS/EIR.

Operation: Similarly, this modification would not change the nature of bus operations, but would shift the location of the transition from center- to side-running bus lanes one block to the west. This would not result in any new or more severe visual impacts during project operation.

4.4.4.2 | CONSTRUCTION EFFECTS

4.4.4.2.1 NO BUILD ALTERNATIVE – CONSTRUCTION EFFECTS

Improvements associated with the No Build Alternative are comprised of physical infrastructure and transit service changes associated with other City projects that are either planned or programmed to be implemented in the Geary corridor by the year 2020. Construction of these improvements would be within public right-of-way areas. In some locations, the No Build Alternative could require tree removal during construction, during which a temporary decline in visual quality may occur. Other evidence of construction associated with signage, detours, construction materials, etc. could also affect the visual quality for residents, transit riders, motorists, and other viewer groups in the Geary corridor.

4.4.4.2.2 BUILD ALTERNATIVES – CONSTRUCTION EFFECTS

Project related construction activities for any of the build alternatives would involve the use of a variety of equipment, stockpiling of materials, and other visual signs of construction. Various TMP elements, such as portable Changeable Message Signs, detours, and other signage would be used during construction. While evidence of construction activity may be noticeable to area residents, transit-riders, and other viewer groups, such visual disruptions would be short term and are a common feature of the urban environment. Additionally, construction of the build alternatives would require varying levels of tree removal, during which a temporary decline in visual quality would occur.

Some construction may occur at night, requiring the use of additional task-specific lighting at certain worksites. Construction best practices would be implemented to minimize any nighttime light and glare effects. Any such lighting would be temporary, to cease upon the completion of nighttime construction activity in a given location.

4.4.4.3 | OPERATIONAL EFFECTS

Under FHWA methodology, adverse changes to the visual resources (visual quality and visual character), in combination with high levels of anticipated negative viewer response (viewer sensitivity and exposure), result in adverse effects.

4.4.4.3.1 NO BUILD ALTERNATIVE – OPERATIONAL EFFECTS

Under the No Build Alternative, transit and transportation facilities and services would remain unaltered except for changes that are currently planned or programmed to be implemented in the Geary corridor by 2020, which is defined as the opening year for all alternatives. Under the No Build Alternative, the Geary corridor would consist of essentially the same transit service as today including for SFMTA and Golden Gate Transit bus services. The No Build Alternative also includes opening of the new Transbay Transit Center (which would modify the current routing of the 38R and local 38 Geary (38) buses when they operate south of Market Street on new dedicated bus-only lanes near the Transbay Transit Center.

Finally, the No Build Alternative also includes several pavement maintenance/rehabilitation and roadway infrastructure improvements and new shelter enhancements at Muni Rapid stops including bike racks, shelter decals, redesigned flag signs, and new transit poles outfitted with solar powered lanterns. The solar powered lanterns are to be installed at all stops throughout the City after completion of installation along Rapid stops. Lanterns would illuminate bus stop signs with downwardly focused light to minimize light spillover.

4.4.4.3.2 BUILD ALTERNATIVES – OPERATIONAL EFFECTS

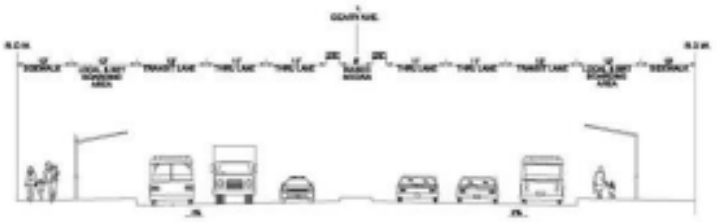
Figure 4.4-7 shows proposed cross-sections for each build alternative. Under Alternative 2, the primary visual changes would result from the coloring of BRT lanes and the introduction of new BRT stops on bus bulbs. At these stops, amenities such as new shelters, decorative lighting, custom paving associated with the bulbouts and dedicated bus lanes, and tree planting would be placed on widened passenger areas (bus bulbs) created by extending the sidewalk into the existing parking lanes. Existing center medians and associated landscaping would remain.

Under Alternative 3 and Alternative 3-Consolidated, dedicated, center-running bus-only lanes would replace existing center medians. The center-running bus-only lanes would be separated from auto traffic by continuous raised, landscaped medians and BRT platforms. The existing center medians and associated landscaping lost to the center BRT lanes would be replaced by extensive landscape planting in the adjoining new center-running medians, with a substantial net increase in the amount of landscaping in the Geary corridor.

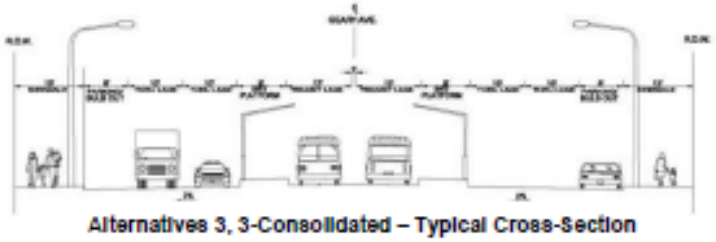
East of Van Ness Avenue, all alternatives would be identical. They would include dedicated bus-only lanes as is the existing condition with the addition of an extension of the red bus-only lanes on the last blocks of Geary and O'Farrell before Market Street. Bus stops would be provided with new amenities such as shelters, decorative lighting, custom paving, and tree planting behind the station shelters on widened bulbout passenger waiting areas.

Table 4.4-1 below summarizes potential operational period visual effects for each project alternative. These summaries are drawn from the detailed impact discussions in Section 4.4.4.3.2, which, per FHWA methodology, consider visual effects by alternative and landscape unit. Some landscape units are further disaggregated where existing visual conditions or visual effects warrant.

Figure 4.4-7 Typical Project Alternative Cross-Sections



Alternative 2 – Typical Cross-Section



Alternatives 3, 3-Consolidated – Typical Cross-Section (BRT Stop)

Alternatives 3, 3-Consolidated – Typical Cross-Section (without Stop)

All Alternatives – Van Ness to Market Typical Cross-Section (BRT Stop)

Note: The Hybrid Alternative/LPA incorporates elements of Alternatives 2 and 3-Consolidated at different points in the corridor. Each of these cross-sections is illustrative of the Hybrid Alternative/LPA at different points in the Geary corridor.

Source: WKA, 2013

Table 4.4 -1 Potential Operational Visual Effects

VISUAL ASSESSMENT UNITS	VISUAL EFFECTS UNDER EACH ALTERNATIVE				
	NO BUILD	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/LPA
Landscape Unit 1 (Refer to Figure 4.4-3)					
48th Avenue to 33rd Avenue (15 blocks)	Neutral or somewhat beneficial	Neutral or somewhat beneficial	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
33rd Avenue to 27th Avenue (6 blocks)	Neutral or somewhat beneficial	Neutral or somewhat beneficial	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
27th Avenue to Palm Avenue (27 blocks)	Neutral or somewhat beneficial	Somewhat beneficial at new stops	Beneficial	Same as Alternative 3	Same as Alternative 3
Palm Avenue to Wood Street (8 blocks)	Neutral or somewhat beneficial	Somewhat beneficial at upgraded stops	Same as Alternative 2	Somewhat beneficial at new BRT station	Same as Alternative 2
Landscape Unit 2 (Refer to Figure 4.4-4)					
Wood Street to Broderick Street (Anza Vista Hill/Masonic Avenue area) (5 blocks)	Neutral or somewhat beneficial	Somewhat beneficial	Visual environment for bus passengers somewhat degraded in proposed Masonic tunnel boarding area. Improvement measure proposed.	Same as Alternative 3; however, slightly improved due to additional landscaped median	Same as Alternative 2
Broderick Street to Scott Street (Kaiser Campus/Western Addition) (2 blocks)	Neutral or somewhat beneficial	Somewhat beneficial	Beneficial	Same as Alternative 3	Same as Alternative 2
Scott Street to Laguna Street (Western Addition/Fillmore/ Japan Center) (5 blocks)	Neutral or somewhat beneficial	Somewhat beneficial at upgraded stops	Beneficial effect experienced by all viewer groups	Same as Alternative 3	Same as Alternative 2
Laguna to Cleary Court (Cathedral Hill) (1/2 block)	Neutral or somewhat beneficial	Minor, visually neutral or slightly beneficial effect	Same as Alternative 2	Beneficial	Same as Alternative 2
Cleary Court to Van Ness Avenue (Cathedral Hill) (2 1/2 blocks)	Neutral or somewhat beneficial	Minimal, visually neutral or slightly beneficial effect	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
Landscape Unit 3 (Refer to Figure 4.4-5)					
Van Ness Avenue to Market Street (11 blocks)	Neutral or somewhat beneficial	Somewhat beneficial, particularly for bus passengers and pedestrians	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2

Note: All effects are assumed to be long-tern for all viewer groups unless otherwise noted.
Source: Circlepoint, 2016

Landscape Unit 1: Operational Effects

Alternative 2 – Operational Effects Overview

Alternative 2's effects on blocks without stops would be minimal: existing landscaping on sidewalks and in center medians would remain unchanged; visual change due to BRT lane striping would be minimal

In blocks with BRT stops, intactness and unity would be enhanced through a noticeable increase in the extent, consistency, and scale of street tree canopy

Key View Point (KVP) 1 (Figures 4.4-8a and 4.4-8b) depicts a typical representative view of the Geary corridor under Alternative 2 as it would appear in the Richmond District and other sections of Landscape Unit 1, which are essentially similar in character throughout. Under Alternative 2, existing curbside parking would be eliminated on blocks where new BRT stops are introduced, as in the simulated view in Figure 4.4-8b. In other blocks without stops, curbside parallel parking would replace diagonal parking, with a dedicated bus lane directly adjacent to the parking area and two auto travel lanes to the left of the bus lane. Center medians and landscaping would remain unchanged. The primary visual changes due to Alternative 2 at blocks with BRT stops would include block-long bus bulbs (widening of the sidewalks to accommodate bus boarding without bus lane change); an increased number of shelters; additional sidewalk street tree planting; addition of decorative street lighting and pavement patterns. Proposed new tree plantings as part of this alternative would include tree species of larger stature and more vertical form than the existing *Metrosideros* plantings that currently typify the Richmond district streetscape.

The overall effect of the proposed Geary corridor improvements as depicted in Figure 4.4-8b would be to enhance visual intactness and unity of the streetscape at blocks with BRT stops. Under Alternative 2, effects on blocks without stops would be minimal: existing landscaping on sidewalks and in center medians would remain unchanged; visual change due to BRT lane striping would be minimal. In blocks with BRT stops, intactness and unity would be enhanced through a noticeable increase in the extent, consistency, and scale of street tree canopy. As tree canopies mature, a more continuous street tree canopy would have a unifying effect on the streetscape, providing a common visual feature that could dominate and filter the heterogeneous building facades, while presenting an intact, memorable, recognizable street image. Unity would also be enhanced by replacement of existing utilitarian cobra head street lighting with Geary corridorwide decorative and street lighting, additional shelters, decorative paving and associated street furniture. Intactness would be enhanced, particularly for waiting bus passengers and pedestrians, by an enlarged pedestrian environment due to bus bulbs at blocks with BRT stops. The effect of BRT stops would thus be to enhance overall visual quality of the streetscape in the long term. As described in Section 4.4.2, viewer sensitivity and response varies by viewer group, ranging from moderate to high. The improvements to visual quality of the streetscape as a result of Alternative 2, however, would be a somewhat beneficial effect for all affected viewer groups in the Geary corridor, including adjacent businesses, pedestrians, bus passengers, and motorists in the long term.

Alternative 2 would contribute substantially to achieving the objectives of the *Better Streets Plan*

Tree replacement at locations with existing plantings would cause an immediate decline in visual intactness, an adverse effect. This adverse effect would persist until replacement plantings begin to mature over three to five years (though full maturity would take five to 10 years or longer). In the short term, improvements to visual intactness and unity of the streetscape due to introduction of other Geary corridor design features, as discussed above, would partly off-set the loss of existing

Figure 4.4-8 Key Viewpoint 1 – Typical BRT Stop, Alternative 2 (25th Avenue)

A. Existing view looking west

B. Simulated view looking west showing mature vegetation

Source: WKA, 2013

tree canopy. Although it would result in greater short-term visual effects, replacement of existing *Metrosideros* plantings with a unified street tree treatment would have the long-term beneficial effect of a degree of visual unity to the more visually varied landscape.

San Francisco's BSP calls for a comfortable pedestrian realm, particularly on streets of citywide importance such as Geary Boulevard, with significant pedestrian amenities that include: curb ramps, marked crosswalks, pedestrian signals, pedestrian crossing bulbs, street trees, tree grates, sidewalk planters, storm water controls, pedestrian lighting, special paving, and site furnishings. Alternative 2 would include all the aforementioned features and would contribute substantially to achieving the objectives of the BSP.

Alternative 3 – Operational Effects Overview

Under Alternative 3, existing center medians and travel lanes would be replaced through most of Landscape Unit 1 (27th Avenue to Wood Street) by two adjacent center-running BRT-only lanes

Existing side curbs would remain, except for new bus bulbs at the corners of blocks with bus stops/BRT stations, for traffic calming and improved pedestrian access to bus platforms. Existing sidewalk tree planting would thus remain unaffected by Alternative 3

KVP 2 (Figure 4.4-9) depicts a typical view of a local bus stop under Alternative 3 as it would appear in the Richmond District and other sections of Landscape Unit 1. Under Alternative 3, there would be two typical stop configurations: local-bus-only and local-and-BRT stops. Figure 4.4-9 depicts a typical local stop configuration. The local stop configuration depicted is unique to Alternative 3 and would not be a part of Alternative 3-Consolidated. The local-and-BRT stop configurations would be substantially identical under Alternatives 3 and 3-Consolidated. A typical BRT stop under Alternatives 3 and 3-Consolidated is depicted in Figure 4.4-10, under the discussion of Alternative 3-Consolidated, below.

Under Alternative 3, existing center medians and travel lanes would be replaced through most of this landscape unit (27th Avenue to Wood Street) by two adjacent center-running BRT-only lanes. These BRT lanes would be separated from auto travel lanes by adjoining raised medians with landscaping and/or new BRT stations. Auto traffic would occupy the two outer travel lanes in each direction, outside of the landscaped medians/bus platforms. Parallel auto parking at the curb would replace existing diagonal parking. Existing curbs would remain, except for new pedestrian crossing bulbs at the corners of blocks with bus stops, for traffic calming and improved pedestrian access to bus platforms. Existing sidewalk tree planting would thus remain unaffected by Alternative 3.

Alternative 3 would require removal of all existing center medians and median trees from 27th Avenue to Buchanan Street, resulting in an immediate short-term decline in visual intactness and visual quality. That decline would be partially off-set by the increase in visual unity due to the new median design, median landscaping and replacement tree planting, and introduction of aesthetically coordinated local stops and new BRT stations. Overall, there would be a minor to moderate decline in visual quality due to loss of existing trees in the short term, for a period of three to five years as replacement tree canopies begin to mature.

Improvements to visual quality of the Geary corridor streetscape would be greater under Alternative 3 than under Alternative 2 in Landscape Unit 1

However, the overall effect of the proposed improvements of Alternative 3 in the long term, as depicted in Figure 4.4-9b, would be to enhance intactness and unity of the streetscape. In contrast to Alternative 2, which would visually enhance blocks with bus stops and new BRT stations through new tree plantings, lighting and street furnishings but leave other blocks largely unchanged, Alternative 3 would add new center medians, stops, and associated new tree planting in virtually all blocks with center-running configuration.

Figure 4.4-9 Key Viewpoint 2 – Typical Local Stop, Alternative 3 (18th Avenue)

A. Existing view looking west

B. Simulated view looking west showing mature vegetation

Source: WKA, 2013

The most prominent visual effect of Alternative 3 would thus be to transform the character and quality of the Geary corridor streetscape from a relatively open expanse of auto-dominated roadway and paving with sparse landscaping, to a more complex boulevard cross-section of distinct, smaller-scale, functionally separate but visually unified spaces. There would be an overall increase in street tree planting in the center landscape medians and at existing bus stops. Proposed street tree plantings would comprise a limited palette of species, to be used consistently throughout the Geary corridor. In general, proposed replacement species are larger and taller than the existing *Metrosideros* trees found in the Richmond District. These larger species would be more in scale with the width of Geary Boulevard, which would visually benefit from a larger tree canopy to unify and soften its broad expanse of paving and traffic.

The dual center-running landscaped medians would reduce the dominance of paving and auto travel lanes by visually separating and buffering the two sides of the street, reducing the visual scale of paved area. Viewers would occupy narrower, more pedestrian- and passenger-scaled realms – pedestrian and autos to each side, BRT in the center – visually filtered from each other by tree plantings and station structures, but also unified by the linear pattern of tree canopies. This, together with the addition of unified Geary corridor street lighting and furnishings, would result in a substantial increase in vividness, intactness, unity and overall visual quality of the Geary corridor in the long term.

Again, viewer sensitivity and response varies by viewer group. As under Alternative 2, however, the improvements to visual quality of the streetscape as a result of Alternative 3 would be a beneficial effect for all affected viewer groups. These beneficial effects on the Geary corridor streetscape would be greater under Alternative 3 than under Alternative 2.

As under Alternative 2, but to a much greater extent, streetscape improvements under Alternative 3 would conform with and advance the objectives of the BSP. In general, Alternative 3 would have a marked beneficial effect on the image of the Geary corridor in Landscape Unit 1. In keeping with many of the specific recommendations of the BSP, Alternative 3 would enhance visual intactness and unity, creating a more unified, recognizable Geary corridor image and improved overall visual quality.

Alternative 3-Consolidated – Operational Effects Overview

KVP 3 (Figure 4.4-10) depicts a typical view of a BRT stop under Alternative 3-Consolidated as it would appear in the Richmond District and other sections of Landscape Unit 1. Although specific locations would differ between Alternatives 3 and 3-Consolidated, the BRT stop configurations would be similar in layout.

The primary difference between Alternatives 3 and 3-Consolidated would be the inclusion of center local stops, as depicted in Figure 4.4-10b. The overall amount of landscaped median would be somewhat less under Alternative 3-Consolidated than under Alternative 3 due to the smaller footprint of local-only stops under Alternative 3.

Overall, however, the effects on visual quality of Alternative 3-Consolidated would be essentially similar to those of Alternative 3

As under Alternative 3, Alternative 3-Consolidated would replace existing center medians and travel lanes through most of this landscape unit with two adjacent center-running BRT-only lanes. These BRT lanes would be separated from auto travel lanes by adjoining raised side medians with landscaping and/or new BRT stations. Auto traffic would occupy the two outer travel lanes in each direction, outside of the landscaped medians/BRT stations. Parallel auto parking at the curb would replace existing diagonal parking.

Figure 4.4-10 Key Viewpoint 3 – Typical BRT Stop, Alternative 3-Consolidated (17th Avenue)

A. Existing view looking west

B. Simulated view looking west showing mature vegetation

Source: WKA, 2013

Existing curbs would remain, except for new pedestrian crossing bulbs at the corners of blocks with bus stops and new BRT stations. Existing sidewalk tree planting would remain unchanged. The primary difference between Alternatives 3 and 3-Consolidated would be the inclusion of center local stops. These stops would be shorter than corresponding full BRT stops and complemented by additional landscaped area in the adjoining side-running medians where the existing bus shelters would be removed. The overall station platform area would thus be somewhat greater, and landscaped median area somewhat lesser than Alternative 3.

Overall, however, the effects on visual quality of Alternative 3-Consolidated would be essentially similar to those of Alternative 3. Like Alternative 3, Alternative 3-Consolidated would result in substantial new tree planting throughout Landscape Unit 1, and addition of unified Geary corridorwide street lighting and furnishings, with resulting improvements to the visual image and visual quality of the Geary corridor. It would leave existing sidewalk tree plantings unchanged; and reduce the scale and visual dominance of paving and travel lanes within the Geary corridor by visual separation from landscaped medians. Visual quality of the streetscape as a result of Alternative 3-Consolidated would represent a beneficial effect for all affected viewer groups in the Geary corridor in the long term. In keeping with the BSP, Alternative 3-Consolidated would greatly enhance visual intactness and unity, creating a more unified, recognizable Geary corridor image and improved visual quality.

The Hybrid Alternative/LPA combines various segments of Alternatives 2 and 3-Consolidated to produce a build alternative that meets the project's purpose and need with minimal environmental effects

The overall amount of landscaped median would be somewhat less under Alternative 3-Consolidated than under Alternative 3 even though there are fewer overall stations due to the smaller footprint of local-only stops under Alternative 3.

In terms of visual changes by segment, Alternative 3-Consolidated would not include smaller, local-only stops. Instead of eight BRT stops and ten separate local stops as under Alternative 3, Alternative 3-Consolidated would have twelve BRT stops between 27th Avenue and Palm Avenue. From a visual standpoint the increase in the number of BRT stops under Alternative 3-Consolidated would be off-set by the absence of separate local stops as under Alternative 3.

Hybrid Alternative/LPA – Operational Effects Overview

Overall Hybrid Alternative/LPA effects would be neutral to somewhat beneficial in the long term for all viewer groups in Landscape Unit 1. From 27th Avenue to Palm Avenue the Hybrid Alternative/LPA would enhance visual intactness and unity

Overall, Hybrid Alternative/LPA effects would be neutral to somewhat beneficial in the long term for all viewer groups in Landscape Unit 1. From 27th Avenue to Palm Avenue the Hybrid Alternative/LPA in would enhance visual intactness and unity, creating a more unified, recognizable Geary corridor image and improved overall visual quality.

Landscape Unit 1: Segment by Segment Operational Effects

Alternative 2, 48th Avenue to 33rd Avenue

Effects of the Hybrid Alternative/LPA in Landscape Units 2 & 3 and for the remainder of the Geary corridor would be identical to those described for Alternative 2

Viewer sensitivity of adjacent residents is high; of bus passengers, moderately high. However, visual changes resulting from Alternative 2 would be minimal in most of this segment, except for a BRT stop located at 33rd/34th avenues. Street trees ranging from very young saplings to mature 25-foot trees would be removed to construct the BRT stops, resulting in a moderate short term decline in visual quality. These would be replaced as part of the new stop design. Visual effects would be similar to those depicted in Figure 4.4-8b, KVP 1. An increase in intactness and

unity from new BRT design features, widened sidewalks, and increased sidewalk tree planting would represent an improvement to visual quality at the stops, particularly after growth of tree canopies over a period of three to five years. Effects on scenic eastward views would be negligible. Thus overall effects of Alternative 2 would be neutral or somewhat beneficial in the long term for all viewer groups.

Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA, 48th Avenue to 33rd Avenue

Like Alternative 2, these three alternatives would have side-running BRT throughout this segment, and thus would have similar neutral/beneficial visual effects as Alternative 2.

Alternative 2, 33rd Avenue to 27th Avenue

Visual effects of Alternative 2 would be minimal. There would be no BRT stops in this segment. Local stops/BRT layover stops would be located on the south between 30th and 32nd avenues, with negligible visual change. Thus, overall effects of Alternative 2 would be neutral or somewhat beneficial in the long term for all viewer groups.

Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA, 33rd Avenue to 27th Avenue

Similar to Alternative 2, each of these alternatives would have side-running BRT throughout this segment, and would thus result in similar neutral to beneficial visual effects as Alternative 2.

Alternative 2, 27th Avenue to Palm Avenue

Eight BRT stops would be located at 25th/26th avenues, 14th/15th avenues, Fifth/Sixth avenues (westbound) and Sixth/Seventh avenues (eastbound), and Arguello/Second avenues. The appearance of these stops would be substantial as depicted in Figure 4.4-8b, with similar beneficial long-term visual effects. There would also be seven local stops in each direction in this segment. These would be similar to existing stops and would have negligible visual effects. Overall, visual effects would be somewhat beneficial at new stops for all affected viewer groups.

Alternative 3, 27th Avenue to Palm Avenue

Alternative 3 would transition from side-running to center-running between 26th and 27th avenues. This segment is depicted by typical representations in Figures 4.4-10 and 4.4-9. Although BRT stations under Alternative 3 would be located at different locations than shown in Figure 4.4-10, the station configuration and general appearance would be substantially the same as depicted in the figure. There would be eight BRT stations in this segment, located at 24th Avenue, 12th Avenue, Fifth/Sixth avenues, Arguello/Second avenues, plus 10 local stops.

Alternative 3 would transition from side-running to center-running near 27th Avenue. Between 27th and Palm avenues, several trees would be removed in the existing center medians

There would be a minor to moderate decline in visual quality due to loss of existing trees in the short term, for a period of 3 – 5 years as replacement tree canopies begin to mature, but in the long term effects of Alternative 3 would be beneficial

In this segment several trees would be removed in the existing center medians. These vary in size from young saplings to mature 20-foot *Metrosideros*. The larger center median trees are generally planted in scattered, irregular patterns in contrast to the denser, more regular sidewalk planting found, for example, between 19th and 22nd avenues. Their removal would result in an immediate decline in visual quality, partly off-set by positive design elements of the new median and bus stop design. As discussed above, there would be a minor to moderate decline in visual quality due to loss of existing trees in the short term, for a period of three to five years as replacement tree canopies begin to mature, but in the long term effects of Alternative 3 would be beneficial, particularly once replacement trees fully mature (after five to 10 years).

Alternative 3-Consolidated, 27th Avenue to Palm Avenue

Alternative 3-Consolidated would have twelve BRT stops between 27th Ave and Palm Avenue. From a visual standpoint the increase in the number of BRT stops under Alternative 3-Consolidated would be offset by the absence of separate local stops as under Alternative 3

Alternative 3-Consolidated would incorporate the same transition as described above for Alternative 3. Visual effects of Alternative 3-Consolidated in this area would thus be similarly beneficial as those described above for Alternative 3.

Hybrid Alternative/LPA, 27th Avenue to Palm Avenue

The Hybrid Alternative/LPA would transition from side-running to center-running between 26th and 27th avenues in the eastbound direction and 27th and 28th avenues in the westbound direction. Visual effects of the Hybrid Alternative/LPA in the stretch of Geary between 27th Avenue and Palm Avenue would be similar to those described above for Alternative 3 as this lane configuration would entail the same tree removal in the center median as described for Alternative 3. While there would be a minor to moderate decline in visual quality due to loss of existing trees in the short term, long-term effects would be beneficial.

Alternative 2, Palm Avenue to Wood Street

There would be no BRT stops in this segment, and three local stops. Changes associated with Alternative 2 would thus be limited to lane striping. Visual effects would thus be negligible to beneficial (at upgraded stops) for all affected viewer groups.

Alternative 3, Palm Avenue to Wood Street

There would be no BRT stops in this segment, and two local stops. Changes associated with Alternative 3 would thus be limited to lane striping. Visual effects would thus be negligible to beneficial for all affected viewer groups.

Alternative 3-Consolidated, Palm Avenue to Wood Street

There would be one combined BRT/express stop in this segment. Thus, with implementation of a new BRT station and associated amenities, visual effects under Alternative 3-Consolidated would be beneficial for all viewer groups.

Hybrid Alternative/LPA, Palm Avenue to Wood Street

There would be no BRT stops in this segment, and two combined local/express stops. Changes associated with the Hybrid Alternative/LPA would thus be limited to lane striping. Visual effects would thus be negligible to beneficial for all affected viewer groups.

Landscape Unit 2: Operational Effects

Alternative 2 – Operational Effects Overview

General visual effects of proposed local and BRT stops would largely be similar in Landscape Unit 2 as in Landscape Unit 1. In most cases, the setting conditions and proposed BRT stop configurations would be the same as discussed above. Site-specific differences are described in the following section, discussed by project segment.

Alternative 3 – Operational Effects Overview

General visual effects of proposed local and BRT stops would largely be similar in Landscape Unit 2 as in Landscape Unit 1. Thus several effects would be the same as under Alternative 2. Site-specific differences are described in the following section, discussed by project segment.

Alternative 3-Consolidated – Operational Effects Overview

Visual effects of proposed local and BRT stops would largely be similar in Landscape Unit 2 as in Landscape Unit 1, described previously, and will thus not be repeated. Visual changes associated with Alternative 3-Consolidated in Landscape Unit 2 would be similar to Alternative 3 described above. Site-specific differences are described in the following section, discussed by project segment.

Hybrid Alternative/LPA – Operational Effects Overview

Visual changes associated with the Hybrid Alternative/LPA in this segment and for the remainder of the Geary corridor would be the same as for Alternative 2.

Landscape Unit 2: Segment by Segment Operational Effects

Alternative 2, Wood Street to Broderick Street

There would be one combined local/BRT stop within this segment, located in each direction east of Masonic Avenue. The westbound stop would be in roughly the same location as the existing local stop, but would be nearly doubled in length to extend to the corner of Presidio Avenue. The eastbound stop would be moved from the corner of Presidio Avenue to the corner of Masonic Avenue and also doubled in length. The large landscaped center median would be altered slightly in footprint, but would remain substantially similar in overall size and configuration. All tree planting and landscaping between Masonic and Presidio Avenue, however, would require removal and replacement. No other tree or landscaping removal is proposed. The existing outside lanes would be converted to painted bus-only lanes. A bicycle lane would be added inside the auto travel lanes between Masonic and Presidio avenues.

KVP 4 (Figure 4.4-11) depicts a view of the westbound BRT stop at Masonic Avenue on the Geary Boulevard surface lanes under Alternative 2, located east of Masonic Avenue at the top of Anza Vista Hill. The appearance of the BRT stops in both directions would be similar; the discussion that follows would apply to each.

Figure 4.4-11 Key Viewpoint 4 – BRT Stop, Alternative 2 (Masonic Avenue)

A. Existing view looking east

B. Simulated view looking east

Source: WKA, 2013

As depicted in Figure 4.4-11, the bus stop in this location would be expanded considerably in length, with additional shelters. The existing, relatively large *Metrosideros* trees would be removed to accommodate the new station layout. Planting at the corner of Presidio Avenue would be increased. New decorative street lamps, paving patterns, and railing, along with new shelters, would provide added visual unity to the BRT stop. Semi-opaque railing would provide visual separation from the adjacent car barn parking lot, also enhancing visual unity and intactness. These improvements would result in overall improvement to visual quality. The overall effect on visual quality in this segment would thus be somewhat beneficial due to an increase in visual unity in the block between Masonic and Presidio Avenue. This would be a beneficial effect as experienced by all viewer groups. Vivid, scenic views eastward of downtown would be unaffected by the proposed improvements.

Despite relatively limited lane changes between Masonic and Presidio avenues under Alternative 2, tree replacement would be required for all trees in this block in the landscaped center median. All existing trees would be replaced with replacement plantings of large-stature species in keeping with landscape/streetscape themes for the Geary corridor as a whole. The removal of existing trees would result in immediate short-term adverse effects to visual quality; due to the loss of visual intactness during the period that replacement planting matures. Within a period of three to five years, lost visual intactness would begin to be restored; and as plantings further mature (over a period of five to 10 years), the use of new, larger-scale tree species would improve visual unity and intactness of this location.

Alternative 3, Wood Street to Broderick Street

The Wood Street to Broderick Street segment includes a local/BRT center lane stop in each direction, located in the entrances to the Geary Boulevard tunnel under Masonic Avenue. The new station would represent a decline in visual quality for bus passengers

This segment includes a local/BRT center lane stop in each direction, located in the entrances to the Geary Boulevard tunnel under Masonic Avenue, in the sections currently enclosed by retaining walls. The eastbound stop would be west of Wood Street; the westbound stop east of Presidio Avenue.

Under Alternative 3, the four narrow travel lanes through the Masonic tunnel would be altered, with the northernmost lane remaining as a westbound auto travel lane; the second existing westbound travel lane would become the BRT platform; and the two existing eastbound auto lanes would become two BRT bus-only lanes, one in each direction. Other auto traffic would be diverted above the tunnel on the Geary Boulevard side lanes. It is possible that tree planting could be incorporated into the platform design, enhancing intactness compared to the rather bleak existing setting of concrete and paving. However, compared to the existing bus stop environment on the above-ground Geary Boulevard side lanes on Anza Vista Hill, the new station would represent a substantial decline in visual quality for bus passengers. The moderate visual quality of the existing hilltop bus stop, characterized by ample street tree plantings and scenic views of downtown, would be replaced by a highly confined, concrete and auto-dominated setting with poor visual quality. Although the platform design could add design elements to enhance the visual quality of the tunnel, the constrained setting would remain dominated by tall concrete retaining walls and adjacent auto and bus traffic and visual quality would remain low.

For motorists and most pedestrians and shoppers, the introduction of a new BRT stop in the tunnel entrance would have a negligible effect. Eastbound motorists and some westbound as well would be diverted from the tunnel to the above-ground

side lanes of Geary Boulevard. Pedestrians on the surface streets would notice little difference. However, bus passengers who now board at the aboveground stops would now board from the tunnel platforms, which would represent an aesthetic change for passengers while waiting for buses. To offset this visual change, improvement measures were developed for this alternative, which include public art and landscape elements at the Masonic tunnel BRT stops in order to enhance visual quality.

Alternative 3-Consolidated, Wood Street to Broderick Street

Alternative 3-Consolidated would include new BRT stops at the Masonic tunnel entrances and overall lane re-configuration described above for Alternative 3. Visual effects of Alternative 3-Consolidated would therefore be identical to those of Alternative 3. In the vicinity of these elements, visual effects would be adverse for bus passengers and largely neutral for other viewer groups.

Alternative 3-Consolidated would include BRT stops in each direction east of Baker Street, and an additional landscaped median

In the above-ground portion of Geary Boulevard east of Masonic Avenue, lane restriping, addition of a bike lane, and landscape replacement in the center median would be the same as described for Alternatives 2 and 3. However, there would be no new local stops in this block. As with Alternative 3, this would result in a slight improvement of visual quality in the long term due to enhanced visual unity from implementation of a Geary corridorwide street tree scheme.

Instead of a local stop west of Baker Street, Alternative 3-Consolidated would place BRT stops in each direction directly east of Baker Street. Because Alternative 3-Consoldiated would have two BRT lanes in this block, rather than three (as in Alternative 3), Alternative 3-Consolidated would include more landscaped median.

Hybrid Alternative/LPA, Wood Street to Broderick Street

Same as Alternative 2.

Alternative 2, Broderick Street to Scott Street

From Broderick Street to Scott Street, several trees would be removed to accommodate new BRT stops for Alternative 2

One combined local/BRT stop located in each direction would be located east (westbound) and west (eastbound) of Divisadero Street. Some of the existing trees would be removed in this segment to accommodate the new BRT stops. The BRT stops would be similar in appearance to that depicted in Figure 4.4-11, although the species of replacement trees is not yet determined. Tree removal would result in a minor decline in visual intactness in the short term, which would be partly off-set by an increase in visual unity from the addition of decorative station fixtures (shelters, street lamps) and replacement tree planting. In the long term with maturation of replacement tree planting, the overall effect on visual quality would be somewhat beneficial due to a net improvement to visual unity and intactness.

Tree removal would result in a minor decline in visual intactness in the short term, which would be partly off-set by an increase in visual unity from the addition of decorative station fixtures and replacement tree planting.

Alternative 3, Broderick Street to Scott Street

One local/BRT stop would be located in each direction west of Divisadero Street in this segment. Existing center median trees of various types, including Monterey cypress, Canary Island pine, and *Metrosideros* would be removed to accommodate the center BRT lanes. These disparate trees range from small to large in height and are planted in irregular, isolated groupings. Shrub plantings in the center medians range from good condition near Kaiser to spotty or barren east of Divisadero. Landscaping in the center median thus varies in quality, but is heterogeneous and

Under Alternative 3, several existing center median trees would be removed to accommodate the center BRT lanes; however, replacement landscaping would occur

lacking in visual unity. On the other hand, existing semi-mature London plane trees line the south side of the street throughout this segment, and the north side between Divisadero and Scott Street, provide a unifying feature and enhanced intactness. These would be unaffected by Alternative 3. Removal of the center median trees would have an adverse effect on the streetscape in the short term. However, the decline in visual quality would be less severe than in some other segments because of the positive effect of the existing plane tree plantings, which would remain visually dominant, and because of the enhanced visual unity of new Alternative 3 replacement landscaping, even in its immature phase.

Overall, the improvement of the streetscape visual quality from median landscaping and platform design under Alternative 3 in this segment would be a beneficial effect as experienced by all viewer groups in the long term

Similar to the depiction of Alternative 3-Consolidated shown in Figure 4.4-10, KVP 3, above, Alternative 3 would introduce dual landscaped center medians separating the center bus-only and outer auto travel lanes. Along with tree planting on the BRT platforms themselves, these medians would introduce regular, consistent plantings of Geary corridorwide theme tree plantings to complement and reinforce the existing plane tree canopy. Such plantings could substantially improve the visual intactness, unity and overall visual quality of the segment, while enhancing the visual unity of the Geary corridor as a whole. For example, replacement planting in the center medians with new plane trees could complement the existing plane tree canopy, creating an *allee* effect more in keeping with the wide scale of Geary Boulevard. As at the other new BRT stops, the platforms would also introduce distinctive lighting, paving and tree planting, contributing to enhanced visual unity of the streetscape. Overall, the improvement of the streetscape visual quality from median landscaping and platform design would be a beneficial effect as experienced by all viewer groups in the long term.

Alternative 3-Consolidated, Broderick Street to Scott Street

Instead of local/BRT stops west of Divisadero Street as under Alternative 3, BRT stops would be located mid-block in each direction between Divisadero and Scott streets. These stops would be connected to crosswalks at each intersection by solid medians. This alternative would thus have less tree planting than Alternative 3 in this block. Overall, however, effects would be substantially similar to Alternative 3. Improvement of the streetscape visual quality from platform design and landscaping would be a beneficial effect as experienced by all viewer groups.

Hybrid Alternative/LPA, Broderick Street to Scott Street

Same as Alternative 2.

Alternative 2, Scott Street to Laguna Street

BRT stops would be located in each direction at Fillmore Street (west of the Fillmore intersection). Existing local-only stops would remain at Scott and Buchanan streets in each direction.

KVP 5 (Figure 4.4-12) depicts a view of the westbound BRT stop on the Geary Boulevard surface lanes under Alternative 2, located west of Fillmore Street. This view is representative of proposed stops in this segment. The appearance of the new stops in both directions would be similar and the discussion that follows would apply to both.

Figure 4.4-12 Key Viewpoint 5 – BRT Stop(Fillmore Street)

A. Existing view looking east

B. Simulated view looking east showing mature vegetation (Alternative 2)

Source: WKA, 2013

C. Simulated view looking east showing mature vegetation and the Webster Street pedestrian bridge (Hybrid Alternative/LPA)

Source: SFCTA, 2016

As depicted in Figure 4.4-12b, the proposed BRT stop in this location under Alternative 2 would be very similar to that depicted in Figure 4.4-11b. In this case, the relatively poor visual quality of the existing location would be more noticeably improved by the introduction of the proposed stop. New decorative street lamps, custom paving associated with new bulbouts, as well as with dedicated bus lanes, new railings, and new shelters, would provide added visual unity to the BRT stop. Widened sidewalks and new tree planting would enhance unity and intactness. The overall effect on visual quality would thus be beneficial. This would be a beneficial effect as experienced by all viewer groups.

Effects of the eastbound stop would be similar. Although existing visual quality of that location is not as poor, the new station features would have an overall beneficial effect on visual quality.

Alternative 3, Scott Street to Laguna Street

In the long term, complementary replacement tree planting in the center medians would restore and could enhance the intactness and unity of this section between Webster and Laguna Streets

In Alternative 3, a center median local stop would be located in each direction between Scott and Steiner streets. An additional eastbound local stop would be located on Geary Boulevard at the southwest corner of Fillmore Street. Alternative 3 also includes the filling of the Fillmore undercrossing and the associated raising of Geary Boulevard from below grade to at-grade. Fillmore and Geary would thus become a normal at-grade intersection. A center median local/BRT stop would extend the entire block between Fillmore and Webster streets.

Several trees would be removed from the center median between Scott and Steiner streets to accommodate the center-running BRT lanes and landscaped medians. This would have an adverse effect on visual quality in the short term, though this effect would be moderated by the compromised visual quality of the existing plantings, which are of inconsistent types, spacing, and health, and by the strong visual dominance of the continuous tall plane trees that would remain on each side of this block. Replacement landscaping would also create enhanced visual unity, even in its immature phase. In the long term, complementary replacement tree planting in the center medians could thus enhance the intactness, unity and overall visual quality of this section between Scott and Fillmore streets.

KVP 6 (Figure 4.4-13) depicts the local/BRT stops in the newly filled portion of Geary Boulevard between Fillmore and Webster streets under Alternative 3.

As depicted in Figure 4.4-13b, the proposed local/BRT stop would extend for the entire block. The existing block is visually fragmented and divided by the undercrossing structure, and thus lacks visual intactness and unity. Existing visual quality is thus moderately low. As depicted in Figure 4.4-13b, the restoration of a continuous at-grade boulevard in this section would enhance if not fully restore visual unity of the space. The enhanced visual unity would be appreciated by pedestrians, people in surrounding buildings, as well as by transit riders and drivers. Introduction of the platforms would add to that restored unity through the addition of visually unified elements of regular tree planting, decorative light standards, repeating shelter structures, and decorative railing. Greatly widened sidewalks and decorative platform lighting would add further to the improved intactness and unity of the streetscape. Overall, visual quality would thus be improved by the new stops and filled configuration, a beneficial effect as experienced by all viewer groups.

Some trees in the center median between Webster and Buchanan streets would be removed to accommodate a reconfigured center median and a major new pedestrian crosswalk serving the main entrance to the Japantown Peace Plaza in the middle of this block. These trees are a part of a continuous center median tree planting extending between the vicinity of the Peace Plaza to Laguna Street. The removal of trees would have an adverse effect on visual quality in the short term, which would be somewhat moderated by the continued strong visual dominance of existing plantings of tall plane trees on the entire south side of the street between Webster and Laguna streets. In the long term, complementary replacement tree planting in the center medians would restore and could enhance the intactness and unity of this section between Webster and Laguna streets. The center BRT lanes would make the transition from center-running to side-running in this block between Buchanan and Laguna streets.

Alternative 3-Consolidated, Scott Street to Laguna Street

Same as Alternative 3.

Figure 4.4-13 Key Viewpoint 6 – BRT Stop, Alternative 3 (Fillmore Street)

A. Existing view looking east

B. Simulated view looking east showing mature vegetation

Source: WKA, 2013

Hybrid Alternative/LPA, Scott Street to Laguna Street

Similar to Alternative 2 regarding proposed BRT stops; local-only stops would be in different locations than those of Alternative 2. In addition, the Hybrid Alternative/LPA would relocate reconfigured on-street parallel parking spaces on both sides of Geary Boulevard between Webster and Laguna.

Unlike the other build alternatives, the Hybrid Alternative/LPA would not remove the Webster Street bridge (refer to Figure 4.4-12c). This would reduce the scale of construction-period visual effects in the area as the bridge would no longer be demolished.

The Hybrid Alternative/LPA would add combined local/BRT stops in both directions on new transit islands at Laguna Street. The addition of transit islands would ultimately enhance the visual quality of the pedestrian environment by reducing the width and dominance of auto travel lanes. The Laguna Street transit islands would also provide an opportunity for aesthetic improvements such as additional street tree planting, decorative street lighting, and pavement patterns, and would result in a visual narrowing of paved roadway area. These improvements would result in a net visual benefit.

Alternative 2, Laguna to Cleary Court

There would be no new stops in this segment. Changes associated with Alternative 2 would include lane re-striping, painting of the dedicated bus lane, and widening of the sidewalk by approximately 20 feet. Visual effects for all users would thus be minor.

Alternative 3, Laguna to Cleary Court

This segment marks the beginning of a side-running BRT lane configuration that would then continue to the eastern Geary corridor terminus at Market Street. One local stop would be located in each direction at the corners east of Laguna Street, on bus bulbs extending to Cleary Court. These would also accommodate parallel street parking beyond the stops. The BRT lanes would be located inside the parallel parking zones. The widened sidewalk would result in an improved bus passenger and pedestrian environment. From the perspective of bus passengers and pedestrians, the new stops would provide a visually improved, more spacious environment. Existing young plane trees at these locations would be preserved at the new stops. The stops would thus have a minor, visually neutral or slightly beneficial effect.

From the perspective of motorists, bus passengers and pedestrians, the introduction of the BRT stops would reduce the auto- and pavement-dominated character of the streetscape, enhance intactness with additional platform-related tree planting, while preserving visual unity through replacement of the existing pattern of plane tree planting

Alternative 3-Consolidated, Laguna to Cleary Court

Alternative 3-Consolidated would introduce BRT stops in both directions near Cleary Court. The eastbound BRT stop would be located within this segment. The westbound BRT stop would be located east of Cleary Court in the below segment. The BRT stops would be substantially similar to the side-running BRT stops depicted in Figures 4.4-8, 4.4-11, and 4.4-12. Rather than occupying an entire block, however, they would be located on wide bus bulbs extending into the existing roadway, requiring removal of several existing young plane trees at the eastbound stop. These would be replaced in kind as feasible as part of the platform design to maintain continuity with the existing plane tree plantings in this segment. The tree

replacement would result in a decline in visual quality in the short term, until maturation of the replacement tree planting. As a result of the very wide proposed bus bulbs, the BRT stops would become a prominent feature of the streetscape in this section, increasing the scale of the passenger waiting area and reducing the existing expanse of paving (from four auto lanes plus curbside parking, to two auto lanes and one BRT lane, with curbside parking west of the BRT platforms) in the vicinity of the stops. From the perspective of motorists, bus passengers and pedestrians, the introduction of the BRT stops would reduce the auto- and pavement-dominated character of the streetscape, enhance intactness with additional platform-related tree planting, while preserving visual unity through replacement of the existing pattern of plane tree planting. From the perspective of bus passengers and pedestrians, the new stops would provide a visually improved, more spacious environment.

Hybrid Alternative/LPA, Laguna to Cleary Court

The Hybrid Alternative/LPA would add combined local/BRT stops in both directions on new transit islands at Laguna Street; the outbound stop would be between Laguna Street and Cleary Court. The addition of transit islands would ultimately enhance the visual quality of the pedestrian environment by reducing the width and dominance of auto travel lanes. The Laguna Street transit islands would also provide an opportunity for aesthetic improvements such as pavement patterns and would result in a visual narrowing of paved roadway area. These improvements would result in a net visual benefit.

Alternative 2, Cleary Court to Van Ness Avenue

Alternative 2's visual effects would be minor to somewhat beneficial for all viewer groups from Cleary Street to Van Ness Avenue

In this segment one westbound local/BRT stop would be located west of Gough Street, and one local/BRT stop would be located in both eastbound and westbound directions at the northwest corner of Geary and southwest corner of O'Farrell west of Van Ness Avenue.

Some trees would be removed to accommodate the westbound stop west of Gough Street. These are part of a virtually continuous curb planting of plane trees extending between Laguna Street and Gough Street. It is possible that center median landscaping would also be replaced in the vicinity of this stop for lane re-configuration to accommodate the BRT lanes.

Alternative 2 includes a BRT stop on a bus bulb at the northwest corner of Geary Street and Van Ness Avenue. There are no sidewalk trees in this area of the block, so no tree removal would be required. Existing visual quality of this corner of Geary Street is moderately low, with construction underway at the northwest corner of Geary and Van Ness Avenue, no street tree planting, narrow sidewalks, adjoining a utilitarian, nondescript side façade lacking street-level windows or pedestrian access. Similarly, a BRT stop would be built at the southwest corner of O'Farrell Street and Van Ness Avenue. Some existing young London plane trees of moderate (about 20') height would be removed to construct the new BRT stations. These are part of a uniform, continuous plane tree planting on both sides of the street between Van Ness Avenue and Franklin Street.

The appearance of the stops would be substantially similar to those previously depicted in Figures 4.4-11 and 4.4-12 (KVPs 4 and 5). The removal of existing trees would cause a decline in visual intactness, unity and overall visual quality in the short term. This adverse effect would be partly off-set by replacement tree planting, new decorative street lamps, paving patterns, and shelters, and particularly a greatly widened sidewalk/passenger area which would enhance visual unity and intactness at the BRT stop, particularly for bus passengers. Tree replacement at the stop would be in-kind to match the existing planting pattern. In the long term, with maturation of replacement tree planting, intactness, unity and overall visual quality of the site would be somewhat enhanced. The overall effect on visual quality would thus be somewhat beneficial in the long term as experienced by all viewer groups.

Alternative 3, Cleary Court to Van Ness Avenue

Alternative 3 would relocate the existing eastbound local stop from the east to west side of Gough Street and would upgrade an existing eastbound local stop on the corner of O'Farrell Street west of Van Ness Avenue to local/BRT. The local stop would be essentially similar to other side-running local stops depicted previously (refer to Figure 4.4-9). The eastbound BRT stop at Van Ness Avenue would be located at an already widened bus bulb. The bus bulb would be extended to the west of the existing bulbout. The new bulbout would be located between two driveways (of an adjacent auto dealership/auto service shop). The new stop would thus represent a minimal change, with some visual enhancement from introduction of new fixtures and additional shelters. Alternative 3 would thus have minimal, visually neutral or slightly beneficial effects in this segment.

Alternative 3-Consolidated, Cleary Court to Van Ness Avenue

Alternative 3-Consolidated would include the same eastbound BRT stop at O'Farrell Street and Van Ness Avenue as described above for Alternative 3. The eastbound BRT stop at Van Ness Avenue would be located at an already-widened bus bulb. The bus bulb would be extended to the west of the existing bulbout. The resulting new bus bulb would be located between two driveways of an auto dealership/service shop. The new stop would thus represent a minimal change, with some visual enhancement from introduction of new fixtures and additional shelters.

Similar to Alternative 2, Alternative 3-Consolidated would include a westbound BRT stop at the northeast corner of the Van Ness/Geary intersection. There are no sidewalk trees in this location, so no tree removal would be required. Existing visual quality of this corner of Geary Boulevard is moderately low, lacking street tree planting, with narrow sidewalks adjoining a utilitarian side façade lacking street-level windows, pedestrian access or traffic. The bus bulb would introduce a wider bus passenger and pedestrian environment, with street trees, decorative street lighting and paving patterns enhancing visual unity and intactness.

Hybrid Alternative/LPA, Cleary Court to Van Ness Avenue

Same as Alternative 2.

Landscape Unit 3: Operational Effects

Alternative 2 – Operational Effects Overview

Overall, Alternative 2 would have a subtle but somewhat beneficial visual effect from Van Ness Avenue to Market Street, as experienced by all viewer groups, particularly bus passengers and pedestrians

Visual changes in Landscape Unit 3 would be similar to those described for Landscape Units 1 and 2. The character of the adjoining setting is denser, taller and more urban than in the units to the west, and the cross-section of Geary Boulevard is narrower, about 60 feet to 69 feet rather than up to 100 feet. However, the configuration of the proposed stops in Landscape Unit 3 is the same as for other side-running stops described for Alternative 2.

Alternative 3, 3-Consolidated, and Hybrid Alternative/LPA – Operational Effects Overview

In Landscape Unit 3, these three alternatives would each have features similar to Alternative 2. Accordingly, visual effects would be similar as those for Alternative 2.

Landscape Unit 3: Segment by Segment Operational Effects

Alternative 2, Van Ness Avenue to Market Street

In Alternative 2 (as well as for all of the build alternatives), five BRT or local/BRT stops in each direction would be included. KVP 7 (Figure 4.4-14) depicts a view of a typical BRT stop at Powell and O'Farrell streets. As illustrated in the simulation, the new stops would be essentially similar to other side-running stops depicted previously (refer to Figure 4.4-8). Specific street tree recommendations (*Tristania*) would blend with prevailing tree plantings in this segment. There are no existing street trees in this block, and in general tree plantings are scattered and isolated within the downtown area of this segment.

Figure 4.4-14b depicts the bus bulb, and a new lane configuration with bus-only lane similar to existing but with one auto travel lane only, and a curbside parking lane. The change from existing conditions would thus be fairly minor. At BRT stops, the widening of the sidewalk passenger area and addition of street trees, lighting, distinctive paving and other amenities, as well as a visual narrowing of paved area, would enhance intactness and overall visual quality somewhat for all viewer groups, particularly for pedestrians and bus passengers. A primary visual concern in this segment is to ensure that new features remain compatible with the historic characteristics of the setting. Throughout the KMMS Conservation District, the streetscape is distinguished by historic street lamps as seen in Figures 4.4-6 and 4.4-14. As noted previously, many buildings in this area are designated architecturally significant or contributing, and the corner property shown in KVP is one such example. Visually distinctive features of adjoining historic properties, such as the sign adjoining this BRT stop, are a concern, and platforms would be designed to avoid obscuring or visually clashing with such features. See Section 4.5 (Cultural Resources) for a further discussion of consistency with national, state and local standards governing historic resources, including potential project-related visual effects.

Overall, Alternative 2 would have a subtle but somewhat beneficial visual effect in this segment as experienced by all viewer groups, particularly bus passengers and pedestrians.

Figure 4.4-14 Key Viewpoint 7 – BRT Stop, All Alternatives (Powell Street and O'Farrell Street)

A. Existing view looking west, prior to 2014 installation of red lanes

B. Simulated view looking west showing mature vegetation

Source: WKA, 2014

Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA, Van Ness Avenue to Market Street

These three alternatives would incorporate the same features as Alternative 2 described above. Visual effects of these alternatives would therefore be similar to those of Alternative 2.

4.4.4.4 | COMPARATIVE EFFECTS OF ALTERNATIVES

Alternatives 3 and 3-Consolidated would have the greatest visual disruptions during construction, followed by the Hybrid Alternative/LPA, then Alternative 2. Once operational, Alternative 3-Consolidated and the Hybrid Alternative/LPA would have the greatest long-term benefits to visual quality, followed by Alternative 2 and Alternative 3. The No Build Alternative would have the least beneficial impacts to visual quality throughout the corridor, featuring only marginal improvements.

4.4.5 | Avoidance, Minimization, and/or Mitigation Measures

4.4.5.1 | CONSTRUCTION MEASURES

In addition to compliance with City policies regarding minimization of disruption associated with working within City streets (refer to Section 4.6.1), implementation of the following measures would help minimize any adverse visual effects associated with construction of any of the build alternatives.

- **MIN-VQ-C1**.
  - » Project construction shall be phased to reduce the period of disruption at any particular location to the shortest practical length of time.
  - » Construction lighting shall be shielded and directed to limit direct illumination to within the area of work and avoid all light trespass.
  - » Construction staging and storage areas shall be screened by visually opaque screening wherever they will be exposed to public view for extended periods of time.

4.4.5.2 | OPERATIONAL MEASURES

As no adverse operational period visual effects have been identified, no avoidance, minimization, or mitigation measures are warranted. However, please note Section 4.6.5, where minimization (MIN-CUL-7) calls for harmonization of the visual qualities of built elements of the build alternatives with adjacent historic properties through careful consideration of design, lighting, materials, and color choices that would complement and be sensitive to nearby historic properties. In addition, SFCTA and SFMTA, in cooperation with the San Francisco Planning Department, have identified a number of improvement measures listed below to further enhance the visual quality of the build alternatives.

- **I-VQ-1**. Incorporate public art and landscape elements at Masonic tunnel BRT stops. In order to enhance visual quality at Masonic tunnel BRT stops under Alternatives 3 and 3-Consolidated, public art could be incorporated in the station design, tunnel retaining walls and overcrossing parapet. Climbing vines or other landscape planting could be incorporated into station design as feasible.

- **I-VQ-2**. In order to maximize overall Geary corridor visual unity, a consistent palette of street tree types could be developed, reviewed by City planning staff, and applied throughout the Geary corridor.
- **I-VQ-3**. Coordinate with Geary corridor planning efforts of the City planning department. Station design could be coordinated with long-term urban design studies of the City planning department, including studies for the Divisadero to Laguna Street segment of the Geary corridor.

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4.5 Cultural Resources

The information in this section is largely derived from reports prepared for the San Francisco County Transportation Authority (SFCTA). These include the Archaeological and Native American Cultural Resources Sensitivity Assessment (ASA), and a Historic Resources Inventory and Evaluation Report (HRIER) and Finding of Effect (FOE). Since the publication of the Draft EIS/EIR, to analyze modifications to the Hybrid Alternative/LPA, an addendum to the ASA was prepared (June 2017), the HRIER was updated (April 2017), and the FOE was updated (July 2017) to include specific archaeological findings. Due to the sensitive nature of the specific identification of archaeological/historic resources, the ASA, HRIER, and FOE are on file with SFCTA. However, Appendix E includes maps of both the Architectural and Archaeological areas of potential effect (APE maps) along with correspondence from the California State Historic Preservation Officer (SHPO). Appendix E also includes FTA's September 14, 2017 request to include the six minor project modifications in its consultation, and the SHPO's October 2017 concurrence with the lead agency's determinations for the project pursuant to Section 106 of the National Historic Preservation Act (NHPA).

4.5.1 | Regulatory Setting

Various federal, state, and local regulations are relevant to cultural resources.

4.5.1.1 | FEDERAL REGULATIONS

4.5.1.1.1 THE NATIONAL HISTORIC PRESERVATION ACT

The NHPA (54 U.S.C. 300101 et seq.) established a national program to preserve the country's historical and cultural resources, including both archaeological resources and historic architectural resources.

Section 106 of the NHPA requires federal agencies to consider the effects of their actions on historic properties and provide the President's Advisory Council on Historic Preservation (ACHP) opportunity to comment on any proposed action before implementation. The goal of Section 106, as outlined in the regulations promulgated by the ACHP at Title 36 CFR Part 800, is to identify historic properties that could be affected by a project, assess the project's potential effects to such properties, and seek ways to avoid, minimize, or mitigate any adverse effects to historic properties. The NHPA also requires that, in carrying out the requirements of Section 106, each federal agency must consult with any federally-recognized Native American tribe that attaches religious and cultural significance to historic properties that may be affected by the agency's undertakings.

Cultural resources of particular concern are those that are eligible for listing in the National Register of Historic Places (NRHP). The NRHP eligibility criteria (36 CFR 60.4) state that the quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design,

setting, materials, workmanship, feeling, association, and that meet one or more of the following criteria:

> Criterion A: The resource is associated with events that have made a significant contribution to the broad patterns of our history.
>
> Criterion B: The resource is associated with the lives of persons significant in our past.
>
> Criterion C: The resource embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic values; or represents a significant and distinguishable entity whose components may lack individual distinction.
>
> Criterion D: The resource has yielded, or may be likely to yield, information important to prehistory or history.

Impacts to NRHP-eligible resources are considered adverse when "an undertaking may alter directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association" (36 CFR 800.5[1]).

Section 106 of the NHPA requires the lead federal agency to consult with the appropriate State Historic Preservation Officer (SHPO). The SHPO's role in Section 106 consultation includes review and comment on the Area of Potential Effect, review and concurrence with inventories of historic resources potentially affected by the project, review and concurrence with the assessment of adverse effects, and assistance in the resolution of any adverse effects identified.

Since this project is located entirely in the State of California, the California SHPO is the appropriate SHPO with which to consult. The lead agency initiated consultation with the California SHPO on April 20, 2015. Efforts to involve the public in the Section 106 process have included:

- Establishment of the Geary BRT Technical Advisory Committee (TAC) composed of staff from primary local participating and responsible agencies.
- Issuance of a Notice of Preparation (NOP) to prepare an Environmental Impact Report on November 20, 2008
- Issuance of a Notice of Intent (NOI) to prepare an Environmental Impact Statement on November 24, 2008.
- Various scoping and general community meetings.
- Dissemination of online, print media notices and mailings.
- Establishment of a Citizens Advisory Committee (CAC)
- Meeting with a variety of local community and business groups.

The lead agency sent letters to interested parties on September 20, 2013 to inform area planning agencies, local governments, historical societies, museums and other parties interested in historic preservation issues. No responses were received. Copies of the transmittals letters are included in Appendix E. The following organizations received this letter:

- San Francisco Architectural Heritage
- San Fran cisco Beautiful
- San Francisco History Association
- San Francisco Museum and Historical Society
- DOCOMOMO US/Northern California
- American Institute of Architects, Historic Resources Committee
- San Francisco Historic Preservation Commission
- The Victorian Alliance of San Francisco
- Art Deco Society of California
- California Historical Society
- Western Neighborhoods Project
- San Francisco City Guides
- San Francisco Cable Car Museum
- National Japanese American Historical Society
- Friends of 1800
- SPUR

The lead agency contacted the Native American Heritage Commission (NAHC) on November 21, 2008, and requested that they conduct a search of their Sacred Lands file to determine if there were known cultural sites within or near the Study Area for the current project. On December 5, 2008, the NAHC responded stating that no Native American cultural resources were reported from the Sacred Lands file records search. A list of interested Native American groups and individuals was also requested on November 21, 2008. All six contacts on that list were sent letters requesting input on December 8, 2008. A follow up email was then sent to all six contacts on February 19, 2009. Mr. Andrew Galvin responded on February 19, 2009, requesting a copy of this study so that he could provide comment as appropriate. No other responses were received. On October 21, 2011, a second letter was sent to the six contacts on the list. This letter informed them of the expansion of the project eastward and requested input from them. No responses were received.

On October 17, 2017, SHPO concurred with the lead agency's finding that the undertaking would have no adverse effects to historic properties. See Appendix E for pertinent correspondence.

4.5.1.2 | STATE REGULATIONS

4.5.1.2.1 CALIFORNIA REGISTER OF HISTORIC RESOURCES (CRHR)

The California Register of Historic Resources (CRHR) is established under California Public Resources Code (PRC) section 5024.1. The CRHR encourages public recognition and protection of cultural and historic resources. Generally, a resource should be considered by a lead agency to be historically significant if the resource has integrity and meets one of the criteria for CRHR listing listed below (CEQA Guidelines 15064.5 [a][3]). These criteria resemble NRHP criteria but are more narrowly targeted toward California history. The CRHR also encompasses properties listed in or eligible for listing in the NRHP, as well as California Historical

Landmarks numbered 770 or higher. The CRHR also includes locally designated city or county landmarks under a local preservation ordinance when the designation criteria are consistent with California Register criteria. The CRHR criteria are:

- The resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.
- The resource is associated with the lives of persons important in California's past.
- The resource embodies the distinctive characteristics of a type, period, region, or method of construction; represents the work of an important creative individual; or possesses high artistic values.
- The resource has yielded, or may be likely to yield, information important in prehistory or history.

The CRHR is similar to the NRHP in that any resource determined eligible for the NRHP is also automatically eligible for the CRHR. However, the treatment of historical resources under the California Environmental Quality Act (CEQA) and in the CRHR is more inclusive in that resources listed in local historical registers may be included.

Projects that would impact CRHR-listed and -eligible resources and resources listed in local historical registers may result in a significant effect on the environment if the project would cause an adverse change in the significance of a historical resource.[10] Adverse change in the significance of a historical resource refers to physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that [its] significance would be materially impaired.[11] Material impairment means demolition of the resource, or alteration of the physical characteristics that make the resource eligible for listing such that it would no longer be eligible for the CRHR or a local historical register.[12]

4.5.1.3 | LOCAL REGULATIONS

The City and County of San Francisco maintains a comprehensive list of its locally designated landmarks and historic districts. Landmarks can be buildings, sites, or landscape features. Districts are defined generally as an area of multiple historic resources that are contextually united. A list of landmarks and descriptions of each historic district can be found in Article 10 of the Municipal Planning Code. None of the recognized historic districts overlap with the Geary corridor.

Article 11 of the Municipal Planning Code identifies several Downtown Conservation Districts. Buildings within the Conservation Districts may be designated as contributory elements of the district based on architectural significance of the building. The Geary corridor travels through one Downtown Conservation District (Kearny-Market-Mason-Sutter) and is adjacent to one other (New Montgomery-2nd Street).

[10] Public Resources Code Section 21084.1.
[11] CEQA Guidelines Section 15064.5[b][1].
[12] CEQA Guidelines Section 15064.5[b][2].

The San Francisco Historic Preservation Commission makes recommendations to the Board of Supervisors on the designation of landmark buildings, historic districts, and significant buildings, as well as any construction, alteration, or demolition that would affect listed sites and resources.

4.5.2 | Affected Environment

4.5.2.1 | BACKGROUND ON CULTURAL RESOURCE TYPES

4.5.2.1.1 ARCHAEOLOGICAL RESOURCES BACKGROUND

Archaeology is the study of both prehistoric and historical human activities and cultures. Archaeological resources typically fall into three different categories.

- **Prehistoric Archaeological Sites**: In California, prehistoric archaeological sites are places where one can find evidence of human activities prior to 1769 AD, which is generally accepted as the date of European arrival and exploration leading to permanent settlement. Prehistoric sites typically contain human burial or subsistence remains and artifacts or tools made by people. Objects that may be found on a prehistoric archaeological site include tools, beads, ornaments, ceremonial items, rock art, and inedible remains of food sources.
- **Historic Archaeological Sites**: Historic archaeological sites are places where evidence exists of human activities between 1769 AD and the early 20th century. Many historic archaeological sites are places where houses formerly existed and contain ceramic, metal, glass refuse resulting from the transport, preparation and structural remnants, such as windowpane glass, lumber, and nails. Historical archaeological sites can also be nonresidential, resulting from ranching, farming, industrial, and other activities.
- **Traditional Cultural Properties:** Traditional cultural properties are specific locations that are largely associated with the history of the community. These places are typically associated with the cultural practices or beliefs of a living community, such as locations where ceremonial activities were performed.

4.5.2.1.2 HISTORIC ARCHITECTURAL RESOURCES BACKGROUND

Historic architectural resources (or "built environment") resources are structures or buildings that served residential, commercial, industrial, transportation, and other purposes during historic periods (more than 50 years ago). These generally consist of buildings of all types, as well as dams, bridges, roads, and other infrastructure. In addition, districts (recognized and/or established through federal, state, and/or local criteria) are also considered historic architectural resources.

4.5.2.1.3 PALEONTOLOGICAL RESOURCES BACKGROUND

Paleontological resources are fossilized remains of plants and animals. Generally, paleontological resources are those that are more than 10,000 years old and are typically found below ground surface in sedimentary rock units.

4.5.2.2 | ARCHAEOLOGICAL RESOURCES

4.5.2.2.1 ARCHAEOLOGICAL AREA OF POTENTIAL EFFECT

The archaeological evaluation begins with the delineation of the Area of Potential Effects (APE). The APE is generally defined as the maximum geographic area or areas both horizontally and vertically within which a proposed project (referred to as an "undertaking" under Section 106 regulations) may cause direct or indirect changes in the character or use of historic properties, should any such properties be present. Appendix E includes the APE maps prepared for the project.

The horizontal archaeological APE boundaries includes the entire public right-of-way comprising the full travel length of 38 Local and 38 Rapid buses from 48th Avenue on the west to the Transbay Transit Center on the east (see Figure 4.5-1). This includes the entirety of the Geary corridor. Horizontal archaeological APEs – the maximum area potentially affected on the ground surface – were developed for each build alternative based on design (as reflected in plan sets included in Appendix A), as each build alternative has slight variations in anticipated ground disturbance related to proposed locations of project features. In all, the horizontal archaeological APEs extend about 8.9 miles in length; each covers approximately 131 acres in area.

Figure 4.5-1 Archaeological Area of Potential Effect

Source: Far Western, 2014

The vertical archaeological APE has not yet been formally established but would be based upon maximum anticipated excavation depths. For Alternative 2 and the Hybrid Alternative/LPA, the maximum expected excavation depth is 16 feet (for light poles and potential underground sewer line relocations). Alternatives 3 and 3 Consolidated would have a maximum excavation depth of about 30 feet (related to the prospective removal of an underground pump station at the Geary/Fillmore intersection). Based on these known maximum depths, the general limits of the vertical APE are understood.

As part of its consultation with the lead agency under Section 106 of the NHPA, the SHPO reviewed the table of anticipated maximum construction depths (see Table 4.15-2) as part of its review of the horizontal APEs. The SHPO stated that the horizontal APEs were reasonable for the proposed undertaking and noted that the maximum construction depths constituted a reasonable basis for the ultimate determination of a vertical APE once construction-level design plans are prepared.

4.5.2.2.2 KNOWN ARCHAEOLOGICAL RESOURCES

A records search found that 244 archaeological studies have taken place within the records search area for the project (which encompasses the composite total archaeological APE as well as a surrounding quarter-mile buffer area). While these studies documented 26 formally recorded archaeological resources (including both prehistoric and historic-era sites) along with five potential/not formally recorded archaeological resources, none of the resources are documented as extending into or within the archaeological APE (see Appendix E).

Eight historic period resources are situated immediately adjacent to the archaeological APE.

No Native American cultural resources were reported from the Native American Heritage Commission sacred lands file records search. Nor were any areas of Native American concern identified by the list of Native American contacts provided by the Commission. The SFCTA sent letters to Native American contacts in 2009 and again in 2011. Consistent with Section 106, the lead agency sent invitations regarding government to government consultation in 2015. The lead agency will consult with the appropriate Native American tribes as needed.

4.5.2.2.3 ARCHAEOLOGICAL RESOURCE SENSITIVITY EVALUATION

The lack of previous recordation of archaeological resources within the archaeological APE does not necessarily lead to a conclusion of absence of such resources beneath the ground surface of the Geary corridor. Virtually the entire Geary corridor is covered by some amount of artificial fill and therefore, even the historical surface is not visible.

As it would be prohibitively disruptive and infeasible to remove the entire ground surface of the Geary corridor to more conclusively determine whether archaeological resources may be present, the ASA included an examination of the sensitivity or likelihood of encountering previously unrecorded or unknown archaeological resources during excavation associated with the construction of any of the project alternatives. The sensitivity assessment included consideration of geologic setting, previous nearby archaeological studies, and known historic events. Sensitivity was assessed for both prehistoric and historic-era resources.

Prehistoric-Era Sensitivity. Generally, prehistoric archaeological sites in California are most often located on relatively level landforms near water. Thus, there is increased potential for buried prehistoric archaeological sites in areas near past or present water sources.

Two main areas within the archaeological APE are considered to have a high potential for prehistoric archaeological sites. This includes a large area near the eastern end of study area and a similar area at the western end of the study area. Both geomorphic contexts are sand dunes near productive shoreline resources. These areas comprise approximately 32 percent of the archaeological APE.

In contrast, much of the central portion of the archaeological APE is considered to have a low potential for prehistoric sites. This includes portions of the corridor that are situated atop areas formerly covered in sand dunes. These areas lacked sustained water sources and therefore have low sensitivity for encountering buried archaeological sites. These low-sensitivity areas comprise about 61 percent of the archaeological APE.

Portions of the Geary corridor that are situated on top of bedrock (in the vicinity of Presidio Avenue and between Webster and Gough Streets), have no sensitivity for buried sites. Approximately seven percent of the archaeological APE would be considered to have no likelihood of uncovering prehistoric archaeological resources.

Historic-era sensitivity. Two portions of the archaeological APE are considered to have moderate to high sensitivity of yielding historic-era archaeological resources. These include the Yerba Buena Cove area northeast of First Street, which is considered to have a high sensitivity to contain resources associated with the Gold Rush time period. The portion of the Geary corridor between Masonic and Gough streets is believed to have a moderate sensitivity to yield remains of late-nineteenth/early twentieth-century residential and cemetery uses, though it is considered likely that construction of Geary Boulevard itself (particularly the widening, underpass, and tunneling in this area) would have removed or destroyed any intact archaeological resources. Finally, City infrastructure features (such as those associated with water systems) may occur throughout the archaeological APE. The depth below the modern surface in which old infrastructure features may be encountered and whether or not subsequent development has destroyed them is uncertain and undoubtedly highly varied throughout the archaeological APE.

4.5.2.3 | HISTORIC ARCHITECTURE

4.5.2.3.1 HISTORIC ARCHITECTURAL STUDY AREA

In contrast to archaeological properties, historic architectural resources are property types such as buildings, structures, objects, and districts that, in general, are still used and/or maintained. The evaluation of historic architectural resources begins with delineation of the architectural APE. A single architectural APE was developed to encompass "footprint" variations associated with all build alternatives and to account for potential direct and indirect effects. For portions of the Geary corridor where improvements would be confined to the curb-to-curb roadway, the APE is set to the public right-of-way. In areas where a new side platform associated with a new BRT station is proposed or where there are new or moved local bus stops, the architectural APE expands outwardly to encompass one adjacent parcel. In April 2015, the lead agency initiated consultation with the SHPO. In May 2015, SHPO

concurred with the architectural APE. Appendix E includes maps of the architectural APE.

In the case of the Kearny/Market/Mason/Sutter Conservation District and the Uptown Tenderloin Historic District, the architectural APE encompasses only those portions of the districts directly fronting proposed side BRT stations and/or new or moved local stops.

Once the architectural APE was established, the area was surveyed to account for all buildings, structures, objects that appeared to be 45 years of age or greater[13] and to confirm the current condition of properties already listed or determined eligible for listing in the NRHP and/or CRHR, California Historical Landmarks, and the California Points of Historic Interest.

4.5.2.3.2 HISTORIC ARCHITECTURAL RESOURCES

The architectural APE contains 123 buildings or groups of buildings and structures that required formal evaluation. All of these surveyed properties were constructed in 1968 or before. Of these properties:

- 70 are not eligible for listing in the NRHP or CRHR.[14]
- 31 are currently listed in the NRHP and the CRHR (Table 4.5-1)
- 22 are eligible for the NRHP (Table 4.5-2)[15]
    - 21 through previous survey efforts
    - 1 found eligible as a result of this project's study (St. Francis Square Cooperative).

The 53 properties identified as either currently listed in the NRHP and/or the CRHR as well as those that are eligible for the NRHP are considered historical resources under CEQA.

All but one of the 31 properties listed in Table 4.5-1 are located east of Van Ness Avenue. Approximately 18 of these structures have mixed-use functions and the remainder are residential. Thirty of these historical resources are located within the federally recognized Uptown Tenderloin Historic District (and are considered contributing elements thereto).

[13] The California SHPO recommends evaluation of properties that are 45 years old or greater in recognition that there can be a lengthy time gap between resource identification and the date that planning decisions are made.

[14] Of these 70 properties, one is considered to be a historic resource only for the purposes of the California Environmental Quality Act (CEQA). In its October 2017 concurrence with the lead agency's Section 106 determination for the project, SHPO concurred that the remaining 69 properties are ineligible for the NRHP. See SHPO correspondence in Appendix E.

[15] In its October 2017 concurrence with the lead agency's Section 106 determination for the project, SHPO concurred with the eligibility determinations for all 22 of these properties. Although 21 had been found potentially eligible in previous survey efforts, that eligibility had not been submitted to the SHPO for concurrence. See SHPO correspondence in Appendix E.

Table 4.5-1 Properties listed in or previously determined eligible for listing in the NRHP

ADDRESS	RESOURCE NAME	YEAR BUILT	NRHP CRITERIA
945-999 Van Ness Avenue	Ingold Chevrolet Showroom	1937	A, C
946 Geary Street	Briscoe Apartments	1916	A, C
447-453 O'Farrell Street	Wilchar Apartments	1908, 1912	A, C
573-577 O'Farrell Street	El Capitan Apartments	1927	A, C
765 O'Farrell Street	Rockwell Apartments	1924	A, C
401-411 O'Farrell Street	Columbia Hotel	1909-1910	A, C
415-421 O'Farrell Street	Strand Hotel	1908	A, C
433-445 O'Farrell Street	Hotel Winton	1907	A, C
501-525 Taylor Street	Geary-Taylor Apartments	1919-1920	A, C
516-528 Geary Street	St. Francis Arms Apartments	1922-1923	A, C
545 O'Farrell Street	Atherstone Apartments	1910	A, C
555 O'Farrell Street	Palace Court Apartments	1924	A, C
579 O'Farrell Street	Kohlen Lodgings/Sonny Hotel	1907	A, C
587-593 O'Farrell Street	The McCormick	1914	A, C
595-599 O'Farrell Street	Harding Apartments	1918	A, C
746 Geary Street	None Listed	1917,1923	A, C
771-775 O'Farrell Street	None Listed	1923	A, C
777-775 O'Farrell Street	None Listed	1926-1927	A, C
801-815 O'Farrell Street	Burnett Apartments	1913-1914	A, C
835 O'Farrell Street	Hotel Iroquois	1913,1996	A, C
838-842 Geary Street	None Listed	1923	A, C
845 O'Farrell Street	Barbett Apartments	1924	A, C
846-854 Geary Street	Kirkland Apartments	1922	A, C
900-914 Geary Street	Hotel Toronto/Leahi Hotel	1909	A, C
920-924 Geary Street	Hotel Earle	1906	A, C
936-940 Geary Street	Geary Apartments, Francine Apartments	1916,1922-1923	A, C
928-930 Geary Street	None Listed	1923	A, C
954-958 Geary Street	Oswald Apartments	1924	A, C
970 Geary Street	Gray Moor Apartments	1922	A, C
859 O'Farrell Street	Blanco's Café/Music Box	1908	A, C
851 O'Farrell Street	Blanco's Hotel & Restaurant	1908	A, C

Source: JRP, 2015

Table 4.5-2 Properties that are Eligible for Listing in the NRHP

ADDRESS	RESOURCE NAME	YEAR BUILT	NRHP CRITERIA
3700 Geary Boulevard	Park & Ocean Railroad Company, Geary Street Car Barn	1893	A
1510 O'Farrell Street	St. Francis Square Cooperative	1962-1963	A, C
1610 Geary Boulevard	Japan Center	1965-1968	A, C
1450 Laguna Street	San Francisco Japanese Salvation Army	1936,1955,and 1963	A
601 Leavenworth Street	Casa Feliz Apartments	1924	A, C
Geary Boulevard/O'Farrell Street	Golden Triangle Light Standards	1917-1918	A, C
301-345 Powell Street	St. Francis Hotel	1904-1913	A, C
(Multiple locations across San Francisco)	Auxiliary Water Supply System	1908-1964	A,C
235-243 O'Farrell Street	Hotel Barclay	1910	C
201-219 O'Farrell Street	Marquard's Little Cigar Store	1907	C
166-170 Geary Street	Whittell Building	1906-1907	C
156 Geary Street	None Listed	1907	C
152 Geary Street	None Listed	1907	C
146 Geary Street	None Listed	1907	C
132-140 Geary Street	Sachs Building	1907	C
46-48 Stockton Street	Newman & Levinson Building	1909	C
760-784 Market Street	Phelan Building	1908	C
46 Geary Street	None Listed	1907	C
28-36 Geary Street	Rosenstock Building	1908	C
10-12 Geary Street	Schmidt Building	1907,1908	C
2 Geary Street	Fidelity Savings	1908	C
66 Geary Street	Hotel Greystone	1906	C

Source: JRP, 2015

The historic district consists of 409 contributing buildings and sites and 68 non-contributing elements within a 16-block area generally bounded by Taylor, Turk, Larkin and Geary streets. It is significant under NRHP Criterion A (and CRHR Criterion 1) "in the area of social history for its association with the development of hotel and apartment life in San Francisco during a critical period of change. As a distinctive residential area it is also associated with commercial activity, entertainment, and vice." It is also significant under NRHP Criterion C (CRHR Criterion 3) "for its distinctive mix of building types that served a new urban population of office and retail workers. Predominantly hotels and apartments, the district also includes non-residential building types associated with life in the neighborhood." The district features streetlights, granite curbs, fire hydrants, sidewalks, and other public realm elements that were recognized as part of the district's setting but not contributing elements to the district. Only the contributing buildings and structures were identified as contributing elements.

Additionally, SHPO determined the Ingold Chevrolet Showroom (945-999 Van Ness Avenue) as individually eligible for the NRHP in December 2012, also shown in Figure 4.5-2.

In October 2017, SHPO concurred that the 22 properties listed in Table 4.5-2 are eligible for listing in the NRHP and CRHR. The majority of these properties are located east of Van Ness Avenue and were previously identified as eligible in architectural surveys conducted between the 1970s and early 1990s.

Only one of these 22 properties, the St. Francis Square Cooperative (Figure 4.5-2), was found eligible through the current HRIER.

The St. Francis Square Cooperative is a low-income housing development constructed in 1963 as part of the City's redevelopment effort of the Western Addition. The complex is significant as the first racially integrated cooperative housing in San Francisco (NRHP Criterion A and CRHR Criterion 1). Additionally, the St. Francis Square Cooperative is significant under NRHP Criterion C and CRHR Criterion 3 as significant examples of their architecture style and/or as works of a master architect (Marquis & Stoller architects; Lawrence Halprin & Associates landscape architects).

The remaining 21 properties were identified as eligible through previous survey efforts. Of the 21 previously evaluated historic properties, 15 are located within the downtown area of San Francisco and significant under NRHP Criterion C (CRHR Criterion 3) as significant examples of their architecture style and/or as works of a master architect. The majority of these properties are commercial buildings that range between 3 and 16 stories in height and employ a mixture of Baroque, Renaissance, or Gothic styles.

This grouping includes some of San Francisco's more notable buildings including the Phelan, Whittle, and Newman & Levinson buildings as well as the St. Francis Hotel. All 15 properties are located within the local Kearney-Market-Mason-Sutter Conservation district; 13 are designated significant (Article 11 Category I) or contributory (Article 11 Category IV) buildings, including the Phelan Building (San Francisco Landmark No. 156), and two are unrated (Category V).

Also located east of Van Ness Avenue are the Golden Triangle Light Standards, a grouping of 189 Beaux Arts-style streetlights generally located between Mason, Market, and Sutter streets (Figure 4.5-3). Only 21 streetlights are located within the architectural APE. Designated San Francisco Landmark No. 233, the streetlights were installed between 1917 and 1918 and were previously found significant under NRHP Criterion A (CRHR Criterion 1) for their "association with the Panama-Pacific International Exposition of 1915 and the development of merchant businesses in the present-day Union Square retail district," and under NRHP Criterion C (CRHR 3) because they "typify early 20th century innovations in street lighting and embody characteristics of the City Beautiful movement." The streetlights are also significant under Criterion C (CRHR Criterion 3), as the work of master lighting engineers Walter D'Arcy Ryan and J.W. Gosling. The period of significance is 1917-1918. The locations of some streetlights have been adjusted since their installation as their spacing is not consistently uniform.

Components of the Auxiliary Water Supply System (AWSS) are located throughout San Francisco. Under the jurisdiction of the San Francisco Public Utilities Commission (SFPUC), the AWSS was initially constructed in 1908 as a secondary means of providing water for firefighting purposes. Also known as the Emergency Firefighting Water Supply System, the AWSS includes over 135 miles of high pressure underground pipeline, 172 underground cisterns, 1,600 hydrants, 3,800 valves, two pump stations, two large capacity storage tanks, a reservoir, 52 suction connections, two fireboats, and five fireboat manifolds.

Within the architectural APE for the Geary corridor are approximately 2.4 miles of pipeline, 35 fire hydrants, 90 valves, and five cisterns, each apparently installed prior to 1965. In 2009, the AWSS was found eligible, presumably at the local level, under NRHP Criterion A (CRHR Criterion 1) for its direct association with the 1906 San Francisco earthquake and San Francisco's recovery from that disaster. It is also presumably eligible for its engineering and architectural design under NRHP Criterion C (CRHR Criterion 3). The periods of significance identified (in the 2009 evaluation) extended between 1908 and 1913 (NRHP Criterion A and CRHR Criterion 1), when construction occurred, and between 1908 and 1964 (NRHP Criterion C and CRHR Criterion 3), when construction first began to the end of the historic era (45 years from 2009). Following passage of a bond measure in 2010, the SFPUC has allocated funds for restoration and seismic upgrades to the core elements of the AWSS.

The Casa Feliz Apartments (Figure 4.5-4) at 601 Leavenworth Street appears eligible for the NRHP and CRHR as a contributor to the NRHP-listed Uptown Tenderloin Historic District, which is significant under NRHP Criterion A (CRHR Criterion 1) in the area of social history for its association with the City's apartment/hotel lifestyle and commercial activity and under NRHP Criterion C (CRHR Criterion 3) for its distinguishing mixture of hotels, apartment, and commercial buildings. Constructed in 1924, the five-story building with Renaissance and Baroque details has served as an apartment building with first-floor storefront for nearly 90 years.

The remaining four historic properties are located west of Van Ness Avenue and consist of industrial, social, commercial, and residential building types.

The brick, Beaux Arts-style Park & Ocean Railroad Company Geary Street Car Barn at 3700 Geary Boulevard at Arguello was previously found eligible for the NRHP under Criterion A (NRHP Criterion 1) for its association with early streetcar transportation in the Inner Richmond District.

The Park & Ocean Railroad (Figure 4.5-5) operated successfully for 32 years from 1880 until 1912, when its franchise expired and was replaced by the San Francisco Municipal Railway's electric line. The period of significance extends from its construction in 1880 to 1912, when the Park and Ocean Railway ceased operation.

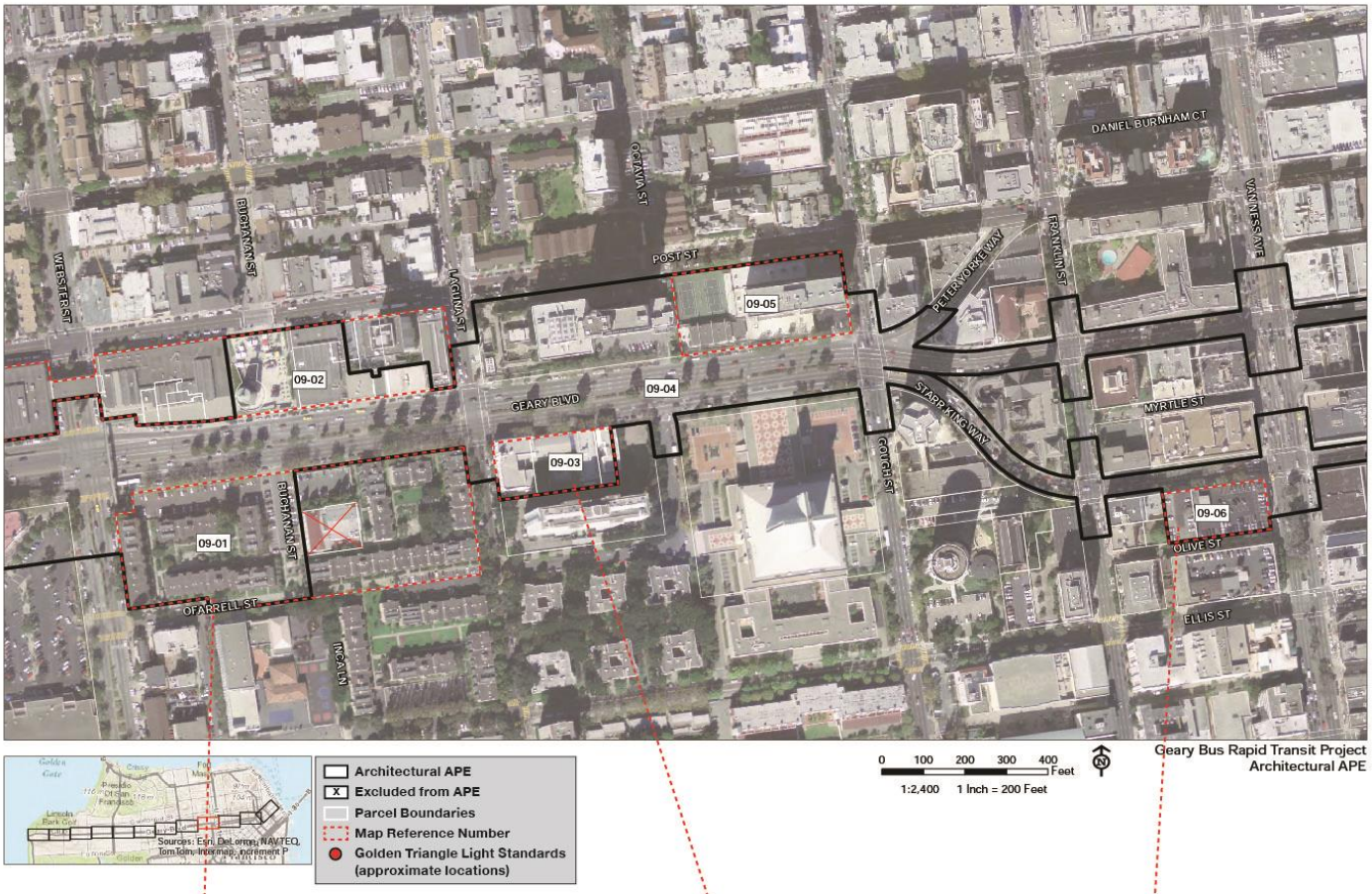
The San Francisco Japanese Salvation Army (Figure 4.5-2) located at 1450 Laguna Street is comprised of three buildings constructed between 1936 and 1955. The oldest building within this complex was previously found eligible for the NRHP, CRHR, and local register. The three-story building is significant under NRHP Criterion A (CRHR Criterion 1) for is associations with the Japanese American community between 1937, when the building was completed, and 1941, the beginning of the United States involvement in World War II. It represents the

community-building efforts of Japanese Americans in San Francisco; the importance of religion, community values, civic service, and personal betterment in Japanese American society; and the struggles for civil rights and community recognition that the Japanese Americans encountered.

The former Japanese Cultural and Trade Center, commonly known as Japan Center, is a three-block long shopping mall that has served San Francisco's Japanese American community both as a commercial center, but also as a community and cultural venue for nearly 50 years. Constructed between 1965 and 1968, Japan Center is a series of connected multi-level buildings, structures, and open space designed in the Japanese American modern-style. The center was previously evaluated and because it was less than 50 years old at the time of that survey, it was found to be potentially eligible for the NRHP. Although the resource is still less than 50 years old, it is assumed eligible under various NRHP and CRHR criteria. The center has a demonstrable association with cultural development of the Japanese American community and with the redevelopment of the Japan Town neighborhood "which has ultimately resulted in the promotion of the local Japanese American culture by housing community businesses and organizations, by providing a venue for festivals, celebrations, and social activity, and by initiating a wave of culturally relevant architecture in Japantown." It is also significant under NRHP Criterion C (CRHR Criterion 3), as an "example of culturally relevant design" by a significant Japanese American architect, Minoru Yamasaki. The center "exhibits his trademark fusion of traditional Asian and European/American styles with modern design." The period of significance is between 1965, when construction of the center began, through the present-day.

Furthermore, as part of the Japantown Better Neighborhood Plan project, the firm of Page & Turnbull prepared a potential Traditional Cultural Property (TCP) evaluation for Japantown and individual properties within the community. That study identified Japan Center as potentially meeting NRHP Criteria Consideration G and NRHP Criteria A and C as a TCP.

Figure 4.5-2 Historic Properties, Webster Street to Van Ness Avenue



1510 O'Farrell Street - St. Francis Square Cooperative

1450 Laguna Street - San Francisco Japanese Salvation Army

945-999 Van Ness Avenue - Ingold Chevrolet Showroom

Source: JRP, 2015

Figure 4.5-3 Golden Triangle Streetlights

Source: WKA, 2014

Figure 4.5-4 Casa Feliz Apartments – 601 Leavenworth Street

Source: JRP, 2014

Figure 4.5-5 Park & Ocean Railroad Co. – 3700 Geary Boulevard

Source: JRP, 2015

4.5.2.4 | PALEONTOLOGICAL RESOURCES

Historically, San Francisco Bay Area environments were typified by estuaries, coastal marsh lands, coastal prairie, and willow groves. These environments contained varied animal resources such as fish, shellfish, large mammals, and a range of plant resources. The City is primarily underlain by Franciscan Complex bedrock and surficial deposits such as dune sand and artificial fill.[16] The bedrock comprises sedimentary and metamorphic rocks of the Franciscan formation, late Jurassic or Cretaceous in age (65 to 165 million years old.)

Fossils are typically found in river, lake, and bog deposits. Franciscan complex rocks underlying the City mostly consist of sandstone, shale, serpentinite, mélange, and minor greenstone outcrops. Fossils are usually uncommon in low-grade metamorphic Franciscan rocks, but may be found scattered in the geologic deposits.

Wind-blown sand dunes covered a large part of the San Francisco peninsula until the nineteenth and twentieth centuries. The gold rush in the mid-1800s largely influenced population growth and development in San Francisco; thick deposits of artificial fill were placed around the margins of the Bay to reclaim the marshes and wetlands for human development. Thus, undifferentiated surficial deposits found in the City include beach sand, marine deposits, and artificial fill. Remains of land mammals have been reported in younger alluvium along with Holocene-age pollen, plan, and shell fossils. No fossils have been reported from artificial fill in San Francisco.

As shown in Figure 4.5-6, the Geary corridor is primarily underlain by Latest Pleistocene to Holocene-age dune sand (Qds) and artificial fill over bay mud (afbm). Dune sand consists of loose to soft, well-sorted sand deposits. Artificial fill typically consists of man-made deposits of varying character, consisting of clay, silt, sand, rock fragments, organic material, and man-made debris. Pleistocene alluvial deposits consist of crudely bedded, moderately to poorly sorted, brown gravel and clay sand. Fossil vertebrates have been found in sediments of Pleistocene alluvium in other San Francisco Bay areas.

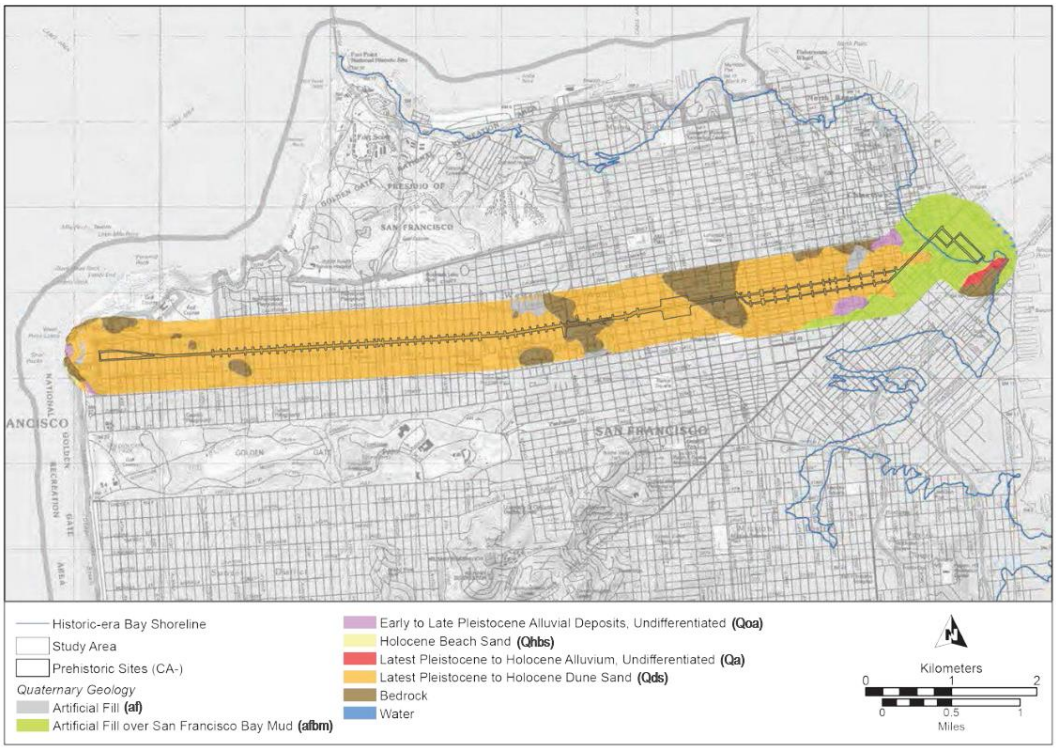
4.5.2.4.1 PALEONTOLOGICAL RESOURCE SENSITIVITY

Significant paleontological resources are fossils or groups of fossils that are unique, rare, unusual, or uncommon. According to Caltrans Standard Environmental Reference (SER), scientifically significant paleontological resources are identified sites or geologic deposits containing individual or groups of fossils that are unique, unusual, or otherwise important, and/or that add to the existing body of knowledge in specific areas.[17]

These resources can generally be anticipated based on the stratigraphic layer of the earth's surface, as some layers are more prone to paleontological significant resources. As a result, paleontological sensitivity is based on the underlying geological unit and work proposed in that area (Table 4.5-3). Caltrans uses the following scale to rate paleontological sensitivity.

[16] City and County of San Francisco Housing Element EIR, 2010.
[17] This document adapts the Caltrans scale and sensitivity definitions in the absence of locally-adopted criteria.

Figure 4.5-6 Geological Deposits within the Geary Corridor



Source: Far Western, 2014

- **High Potential** - Rock units which, based on previous studies, contain or are likely to contain significant vertebrate, significant invertebrate, or significant plant fossils.
- **Low Potential -** This category includes sedimentary rock units that: 1) are potentially fossiliferous, but have not yielded significant fossils in the past; 2) have not yet yielded fossils, but possess a potential for containing fossil remains; or 3) contain common and/or widespread invertebrate fossils if the taxonomy, phylogeny, and ecology of the species contained in the rock are well understood.
- **No Potential** - Rock units of intrusive igneous origin, most extrusive igneous rocks, and moderately to highly metamorphosed rocks are classified as having no potential for containing significant paleontological resources.

As indicated in Figure 4.5-6 and Table 4.5-3, the vast majority of the Geary corridor and surrounding areas have low to no potential to encounter paleontological resources. None of the Geary corridor is underlain by geologic units with a high potential to encounter paleontological resources.

Table 4.5-3 Geologic Unit and Paleontological Sensitivity

GEOLOGIC UNIT	GEOLOGIC AGE	PALEONTOLOGICAL SENSITIVITY
Artificial Fill (af)	Historic	None
Artificial Fill over San Francisco Bay Mud (afbm)	Historic	Low
Holocene Beach Sand (Qhbs)	Holocene	Low
Latest Pleistocene to Holocene Dune Sand (Qds)	Latest Pleistocene to Holocene	Low
Latest Pleistocene to Holocene Alluvium, Undifferentiated (Qa)	Latest Pleistocene to Holocene	High
Early to Late Pleistocene Alluvial Deposits, Undifferentiated (Qoa)	Early to Late Pleistocene	High
Bedrock	Jurassic to Cretaceous	Low

Source: University of California Museum of Paleontology, 2014

4.5.3 | Methodology

The alternatives were evaluated for potential effects to cultural resources with reference to the evaluation of the National Register (36 CFR 60). These criteria state that the quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and which:

a. Are associated with events that have made a significant contribution to the broad patterns of our history; or

b. Are associated with the lives of persons significant in our past; or

c. Embody the distinctive characteristics of a type, period, or method of construction, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

d. Have yielded, or may be likely to yield, information important in prehistory or history (36 CFR 60.4).

The four criteria, in addition to a property generally having to be a minimum of 50 years of age for NRHP consideration, are essential to evaluation of eligibility because they "indicate what properties should be considered for protection from destruction or impairment" (36 CFR 60.2). Any action that, as part of an undertaking, could affect significant cultural resources is subject to review and comment under Section 106 of the NHPA.

The definition of *effect* is contained within 36 CFR Part 800: "effect means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." An adverse effect occurs "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association."

Application of the criteria of adverse effect is largely an assessment of an undertaking's impact on the historic integrity of a historic property. It is also crucial to assess how an undertaking will affect those features of a historic property that contribute to its eligibility for listing in the NRHP. Effects are divided into three groups: direct, indirect, and cumulative. Direct effects included physical destruction or damage. Indirect effects include the introduction of visual, auditory, or vibration impacts as well as neglect to a historic property, and cumulative effects are the impacts of this project taken into account with known past or present projects as well as foreseeable future projects. An effect is noted in this document only when it poses the potential to alter the characteristics of the historic property that quality it for inclusion in the NRHP such as:

i. Physical destruction of or damage to all or part of the property;

ii. Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's standards for the treatment of historic properties (36 CFR part 38) and applicable guidelines;

iii. Removal of property from its historic location;

iv. Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;

v. Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;

vi. Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and

vii. Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

The alternatives have the potential to result in construction period and/or operational period effects as noted below.

Construction-Related Effects

- Ground disturbance and excavations
- Sewer relocations
- Alterations of streetlights, granite curbs, fire hydrants, sidewalks, and other components that comprise the historic setting of the Uptown Tenderloin Historic District.
- Relocation of streetlights that are individually eligible (Golden Triangle Streetlights) or contributing elements of an eligible resource (Japan Center)
- Modification or relocation of components of the AWSS

Operational-Related Effects

- Side-running stations and bus stops

These elements of the build alternatives listed above were evaluated in terms of potentially uncovering cultural resources, relocating historic resources, and potential to create noise, air quality, or visual effects to any historic or cultural resources.

To more accurately characterize potential effects of the project alternatives, this analysis considers the cultural, historic, and paleontological environment along the Geary corridor between 2013-2014.

4.5.4 | Environmental Consequences

This section describes potential impacts and benefits for cultural resources. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 4.5.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding impacts to cultural resources in the Draft EIS/EIR.

4.5.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe impacts to cultural resources during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe impacts to cultural resources relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: Demolition of the existing Webster Street pedestrian bridge would reduce the extent of construction activities at this location, thereby reducing the potential to encounter unrecorded archaeological or paleontological resources during construction, as well as reducing the extent of construction activities in proximity to historic structures such as the nearby Japan Center light standards. Moreover, the Draft EIS/EIR concluded that bridge demolition would not have adverse effects on historic properties (as the bridge was not itself a historic resource). Therefore, retention of the bridge would not result in any new or more severe impacts to cultural resources during the construction period.

Operation: As adverse effects to archaeological and paleontological resources are most often due to construction and other ground-disturbing activities, operational effects related to such resources are generally rare for a project like the Geary

Corridor BRT. Retention of the existing Webster Street pedestrian bridge would not pose a risk of uncovering archaeological resources or impacting a historic property during project operation. Based on the foregoing reasons, no new or more severe impacts to cultural resources would result during project operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: Because the project would no longer add previously proposed BRT stops between Spruce and Cook streets, this would eliminate construction activity outside the curb-to-curb portion of the right-of-way in this area. As a result, this modification would lessen the potential to encounter unrecorded archaeological or paleontological resources during construction. No historic architectural resources are located in the Spruce/Cook area; therefore, this modification would not affect any historic architectural resources. Therefore, this modification would not result in new or more severe cultural resources impacts during construction.

Operation: Operationally, this modification would pose no new or additional risk of uncovering archaeological resources, nor would bus stop retention change the existing neighborhood context. Therefore, no new or more severe impacts to cultural resources would result from this modification during project operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: Implementation of additional pedestrian enhancements throughout the corridor would entail localized construction activities where new pedestrian crossing bulbs would be constructed. Construction would include excavation to a maximum depth of 1.5 feet and would occur in highly urbanized areas, in which the ground surface has been repeatedly disturbed over a century or more of urban development. Given this, the potential to encounter unrecorded archaeological resources or paleontological resources would be low and no new or more severe impacts to archaeological resources would occur during construction. Additional pedestrian crossing improvements would be located within the public right-of-way and would not cause direct or indirect adverse effects to historic properties at or near these project components. Therefore, this modification would not result in new or more severe impacts to cultural resources during construction.

Operation: Once operational, curb bulb outs would not pose risks to historic properties as they would not cause a change in the character or setting of historic properties. Similarly, project operation would not require ground disturbance that could have the potential to encounter unrecorded archaeological or paleontological resources. As such, implementation of this modification would not result in any new or more severe impacts to cultural resources during project operation.

Addition of BRT Stops at Laguna Street

Construction: Laguna Street is located in an area with high potential for encountering historic-era resources, low potential to yield prehistoric archaeological resources and low paleontological sensitivity. However, earlier extensive ground disturbance and construction associated with the construction of the "expressway" section of Geary through this area would likely have disturbed or destroyed any intact historic-era resources, so the likelihood of encountering new intact, eligible resources is low. Therefore, construction of transit islands at Laguna Street would have low potential to encounter or harm any previously unrecorded archaeological resources, paleontological resources, or intact historic-era resources. Similarly,

construction of transit islands would occur entirely within the existing transportation right-of-way, outside of historic property boundaries, and would not pose direct or indirect effects to either of the two historic properties within the vicinity; St. Francis Square Cooperative and the AWSS. Therefore, no new or more severe impacts to cultural resources would result from this modification during project construction.

Operation: Project operation would not include ground disturbance that would pose a risk of uncovering archaeological or paleontological resources. The St. Francis Square Cooperative was constructed along a primary pedestrian and automobile route (today's Geary Boulevard) that currently serves Muni bus lines, and the operation of BRT stops at Laguna Street would not significantly or importantly alter the relationship of this historic property to its transportation corridor. Shelters or other passenger amenities would be located within the transit islands and far enough away from buildings and landscape features that contribute to the significance of the St. Francis Square Cooperative, would not noticeably block views when looking to or from the historic property, and would not alter the property's character-defining features. While the BRT/local stops at Laguna Street would be visible from the cooperative, the stops would be consistent with the character of the existing transportation corridor and would not adversely alter its setting or integrity. Operation of BRT stops at Laguna Street would also have no adverse effect on the AWSS. The bus stops would be designed to avoid removal, relocation, or damage to nearby underground pipelines, fire hydrants, valves, and cisterns that contribute to the significance of the AWSS, resulting in a finding of no adverse effect. Therefore, no new or more severe impacts to cultural resources would result from this modification during project operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: Similar to retaining the Spruce and Cook local and express tops, retention of the Collin Street bus stops would eliminate construction activity outside the curb-to-curb portion of the right-of-way in this location. Thus, this would lessen potential to encounter unrecorded archaeological or paleontological resources during construction. Retention of existing bus stops also would not have any effect on historic properties. Therefore, this modification would not result in new or more severe impacts to cultural resources during construction.

Operation: Operation of the existing bus stops at Collins Street and would retain existing conditions at this location and thus would not affect cultural resources. Therefore, no new or more severe impacts to cultural resources would result from this modification during project operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: The relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities but would simply shift about half of it one block to the west. This modification would not require median removal on that block and, hence, would not require associated excavation which would have the potential to encounter unknown archaeological resources. As there are no historic architectural resources in the area, and construction would occur entirely within the existing transportation right-of-way, no new or more severe impacts to cultural resources would occur as a result of this modification during project construction.

Operation: Similarly, operation of the project with this modification would not change the nature of bus operations as described in the Draft EIS/EIR Therefore, no new or more severe impacts to cultural resources would result from this modification during project operation.

4.5.4.2 | CONSTRUCTION EFFECTS

4.5.4.2.1 CONSTRUCTION EFFECTS UPON ARCHAEOLOGICAL RESOURCES

As set forth in Section 4.5.2.2.2 above, there are no archaeological resources above ground in the Geary corridor. The Geary corridor lies in the vicinity of 26 formally recorded archaeological sites but not within any of the sites. Therefore, construction of the project alternatives would not result in any disturbance to previously recorded (i.e. known) archaeological sites.

Detailed Phase I archival investigations into the potential presence of prehistoric and historic archaeological sites have identified, to the extent possible using available data, all sites within the project APE. An initial investigation in 2014 was updated in 2017 to take into account project modifications subsequent to publication of the Draft EIS/EIR

No known sites would be affected by project impacts, and the sensitivity for buried prehistoric archaeological sites within areas of sub-surface impacts is very low, low, or moderate.

Similarly, the historic-era archaeological sensitivity study determined that there is a low probability of encountering NRHP-eligible deposits.

In the unlikely event that archaeological deposits are identified, an Inadvertent Discovery Plan, which also details identification of human remains, would then be implemented. Section 4.5.5 includes measures to minimize effects if such resources are encountered.

No Build Alternative – Construction Effects upon Archaeological Resources

The improvements associated with the No Build Alternative are generally confined to surficial improvements and service level changes. Construction of such improvements would have little or no potential to have an adverse effect upon archaeological resources. However, some ground disturbance is anticipated in association with road surface improvements, curb improvements, and installation of streetscape infrastructure. Such improvements would occur in highly urbanized areas, in which the ground surface has been repeatedly disturbed over a century or more of urban development. Moreover, these improvements generally do not require deep excavation. Therefore, the potential for the No Build Alternative to encounter and harm previously unrecorded archaeological resources is considered low to very low.

Alternative 2 (Side-Lane BRT) – Construction Effects upon Archaeological Resources

This alternative includes bus-only lanes in the rightmost lane of the Geary corridor with the addition of new BRT stations on bus bulbs from 34th to Van Ness Avenue. Similar to the No Build Alternative, the improvements associated with Alternative 2 would be largely surficial. However, construction of Alternative 2 would include a more extensive installation of streetscape infrastructure (particularly bus shelters and

lighting) that would require deeper excavation in selected locations. These locations are generally within areas of low or no sensitivity to yielding previously unrecorded archaeological resources, so the potential for Alternative 2 to encounter and harm such resources is considered to be low.

Alternatives 3 and 3-Consolidated (Center-Lane BRT with Dual Medians and Passing Lanes; Center-Lane BRT with Dual Medians and Consolidated Bus Service) – Construction Effects upon Archaeological Resources

These alternatives require more extensive ground disturbance associated with the removal of existing medians, trees, and irrigation and the construction of new center-running bus lanes (with new landscaped medians and bus boarding areas) between 27th Avenue and Laguna Street. In addition, these alternatives require the relocation of sewer lines in the vicinity of Park Presidio Boulevard. Both alternatives also include the filling of the Fillmore underpass, which could include excavation and removal of the existing pump station. All of these improvements would entail deeper excavation (to approximately 16 feet below ground surface for sewer relocation; approximately 30 feet for the pump station). These improvements would occur in areas considered to have low potential to yield prehistoric archaeological resources, but high potential for encountering historic-era resources, particularly between Masonic Avenue and Gough Street. However, any high potential for historic resources is tempered by earlier extensive ground disturbance and construction associated with the construction of the Fillmore underpass (and associated pump station) as well as the Masonic tunnel. The construction of these undertakings would likely have disturbed or destroyed any intact historic-era resources, so that the likelihood of encountering new intact, eligible resources is low.

Outside these locations, Alternatives 3 and 3-Consolidated would include a similar array of physical improvements as Alternative 2. Therefore, excepting the portion of the Geary corridor between 27th Avenue on the west and Laguna Street on the east, the potential for these alternatives to encounter and harm unrecorded archaeological resources would be low.

Hybrid Alternative/LPA – Construction Effects upon Archaeological Resources

The Hybrid Alternative/LPA combines various elements of Alternatives 2, 3, and 3-Consolidated. Between 27th Avenue and Palm Avenue, the Hybrid Alternative/LPA would be similar to Alternatives 3 and 3-Consolidated in the removal of existing medians to construct new center-running bus lanes and new medians. Construction of the Hybrid Alternative/LPA would also require sewer relocations near Park Presidio Boulevard. These improvements would occur in areas considered to have low potential to encounter either pre-historic or historic-era archaeological resources. Further archaeological sensitivity analysis conducted in 2017 confirmed that the Hybrid Alternative/LPA would have a low probability of encountering any NHRP-eligible historic period archaeological resources.

4.5.4.2.2 CONSTRUCTION EFFECTS UPON HISTORIC ARCHITECTURAL RESOURCES

No Build Alternative – Construction Effects upon Historic Architectural Resources

Transit and transportation facilities and service would remain unaltered under the No Build Alternative except for various minor improvements, such as transit signal

priority, pavement maintenance and rehabilitation, replacement of traffic signal infrastructure, and construction of curb ramps and corner bulbouts. All of these improvements would occur within the existing right-of-way, which is generally lacking historic resources, except for components of the AWSS and certain streetlights in the Union Square area (the "Golden Triangle" light standards) and Japan Town. The nature of the No Build improvements are such that removal or relocation of these streetlights or AWSS components is unlikely to occur; however, if such movement was necessary, associated projects would be subject to similar mitigation measures incorporated here for the build alternatives. As such, the No Build Alternative would not be expected to have an adverse effect on historic properties.

Construction Effects upon Historic Architectural Resources Common to Alternatives 2, 3, 3-Consolidated, and the Hybrid Alternative/LPA

Alternatives 2, 3, 3-Consolidated, and the Hybrid Alternative/LPA are similar with respect to effects on historic architectural resources in the following ways:

No adverse effects in curb-to-curb roadway. The build alternatives propose a wide array of streetscape improvements, all of which would occur within the existing curb-to-curb roadway. Additionally, all construction staging and laydown areas would be located within public right-of-way areas.

Components of the AWSS are the only historic architectural resources located within the curb-to-curb roadway; specifically AWSS cisterns and valves. All of the build alternative improvements, including new or relocated bus stops/stations, would be designed to avoid the removal, relocation, or damage to these historic components of the AWSS. However, if during further refinement to project design it is determined that one or more of the contributing elements of the AWSS cannot be avoided, the AWSS cisterns, valves, etc. would be relocated to another appropriate nearby location.

While the relocation of any cistern or valve would be a direct effect to this historic property, any relocations would be required to adhere to the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (SOI Standards). Adherence to the SOI standards would ensure that the AWSS system retains its overall integrity of location, design, setting, materials, workmanship, feeling, and association and would still be able to convey its significance under Criterion A and C. Therefore, none of the curb-to-curb roadway work associated with the build alternatives would have an adverse effect on any historic property.

Side-running stations/stops would avoid or minimize any effects to historic elements in sidewalk areas: Each of these alternatives would include side-running stations and stops within the public right-of-way area. Construction of these improvements could require alterations of streetlights, granite curbs, fire hydrants, sidewalks, and other components that comprise the historic setting of the Uptown Tenderloin Historic District (but are not contributing elements to the District's eligibility). The number and location of these minor infrastructural features within the historic district are unknown. However, when considering the size and scale of the district (409 contributing buildings within an approximately 16-block area) and given that there are no more than six locations where a station or stop is proposed under any one build alternative, any potential damage to these non-contributing

features would not present an adverse effect to the overall historic district. The integrity of setting, location, association and feeling of the historic district and its contributors would remain unchanged. Set in an dense urban setting, the historic district has already been altered by the construction of modern buildings and structures and infrastructure, including the addition and/or replacement of light standards, mailboxes, signage, traffic and pedestrian light, bus shelters, parking meters, and sidewalk improvements (including corner bulbs, sidewalk extensions, curb replacement, etc.). Therefore, there will be no direct or indirect adverse effects to any of the historic district properties.

Similarly, side-running stations proposed for all build alternatives could potentially relocate the Golden Triangle Streetlights. The build alternatives are adjacent to 14 Golden Triangle Light Standards (historic property) out of 149 that currently exist within the twelve-block area. As set forth in avoidance measure **A-CUL-C5**, with regard to the Golden Triangle Streetlights, proposed stations and stops would be designed to minimize or avoid the removal, relocation, or damage to these historic structures. In the event that one or more of these streetlights must be relocated, such relocation would conform to appropriate standards. The relocation and restoration/rehabilitation according to SOI Standards would minimize potential effects to the overall historic property from the construction of side-running shared or BRT-only stops under all build alternatives and would result in no direct adverse effects to this historic property. Additionally, a Certificate of Appropriateness would be required from the Historic Preservation Commission under Article 10 of the Municipal Planning Code.

Additionally, the side running stations proposed for all build alternatives could also potentially require the relocation of one or more AWSS fire hydrants (contingent on final construction plans that will be prepared following selection of a preferred alternative). Even if all 35 AWSS hydrants within the APE needed to be relocated, this would constitute four percent or less of the estimated total of contributing hydrants. As set forth in avoidance measure **A-CUL-C5,** all proposed stations or stops under the build alternatives would be designed to avoid removal, relocation, or damage to these historic components of the AWSS. However, if one or more of the AWSS fire hydrants cannot be avoided, the hydrant would be relocated to another location immediately adjacent to or nearby its original location. While the relocation of any hydrants would be a direct effect to this historic property, it would not be adverse. All effort will be made first for relocation of hydrants within the immediate vicinity of their original location while maintaining placement (distance) of the hydrant within the sidewalk in respect to curb and/or adjacent buildings. In addition, any hydrant moved will be restored and/or rehabilitated and any inadvertent damage resulting from the relocation will be repaired in accordance with the SOI Standards.

Construction noise would not result in indirect adverse effects: Regulations at 36 CFR 800.5(a)(2)(v) stipulate that adverse effects to a historic property could result if a project were to introduce "audible elements that diminish the integrity of the property's significant historic features." None of these alternatives would result in indirect adverse effects to any of the 53 historic properties or associated historic districts from construction noise because none of these properties have an inherent quiet quality that is part of a property's historic character and significance. Instead,

all of the 53 historic properties are buildings or structures that have long been located along a major thoroughfare in a long-urbanized area.

No adverse effects from pedestrian bridge removal: Each build alternative proposes removal of the existing pedestrian bridge at Steiner Street. Alternatives 2, 3, and 3-Consolidated also propose the removal of the Webster Street pedestrian bridge. Elements of the AWSS (pipelines and cisterns) are located near the pedestrian bridges in both locations. However, the cisterns are not located directly beneath the pedestrian bridges and conform to the grade of the existing roadway, and the pipelines are located underground, as previously described in Section 4.5.2.3.2. Therefore, no adverse effects to the AWSS would be expected from demolition of either pedestrian bridge.

The Webster Street demolition activity would be conducted in the vicinity of two historic properties, the St. Francis Square Cooperative and Japan Center. All proposed work would be conducted within the existing right-of-way. There would thus be no potential to directly affect either of these historic resources. While the setting of each resource would be altered by the removal of the bridge, the relationship between these historic properties and the transportation corridor would not be significantly altered, so no indirect adverse visual effect would occur.

DEFINITION

CATEGORY I: Reinforced concrete buildings with steel or timber (no plaster)

CATEGORY II: Engineered concrete and masonry buildings (no plaster)

CATEGORY III: Non-engineered timber and masonry buildings

CATEGORY IV: Buildings extremely susceptible to vibration damage

Historic structure susceptibility to vibration effects depends on impact distance: As further discussed in Section 4.11 (Noise and Vibration) the vibration from most rubber-tired construction vehicles moving slowly through the construction area would not be expected to result in adverse vibration effects. Impact equipment, such as vibratory rollers, hoe rams, small bulldozers loaded trucks, and jackhammers would be used during construction for utility relocation, asphalt removal and repaving and the construction of project elements. Construction of the build alternatives would not require construction activities, such as pile driving or underground tunneling that produce high levels of vibration.

FTA has developed impact criteria for four types of buildings. Commercial type multiple-storied structures are generally represented by Categories I and II. Typical wood-framed residences fall under Category III, while any structurally fragile buildings (i.e., historical structures) fall under Category IV. The impact criteria are presented in Table 4.5-4. The vibration levels generated by construction equipment and vibration distances at which short-term construction vibration impacts may occur are shown in Table 4.5-5. The vast majority of intensive construction work would be associated with the creation of new center-running bus-only lanes and the filling of the Fillmore Street underpass. These activities would occur in the western portion of the City, where the most susceptible historic building types (category IV) are least likely to occur. Notwithstanding, until a preferred alternative is selected and design plans advanced, precise levels of construction activity and thus vibration levels at specific buildings is unknown. To avoid or minimize any potential effect upon historic structures during construction, Minimization measures **MIN-CUL-C1** through **MIN-CUL-C4** (detailed below) would set forth appropriate standards for the potential use of vibration-causing equipment in the vicinity of vibration-sensitive buildings.

Table 4.5-4 Construction Vibration Damage Criteria

BUILDING CATEGORY	PPV (IN/SEC)	APPROXIMATE L_V
I. Reinforced-concrete, steel or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage (historic structures)	0.12	90

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006

Table 4.5-5 Vibration Velocities for Construction Equipment

EQUIPMENT	PPV AT 25 FEET (INCHES/SECOND)	IMPACT DISTANCE FOR BUILDING CATEGORY, (FT)			
		I	II	III	IV
Vibratory Roller	0.210	14	19	25	36
Hoe Ram	0.089	7	11	14	20
Jackhammer	0.035	4	5	7	11
Loaded Trucks	0.076	7	10	13	18
Small Bulldozer	0.003	1	1	2	2

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006

Construction Effects Unique to Alternative 2

Alternative 2 proposes new side-running bus-only lanes in the rightmost lane of the Geary corridor from 34th to Van Ness Avenue, continuing onto existing bus-only lanes from Van Ness Avenue to the Transbay Transit Center. The new lanes would be in close proximity to historic properties along the Geary corridor.

Bus lane and station construction: Construction of the new lanes and proposed new stations would not cause any change in use or physical features of the setting that may contribute to a property's historical significance. However, vibration effects (from vibratory rollers) used during installation of right-of-way improvements as well as associated utility relocation/demolition activities could cause physical damage or alteration to historic properties. Adherence to minimization measures **MIN-CUL-C1** through **MIN-CUL-C4** would avoid or lessen any such effects such that no adverse effect would be expected to occur.

Alternative 2 would include construction of new westbound local stops at the intersections of Geary Boulevard and Webster Street and Geary Boulevard and Buchanan Street. These stops would be near or adjacent to as many as eight light standards that contribute to the Japan Center, as well as one AWSS hydrant (corner of Webster Street and Geary Boulevard). Similarly to the Golden Triangle Streetlight historic resources discussed above, the proposed stops would be designed to avoid removal, relocation, or damage to the AWSS hydrant and the eight Japan Center light standards out of 48 extant light standards that surround the three block-long Japan Center complex. The light standards are not individually eligible but are contributing elements to the eligibility of the Japan Center. As further described in Section 4.5.6, proposed stations and stops would be designed to minimize or avoid the removal, relocation, or damage to any historic resources. In the event that one or more of these elements must be relocated, such relocation would conform to appropriate SOI Standards. The relocation and restoration/rehabilitation according to SOI standards would minimize potential effects to the overall historic properties

from the construction of side-running local stop and would result in no direct adverse effects to the Japan Center and AWSS.

Construction Effects upon Historic Architectural Resources Unique to Alternatives 3 and 3-Consolidated

Alternatives 3 and 3-Consolidated propose new center-running bus lanes between 27th Avenue and Laguna Street, and new side-running bus lanes from Laguna Street to Van Ness Avenue, connecting to existing side-running bus lanes on Geary Street at Van Ness Avenue.

Alternative 3 and 3-Consolidated propose raising Geary Boulevard to grade between Fillmore and Steiner Streets by filling of the Fillmore Street underpass. This construction activity would be conducted in the vicinity of three historic properties, the St. Francis Square Cooperative, the Japan Center, and the AWSS. These potential effects are addressed below.

Bus lane and station construction: Similar to Alternative 2, construction of the new lanes and proposed new stations would not cause any change in use or physical features of setting that may contribute to a property's historical significance. However, median stations and/or stops would be in the direct vicinity of cisterns and valves that contribute to the AWSS. As previously discussed, all proposed stations or stops under these alternatives would be designed to avoid removal, relocation, or damage to these historic components of the AWSS; thus resulting in a finding of no direct adverse effect. Furthermore, in the event relocation is necessary, these resources would be restored and/or rehabilitated in accordance with the SOI Standards.

Vibration effects (from vibratory rollers) used during installation of right-of-way improvements as well as associated utility relocation/demolition activities could cause the physical damage or alteration to historic properties. Adherence to minimization measures **MIN-CUL-C1** through **MIN-CUL-C4 w**ould avoid or lessen any such effects such that no adverse effect would be expected to occur.

Filling the Fillmore Street underpass: All proposed construction work would be conducted within the existing right-of-way; therefore, there is no potential to directly affect nearby historic resources (the St. Francis Square Cooperative and the Japan Center). While the setting would be somewhat altered by the new at-grade intersection roadway, the relationship between these historic properties and the transportation corridor would not be significantly altered, therefore this project component would not result in an indirect adverse visual effect (36 CFR 800.5[a][2][iv] and [v]) as the integrity of each of these properties' significant features and use, both of which contribute to its historic significance, would remain unchanged. No indirect effect from construction vibration would occur at either of the historic properties as application of minimization measures (Section 4.5.5) would avoid and/or minimize adverse effects to historic properties.

Components of the AWSS are located within the existing right-of-way in this location, including cisterns, valves, and pipelines. However, as previously discussed, if any of the AWSS components would be affected, they would be relocated in close vicinity to their original location. Furthermore, they would be restored and/or rehabilitated and any inadvertent damage resulting from the relocation will be

repaired in accordance with the SOI Standards. Therefore, no adverse effects would result.

Construction Effects upon Historic Architectural Resources Unique to the Hybrid Alternative/LPA

The Hybrid Alternative/LPA's effects on historic architectural resources would be the same as those described above for Alternatives 3 and 3-Consolidated, with the exception of the filling of the Fillmore underpass. The Hybrid Alternative/LPA does not include filling of the underpass. Similar to Alternative 2, construction of the Hybrid Alternative/LPA would also include construction of new westbound local stops at the intersection of Geary Boulevard and Webster Street. Therefore, the proposed stops would be designed to avoid removal, relocation, or damage to the single AWSS hydrant and the eight contributing Japan Center light standards as described for Alternative 2. In the event that one or more of these elements must be relocated, such relocation would conform to appropriate SOI standards. The relocation and restoration/rehabilitation according to SOI standards would minimize potential effects to the overall historic property from the construction of side-running local stop and would thus result in no adverse effect to this historic property.

No adverse effect findings: Each of these alternatives would have some potential indirect effects from the introduction of visual elements that differ based on components unique to each alternative, as previously described. However, these effects are negligible and do not diminish the integrity of location, setting, feeling, association, workmanship, design, or materials for any historic property, particularly with the adherence to avoidance and minimization measures incorporated herein (refer to Section 4.5.5, Avoidance, Minimization, and Mitigation Measures). Therefore, none of the alternatives would result in any adverse effect finding on the historic properties within and adjacent to the APE.

4.5.4.2.3 CONSTRUCTION EFFECTS UPON PALEONTOLOGICAL RESOURCES

Construction of improvements associated with the No Build Alternative would not require excavation or ground-disturbing activities to depths that would likely expose or damage any paleontological resources.

Similarly, Alternative 2's improvements would generally be surficial and would occur in areas with low potential to yield paleontological resources.

Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA include construction aspects that would require deeper than surficial excavation. All three of these alternatives would require relocation of sewers in several blocks in the vicinity of Park Presidio Boulevard. Such utility work would require excavation up to 16 feet in depth. However, this portion of the Geary corridor is underlain by geologic layers with relatively low potential to encounter paleontological resources.

Alternatives 3 and 3-Consolidated include filling the Fillmore underpass area. An optional task associated with this effort is the excavation and decommissioning (and potential removal) of the existing pump station. However, geologic layers underlying this portion of the Geary corridor are composed of bedrock, which is considered to have a low potential to yield paleontological resources.

4.5.4.3 | OPERATIONAL EFFECTS

4.5.4.3.1 OPERATIONAL EFFECTS UPON ARCHAEOLOGICAL RESOURCES

Operational effects related to archaeological resources are generally rare for a project like the Geary Corridor BRT, as effects are most often due to construction and other ground-disturbing activities that would increase the potential risk to unknown and previously unrecorded archaeological resources that may exist below the ground surface on Geary corridor.

No Build Alternative – Operational Effects upon Archaeological Resources

Under the No Build Alternative, transit and transportation facilities and services would remain unaltered except for changes that are currently planned or programmed to be implemented on the Geary corridor by 2020.

Under the No Build Alternative, Geary bus service would continue and existing parking, through traffic, and turning vehicle-movements would remain unchanged. Once improved bus technology, signaling, and pedestrian facilities was in place, there would be no risk of uncovering archaeological resources from operation of these improvements as the Geary corridor is already used for transportation purposes in a highly urbanized area.

Build Alternatives – Operational Effects upon Archaeological Resources

Implementation of the build alternatives would include designated bus-only lanes, improved bus service, enhanced bus technology, and installation of transit signal priority. Additionally, the build alternatives would include improved pedestrian facilities for safety, such as corner bulbs, curb ramps, and enhanced bus station amenities. Operation of these features would not pose a risk of uncovering archaeological resources as most potential risks associated with disturbing archaeological resources would occur during construction. With implementation of the build alternatives, the Geary corridor would continue to remain for transportation and transit use.

4.5.4.3.2 OPERATIONAL EFFECTS UPON HISTORIC ARCHITECTURAL RESOURCES

No Build Alternative – Operational Effects upon Historic Architectural Resources

The No Build Alternative would generally maintain existing transit and transportation facilities except for changes that were previously approved to be implemented on the Geary corridor by 2020. Such improvements include transit signal priority, pavement maintenance, and other activities that are typical for a roadway. Operation of such improvements would occur within the existing right-of-way and would have no potential to effect historic properties within the Geary corridor.

Build Alternatives – Operational Effects upon Historic Architectural Resources

No operational noise or vibration effects: None of the build alternatives would result in indirect adverse effects to any of the 53 historic properties or associated historic districts from operational noise because none of these properties have an inherent quiet quality that is part of a property's historic character and significance. Additionally, none of these alternatives would cause indirect adverse effects from

operational vibration as buses have rubber tires and suspension systems that isolate vibrations from the ground. Furthermore, the Geary corridor is already a high capacity transit way for buses, so BRT service would not represent a major change in the operational noise of vibration associated with the roadway.

Bus lane operation: As the new bus lanes would be created by reconfiguring existing lanes and not adding new lanes, Alternative 2 would not cause an indirect visual effect to any historic property lining the Geary corridor.

Similar to Alternative 2, the side-running bus-only lane is proposed in Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA east of Gough Street and west of 27th Avenue, and would be in close proximity to historic properties along the corridor. From a visual perspective, the new bus lane would be created by reconfiguring existing lanes, not adding new lanes, and thus would not cause an indirect visual effect to any historic property. The center bus-only lane portions of Alternatives 3 and 3-Consolidated (Gough Street to 27th Avenue) and the Hybrid Alternative/LPA (Palm Avenue to 27th/28th Avenue), would be far enough away from historic properties so as not to result in any adverse effects. Additionally, the Geary Corridor is already a high capacity transit way for buses so BRT service would not represent a major change in the character of the roadway.

New station operations: Operation of new side-running stations and stops have the potential to create indirect visual effects. In Alternative 2, new BRT/local stations would be constructed in new bus bulbs that would be adjacent to 31 historic properties. BRT-only and local stops within the median would be far enough away to not cause any adverse effects to historic properties; therefore, only side-running stations and stops have potential for indirect visual effects. Similar to Alternative 2, no side-running BRT-only stations are proposed in Alternative 3. However, Alternative 3-Consolidated would include the construction of BRT-only stations that would operate near 41 historic properties and a proposed shared station near one historic property. Alternatives 3 and 3-Consolidated would not cause any indirect adverse effects to any of the 53 historic properties or associated new visual elements as all of the historic properties are currently served by automobile routes and Muni bus lines. Notwithstanding the Uptown Tenderloin Historic District and Golden Triangle Streetlight and Japan Center light standards discussed above, the new stations and relocated bus shelters would be far enough away from the historic properties as to not create an indirect visual effect to the historic properties within and adjacent to the APE. Thus operation of the proposed BRT stations and new and relocated local bus stops would not alter the relationship of any historic building or associated district to its transportation corridor.

Filling the Fillmore Street Underpass: Implementation of Alternatives 3 and 3-Consolidated in the long-term would include operation of the new at-grade roadway at Fillmore Street and Geary Boulevard. This would somewhat alter (or restore) the setting, the extent of alteration would be minor in terms of the resources. Therefore, there would be no adverse visual effect upon these resources.

4.5.4.3.3 OPERATIONAL EFFECTS UPON PALEONTOLOGICAL RESOURCES

Similar to the operational archaeological effects discussion, potential effects to paleontological resources are generally due to construction and other ground-disturbing activities that would increase the potential risk to unknown and previously unrecorded resources that may exist below the ground surface on Geary

corridor, and operational effects are generally unlikely. Operation of the No Build and build alternatives would not pose a risk of uncovering paleontological resources as most potential risks associated with disturbing paleontological resources would occur during construction. Furthermore, geologic layers underlying this portion of the Geary corridor are composed of bedrock, which is considered to have a low potential to yield paleontological resources. The Geary corridor would continue to remain for transportation and transit use.

4.5.4.4 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, all project alternatives are similar in that none of the alternatives (No Build or build alternatives), would adversely affect historic architectural resources, archaeological resources, or paleontological resources. All build alternatives feature minimization measures to avoid or minimize any potential effects to cultural resources.

4.5.5 | Avoidance, Minimization, and/or Mitigation Measures

Operation of any of the project alternatives would not result in any adverse effects upon cultural resources.

However, the following avoidance, minimization, and improvement measures are proposed to be implemented as part of the construction of any of the build alternatives to avoid or minimize any potential effects upon archaeological, historic architectural, or paleontological resources.

4.5.5.1 | CONSTRUCTION MEASURES

MIN-CUL-C1. Limit the use of construction equipment that creates high vibration level, such as vibratory rollers.

MIN-CUL-C2. Develop and implement a Vibration Reduction and Minimization Plan, which would include the identification of vibration-sensitive structures using distance impact thresholds.

MIN-CUL-C3. During advanced conceptual engineering or final design phases, an individual assessment of vibration-sensitive structures' would be conducted where construction activities and equipment would exceed FTA's impact distance guidance for category IV structures.

MIN-CUL-C4. Conduct vibration monitoring during construction.

A-CUL-C5. Design proposed stations and stops in the vicinity of the Golden Triangle Streetlights, Japan Center light standards, and components of the AWSS to avoid the removal, relocation, or damage to these historic structures.

OR

MIN-CUL-C6. In the event that avoidance of the Golden Triangle Streetlights, Japan Center light standards, and AWSS are infeasible, all effort will be made first for relocation of such elements within the immediate vicinity of their original location while maintaining placement (distance) within the sidewalk in respect to curb and/or adjacent buildings. For the light standards, additional effort would be made to relocate a light standard within the same block if there is a site where the original light standard has been removed or replaced by modern standards; and last,

relocation to an available site within the historic property boundary where an original standard has been removed or replaced by modern standards.

I-CUL-C7. Harmonize the visual qualities of built elements of the project alternatives with adjacent historic properties through careful consideration of design, lighting, materials, and color choices that would complement and be sensitive to nearby historic properties.

MIN-CUL-C8. Focused archival research will identify any specific areas within the APE that may be likely to contain potentially significant remains, and methods and findings will be documented as an addendum to the current report. The Phase I addendum report will be submitted to the City's Environmental Review Officer (ERO) and the SHPO for concurrence. Research will be initiated once the project's APE map is finalized identifying the major Areas of Direct Impact. The Addendum Survey Report would include:

- A contextual and documentary research section that addresses the development of urban infrastructure that provides a basis for evaluating potential resources as they relate to the history of San Francisco.
- A cut-and-fill reconstruction of the corridor, comparing the modern versus mid-1800s ground surface elevations, to fine-tune the initial prehistoric sensitivity assessment, and refining the location of high-sensitivity locations where prehistoric remains may be preserved.
- Relevant profiles and plan views of specific blocks to illustrate the methods used in analyzing available documentation.
- Summary and conclusions to provide detailed information on locations that have the potential to contain extant historic-era and prehistoric archaeological remains that might be evaluated as significant resources, if any.

Two results are possible based on documentary research:

- No or low potential for sensitive locations: major Areas of Direct impact have no potential to retain extant archaeological remains that could be evaluated as significant resources. No further work would be recommended, beyond adherence to the Unanticipated Discovery Plan.
- Potential sensitive locations: if major Areas of Direct Impact contain locations with moderate to high potential to retain extant historic or prehistoric archaeological remains that could be evaluated as significant resources, further work would be carried out, detailed in a Testing and Treatment Plan.

MIN-CUL-C9. Depending on the results of archival research, in concert with the City's ERO, project avoidance areas or, more likely, areas requiring presence/absence investigations for cultural resources will be identified and fieldwork undertaken following exposure of the ground surface, but prior to construction to identify buried cultural resources.

MIN-CUL-C10. A Testing and Evaluation/Treatment Plan, if required, will provide archaeological protocols to be employed immediately prior to project construction to test areas identified as potentially significant or having the potential to contain buried cultural resources. In case such areas might be unavoidable,

minimization measures will be proposed. The procedures detailed in the Treatment Plan would be finalized in consultation with the City's ERO and the SHPO.

For historic-era resources, work would initially entail detailed, focused documentary research to evaluate the potential significance of any archaeological material identified during initial research that might be preserved. Significance would be based on the data-potential of possible remains applied to accepted research designs. Two results could ensue:

- No potentially significant remains: if no locations demonstrate the potential for significant remains, no further archaeological testing would be recommended.
- Potentially significant remains: if any locations have the potential to contain significant remains, then appropriate field methods will be proposed, including compressed testing and data-recovery efforts. Testing will be initiated immediately prior to construction, when there is access to historic ground levels. Should a site or site feature be found and evaluated as potentially significant, data recovery would take place immediately upon discovery if avoidance of the site is still not possible.

For prehistoric resources, a Treatment Plan will identify relevant research issues for resource evaluation, and pragmatic methods to identify, evaluate, and conduct data recovery if needed. This may include a pre-construction geoarchaeological coring program or a compressed three-phase field effort occurring prior to construction when the ground surface is accessible.

MIN-CUL-C11. Upon completion of all fieldwork, a technical report shall be prepared. This Final Archaeological Resources Report (FARR) shall document all field and laboratory methods, analysis, and findings. The FARR shall be subject to review and approval by the City's ERO and the SHPO. Copies of the approved FARR shall be submitted to the City's ERO, the SHPO, and the Northwest Information Center (NWIC), together with any associated archaeological site records.

MIN-CUL-C12. If buried cultural resources are encountered during construction activities, construction will be halted and the discovery area isolated and secured until a qualified archaeologist assesses the nature and significance of the find.

MIN-CUL-C13. If human remains are discovered, the County coroner will be notified as soon as is reasonably possible (CEQA Section 15064.5). There will be no further site disturbance where the remains were found. If the remains were determined to be Native American, then the coroner is responsible for contacting the California Native American Heritage Commission (NAHC) within 24 hours. The NAHC, pursuant to Public Resources Code (PRC) Section 5097.98 will notify those persons it believes to be the most likely descendant (MLD). Treatment of the remains will be dependent on the views of the MLD.

MIN-CUL-C14: In the event that paleontological resources are encountered during any phase of project construction, all soil-disturbing activity within 100 feet of the find shall be temporarily halted until a qualified paleontologist can assess the significance of the find and provide proper management recommendations.

4.6 Utilities

This section summarizes the regulatory setting, affected environment, environmental consequences, and measures to avoid, mitigate, or compensate for effects to utilities that could result from implementation of any of the project alternatives.

Documents reviewed to prepare this analysis include the San Francisco *Better Streets Plan*, utility maps of the Geary corridor (obtained from utility provider planning documents and City departments), and related information compiled by San Francisco Public Works (SFPW).

4.6.1 | Regulatory Setting

4.6.1.1 | STATE REGULATIONS

4.6.1.1.1 STATE OF CALIFORNIA CODE OF REGULATIONS, SUBCHAPTER 5, ELECTRICAL SAFETY ORDERS, GROUP 2, ARTICLE 37

Maintenance and any other work around the overhead contact system (OCS) that intersects the Geary corridor at Masonic/Presidio avenues, Fillmore Street, and Van Ness Avenue is governed by the California Division of Occupational Safety and Health Administration (Cal-OSHA) rule for working around the energized wires (Subchapter 5, Electrical Safety Orders, Group 2, Article 37). This section sets the clearance requirements for equipment used around energized OCS to prevent accidental contact with the overhead lines. Minimum allowable clearances to wires and work requirements near overhead lines are of specific relevance to the build alternatives.

DEFINITION

CALTRANS ENCROACHMENT PERMIT: An encroachment permit would need to be obtained for all proposed activities related to the placement of encroachments within, under, or over the State highway rights of way. Some examples of work requiring an encroachment permit are: utilities, excavations, encroachment renewals, advertisements (when allowed by statute), vegetation planting or trimming, etc.

4.6.1.1.2 CALTRANS REQUIREMENTS

The Geary corridor crosses both Van Ness Avenue (part of US 101) and Park Presidio Boulevard (part of State Route (SR) 1). Both US 101 and SR 1 are operated and maintained by the California Department of Transportation (Caltrans). Caltrans has mandatory standards, policies, and procedures for the placement and protection of underground utility facilities within its right-of-way.[1] Caltrans's policies require all utility relocations to be approved through an encroachment permit process which governs utility identification, location, and required clearances, and also sets forth limits on construction period activities. Any construction across Park Presidio Boulevard and/or Van Ness Avenue would require obtaining and complying with terms of encroachment permits from Caltrans.

[1] See Chapter 13 of Caltrans's Right-of-Way Manual and the Policy on High- and Low-Risk Underground Facilities within Highway Rights-of-Way.

4.6.1.2 | LOCAL REGULATIONS

4.6.1.2.1 SAN FRANCISCO PUBLIC WORKS CODE, ARTICLE 2.4 AND DIRECTOR'S ORDER NO. 176,707

RESOURCE

Article 2.4, Excavation in the Public Right-of-Way, of the San Francisco Department of Public Works Code can be accessed Online: http://www.amlegal.com/library/ca/sfrancisco.shtml

Public Works Code Article 2.4 (Excavation in the Public Right-of-Way) governs excavation within portions of public right-of-way under jurisdiction of SFPW (in other words, public right-of-way that is not under state or federal jurisdiction). Article 2.4 requires any person excavating in the public right-of-way to obtain an excavation permit and comply with the Orders and Regulations of SFPW.

Order No. 176,707 establishes rules and regulations for excavating and restoring SFPW jurisdictional streets. These rules and regulations are intended to "balance the needs to preserve and maintain public health, safety, welfare, and convenience" by minimizing disruption to neighborhoods and the traveling public while upgrading and maintaining utility services.

SFPW Order No. 176,707 establishes a requirement for 5-year plans of major anticipated work. Each April and October, utility providers and municipal excavators, or City project proponents, must submit a 5-year plan to SFPW that lists all major work anticipated to be completed within the public right-of-way.

RESOURCE

Information regarding the SFDWP 5-Year Plan can be accessed online: http://sfdpw.org/index.aspx?page=370

SFPW coordinates these plans with the SFPW Five-Year Paving Plan into a single, comprehensive Five-Year Plan and Map to identify conflicts and opportunities for joint work. This work is coordinated through the SFPW-led Committee for Utility Liaison on Construction and Other Projects (CULCOP) empowered by the San Francisco Administrative Code Sec 5.63.

The CULCOP, which includes every utility provider and municipal excavator in the City, meets monthly to discuss the scheduling of utility work and major projects. The Street Construction Coordination Center works closely with CULCOP to coordinate all work in City streets and provides an agency contact list for official written intent to begin construction, known as Notice of Intent (NOI), for distribution. Prior to issuance of an excavation permit, the permit application is checked against the Five-Year Plan and scheduled paving projects.

Order No. 176,707 establishes a 5-year plan moratorium on excavating in streets that have been reconstructed, repaved, or resurfaced within a preceding 5-year period. Such projects are listed in the Streets under Excavation Moratorium list maintained by SFPW. The 5-year plan moratorium encourages utility owners to determine alternative methods of making necessary repairs to avoid excavating in newly paved streets. It also encourages utility providers and construction project proponents to coordinate and plan activities to avoid work in the recently disturbed public ROW.

Waivers to the moratorium and permits to excavate in moratorium streets may be granted by the Director of Public Works for "good cause," such as to repair leaks, deploy new technology, provide new service, or other situations deemed to be in the best interest of the general public.

As of December 2017, there are moratoria for more than 20 intersections within the Geary corridor that will end between 2018 and 2022. There are also intersections on O'Farrell Street that will remain under moratorium through the same period.

A Five-Year Plan mapping system/database, known as Envista, is a tool that supports the aforementioned planning efforts by providing a centralized location for utility owners and agencies to provide and obtain information about other relevant utility work. A user-friendly application of this database is available on line to the general public. The publicly-available database lists permits for projects scheduled to occur in the public right-of-way over a rolling six month period; registered users can view the full five-year data.

4.6.1.2.2 REGULATIONS FOR WORKING IN SAN FRANCISCO STREETS (BLUE BOOK)

In addition to the aforementioned SFPW right-of-way regulations, the San Francisco Municipal Transportation Agency (SFMTA) has established its own set of "Regulations for Working in San Francisco Streets," informally known as the "Blue Book." The Blue Book sets forth rules for construction and repair work to ensure such work can be done safely and with the least interference to pedestrians, bicycles, transit, and vehicular traffic.

The Blue Book requires the use of control, warning, and guidance devices that must conform to the most current version of the California Manual on Uniform Traffic Control Devices (CA MUTCD), which is the amended version of FHWA's MUTCD for use in California that provides uniform standards and specifications for all official traffic control devices in California.

The Blue Book states that only one general contractor at a time (inclusive of any associated subcontractors) is allowed to work on any one block. This means that project construction and maintenance work must be coordinated with other projects, including those of utility providers, along the corridor to ensure that adequate and continuous travel lanes remain open. In addition, typically only one crosswalk at an intersection is allowed to be closed at a time per the Blue Book. Furthermore, appropriate temporary crosswalk signs must be posted to guide pedestrians and bicyclists.

The Blue Book rules would be applied to the build alternatives at SFMTA's discretion, because the Blue Book is intended for minor development or construction projects that are typically only a few blocks in extent.

4.6.1.2.3 SAN FRANCISCO PUBLIC UTILITIES COMMISSION (SFPUC) WASTEWATER & WATER STANDARDS FOR SURFACE IMPROVEMENTS PROJECTS

In order to minimize disruption to the various wastewater and water conveyance and storage facilities that travel along and/or below public rights-of-way, SFPUC has established a series of standards for the placement

of wastewater and water facilities with respect to street and sidewalk improvements.

Wastewater and water facilities under SFPUC's oversight include all conveyance and storage facilities associated with sewer and stormwater conveyance and storage pipes and structures; and fire-fighting, potable use, recycled water, and groundwater distribution systems. These facilities include but are not limited to sewer mains, manholes, catch basins, culverts; and water distribution lines, cisterns, and fire hydrants. As access to such facilities is needed for both emergency and routine maintenance needs, SFPUC has set forth these standards to help maintain efficient access when street or sidewalk repairs are necessary.

4.6.1.2.4 SAN FRANCISCO BETTER STREETS PLAN

RESOURCE

The San Francisco Better Streets Plan was adopted in December 2010 and is available online: http://www.sf-planning.org/ftp/BetterStreets/index.htm

The San Francisco *Better Streets Plan* includes guidelines for streetscape and pedestrian design that are intended to foster a unified set of standards, guidelines, and implementation strategies for the City's pedestrian environment. Chapter 6.6 (Utilities and Driveways) sets forth guidelines for well-organized utility design and placement that address the following goals:

- Minimization of streetscape clutter and maximization of space for plantings;
- Improved efficiency of utilities and integrated alignment with storm water facilities, street furnishings, and lighting;
- Reduced cutting and trenching;
- Reduced long-term maintenance conflicts and potential costs;
- Reduction of long-term street and sidewalk closures; and
- Improved pedestrian safety, quality of life, and right-of-way aesthetics.

The *Better Streets Plan* also includes guidelines for screening surface-mounted utilities and recommendations that support utility undergrounding to address aesthetic goals in citywide streetscape improvement. Section 4.4 (Visual/Aesthetics), discusses these and other City aesthetic and streetscape policies.

4.6.1.2.5 SFPUC URBAN WATERSHED MANAGEMENT PROGRAM

SFPUC's Urban Watershed Management Program encourages proponents of projects in the public right-of-way to integrate stormwater management features. If determined that stormwater management is feasible, any proposed stormwater features or best management practices (BMPs) must be designed per SFPUC Stormwater Design Guidelines and per SFPW requirements.

4.6.1.2.6 WATER EFFICIENT IRRIGATION ORDINANCE

In response to the Water Conservation in Landscaping Act (Assembly Bill 1881), San Francisco has replaced its existing irrigation ordinance (Chapter 63 of the San Francisco Administrative Code) with the Water Efficient Irrigation Ordinance and companion rules that will expand the water

conservation requirements for outdoor water use. This ordinance is applicable to public agency projects (among others) that include at least 1,000 square feet of new or modified landscape area and propose substantial areas of new turf and/or non-climate appropriate or non-low water use plantings.

4.6.1.2.7 CITY OF SAN FRANCISCO ORDINANCE 175-91

This ordinance, enacted in 1991, requires that water used for dust control, consolidation of backfill, or other nonessential construction purposes must be either groundwater or secondary treated wastewater (aka recycled water).

4.6.2 | Affected Environment

Underground and aboveground utilities are present along the entire Geary corridor. Utilities in the project corridor include utility poles and overhead wires, underground electric and telecommunications wires, surface-mounted utility boxes, OCS support poles and wires, the cable car tracks, traffic signals, streetlights, fire hydrants, natural gas lines, steam mains, and water and sewer mains, laterals, vaults, manholes, and valves.

Most utilities typically run parallel to the Geary corridor within the sidewalk, pavement, and median. In addition, some utilities run perpendicular (e.g., Muni OCS lines and some underground lines) and obliquely to the Geary corridor at cross street locations and at lateral connections serving adjacent land uses.

Muni Overhead Contact System (OCS)
Photo credit: SFGATE

DEFINITION

MANHOLE: the top opening to an underground utility access point for making connections or performing maintenance on underground utilities

4.6.2.1 | EXISTING UTILITIES AND MAJOR SERVICE PROVIDERS

Primary utility providers and facilities serving the Geary corridor include:

- **San Francisco Public Utilities Commission (SFPUC):** underground combined sewer/stormwater treatment system, Hetch Hetchy water and power, street lights**,** potable water lines, low pressure hydrants, auxiliary water supply service system (AWSS) lines, underground cisterns, emergency drinking water hydrants
- **Recology:** solid waste disposal
- **SFMTA:** underground traction power duct bank, OCS facilities, underground cable car cable system
- **SFMTA Bureau of Engineering:** traffic signal hardware and conduits
- **Pacific Gas & Electric (PG&E):** Golden Triangle Street Lights, underground natural gas lines, electrical transmission and distribution lines
- **NRG Energy:** Steam mains
- **AT&T, Century Link, City of San Francisco, Level 3, RCN, Sprint/Nextel, Time Warner, Verizon/MCI, XO Communications, ZAYO, and Comcast (above- and below-grade):** Telecommunications copper and fiber-optic lines

The utility facilities and their relation to the Geary corridor are described in more detail below.

Sewer/Stormwater Treatment System

SFPUC operates and maintains various sewer lines that generally run down the center of the Geary corridor. The sewer also functions as a stormwater system, called the combined sewer system (CSS). According to SFPUC,[2] San Francisco is the only coastal city in California with a combined sewer system that collects both wastewater and stormwater in the same network of pipes. Generally, stormwater enters the combined sewer system through building roof drains or catch basins along the street and is treated, in addition to wastewater, at one of San Francisco's wastewater treatment plants.

SFPUC released the draft San Francisco System Improvement Program (SSIP) Report in 2010 that summarizes capital improvements and level of service goals for sustainable operation of the City's sewer system. The SSIP is the culmination of seven years of Sewer System Mater Plan planning efforts. According to the report, San Francisco has approximately 781 miles of local sewers threading under all the streets that collect wastewater and stormwater. The average age of these sewers is about 72 years old; however, some portions of sewer are over 100 years old. Several sections have been upgraded over the years, but many emergency repair projects have been required in recent years due to pipe failure. The sizes and types of sewer lines in the Geary corridor vary from 3-foot to 5-foot egg-like shaped brick sewers to circular sewers that range in diameter from 12-inch to 72-inch made of materials such as brick, reinforced concrete, and iron-stone pipe. Generally, the sewers are located under or adjacent to the center median. Some of the oldest pipe sections lie beneath the Geary corridor.

A series of pump stations exist within the City's collection system and face challenges such as aging infrastructure, system deficiencies, operational efficiency, and community impacts (i.e., odor, flooding, etc.). Generally, the collection system is a network of sewers that collects residential, business, and industrial wastewater and stormwater runoff and conveys flows through the transport/storage system via eight major pump stations to one of three San Francisco treatment facilities. An existing pump station is located at Geary Boulevard near the Fillmore Street underpass; this station is used to collect stormwater and groundwater to keep the underpass from flooding.

Hetch Hetchy Reservoir
Photo credit: Yosemite hikes.com

Potable (Drinking) Water

The San Francisco Water Department of the SFPUC operates the water system that feeds low-pressure fire hydrants and provides water to the area. According to the San Francisco Urban Water Management Plan, San Francisco's water system includes 10 reservoirs and 8 water tanks that store the water delivered by the Hetch Hetchy system and complementary local facilities. Within San Francisco city limits, there are 17 pump stations, several storage facilities, and approximately 1,250 miles of mostly underground distribution lines.

[2] San Francisco Public Utilities Commission. 2014. About the Wastewater Enterprise. Accessed March 1, 2014 from http://www.sfwater.org/index.aspx?page=392.

The system includes underground pipes, gate valves to control water flow, and hydrants along the west and east sides of the Geary corridor. Water lines parallel to the Geary corridor vary from 8 to 16 inches in diameter. Lines that cross the corridor vary between 8 to 22 inches in diameter.

Auxiliary Water Supply System (AWSS) and Emergency Water Supply

SFPUC operates and maintains the AWSS, which is a high-pressure water system that supplies water to San Francisco Fire Department (SFFD). Historical need for the AWSS was made clear when the 1906 San Francisco earthquake crippled access to water to combat the resulting fires. As a result, the fire destroyed 25,000 buildings and was a catalyst for an improved water system design for the sole purpose of fire protection. The AWSS was constructed between 1908-1913 in an effort to limit such devastation in the event of another natural disaster.

The AWSS is a separate and distinct water supply system for fire protection use only. As of 2014, the AWSS has approximately 135 miles of underground pipe (27 miles of ductile iron pipe and 108 miles of cast-iron pipes), underground cisterns, and aboveground gate valves to control water flow.[3] A special truck with a motorized rig is used to turn gate valves. Also as of 2014, AWSS above- and below-ground infrastructure is nearly 100 years old, which compromises the system's reliability. Efforts to study possible system upgrades are underway.

DEFINITION

CISTERN: a large storage tank buried under the roadway surface that holds a large amount of water

According to the Auxiliary Water Supply System Study (2009), existing AWSS pipelines primarily cover the northeast portion of the City. AWSS pipelines travel along the Geary corridor beneath the roadway in the eastern portions of the Geary corridor on Geary Street and O'Farrell Street between Taylor Street and Market Street, and also between Scott Street and Van Ness Avenue. The AWSS also crosses the Geary corridor at several locations between 12th Avenue and Market Street. Pipes are typically 8 to 12 inches in diameter.

There are approximately 177 underground cisterns in the City that can be used for emergency safe drinking water or SFFD use, as needed. Cisterns are large storage tanks buried under the roadway surface approximately 25 to 30 feet in diameter and 20 to 25 feet tall, and they hold approximately 75,000 gallons of water. The cisterns provide a source of water second to that of fire hydrants. Approximately 8 cisterns have been identified along Geary corridor. Five of these cisterns are located directly under Geary Boulevard and three are directly adjacent, located just off the cross street intersection.

In a program initiated in 2006, the City designated 67 low-pressure hydrants as Emergency Drinking Water Hydrants. These are marked with a blue water droplet icon. Two are located on Geary Boulevard, one near Park Presidio; the other at 21st Avenue.

[3] Final Report Auxiliary Water Supply System (AWSS) Study, prepared for Capital Planning Committee City and County of San Francisco, Metcalf & Eddy/AECOM - January 23, 2009.

Solid Waste

According to the Central SoMa Plan Initial Study (2014), San Francisco generated about 454,500 tons of solid waste in 2012, including materials from residents and businesses. Approximately 375,000 tons were disposed of in landfills.

Waste collection is handled by Recology (formerly Norcal Waste Systems Inc.), which provides disposal services through the following subsidiaries: San Francisco Recycling and Disposal, Golden Gate Disposal and Recycling, and Sunset Scavenger. Residents and businesses in San Francisco separate their refuse into recyclables, compostables, and garbage. Materials collected are hauled to the Recology transfer station/recycling center on Tunnel Avenue located in southeast San Francisco, for sorting and subsequent transportation to other facilities. Recyclable materials are taken to Recology's separating facility at Pier 96, where they are sorted into commodities (e.g., aluminum, glass, and paper) and transported to other facilities for reprocessing. Compostables (e.g., food waste, plant trimmings, and soiled paper) are transferred to a Recology composting facility in Solano County, where they are converted to soil amendment and compost. The remaining material that cannot otherwise be reprocessed ("trash") is transported to the Altamont Landfill in Alameda County for disposal.

Traction Power Duct Bank

To provide traction power to the OCS as well as electricity to traffic signals, SFMTA operates and maintains major duct banks at Fillmore Street and Van Ness Avenue, consisting of a series of concrete-encased electrical ducts. A duct bank is an assembly of conduits or ducts installed between structures or buildings to protect electrical wiring. The duct bank is used for traction power and communications infrastructure. The Fillmore Street Duct Bank carries six, 1 1/2 –inch conduits in 3 7/8-inch diameter ducts supported on UNISTRUT hangers attached to the Fillmore Bridge Deck. Off the bridge the ducts are encased in concrete.

Cable Car System

SFMTA operates and maintains the cable car system (in addition to bus and light rail services). The cable car system began in the late 1800s and dominated the City's transit scene for more than 30 years, remaining an iconic cultural symbol of San Francisco. These cable cars are located above ground with a cable system below ground. There are three service lines: the California Street line, the Powell-Mason line, and the Powell-Hyde line. Both Powell Street Cable car lines cross Geary Street and O'Farrell Street.

Gas and Electricity

Natural gas and electric power is supplied to the project corridor by the PG&E. PG&E is regulated by the National Transportation Safety Board (NTSB), CPUC, and the Office of Pipeline Safety of the Pipeline and Hazardous Materials Safety Administration (PHMSA).

PG&E owns and manages the natural gas transmission and distribution lines that serve San Francisco. Within the Geary corridor there are only gas distribution lines. Natural gas lines in the Geary corridor vary in size from

4" to 16" in diameter. The lines are located under the sidewalk and the street. There are also abandoned and deactivated gas mains along the Geary corridor.

PG&E owns and operates the electric transmission and distribution infrastructure system in San Francisco, with the exception of the services at Hunters Point and Treasure Island. In addition, PG&E owns all of the high-voltage transmission lines entering the City.

The electric distribution system is generally below ground and is made up of a network of lines and vaults. There are no aboveground electric distribution lines along the Geary corridor; however, SFMTA OCS crosses Geary corridor at Masonic Avenue, Presidio Avenue, and Van Ness Avenue and runs along the Geary corridor between Masonic Avenue and Presidio Avenue.

Telecommunications Systems

Several telecommunications lines (copper and fiber optic lines) and vaults, accessed by manholes, are located beneath Geary Street and O'Farrell Street. At several locations these utilities have been consolidated into a common trench as recommended by the *Better Streets Plan*.

The corridor also is host to above-ground telecommunications suspended from poles (e.g. Comcast) lines at various locations west of Van Ness.

Surface Mounted Utility Boxes

Surface mounted facilities (SMF) are utility boxes of various sizes and are located along the Geary corridor. These include facilities such as AT&T surface boxes and traffic signal cabinets.

Underground Steam Lines

A network of steam distribution lines in downtown San Francisco is maintained by NRG Energy. NRG Energy provides steam for space heating, domestic hot water, air conditioning, and industrial processes. NRG Energy services approximately 170 buildings within a 2 square mile area in downtown San Francisco. The lines have limited length runs along Geary Street and O'Farrell Street. The lines cross Geary Street and O'Farrell Street between Hyde Street and Market Street.

4.6.2.2 | OTHER PLANNED PROJECTS

All alternatives (No Build and build) include several planned projects (described in more detail below) involving utilities in the Geary corridor. For the build alternatives, any of these projects that would be constructed concurrently would be integrated into build alternative construction in compliance with City policies to minimize community disturbance and identify potential conflicts and opportunities for joint work (see Section 4.6.2.3).

California Pacific Medical Center (CPMC) (2013-2019)

A major new medical facility is under construction as of 2014 along Geary Street at Van Ness Avenue. The project will require new or modified utilities into the proposed new facility. Part of the project includes relocation of an existing bus bulb from the east to the west side of the Van Ness Avenue intersection.

Central Subway (2010–2019)

The Central Subway Project is constructing a 1.7-mile extension of Muni's T Third Street Line, with new stops just south of Bryant Street, at the Moscone Center, at Union Square, and at Chinatown. Construction of the tunnel and stations commenced in 2013 and will continue through 2018. The project includes relocation of a number of utility lines to prepare for station construction and tunneling. The Central Subway segment of the T Third Street Line is slated to open to the public in 2019.

Van Ness Bus Rapid Transit (2016–2020)

RESOURCE

The Van Ness BRT Final Environmental Impact Report (EIR) can be accessed online: http://www.sfcta.org/delivering-transportation-projects/van-ness-avenue-bus-rapid-transit-home

The lead agency issued a Record of Decision (ROD) for the Van Ness BRT project on December 30, 2013. The project will implement dedicated bus lanes separated from traffic from Lombard to Mission Streets along Van Ness Avenues. In addition, pedestrian improvements, signal upgrades, new streetlights, new landscaping, and roadway resurfacing will be implemented throughout the corridor. Construction began in November 2016, with BRT service expected to begin in 2020.

Earthquake Safety and Emergency Response Bond (ESER BOND)

The improvements covered within the ESER BOND are divided into two bond measures, 2010-ESER and 2014-ESER.

2010 ESER Bond work is currently underway and includes the construction of a new cistern on Funston just north of Geary Boulevard. The work involves sewer relocation on Funston from Geary to Clement.

In June 2014, San Francisco voters approved the 2014 ESER Bond. This bond will include a range of improvements to the system including an extension of the AWSS pipeline in the Richmond District. The extension is planned to run beneath Geary Blvd from 26th Avenue to 43rd Avenue.

Westside Recycled Water Project (2017–2020)

The Westside Recycled Water Project would be constructed at the SFPUC's existing Oceanside Water Pollution Control Plant (WPCP). The project would produce and deliver up to 2 million gallons per day (mgd) on average of recycled water that is suitable for state-approved recycled water uses. As of 2014, the project is under preliminary design. The environmental review phase will follow. Construction of the project is expected to begin in September 2017 and be complete in March 2020.

The WPCP planning study indicates that the pipeline is planned to cross Geary Boulevard at 39th Avenue.[4] Depending on the construction schedule, work associated with the WPCP may need to be coordinated with implementation of any of the build alternatives.

Eastside Recycled Water Project (2026–2029)

The Eastside Recycled Water Project would deliver recycled water to a variety of customers on the east side of the City for non-potable uses, such as irrigation and toilet flushing. The project aims to save an average of 2 mgd of drinking water that would otherwise be used for non-drinking purposes.

As of 2017, the project has been paused to allow for better coordination with the City's Sewer System Improvement Program. The Southeast Wastewater Treatment Plant has been preliminarily identified as a potential site and water source for the eastside recycled water facility.[5]

SFgo

SFMTA operates traffic signals citywide, including along the Geary corridor. SFMTA is implementing an advanced traffic signal management program called SFgo that operates all of SFMTA's traffic signals. Some of the traffic signals are proposed for upgrade/replacement in order to provide needed functionality for the SFgo program. The SFgo program would implement the signal priority operation needed for Geary BRT. The installation would be done in conjunction with the Geary BRT project.

Pavement Rehabilitation

SFPW is responsible for the maintenance of the Geary Corridor pavement with the exception of Park Presidio Boulevard and Van Ness Avenue, which fall under the jurisdiction of Caltrans. Planned improvement projects would be coordinated with construction of the proposed BRT project and the aforementioned utility projects.

Road Repaving and Street Safety Bond Projects

RESOURCE

More information on Road Repaving and Street Safety Bond Projects can be found at http://sfdpw.org/index.aspx?page=1580

A $248 million Road Repaving and Street Safety Bond was approved by voters in November 2011 (Proposition B), which was recommended as part of the citywide Ten-Year Capital Plan to improve and invest in the City's infrastructure. The bond will repave streets, make repairs to deteriorating street structures, improve streetscapes for pedestrian and bicyclist safety, improve traffic flow on local streets, and install sidewalk and curb ramps to meet the City's obligations under the Americans with Disabilities Act (ADA).

Gas Pipeline Replacement Program

PG&E is responsible for the improvement of the overall safety and reliability of the natural gas distribution system. Since 1985, the Gas Pipeline

[4] San Francisco Westside Recycled Water Project - Project Alternatives Workshop Series, Evaluation of Alternatives Prepared for SFPUC by Kennedy/Jenks Consultants, 11 February 2011.
[5] SFPUC. San Francisco Eastside Recycled Water Project. Available at: http://sfwater.org/bids/projectDetail.aspx?prj_id=311. Accessed 10/3/2014.

Replacement Program (GPRP) continues to work to replace aging and leak prone sections of distribution and transmission pipelines within the San Francisco Bay Area considered vulnerable to earthquake damage, including on the Geary corridor. The focus of this effort is to replace old cast-iron pipe with modern pipe. In the City of San Francisco, 26 miles of cast-iron pipe were to be replaced. PG&E completed this work in December 2014.

SFPUC Water Department Projects

The water supply infrastructure underneath the Geary corridor is aging and in need of replacement. Accordingly, the SFPUC Water Enterprises Division has projects planned to replace approximately eight lane-miles of water mains in the Geary corridor area. As of 2017, these are understood to include segments on Geary Street between Kearny Street and Van Ness Avenue, and on Geary Boulevard between Van Ness Avenue and Stanyan Street, and between 10th and 36th avenues. If a Build Alternative is selected as the Preferred Alternative, water main replacement within the Geary corridor would be timed to coincide with Build Alternative construction, consistent with the City and County of San Francisco's coordination requirements (further discussed in Section 4.6.1.2).

SFPUC Sewer System Improvement Program (SSIP)

Since 2012, SFPUC has been implementing a 20-year, city-wide program to upgrade aging sewer infrastructure. The program is intended to improve seismic safety as well as to improve the quality of water discharged. SFPUC's program includes replacement of sewer mains along and near the Geary corridor. Consistent with City of San Francisco policies regarding coordination of utility replacement, any sewer replacements within the Geary corridor would be coordinated with construction of any of the Build Alternatives, if any are ultimately selected for construction.

4.6.3 | Methodology

The alternatives were evaluated for potential utilities effects in terms of several utility and service system considerations. The alternatives have the potential to result in construction period and/or operational period effects as noted below.

Construction-Related Effects

- Utility facility relocations and modifications

Construction and Operational-Related Effects

- Stormwater management system capacity
- Potable water supply/emergency service water supply capacity
- Solid waste collection capacity
- Electricity demand and capacity

Potential effects to the utilities and service systems listed above were evaluated in terms of changes in demand requirements, available capacity, and/or potential physical conflicts/incompatibility. Note that planned SFPUC projects described in 4.6.2.2 may be coordinated with Geary BRT construction; their cumulative effects have been considered in this EIS.

The Draft EIS/EIR analysis considered utilities existing in the Geary corridor as of 2008 (when the Notice of Intent and Notice of Preparation were issued), as well as any pertinent changes to such facilities through 2014. This Final EIS takes into account actual improvements and plan updates since issuance of the Draft EIS/EIR.

4.6.4 | Environmental Consequences

This section describes potential impacts and benefits for utilities. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 4.6.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding impacts to utilities in the Draft EIS/EIR.

4.6.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe effects to utilities during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe effects to utilities relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: Retention of the Webster Street bridge would reduce the amount of demolition and construction required, thereby reducing construction-period demand for energy. Retention of the bridge would not require any major additional utility relocations, change the amount of impervious surfaces, or change any plans for landscaping or irrigation. Therefore, this modification would not result in any new or more severe impacts to utilities during construction.

Operation: Retention of the Webster Street bridge would not substantially affect BRT ridership and, thereby, solid waste generation. Therefore, this modification would not result in any new or more severe utility impacts during operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: Retention of the existing bus stops between Spruce and Cook streets would eliminate construction outside the curb-to-curb portion of the right-of-way in this area, thereby reducing construction-period demand for energy. Retention of existing stops between Spruce and Cook streets would not require any major additional utility relocations, change the amount of impervious surfaces, or change any plans for landscaping or irrigation. Therefore, this modification would not result in any new or more severe impacts to utilities during construction.

Operation: Retention of the existing bus stops between Spruce and Cook streets would not substantially affect system-wide BRT ridership and, therefore would not be expected to result in any substantial change to solid waste generation. Therefore, this modification would not result in any new or more severe utility impacts during operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: Implementation of additional pedestrian enhancements throughout the corridor would entail localized construction activities where new pedestrian crossing bulbs would be constructed. None would require any major additional utility relocations, change the amount of impervious surfaces, or change any plans for landscaping or irrigation. Therefore, this modification would not result in any new or more severe impacts to utilities during construction.

Operation: Additional pedestrian enhancements would not substantially affect BRT ridership and, thereby, solid waste generation. Therefore, this modification would not result in any new or more severe impacts to utilities during operation.

Addition of BRT Stops at Laguna Street

Construction: Construction of transit islands would not require any major additional utility relocations, change the amount of impervious surfaces, or change any plans for landscaping or irrigation. Therefore, this modification would not result in any new or more severe impacts to utilities during construction.

Operation: During operation, the addition of BRT stops at Laguna Street would not be expected to so substantially increase systemwide ridership so as to result in a substantial increase in solid waste generation. Therefore, this modification would not result in any new or more severe impacts to utilities during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: Retention of the existing bus stops at Collins Street would eliminate construction outside the curb-to-curb portion of the right-of-way, thereby reducing construction-period demand for energy. Retention of existing stops at Collins Street would not require any major additional utility relocations, change the amount of impervious surfaces, or change any plans for landscaping or irrigation. Therefore, this modification would not result in any new or more severe impacts to utilities during construction.

Operation: Retention of the existing bus stops at Collins Street would not substantially affect system-wide BRT ridership and, therefore would not be expected to result in any substantial change to solid waste generation. Therefore, this modification would not result in any new or more severe utility impacts during operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities but would simply shift about half of it one block to the west. This modification would not require any major additional utility relocations, change the amount of impervious surfaces, or change any plans for landscaping or irrigation. Therefore, this modification would not result in any new or more severe impacts to utilities during construction.

Operation: Relocation of the westbound bus-only lane transition would not be expected to change projected BRT ridership and thus no change to anticipated solid waste generation would be expected. Therefore, this modification would not result in any new or more severe utility impacts during operation.

4.6.4.2 | NO BUILD ALTERNATIVE

Under the No Build Alternative, transit and transportation facilities and services would remain unaltered except for changes that are currently planned or programmed to be implemented on the Geary corridor by 2020. Such improvements would include new buses, signaling, and bus-only lanes. Additionally, proposed physical improvements on the Geary corridor by 2020 include some modifications to road surface and curbs to provide better access for pedestrians.

However, the No Build Alternative would not substantially increase the amount of impervious surface from existing conditions that might increase flow to a specific area of the City combined sewer system. Additionally, other previously planned and programmed physical improvements associated with the No Build Alternative would not have the potential to result in substantial increases in demand for potable water or generation of wastewater.

The planned and programmed projects comprising the No Build Alternative would have some potential to affect the access to utility providers to utility facilities. Street and sidewalk improvements may require the relocation or protection in place of below-ground and surface level utilities, either temporarily or permanently.

The No Build Alternative may slightly increase transit ridership as a result of expanded transit facilities, thus leading to an increase in the amount of solid waste produced by passengers. However, this increase would be unlikely to translate into an increase of solid waste that exceeds the capacity of available area landfills, particularly given relatively low waste generation rates in San Francisco.

4.6.4.3 | BUILD ALTERNATIVES

4.6.4.3.1 UTILITY FACILITY RELOCATIONS

In addition to serving as a transportation facility, Geary corridor provides access to key public utilities. Several utility facilities are located both above and below ground within the Geary corridor. Utility providers need to access these facilities for maintenance, repair, and upgrade/replacement.

Implementation of any of the build alternatives would involve construction of: a dedicated transit way, station platforms, curb bulbs, center medians, and landscaping that all have the potential to conflict with public utilities and/or limit access to public utilities by utility providers.

Due to the proximity to existing facilities, some utilities would require relocation or modification due to direct conflict or to maintain access for utility providers to conduct maintenance, repair, and upgrade/replacement activities.

See Section 4.5, Cultural Resources, for a discussion of potential project related effects to the AWSS in light of the historic status of the AWSS

Minor Utility Relocations/Modifications

In general, any of the build alternatives would necessitate some utility relocation. One example is the construction of bus bulbs and pedestrian crossings. These features would require relocation of some existing urban infrastructure, including but not limited to storm water drainage facilities (inlets and laterals), fire hydrants (low pressure and high pressure), valves, manholes, surface-mounted utility boxes, or other appurtenances. Pavement work would require the resetting of manhole and valve covers to meet grade as well as the installation of brick cistern rings.

Major Utility Relocations

In the median of Geary Boulevard between 14th Avenue and 4th Avenue, there is an existing brick sewer more than 120 years old that has relatively shallow cover (as little as 3 feet in some locations). Under Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA, planned construction of the median busway would require excavation and soil compaction over the sewer, which would increase potential risk of damage to the sewer.

Additionally, between Funston Avenue and 12th Avenue, an existing 55-year old reinforced concrete sewer lies at a depth of 60 to 72 inches. The sewer aligns closely with the proposed south platform of the Park Presidio station (Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA). A transit platform would be a significant impediment to access and maintain the sewer line.

As noted in Section 2.3.4.2, Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA each include either reconstruction or relocation of these facilities, pending close coordination and review with SFPUC.

SFMTA will also coordinate with SFPUC regarding other brick sewers with greater thicknesses of soil cover that may nonetheless have age-related vulnerabilities. SFPUC will undertake inspections to assess the condition for these sewers and then determine if rehabilitation or replacement is required.

Alternatives 3 and 3-Consolidated propose the removal of the Fillmore Underpass and decommission (and potential removal) of the Underpass Pump Station. Removal of the pump station would likely require the relocation of utilities (such as AWSS, gas, electric, AT&T, SMFTA traction power duct bank, water, sewers, etc.). The largest of these utilities is the combined sewer under Fillmore Street (6'-4" x 4-0" elliptical reinforced concrete pipe).

Utilities Protected in Place

In situations where utility facilities would remain beneath the busway or station areas, SFMTA would provide temporary closure of the transit way and/or stations to allow utility providers to perform maintenance, repair, and upgrade/replacement of underground facilities. As feasible, station areas would be designed to position station amenities to permit direct access to existing utilities.

Planning for temporary utility access within the transit way would likely involve temporarily rerouting bus service to a mixed-flow travel lane and providing temporary curbside stations or station consolidation if needed. Planning for temporary utility access within the station areas may necessitate temporary relocation of station functions while utility work is underway. Temporary signage for BRT patrons and safety protocols for Muni operators and utility providers would be coordinated. These planning efforts would avoid impacts to facility access by utility providers.

Based on available information, it is anticipated that construction and operation of any of the build alternatives would be coordinated with utility providers to avoid adverse impacts to utility facilities.

4.6.4.3.2 STORMWATER MANAGEMENT CAPACITY

As discussed in Section 4.9, Hydrology and Water Quality, the Geary corridor is almost entirely covered with impervious surfaces, with the exception of tree and landscape plantings on sidewalks and existing landscaped center medians. Under the build alternatives, stormwater would continue to flow from these impervious surfaces into existing catch basins, although some catch basins would be relocated (typically on the same block) to accommodate bus bulbs and other improvements. Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA would require construction of additional catch basins in medians at the downstream ends of the blocks in areas with center-running buses to prevent point flows across the travel lanes, requiring connections to the existing system.

See Section 4.9, Hydrology and Water Quality, for more information on the hydrological effects of the build alternatives

Alternative 2 would generally not disturb existing landscaped medians; thus, the area of impervious surface would not change significantly from existing conditions. Accordingly, Alternative 2 would not result in any need to increase stormwater capacity.

Areas of impervious surfaces under Alternatives 3 and 3-Consolidated would be reduced by slightly less than an acre from current conditions. For the Hybrid Alternative/LPA, areas of impervious surface would be reduced by roughly half an acre from current conditions.

As these alternatives would require construction in the existing landscaped medians, construction of these alternatives could allow the incorporation of rain gardens and biotreatment swales in addition to pervious paving and infiltration planters.

Additionally, Alternatives 3 and 3-Consolidated would involve filling the underpass at Fillmore Street and decommissioning the existing pump station north of Geary Boulevard. These actions would require installation of new inlets and connections to the relocated Fillmore stormwater sewer to replace existing Fillmore Street underpass inlets. Implementation of stormwater retention and treatment features set forth in City ordinances and the *Better Streets Plan* would be possible under all build alternatives. While local stormwater management capacity may change, due to changes in landscaping and pervious land cover, there would be no need to increase stormwater capacity systemwide, as no substantial overall increase in stormwater quantity would be anticipated to result.

4.6.4.3.3 POTABLE WATER CAPACITY AND DEMAND

The build alternatives propose implementing transit improvements in the Geary corridor. Such improvements do not entail components that would substantially alter potable water use beyond existing conditions. Potable water is used in bus washing and maintenance, but proposed new BRT buses would replace existing coaches; no substantial increase in potable water for washing and maintenance would thus be anticipated. Furthermore, non-potable water would be required to be used for dust control and soil compaction activities during project construction as directed by City of San Francisco Ordinance 175-91.

All of the build alternatives would include new landscaping would be installed along the corridor. SFPW requires that any new median landscaping include irrigation, and review of any proposed landscape and irrigation plans for right-of-way areas prior to installation. New landscaping would be subject to the Water Efficient Irrigation Ordinance requiring use of climate-appropriate and low-water use plantings.

As such, no substantial increases in potable water demand would result under any build alternative.

4.6.4.3.4 CORRIDOR SOLID WASTE COLLECTION CAPACITY AND DEMAND

Recology Solid Waste Receptacles
Photo credit: SF Dept. of the Environment

Solid waste receptacles already exist at bus stops along the Geary corridor. Accordingly, solid waste disposal receptacles would continue to exist at stations along the Geary corridor to accommodate garbage generated by bus patrons. The build alternatives propose implementing transit improvements in the Geary corridor. The build alternatives may slightly increase transit ridership as a result of expanded services and facilities, thus slightly increasing the amount of solid waste produced by passengers. However, such improvements do not entail project components that would substantially increase solid waste generation. Accordingly, no adverse effects to existing landfills are anticipated under any project alternative.

4.6.4.3.5 DEMAND AND CAPACITY IMPACTS ON ELECTRICITY

The build alternatives would not result in changes to utility capacity. Changes in demand are described below.

PUC Street Lighting

Existing street lighting would be replaced with new median-street lighting between 27th Avenue and Arguello Boulevard. Moreover, new pedestrian scale lighting is planned for the BRT station areas. New lighting would be consistent with the LED Street Light Conversion Project (2014 – 2016) that replaced high-pressure sodium cobra-head light fixtures with ultra-efficient light emitting diodes (LED) fixtures. All of the project alternatives would benefit from the street lighting with improved energy efficiency, increased reliability, reduced risk to maintenance staff due to a new standardized electrical service, and decreased operational costs.

PG&E Street Lighting

The build alternatives would not require additional capacity or infrastructure for PG&E-owned street lighting.

Other Demands on Electricity

Addition of Shelters with Next-Bus screens lighted advertising and push to talk features would increase demand for electricity.

Addition of Elevators at the Masonic BRT stations in Alternative 3 and 3-Consolidated would introduce additional demand for electricity.

Removal of the Fillmore pump station and Fillmore underpass lighting in Alternative 3 and 3-Consolidated would reduce demand for electricity.

Removal of the Webster Street pedestrian bridge under Alternatives 2, 3, and 3-Consolidated, which has lighting, would reduce demand for electricity.

Two manholes for the duct bank would also need to be replaced and relocated.

Demand and Capacity Impacts on Other Utilities

The build alternatives would not require additional capacity or infrastructure for natural gas or other utility systems in the project corridor.

4.6.4.4 | CONCLUSION

A number of projects are planned within the Geary corridor that would involve utility work. Known projects to be coordinated with the proposed BRT project include the Van Ness BRT, Central Subway, ESER Bond, CPMC, SFgo signal upgrades, Road Repaving and Street Safety Bond repaving, and pedestrian improvement projects, among others. In addition, SFPUC may plan to replace or rehabilitate some of their combined sewer and water mains and laterals as part of the BRT construction.

These projects and other planned projects in the project corridor listed in Section 1.3.4, Related Projects, would be included in the mapping system/database, known as Envista, and also be scheduled and coordinated with CULCOP and the San Francisco Street Construction Coordination Center to avoid impacts to utilities to the largest extent possible.

4.6.4.5 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, all build alternatives would necessitate some utility relocation during construction. The No Build Alternative and Alternative 2 would require the least utility relocations or construction-period enhancements, followed by the Hybrid Alternative/LPA. Alternatives 3 and 3-Consolidated would require additional construction-period energy, utility relocations, and operational stormwater capacity enhancements.

4.6.5 | Avoidance, Minimization, and/or Mitigation Measures

In compliance with City and Caltrans policies, coordination with the utility providers and Caltrans would be initiated during the preliminary engineering phase of the project and would continue through final design and construction.

Where feasible, utility relocations would be undertaken in advance of project construction. Design, construction, and inspection of utilities relocated for any of the build alternatives would be done in accordance with City and Caltrans requirements. SFMTA would coordinate with the affected service provider in each instance to ensure that work completed is in accordance with the appropriate requirements and criteria.

The following minimization measures would be incorporated into project design and planning to minimize adverse impacts to utility systems and services:

MIN-UT-1. BRT construction shall be closely coordinated with concurrent utility projects planned within the Geary corridor.

MIN-UT-2. Inspection and evaluation of sewer pipelines within the project limits shall be undertaken to assess the condition of the pipelines and need for replacement. Drain inlets on the corridor shall also be inspected to assess condition and confirm functionality. Spot repairs or minor replacement-in-place of sewers may be performed during construction of the project if desired by SFPUC and agreed to by SFMTA.

MIN-UT-3. During planning and design, consideration would be given to ensure that Geary corridor station facilities do not prevent access to the underground AWSS lines. Adequate access for specialized trucks to park next to gate valves shall be maintained. Gate valves shall not be located beneath medians, station platforms, or sidewalks.

MIN-UT-4. In situations where utility facilities are being protected in place, SFMTA shall create a plan to accommodate temporary closure of the transitway and/or stations in coordination with utility providers to allow utility providers to perform maintenance, emergency repair, and upgrade/replacement of underground facilities that may be located beneath project features such as the BRT transitway, station platforms, or curb bulbs. Signage for BRT patrons and safety protocols for Muni operators and utility providers shall be integrated into this plan.

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4.7 Geology/Soils/Seismic/Topography

This section considers the potential of the project alternatives to have adverse effects related to geologic and soils related issues. Characterization of geologic resources found in the study area included a review of several published and online maps and reports presenting data on regional geology, seismic hazards, and faulting.

4.7.1 | Regulatory Setting

4.7.1.1 | STATE REGULATIONS

The State of California enacted the Alquist-Priolo State Special Studies Zone Act in 1972 to mitigate the hazard of surface faulting to structures intended for human occupancy. The State has amended the Act 10 times and renamed it the Alquist-Priolo Earthquake Fault Zone (APEFZ) Act in 1994. The APEFZ Act's main purpose is to prevent the construction of structures used for human occupancy on the surface trace of active faults as documented in Special Publication 42 by California Geological Survey (CGS). The APEFZ Act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards.

The Seismic Hazards Mapping Act of 1990 was enacted, in part, to address seismic hazards not included in the APEFZ Act, including strong ground shaking, landslides, and liquefaction. Under this Act, the State Geologist is assigned the responsibility of identifying and mapping seismic hazards. CGS Special Publication 117A, adopted in 2008 by the State Mining and Geology Board, enumerates guidelines for evaluating seismic hazards other than surface faulting, and also recommends certain measures as required by Public Resources Code Section 2695 (a). The CGS seismic hazard zone maps use a ground-shaking event that corresponds to 10 percent probability of exceedance in 50 years.

RESOURCES

For information on the APEFZ Act go to:
http://www.conservation.ca.gov/cgs/rghm/ap/Pages/main.aspx

For information regarding the Seismic Hazards Zonation Program go to:
http://www.conservation.ca.gov/cgs/shzp/Pages/Index.aspx

4.7.2 | Affected Environment

4.7.2.1 | TOPOGRAPHY

The Geary corridor extends east-west across moderately hilly terrain near the north end of San Francisco. Elevations along the majority of the route typically vary from 125 feet to 275 feet above mean sea level (amsl) with an average elevation of 200 feet amsl. The highest elevations are near the west end (about 43rd Avenue) and near the central portion (near intersection of Masonic Avenue and Geary Boulevard). Each area is approximately 270 feet amsl. The east terminus of the Geary corridor descends to slightly above sea level east of Market Street near the Transbay Transit Center.

4.7.2.2 | GEOLOGY

The Geary corridor is located within the San Francisco Bay portion of the Coast Ranges geomorphic province of California, a region characterized by northwest-trending ridges and intervening valleys that parallel the seismically active San Andreas and associated faults. The San Francisco Bay Area is known as one of the most seismically active areas in the United States. Earthquakes are generated by a

global plate tectonics transform boundary between the northwest-moving Pacific Plate on the west and the North American Plate on the east. The San Andreas Fault zone is recognized as surface expression of this complex tectonic boundary.

As shown in Figure 4.7-1, the vast majority of the Geary corridor is underlain by dune sand (Qds). Hills within the Geary corridor are underlain by bedrock. The underlying bedrock layers (further discussed in Section 4.7.2.2.1 below) have been uplifted, fractured, faulted, and deformed most recently from the San Andreas style of tectonics. Depending upon the location, the bedrock is covered in layers (or mantled) by various surficial deposits consisting of artificial fill (both modern and historic), relatively thick accumulations of native soils, Bay Mud, dune sand, alluvium, slope debris and ravine fill, and landslides (Blake et al. 2000 and Schlocker et al. 1958).

4.7.2.2.1 BEDROCK

Most of the original ground surface along the Geary corridor is blanketed by Late Pleistocene to Holocene eolian deposits or dune sand

Where the original shoreline has been historically modified at the extreme east end of the Geary corridor, artificial fill has been mapped from approximately Market Street to the present shoreline to the east of Market Street.

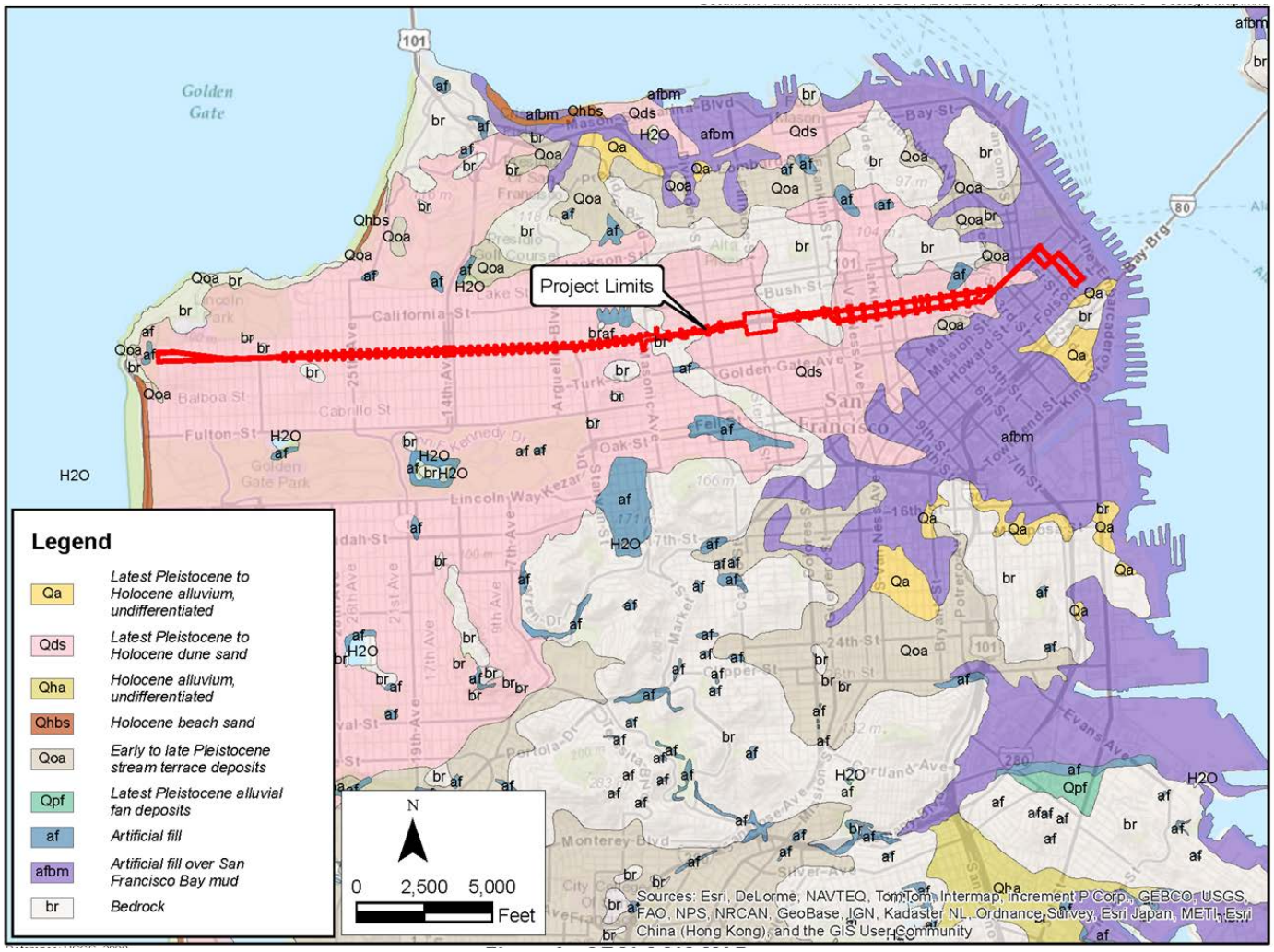
The San Francisco peninsula is underlain by a variety of rock types that collectively make up the Franciscan Complex of the Jurassic-Cretaceous age. The Franciscan Complex is one of the most widespread bedrock formations in California. The formation generally includes chert, graywacke sandstone, greenstone, serpentine, shale, metasedimentary rocks, and sheared rocks in a clayey matrix. The variety of rock types and appearances are understood to be the result of accumulation at the boundary of multiple tectonic plates (Blake et al. 1974, Ellen and Wentworth 1995, Schlocker 1974, and Wagner et al. 2005).

As depicted in Figure 4.7-1, published geologic maps indicate only a few bedrock outcrops exposed along the Geary corridor. These bedrock outcrops are located in the central portion of the corridor near the intersection of Masonic Avenue and Geary Boulevard and east of the central portion near the intersection of Gough Street and Geary Boulevard. At both locations, sheared rocks in a clayey matrix or mélange, and interbedded shales and sandstones are exposed (Blake et al. 1974; Blake et al. 2000; Ellen and Wentworth 1995; Schlocker 1974; and Schlocker et al. 1958).

4.7.2.2.2 SURFICIAL DEPOSIT

The original Geary Boulevard was established sometime before 1900, and the native materials exposed along the alignment have likely been modified to some extent as part of the roadway construction (USGS 1899). Probably the most dramatic alteration of the native materials along the proposed transit alignment is at the east end of the Geary corridor, where the original shoreline was modified beginning in the early 1850s. The original shoreline was near the intersection of First Street and Market Street, but was extended by human activity to its present limits (the Embarcadero). Surficial deposits along the Geary corridor are discussed in detail below.

Figure 4.7-1 Geologic Map



The isolated bedrock hills scattered throughout San Francisco are located between now-buried erosional ravines and canyons that once drained into the Pacific Ocean to the west and into the San Francisco Bay to the north and east. The Geary corridor crosses at least five such paleo-canyons. These are filled with a variety of surficial deposits that typically range from 100 to 200 feet thick. However, the bottom of the deepest buried canyon (at the extreme east end of the Geary corridor near the current shoreline) is approximately 250 feet below sea level (Schlocker 1974).

The various deposits exposed at the ground surface along the Geary corridor are summarized below and shown on Figure 4.7-1. The buried canyons and ravines that mark erosional channels have been backfilled with deeper deposits that may or may not reflect the material exposed along the ground surface. These deeper deposits extend to depths ranging from 100 to 200 feet below the existing ground surface. Subsurface data was reviewed from borings published by the CGS (Blake et al. 1974; Blake et al. 2000; Helley and Lajoie 1979; Schlocker 1974; and Schlocker 1958).

- **Qds** - Most of the original ground surface along the Geary corridor is blanketed by Late Pleistocene to Holocene eolian deposits or dune sand. The sands were blown inland from Pleistocene beaches located west of the current Pacific shoreline.
- **af and afbm** - Where the original shoreline has been historically modified at the extreme east end of the Geary corridor, artificial fill has been mapped from approximately Market Street to the present shoreline to the east of Market Street. The fill is resting on bay mud. The materials used to construct the artificial fills are highly variable and generally consist of clay, silt, sand, and gravel with concrete, brick, and wood debris.

4.7.2.3 | SEISMICITY

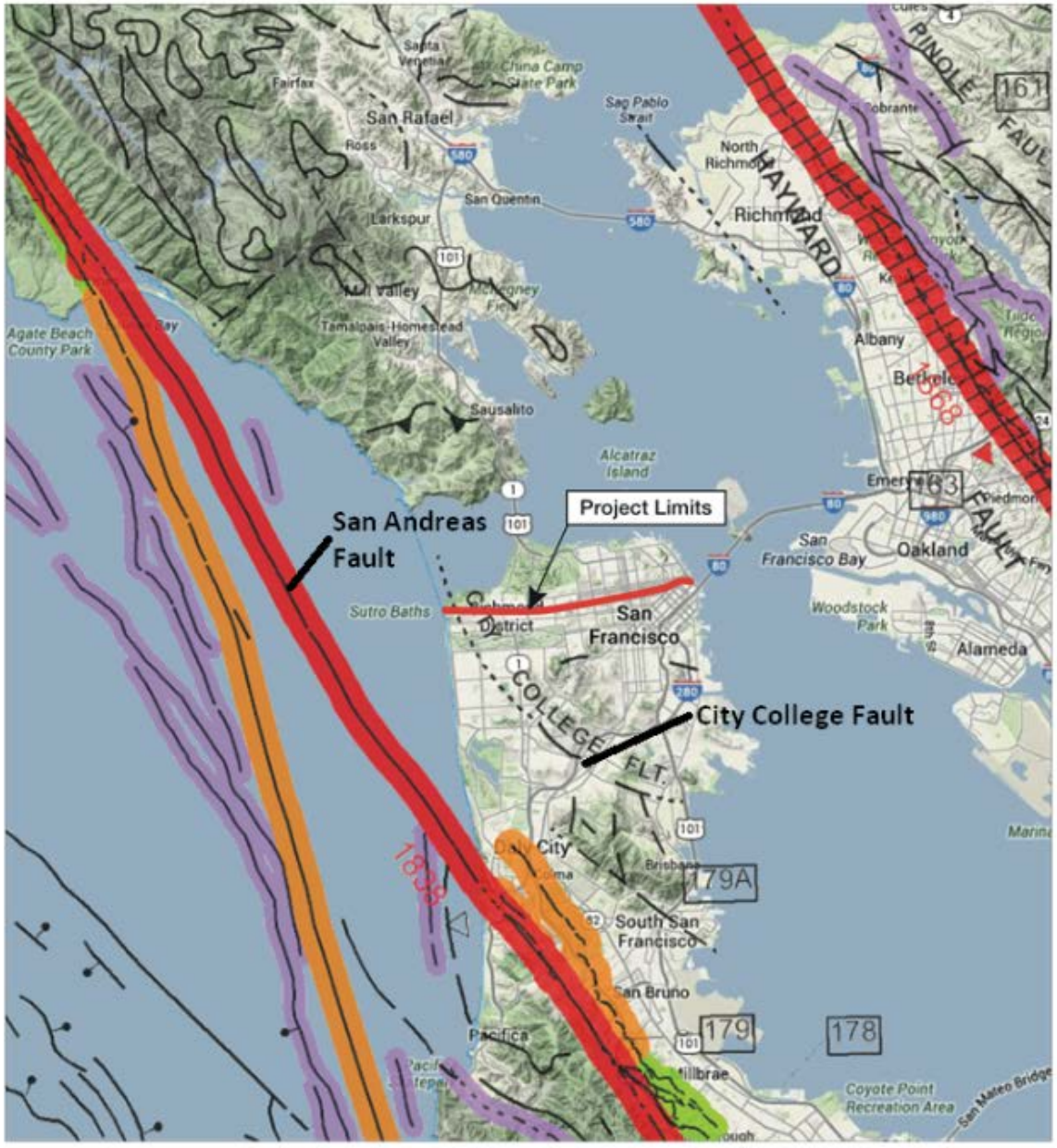
The Geary corridor is located in a seismically active region with a history of strong earthquakes (CGS, 2000a). Although no active faults are known to cross the Geary corridor, several major active faults are mapped within 30 miles including the San Andreas, Hayward, Calaveras, and San Gregorio faults. Movement of any one these faults has the potential to result in ground motion in and around the Geary corridor.

4.7.2.3.1 FAULTING AND EARTHQUAKE POTENTIAL

People standing in Union Square directly following the Loma Prieta Earthquake
Photo: SF Gate

As depicted in Figure 4.7-2, the San Francisco Bay Area is dominated by the northwest-striking, right-slip San Andreas Fault and related major faults, such as the San Gregorio, Hayward-Rodgers Creek, Calaveras, Concord-Green Valley, West Napa, and Greenville-Marsh Creek Faults. The San Andreas and related faults work as a major shear system up to 50 miles wide, accommodating approximately 32 millimeters per year (mm/yr) of slip between the Pacific and North American tectonic plates, with most of this movement occurring along the San Andreas Fault.

Figure 4.7-2 Regional Fault Map



The Geary corridor is not located within any active Earthquake Fault Zone

The Geary corridor is not located within an Earthquake Fault Zone as designated by the State of California for active faults. No mapped active faults cross the Geary corridor. As shown in Figure 4.7-2, the closest active fault to the Geary corridor is the San Andreas Fault, located approximately 6.7 miles to the southwest. Several inactive faults are mapped across the San Francisco peninsula, three of which cross the Geary corridor as shown on the various published geologic maps (Blake et al. 1974 and 2000; Schlocker 1974; Schlocker 1958). These other faults have not been identified as being seismically active according to criteria established by CGS (Hart and Bryant 1997). These other mapped faults include the northwest-striking City College Fault, located near the intersection of Geary Boulevard and 42nd Avenue. The other two inactive faults are unnamed, and cross the central portion of the Geary corridor near Arguello Boulevard and further to the east near Divisadero Street. The locations of the two, unnamed, inactive faults are not accurately known, and are thus not shown on Figure 4.7-2.

4.7.2.3.2 SURFACE FAULTING / GROUND RUPTURE HAZARD

The San Andreas fault is the nearest mapped active fault, approximately 6.7 miles to the southwest

Fault rupture occurs when a fault plane actually breaks the ground surface during large magnitude earthquakes causing horizontal and/or vertical movements at the surface. As noted above, three mapped but inactive faults cross the Geary corridor and no portion of the Corridor is within any State of California Earthquake Fault Zone (Blake et al. 1974; Blake et al. 2000; Schlocker 1974; and Schlocker 1958). The nearest mapped active fault, the San Andreas Fault, is located approximately 6.7 miles to the southwest.

4.7.2.3.3 SEISMIC GROUND MOTION

The Geary corridor is located within a seismically active region of California. Several active faults are located within 30 miles of the Geary corridor; however, no known active faults actually cross any part of the Geary corridor. Table 4.7-1 lists major active faults in the vicinity of the Geary corridor. Earthquakes on any of these major faults have the potential to cause some seismic ground motion along the Geary corridor.

Table 4.7-1 Major Fault Characterization in the Vicinity of the Geary Corridor

FAULT	APPROXIMATE DISTANCE*	MAXIMUM MOMENT MAGNITUDE EARTHQUAKE
San Andreas (Peninsula)	6.7	7.1
San Andreas (North Coast)	9.1	7.6
Northern Hayward	12	6.9
Southern Hayward	14	6.9
Rodgers Creek	22	7.0
Northern Calaveras	23	6.8
Concord – Green Valley	26	6.9
Monte Vista – Shannon	28	6.8
West Napa	28	6.5
Greenville	30	6.9

* Distances measures from center of project alignment.

Source: Jennings and Bryant 2010

4.7.2.3.4 LIQUEFACTION POTENTIAL AND SEISMIC SETTLEMENTS

Liquefaction occurs when saturated, low relative density, low plasticity materials are transformed from a solid to a near-liquid state. This phenomenon occurs when moderate to severe ground shaking causes pore-water pressure to increase. Site susceptibility to liquefaction is a function of the depth, density, soil type, and water content of granular sediments, along with the magnitude and frequency of earthquakes in the surrounding region. Saturated sands, silty sands, and unconsolidated silts within 50 feet of the ground surface are most susceptible to liquefaction. Liquefaction-related phenomena include lateral spreading, ground oscillation, flow failures, loss of bearing strength, subsidence, and buoyancy effects. Lateral spreading is a form of horizontal displacement of soil toward an open channel or other "free" face, such as an excavation boundary. Lateral spreading can result from either the slump of low cohesion and unconsolidated material or more commonly by liquefaction of either the soil layer or a subsurface layer underlying soil material on a slope, resulting in gravitationally driven movement. Earthquake shaking leading to liquefaction of saturated soil can result in lateral spreading where the soil undergoes a temporary loss of strength. As shown in Figure 4.7-3, the Geary corridor east of Grant Avenue is highly susceptible to liquefaction.[1]

DEFINITION

LIQUEFACTION: When saturated, cohesionless soils lose their strength due to the build-up of excess pore water pressure, especially during cyclic loadings (i.e., shaking) such as those induced by earthquakes

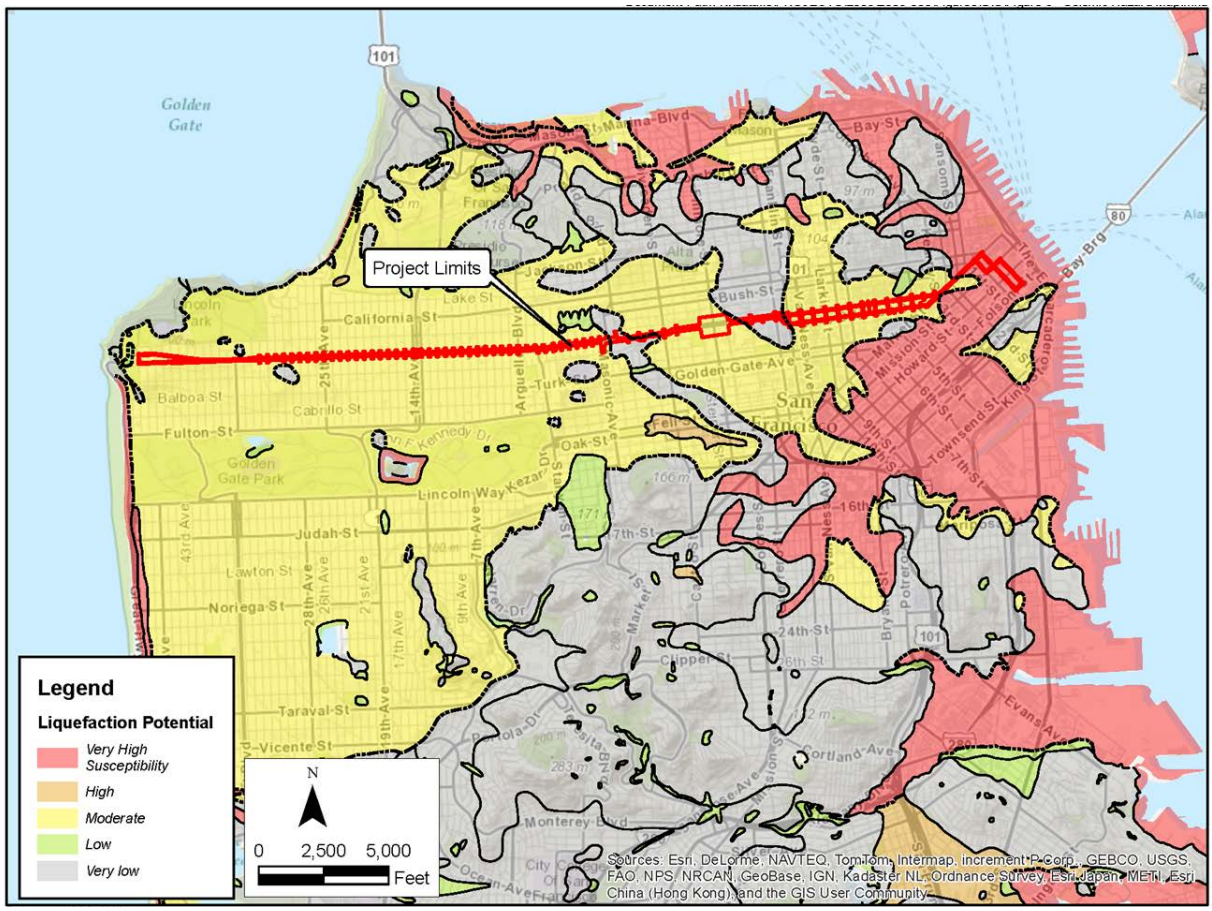
Sand boils and lateral spreads have been documented near the old San Francisco Bay shoreline at the east end of the Geary corridor from both the 1868 Hayward and the 1906 San Francisco earthquakes (Knudsen et al. 1997, and Youd and Hoose 1978). Judging from documented cases from historic earthquakes, the potential for liquefaction and lateral spreading is considered to be very high at the east end of the Geary corridor in the vicinity of the historic San Francisco Bay shoreline.

As shown in Figure 4.7-3 below, the potential for liquefaction to occur along the remainder of the Geary corridor (i.e., west of the historic limit of the San Francisco Bay shoreline) is considered to be moderate.

The potential for lateral spreading along this remainder of the proposed route is considered nonexistent due to the lack of open channels or other free faces of land in this area.

[11] City and County of San Francisco General Plan. 2012. Community Safety Element.

Figure 4.7-3 Liquefaction Potential Map



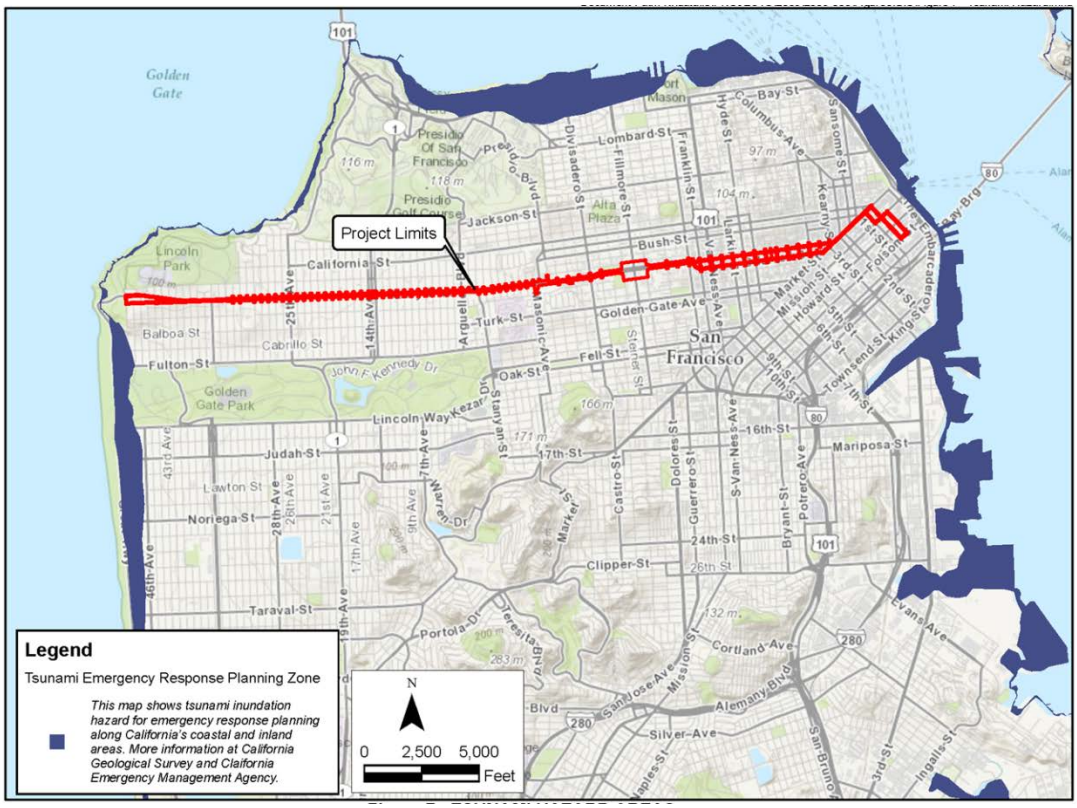
4.7.2.3.5 TSUNAMI

RESOURCE

To see the ABAG tsunami evacuation planning map for San Francisco and San Mateo counties, go to: http://gis.abag.ca.gov

A tsunami occurs when there is a major disturbance in ocean waters, usually from large earthquakes displacing tectonic sea floor plates, but they can also be caused by undersea landslides and rare extraterrestrial events (asteroid impacts). Both local and more distant earthquake sources have been evaluated for potential tsunami effects on the California and San Francisco Bay Area coastline. As shown in Figure 4.7-4, the Geary corridor is located a significant height above the mapped tsunami inundation zone, including the near-sea level portion at the east end of the corridor.

Figure 4.7-4 Tsunami Hazard Areas



4.7.2.4 LANDSLIDE AND SLOPE INSTABILITY

The Geary corridor is not within a designated City and County of San Francisco Landslide Hazard Area.[2] The closest Landslide Hazard Area is located to the south between Stanyan Street and Masonic Avenue in the vicinity of two previous slope failures (landslides at Parker Avenue between Turk and Anza Streets approximately 700 feet to the south of Geary Boulevard and at Turk Street near Baker Street approximately 1,300 feet south of the Geary corridor). The landslide at Parker Avenue appears to have failed in a westerly direction and not toward the proposed transit alignment.

A major landslide or slope failure is not likely to occur along the Geary corridor

Periods of intense rainfall from winter storms have been known to cause landslides in the San Francisco Bay area. No landslides or slope failures within or adjacent to the Geary corridor were triggered by the widespread January 3-5, 1982 rainstorm that affected many areas of the San Francisco Bay Area (Ellen and Wieczorek 1988). Similarly, no landslides have been reported within or near the Geary corridor from the 1997-1998 El Niño rainy season (Hillhouse and Godt 1999).

Landslides generated by earthquake shaking were well documented in the Santa Cruz Mountains as a result of the 1989 Loma Prieta Earthquake, located approximately 61 miles south of the Geary corridor. As a result, CGS has evaluated the landslide potential for the San Francisco Bay area and other areas of California during a seismic event. A series of geologic hazard maps have been published under the Seismic Hazards Mapping Act of 1990 (Chapter 7.8, Division 2 of the California

[2] San Francisco *General Plan*. 2012. Community Safety Element.

Public Resources Code). The maps show that the Geary corridor is not within a CGS Seismic Hazard Zone for Earthquake-Induced Landslides. The closest such zone is approximately 500 feet south of the central portion of Geary Boulevard between Masonic Avenue and Stanyan Street (CGS, 2000a).

No seismically induced landslides have been mapped or reported at or adjacent to the Geary corridor during historic earthquakes, such as the 1868 Hayward or the 1906 San Francisco earthquakes. Likewise, no seismically induced landslides have been documented at or adjacent to the Geary corridor from the more recent 1989 Loma Prieta Earthquake (Knudsen et al. 1997; Keefer and Manson 1998; and Youd and Hoose 1978). Therefore, the potential for earthquake-induced landslides to effect the Geary corridor is considered to be low.

4.7.2.5 | MINERAL RESOURCES

There are no potential sources of mineral resources identified within the Geary corridor

According to records of the California Department of Conservation, no oil or gas exploration or pumping has occurred in or in the area around the Geary corridor.[3]

There are no potential sources of mineral resources identified within the Geary corridor. Historically, there have been several rock quarry operations located throughout the San Francisco peninsula. The closest of these, active from the late 1800s through the early 1900s, was located along the east side of Telegraph Hill approximately 1 mile to the north of the eastern terminus of the Geary corridor. The nearest economical sources for potential crushed rock are located approximately 5 miles to the south, outside San Francisco.

4.7.3 | Methodology

The alternatives were evaluated for potential geologic and seismic-related effects in terms of several risk considerations. The alternatives have the potential to result in construction period and/or operational period effects as noted below.

Construction-Related Effects

- Slope instability
- Seismic risks related to filling the Fillmore Street underpass

Construction and Operational-Related Effects

- Strong ground shaking
- Liquefaction

Potential effects related to the seismic hazards listed above were evaluated in terms of likelihood of occurrence and proposed activity and/or structure location and stability.

This analysis considered geologic landscape along the Geary corridor existing as of 2013, as well as within the broader San Francisco Bay Area, using available geologic data from USGS, CGS, and other published and online maps and reports presenting data on regional geology, seismic hazards, and faulting.

[3] Wildcat Maps and the California Department of Conservation Division of Gas and Geothermal Resources (DOGGR) digital wells database.

4.7.4 | Environmental Consequences

The Geary corridor, like other sites in Northern California, would be subjected to strong ground shaking and liquefaction induced ground settlement and/or differential compaction (settlement due to densification) during a seismic event. Portions of the Geary corridor also could expose people or structures to adverse effects from liquefaction-induced ground failures.

This section describes potential impacts and benefits for geology. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 4.7.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding geology impacts in the Draft EIS/EIR.

4.7.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: ANALYSIS OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe impacts related to geology and soils during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe geologic or seismic impacts relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: Site-specific conditions are the primary driver of impacts with regard to geology and soils. This modification would require less construction (i.e. demolition) activity at this location, would occur under the same geologic conditions as described in the Draft EIS/EIR, and does not include any changes that would result in substantially increased geologic hazards. Therefore, this modification would reduce construction-related effects regarding geologic and seismic hazards relative to what was described in the Draft EIS/EIR.

Operation: The Webster Street pedestrian bridge was seismically retrofitted in 1996. Retention of the bridge would maintain existing conditions and, as such, would not result in any increased seismic risk relative to existing conditions. Therefore, this modification would not result in any new or more severe geologic or seismic effects during project operation relative to what was described in the Draft EIS/EIR.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: Site-specific conditions are the primary driver of impacts with regard to geology and soils. This modification would eliminate construction activity outside the curb-to-curb portion of the right-of-way in this area. This modification would occur under the same geologic conditions as described in the Draft EIS/EIR, and does not include any changes that would result in substantially increased geologic hazards. Therefore, this modification would reduce construction-related effects regarding geologic and seismic hazards relative to what was described in the Draft EIS/EIR.

Operation: Retention of the existing bus stops at this location would maintain existing conditions and, as such, would not result in any increased seismic risk relative to existing conditions. Therefore, this modification would not result in any new or more severe geologic or seismic effects during project operation relative to what was described in the Draft EIS/EIR.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: Implementation of additional pedestrian enhancements throughout the corridor would entail localized construction activities where new pedestrian crossing bulbs would be constructed. Site-specific conditions are the primary driver of impacts with regard to geology and soils. This modification would occur under the same geologic conditions as described in the Draft EIS/EIR, and does not include any changes that would result in substantially increased construction-period geologic hazards. Therefore, the addition of more pedestrian enhancements throughout the corridor would not create any new or more severe geologic or seismic impacts during construction.

Operation: During operation, pedestrian enhancements throughout the corridor would be limited to streetscape features and would bear relatively light loads; therefore, the risk of geologic hazards is low. Based on the foregoing, this modification would not create any new or more severe geologic or seismic impacts during operation.

Addition of BRT Stops at Laguna Street

Construction: Additional construction activities would be required to add BRT stops at Laguna Street. Site-specific conditions are the primary driver of impacts with regard to geology and soils. This modification would occur under the same geologic conditions as described in the Draft EIS/EIR, and does not include any changes that would result in substantially increased construction-period geologic hazards. Therefore, the addition of BRT stops at Laguna Street would not create any new or more severe geologic or seismic impacts during construction.

Operation: During operation, BRT stops at Laguna Street would be limited to streetscape features and would bear relatively light loads; therefore, the risk of geologic hazards is low. Based on the foregoing, this modification would not create any new or more severe geologic or seismic impacts during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: Site-specific conditions are the primary driver of impacts with regard to geology and soils. This modification would eliminate construction activity outside the curb-to-curb portion of the right-of-way in this location. This modification

would occur under the same geologic conditions as described in the Draft EIS/EIR, and does not include any changes that would result in substantially increased geologic hazards. Therefore, this modification would reduce construction-related effects regarding geologic and seismic hazards relative to what was described in the Draft EIS/EIR.

Operation: Retention of the existing bus stops at this location would maintain existing conditions and, as such, would not result in any increased seismic risk relative to existing conditions. Therefore, this modification would not result in any new or more severe geologic or seismic effects during project operation relative to what was described in the Draft EIS/EIR.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities but would shift about half of it one block to the west. Site-specific conditions are the primary driver of impacts with regard to geology and soils. This modification would occur under the same geologic conditions as described in the Draft EIS/EIR, and does not include any changes that would result in substantially increased construction-period geologic hazards. Therefore, the relocation of the transition would not create any new or more severe geologic or seismic impacts during construction.

Operation: Relocation of the bus lane transition would not change bus operations and, as such, would not result in any increased seismic risk relative to what was described in the Draft EIS/EIR; therefore, this modification would not result in any new or more severe geologic or seismic effects during project operation.

4.7.4.2 | NO BUILD ALTERNATIVE – CONSTRUCTION EFFECTS

The No Build Alternative would only include those transit and transportation facilities that are currently planned or programmed to be implemented on the Geary corridor by 2020, which would include but are not limited to the following components subject to strong ground shaking and potential for liquefaction-induced ground failure:

- new concrete paving;
- rehabilitation or resurfacing of existing pavement throughout the Geary corridor;
- replacement of traffic and pedestrian countdown signals;
- construction of curb ramps and pedestrian crossing bulbs.

Soils along the Geary corridor generally appear suitable for construction of elements of the No Build Alternative. The majority of the Geary corridor is located on soils mapped for moderate susceptibility to liquefaction. Features to address seismic-related risks would likely be incorporated into the design of the project components subject to strong ground shaking and potential liquefaction-induced ground settlement, rendering such effects below a level where they would be considered adverse.

Soils in the Geary corridor appear to be suitable for proposed improvements identified in each of the Build Alternatives

The scope of project structures under all alternatives is limited to that of streetscape features that would bear light loads; therefore, the risk from strong ground shaking and liquefaction is low. The design of project features would meet seismic standards, and the project alternatives would not increase the risk of geologic hazards

4.7.4.3 | BUILD ALTERNATIVES – CONSTRUCTION EFFECTS

In the event of an earthquake during project construction, very strong ground shaking could result in slope instability near excavated areas. As a result, each build alternative is susceptible to potential slope instability effects, area-wide potential for ground shaking, and site specific liquefaction, during project construction.

In addition, Alternatives 3 (Center-Lane BRT with Dual Medians and Passing Lanes) and 3-Consolidated (Center-Lane BRT with Dual Medians and Consolidated Bus Service) would include the filling of the underpass at Fillmore Street, decommissioning of the existing pump station at Fillmore Street, and either filling (with inert material) or removing the pump station's fuel tank. There are several seismic-related risks associated with construction activities occurring at the Fillmore Street underpass, particularly in removing the pump station and filling the underpass.

The pump station is an integral part of the north retaining wall and the Fillmore Street bridge abutment. The pump station was likely designed to support earth pressures that are ultimately transferred to the abutment. In order to remove the structure, temporary shoring would be required. The shoring would have to retain about 37 feet of soil, requiring substantial lateral bracing. Because the structure is located within the westbound service road and in Fillmore Street, considerable disruption to traffic would occur. In lieu of removal, it may be more feasible to fill the pump station in place and disconnect and decommission it. Minimization measures specific to removing or filling the Fillmore Street underpass are included to reduce such effects.

4.7.4.4 | OPERATIONAL EFFECTS

Each build alternative would include the following components subject to strong ground shaking and potential liquefaction-induced ground settlement:

- New paving and rehabilitation or resurfacing of existing pavement throughout the Geary corridor;
- pedestrian crossing bulbs;
- BRT (Bus Rapid Transit) stations and associated amenities; and
- installation of streetlights and associated conduit trench replacement.

Soils in the Geary corridor appear to be suitable for proposed improvements identified in each of the build alternatives and the No Build Alternative. As discussed above, some of the proposed bus stations and other features of the build alternatives would be located within areas of potential liquefaction and/or areas with artificial fill. The foundations for new BRT stations would be approximately 5 feet deep. Design features to address very strong ground shaking, liquefaction, and settlement are discussed below in Section 4.7.5.

Overall, build alternative structures are limited to streetscape features that would bear relatively light loads; therefore, the risk of geologic hazards is low. The design of project features would meet seismic standards, and the incorporation of minimization measures discussed below would reduce any such risks further.

4.7.4.5 | COMPARATIVE EFFECTS OF ALTERNATIVES

A demonstrated in the preceding subsections, all project alternatives, including the No Build Alternative, would be subject to potential slope instability effects, area-wide potential for ground shaking, and site specific liquefaction, during construction. As all project alternatives are located within the same geologic setting, differences between the construction-period and operational impacts of all project alternatives would be marginal.

4.7.5 | Avoidance, Minimization, and/or Mitigation Measures

With adherence to the measures below, the build alternatives would not result in any adverse geological or seismic-related effects. The designs shall be reviewed by a geotechnical consultant. The recommendations from the geotechnical consultant shall be incorporated into the final approved designs and shall address geologic/seismic stability of the project during construction and operation. The geotechnical recommendations may include the following:

4.7.5.1 | CONSTRUCTION MEASURES

MIN-GE-C1. Shoring will be typically required for all cuts deeper than five feet. Shoring design of open excavations must consider the potential surcharge load from neighboring structures. Furthermore, the potential for lateral movement of excavation walls as a result of earthquake-related surcharge load from nearby structures must also be assessed. The following shoring and slope stability BMPs will be implemented during construction:

- Heavy construction equipment, building materials, excavated soil, and vehicle traffic shall be kept away from the edge of excavations, generally a distance equal to or greater than the depth of the excavation.
- In the event of wet weather, storm runoff shall be prevented from entering the excavation. Excavation sidewalls can be covered with plastic sheeting, and berms can be placed around the perimeter of the excavated areas.
- Sidewalks, slabs, pavement, and utilities adjacent to proposed excavations shall be adequately supported during construction.

4.7.5.2 | OPERATIONAL MEASURES

MIN-GE-1: A geotechnical consultant shall review the design of the build alternatives and offer recommendations best suited to the build alternative carried forward. Any recommendations provided by the geotechnical consultant shall be incorporated into the final plans, and are likely to include the following:

> **MIN-GE-1a**. For lightly loaded structures such as bus stops, canopies, and walls, incorporate geotechnical and/or structural methods to mitigate the effects of liquefaction on the foundations during final design. The geotechnical mitigation methods may range from recompaction of the upper material to provision of a mechanically stabilized earth (MSE) foundation system. The structural mitigation methods may range from planning for repairs/maintenance after a seismic event to supporting the improvements on mat foundations or interconnected beam foundations to tolerate the anticipated seismic settlement without collapse.

MIN-GE-1b. Fill soils shall be overexcavated and replaced with engineered fill as needed.

MIN-GE-1c. Deeper foundations shall be designed for station platforms and canopies located in areas of fill or areas mapped as liquefaction areas, as needed.

Should Alternatives 3 or 3-Consolidated be selected, minimization measures specific to filling the Fillmore Street underpass include all of the following:

MIN-GE-2. Fill material shall have characteristics similar to the original ground (dune sand), especially comparable unit weight and permeability. With such material, settlement under the fill weight would be "recompression" and groundwater flow would be similar (except for the effects of the retaining wall and roadway slab). Considering the area is generally underlain by sand, the settlements would be "immediate."

MIN-GE-3. If the existing pump station will remain in place, it shall be filled with concrete or a cementitious material, such as controlled density fill (CDF), and a portion of the structure shall be removed to a depth that will not impede future utilities in the service road. Once the pump stops operating, the groundwater will start to rise. The construction sequencing needs to consider the higher groundwater condition, including potential uplift pressure on the bottom of the pump station, roadway slab, etc. Continued, temporary pumping might be required. The special drainage structure behind the south retaining wall/abutment shall be similarly filled.

MIN-GE-4. The large collector pipes for the existing subsurface drainage facilities shall be filled with slurry.

4.8 Hazards and Hazardous Materials

This section summarizes the level of risk associated with hazardous materials, hazardous waste, and/or contamination within and near the Geary corridor that could potentially affect proposed construction activities. An Initial Site Assessment (ISA) was conducted for the Geary corridor in August 2013 in accordance with American Society for Testing and Materials (ASTM) E-1527 guidelines. The ISA is included as Appendix F and is on file with the San Francisco County Transportation Authority (SFCTA). The ISA included an Environmental Data Resources (EDR) records search with federal, state, tribal, and local queries pertaining to past and present hazardous materials use, storage, generation, disposal, and release on properties near the Geary corridor. Additionally, the ISA included a site reconnaissance report to visually evaluate potential evidence of hazardous material leaks. Accordingly, this section identifies recognized environmental conditions (RECs) and other potential concerns near the Geary corridor.

4.8.1 | Regulatory Setting

4.8.1.1 | FEDERAL REGULATIONS

4.8.1.1.1 RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

RCRA governs the disposal of solid and hazardous waste. Congress passed RCRA in 1976 as an amendment to the Solid Waste Disposal Act of 1965. RCRA was intended to address the growing volume of municipal and industrial waste and set national goals for protecting human health and the environment from the potential hazards of waste disposal. RCRA sets forth measures to conserve energy and natural resources. RCRA Subtitle C establishes a hazardous waste program intended to regulate such wastes from their creation to their disposal – a framework sometimes called "cradle to grave." RCRA Subtitle I sets forth an underground storage tank (UST) program to regulate such storage of hazardous substances, including petroleum products. The Environmental Protection Agency (EPA) has primary responsibility for implementing RCRA, but some states, including California, have received authorization to implement RCRA and issue permits.

RESOURCES

For more information on federal laws pertaining to hazardous wastes/materials, please see:

RCRA:

http://www.epa.gov/solidwaste/inforesources/online/index.htm

CERCLA:

http://epa.gov/superfund/policy/cercla.htm

4.8.1.1.2 COMPREHENSIVE ENVIRONMENTAL RESPONSE AND LIABILITY ACT (CERCLA)

CERCLA, also known as Superfund, was enacted in December 1980 and amended significantly in 1986. CERCLA provides a basis for taxing chemical and petroleum manufacturers and provides federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA sets forth requirements concerning closed and/or abandoned hazardous waste sites, determines liability of the persons responsible for releases of hazardous waste at these sites, and administers a trust fund using collected taxes to provide for cleanup when no responsible party can be identified.

4.8.1.1.3 OCCUPATIONAL SAFETY AND HEALTH STANDARDS

ACRONYMNS

RCRA: Resource Conservation and Recovery Act

CERCLA: Comprehensive Environmental Response and Liability Act

OSHA: Occupational, Safety and Health Administration

CCR: California Code of Regulations

Title 29 under the Code of Federal Regulations focuses on worker health and safety as it relates to worker exposure to hazards. The Occupational, Safety, and Health Administration (OSHA), born out of the Occupational Safety and Health Act of 1970, is the primary agency responsible for setting and enforcing standards to assure safe and healthful working conditions for working men and women and provide training, outreach, education, and assistance.

4.8.1.2 | STATE REGULATIONS

4.8.1.2.1 CALIFORNIA HEALTH AND SAFETY CODE

Hazardous waste management in California is regulated under the authority of the California Health and Safety Code. The Health and Safety Code ensures employment of proper technology and management practices, safe handling, treatment, recycling, and destruction of hazardous waste. The California Department of Toxic Substances Control (DTSC) carries out many related programs and measures to protect the public health and environment from potential threats of hazardous substances and wastes.

The California State Fire Marshal (CSFM) participates in the Certified Unified Program Agency (CUPA), which consolidates and coordinates activities and programs related to hazardous wastes generators and treatments, storage tanks, hazardous material releases, and hazardous material management plans required by chapter 6.11 of the California Health and Safety Code. The CSFM provides regulatory oversight, CUPA certifications, evaluations of the approved CUPAs, and training and education.

According to Title 22 Section 66261.20 of the California Code of Regulations (CCR), waste is considered hazardous if it includes one of the following four characteristics; 1) ignitability, 2) corrosivity, 3) reactivity, and 4) toxicity. CCR Title 22, Division 4.5 contains environmental health standards for the management of hazardous waste. Title 22 requires hazardous waste to be managed according to applicable regulations with regard to handling, transport, exposure requirements, and disposal requirements under a uniform hazardous waste manifest, with the specific procedures identified in Title 8 of the California Code of Regulations.

4.8.1.3 | LOCAL REGULATIONS

4.8.1.3.1 SAN FRANCISCO HEALTH CODE (MAHER ORDINANCE)

Article 22A of the San Francisco Health Code (the Maher Ordinance) applies to projects that result in the excavation of more than 50 cubic yards of soil where the project site meets one or more of the criteria below. Also see Figure 4.8-3 below.

- Land that has been filled;
- Areas zoned or used for industrial occupancy, currently or historically;
- Current or former presence of hazardous substances or underground storage tanks (USTs);
- Located within 100 feet of USTs; and
- Located within 150 feet of elevated freeways.

4.8.1.3.2 SAN FRANCISCO DEPARTMENT OF PUBLIC HEALTH (SFDPH) LOCAL OVERSIGHT PROGRAM

Pursuant to Title 23 of the California Code of Regulations (Chapter 16), SFDPH provides oversight for UST release sites. Local Oversight Program (LOP) staff review, comment, and approve of hydro-geological reports, feasibility studies, and work plans for soil and groundwater characterization and remedial action. Staff also review the effectiveness of remedial strategies, certify cleanup sites, and provide regulatory guidance to consultants, contractors, property owners, etc.

4.8.1.3.3 SAN FRANCISCO PUBLIC WORKS CODE ARTICLE 2.4; EXCAVATION IN THE PUBLIC RIGHT-OF-WAY

Article 2.4 of the San Francisco Public Works code sets forth a number of requirements concerning excavation activities in public right-of-way areas. Section 2.4.53 imposes a number of physical requirements on such excavation, including requirements to protect/cover open excavation, exercise good housekeeping practices, and regulations on storage of materials and equipment.

4.8.1.3.4 SAN FRANCISCO GENERAL PLAN

Policies 1.23 and 1.24 of the San Francisco General Plan promote the education and enforcement of regulations that reduce risks associated with hazardous materials, particularly when associated with earthquakes.

RESOURCE

The San Francisco General Plan is available at http://www.sf-planning.org/ftp/General_Plan/index.htm

> Policy 1.23: Enforce state and local codes that regulate the use, storage and transportation of hazardous materials in order to prevent, contain and effectively respond to accidental releases.
>
> Policy 1.24: Educate public about hazardous materials procedures, including transport, storage, and disposal.

4.8.1.3.5 BAY AREA AIR QUALITY MANAGEMENT DISTRICT

The Bay Area Air Quality Management District (BAAQMD) regulates the demolition and renovation of buildings and structures which may contain asbestos, or milling and manufacturing of specific materials which are known to contain asbestos. The provisions that cover these operations are found in District Regulation 11, Rule 2.

BAAQMD Regulation 11-2-401.3 requires that for every renovation involving the removal of 100 square feet/linear feet or greater of Regulated Asbestos Containing Material (or RACM), and for every demolition (even when no asbestos is present), a notification must be made to the BAAQMD at least 10 working days (except in special circumstances) prior to commencement of demolition/renovation. When removing any RACM, BAAQMD regulations must always be followed.

BAAQMD also enforces the California Airborne Toxic Control Measure (ATCM) which regulates emissions from Naturally-Occurring Asbestos (NOA) that may occur during such activities as grading, quarrying, and mining.[1]

[1] California Code of Regulations Section 93015.

4.8.2 | Affected Environment

4.8.2.1 | HISTORICAL LAND USES

San Francisco's diverse physical landscapes and land uses have contributed to defining districts that still exist today. The City has had mostly developed and urban land uses over the past 100 years. According to historical aerial photographs, land use patterns after 1938 showed commercial development intensifying near Presidio Avenue and Van Ness Avenue, replacing residential buildings.

The most significant land use changes occurred in the portion of the Geary corridor South of Market Street. During the 1950s, highway structures for the Embarcadero Freeway and San Francisco-Oakland Bay Bridge were constructed in this area. After 1974, industrial uses south of Market Street gradually changed to commercial and office uses. By 1993, portions of the Embarcadero Freeway were removed following damage from the 1989 Loma Prieta earthquake. According to the San Francisco Downtown Area Plan, numerous factors have contributed to rapid growth of office development in the South of Market area from the late 1990s to the present.

4.8.2.2 | PHYSICAL SETTING

DEFINITION

Hydrogeology:

Hydrogeology is the area of geology that deals with the distribution and movement of groundwater in the soil and rocks of the earth's crust

The Geary corridor has a wide range of hydrogeological conditions as it extends east-west across moderately hilly terrain near the north end of San Francisco. The direction that groundwater flows directly relates to the hydrogeological conditions of an area; thus, such conditions provide insight as to how potentially hazardous materials might travel in the event of a release. Elevations along the majority of the corridor typically vary from 125 feet to 275 feet above mean sea level (amsl) with an average elevation of 200 feet amsl. The highest elevations are near the west end (about 43rd Avenue) and near the central portion (near the intersection of Masonic Avenue and Geary Boulevard). Each area is approximately 270 feet amsl. The east terminus of the Geary corridor descends to slightly above sea level east of Market Street near the Transbay Transit Center.

The eastern half of the Geary corridor is in the Downtown groundwater basin. Based on topography, both surface and groundwater in this half would be expected to flow east toward San Francisco Bay. The western half of the Geary corridor is in the Lobos and Westside groundwater basins. Surface and groundwater in this area would be expected to flow west toward the Pacific Ocean.

The depth of the groundwater basin varies with topography. In the central portion of the Geary corridor, near Geary Boulevard and Arguello Boulevard, depth to groundwater is approximately 19 to 46 feet below ground surface (bgs). Depth to groundwater at the Transbay Transit Center area is approximately 12 feet bgs.

4.8.2.3 | SITE RECONNAISSANCE

The Geary corridor contains several types of business establishments that are typically associated with possible hazardous materials.

- **Corrosive material storage area.** One currently vacant storage area had a hazardous materials placard indicating the storage of corrosive materials.
- **Dry cleaners.** 17 clothing dry cleaners were identified in building frontages along portions of the Geary corridor. These businesses often use and dispose of industrial solvents used for dry cleaning, primarily tetrachloroethylene.
- **Gasoline stations.** Seven gasoline stations with USTs were identified along the Geary Street/Geary Boulevard portion of the Geary corridor.
- **Transportation facilities.** The San Francisco Municipal Transportation Agency (SFMTA) Presidio Division Bus Yard and the Transbay Temporary Terminal buildings were identified along the Geary corridor. These sites may potentially include vehicle fueling and maintenance areas which could use, store, and dispose of fuels, lubricants, and other hazardous materials.
- **Vehicle repair shops.** 18 vehicle repair shops were identified in building frontages along portions of the Geary corridor. These facilities typically use, store, and dispose of fuels, lubricants, solvents, and paints.

Land use types – Transbay Temporary Terminal, Beale Street & Howard Street

Land use types – Auto Body Experts 720 O'Farrell Street

4.8.2.4 | HAZARDOUS RELEASE RECORDS SEARCH

Regulated entities that generate hazardous waste are subject to waste accumulation, manifesting, and recordkeeping standards. Facilities that treat, store, or dispose of hazardous waste must comply with emergency procedures and must conduct remediation efforts to clean up the site in the event of a hazardous waste release. Known or potential sources of hazardous materials releases are described below relative to the Geary corridor.

4.8.2.4.1 HAZARDOUS MATERIALS STORAGE AND DISPOSAL

Underground and Aboveground Storage Tanks. Hazardous materials storage and disposal sites can be above or below ground and are registered with the SFDPH LOP, to store hundreds or thousands of gallons of petroleum products. The environmental database search identified 470 registered UST sites and 12 registered aboveground storage tank (AST) sites within one-eighth mile of the Geary corridor. The majority of these sites were listed as inactive, indicating that the storage tanks have been removed or were closed in-place.

Registered hazardous waste generators and handlers. These sites are registered under the federal RCRA to generate or handle hazardous wastes. Only those sites with significant, on-going hazardous waste generation (generating more than 100 kilograms [kg] of hazardous waste or more than one kg of acutely hazardous waste per month) are required to register under RCRA. The environmental database search identified 147 RCRA-registered hazardous waste facilities within one-eighth mile of the Geary corridor. Of these, 118 were small-quantity generators, registered to generate between 100 and 1,000 kg per month of non-acutely hazardous waste, and 18 sites were large-quantity generators (greater than 1,000 kg/month of hazardous waste, or more than one kg/month of acutely hazardous waste). The remaining 11 sites were registered hazardous materials handlers or transporters. These are businesses that do not generate hazardous waste but may transport or temporarily store such wastes.

4.8.2.4.2 FEDERAL HAZARDOUS MATERIALS SITES

These sites are overseen by US EPA and include National Priority List (NPL) sites, commonly referred to as Superfund sites, and Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) sites, which include sites evaluated by the US EPA for potential inclusion on the NPL. No sites within one-eighth mile of the Geary corridor were listed on the US EPA NPL list. However, one site was listed in the CERCLIS database. This site was screened in 2000, but no further action was required as no releases have been identified.

4.8.2.4.3 STATE HAZARDOUS MATERIALS SITES

These sites are listed on the State Department of Toxic Substances Control (DTSC) ENVIROSTOR database. ENVIROSTOR includes sites from a variety of State hazardous materials cleanup programs, as well as hazardous waste treatment facilities. Two sites were identified on the State ENVIROSTOR database within one mile of the Geary corridor, but are considered "case-closed" and no further action proposed by DTSC is required.

4.8.2.4.4 HAZARDOUS MATERIALS INCIDENT SITES

These sites have reported a one-time release of hazardous materials, generally due to an accident or equipment failure. A total of 48 sites within or in close proximity to the Geary corridor appear on the California Hazardous Materials Incident Reporting System (CHMIRS) and/or the federal Emergency Response Notification System. Most of these incidents involved small quantities of hazardous materials that were noticed and cleaned up immediately after reporting. None of the releases resulted in follow-up investigation or regulatory oversight.

4.8.2.4.5 RECOGNIZED ENVIRONMENTAL CONDITIONS (RECS)

DEFINITION

Recognized Environmental Conditions (RECs):

The presence or likely presence of hazardous substances or petroleum products on a property under conditions that indicate an existing release, past release, or a material threat of a release of hazardous substances on the property or into the ground, groundwater, or surface water of the property

An REC is the likely presence of any hazardous substances or petroleum products in, on, or at a property. The following factors determine whether a site could pose an REC: type of hazardous material, whether groundwater or soil was impacted, date of remedial actions, distance from project, topographic gradient, and groundwater depth. Three reported releases of hazardous materials have affected groundwater at/or near the Geary corridor. Of the three releases, two are from a leaking underground storage tank (LUST) site; one is from a spills, leaks, investigations, and cleanup (Spills, Leaks Investigation, and Cleanup [SLIC]) site.

A release of gasoline was reported at the Chevron Station 9-0535 site at 3675 Geary Boulevard (Figure 4.8-1). The release was discovered in January 1987 when all existing USTs and product piping were removed and replaced. Groundwater monitoring has been performed since that time. During three months from November 2009 to January 2010, groundwater batch extraction was used to remediate the site. Approximately 4,900 gallons of groundwater were extracted from the wells, which appears to have reduced the concentrations of Total Petroleum Hydrocarbons (TPH) as gasoline and benzene in groundwater. Monitoring is ongoing to evaluate the effectiveness of the remedial action. The most recent groundwater monitoring event, from March 2013, identified concentrations of TPH as gasoline at up to 41 mg/L and benzene at up to 13 mg/L, which were significantly elevated over the concentrations reported immediately after the remedial action. This suggests that additional remedial action may be required at this site. Groundwater from this site is flowing toward the northwest, toward the

adjacent intersection of Geary Boulevard and Arguello Boulevard. Accordingly, contaminants from this site may have migrated with the groundwater and affected the Geary corridor's subsurface conditions.

A release of diesel was reported at the World Communications, Inc. site at 450 Mission Street (Figure 4.8-2) in January 2013. A 2,000-gallon UST was removed from the site at this time, and although it was located in a concrete and brick vault, oily groundwater was discovered during the removal. After the oily water was removed, additional oily groundwater re-entered the vault. The oily water contained 11 mg/L of TPH as diesel and 13 mg/L of TPH as motor oil (SFDPH, 2013). The source of the contamination is not yet known. In April 2013, SFDPH LOP submitted a letter requesting an environmental investigation be performed at the site. No groundwater flow direction has been determined, so it is not known if contaminated groundwater at this site may have migrated and affected subsurface conditions within the Geary corridor.

Tetrachloroethylene (PCE) and related compounds have been identified in groundwater beneath a Kaiser Permanente Geary medical center, located at 2130 O'Farrell Street. This is believed to be a result of dry-cleaning operations conducted at the site from 1929 until 1951. The release was discovered in 1987, and interim groundwater extraction and treatment began in 1988. When a new parking structure was constructed at this location in 1991, a new groundwater extraction and monitoring system was installed.

4.8.2.4.6 OTHER ENVIRONMENTAL CONCERNS

The following other environmental concerns are sources of hazardous materials that could potentially pose a risk associated with implementation of the project alternatives.

DEFINITION

Other Environmental Concerns include aerially deposited lead, historical fill, lead-based paint, asbestos, etc.

Aerially-Deposited Lead. Lead alkyl compounds were first added to gasoline in the 1920s. Beginning in 1973, the US EPA ordered a gradual phase out of lead from gasoline that significantly reduced the prevalence of leaded gasoline by the mid-1980s. Prior to the 1970s, the US EPA estimated that vehicles emitted approximately 75 percent of the lead consumed in leaded gasoline as particulate matter in the exhaust. As a result, shallow soils within approximately 30 feet of the edge of pavement in roadway corridors have the potential to be contaminated with aerially deposited lead (ADL) from historical car emissions prior to the elimination of lead in gasoline.

Based on a review of historical aerial photographs, Geary Boulevard has been a major roadway since at least 1931, long before the phase-out of lead in gasoline. Therefore, exposed shallow soils, within and adjacent to the Geary corridor (approximately 30 feet of the edge of paved areas) could be contaminated with ADL.

DEFINITION

Polynuclear aromatic hydrocarbons (PAH) are natural and man-made pollutants that are created during incomplete combustion of coal, oil, or gas. Fumes from vehicle exhaust, for example, can produce PAHs

Historical Fill Material/Maher Ordinance. Much of the area near the eastern San Francisco waterfront was filled during the late 1800s and early 1900s with material of unknown origin. Some of this fill material has been found to contain elevated concentrations of contaminants such as metals and polynuclear aromatic hydrocarbons (PAH). As illustrated in Figure 4.8-3, there are several areas subject to the Maher Ordinance along the Geary corridor. The Maher Ordinance would require the preparation of a site history report for the Geary corridor, soil sampling and analysis, a soil analysis report, a site mitigation report (if needed), and certification that the measures recommended in the site mitigation report were implemented.

Lead and asbestos are state-recognized carcinogens, and lead is considered particularly harmful to reproductive functions

Lead-Based Paint and Asbestos in Structures. Structures in the Geary corridor that may be affected by the implementation of the build alternatives, such as bus shelters and the Fillmore Street pump station, are unlikely to be coated with lead-based paint and/or asbestos-containing materials. The use of lead paint and asbestos-containing materials in the United States began to be phased out in the 1970s and 1980s, and all bus shelters in the Geary corridor were replaced between 2009 and 2015. Some lead paint and asbestos-containing materials continue to be used for specialized uses, such lead chromate used in traffic paints and asbestos fibers used to strengthen specialized concrete components. The risk of exposure to lead-based paint and/or asbestos-containing materials during demolition or renovation of structures is considered to be low.

Naturally-Occurring Asbestos. Geologic mapping from the United States Geological Survey (USGS) shows that serpentinite bedrock underlies a portion of the Geary corridor between Masonic Avenue to the west and Broderick Street to the East. Serpentinite is a metamorphic rock that often contains naturally-occurring asbestos. Therefore, excavation in this area could encounter asbestos.

Yellow Striping – Arguello and Geary Boulevard

Yellow Traffic Striping and Pavement Markings. Until 2004, yellow thermoplastic and yellow paint for traffic striping and pavement marking contained lead and hexavalent chromium. The residue that may be produced from the yellow thermoplastic and yellow paint during road improvement activities may contain lead and hexavalent chromium concentrations that could produce toxic fumes when heated. If concentrations of lead or hexavalent chromium exceed hazardous waste thresholds, debris including removed striping/paint may need to be disposed of as a California and/or federal hazardous waste.

Figure 4.8-1 Leaking Underground Storage Tanks – 5th Avenue to Van Ness

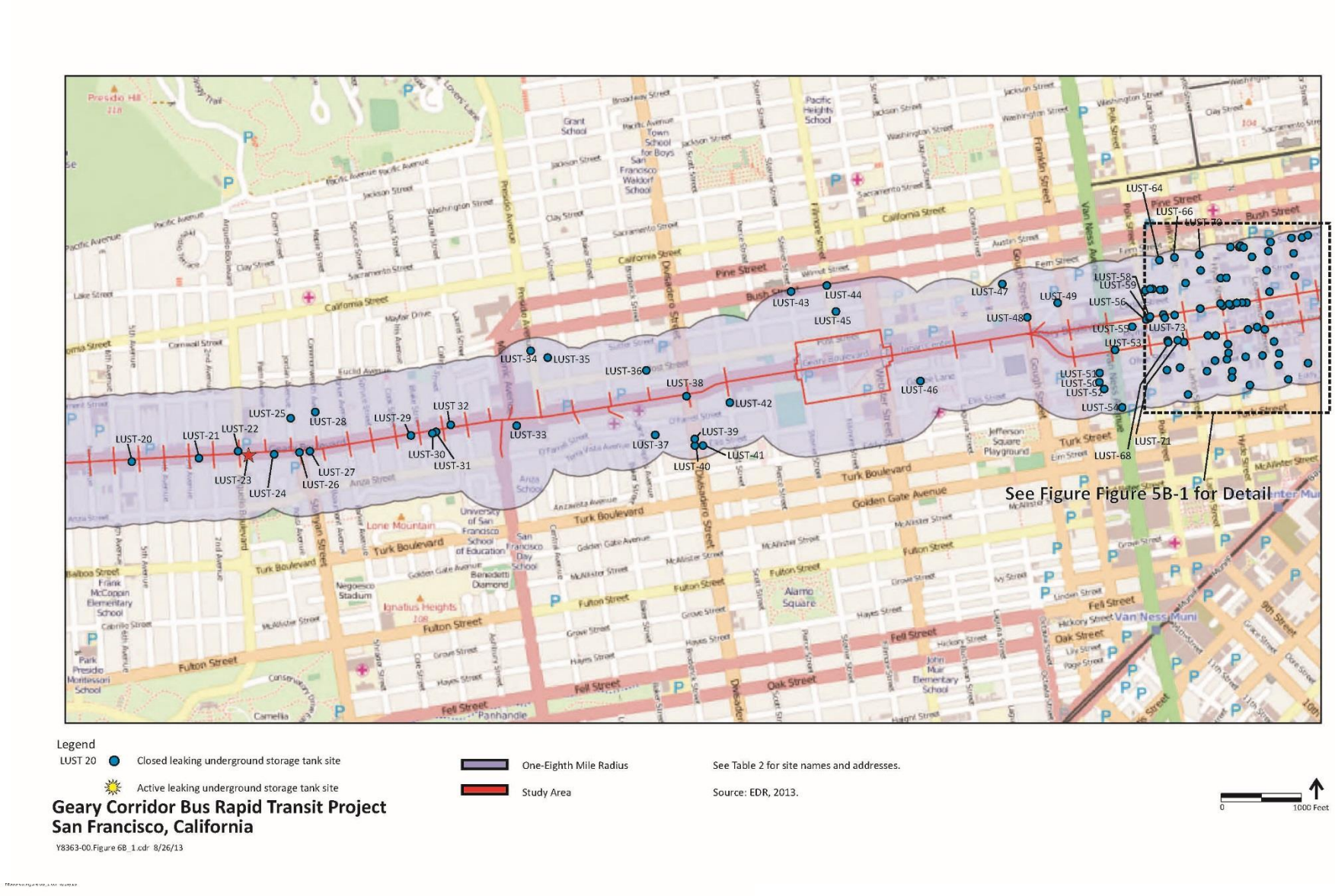


Figure 4.8-2 Leaking Underground Storage Tanks – Van Ness to Spear Street

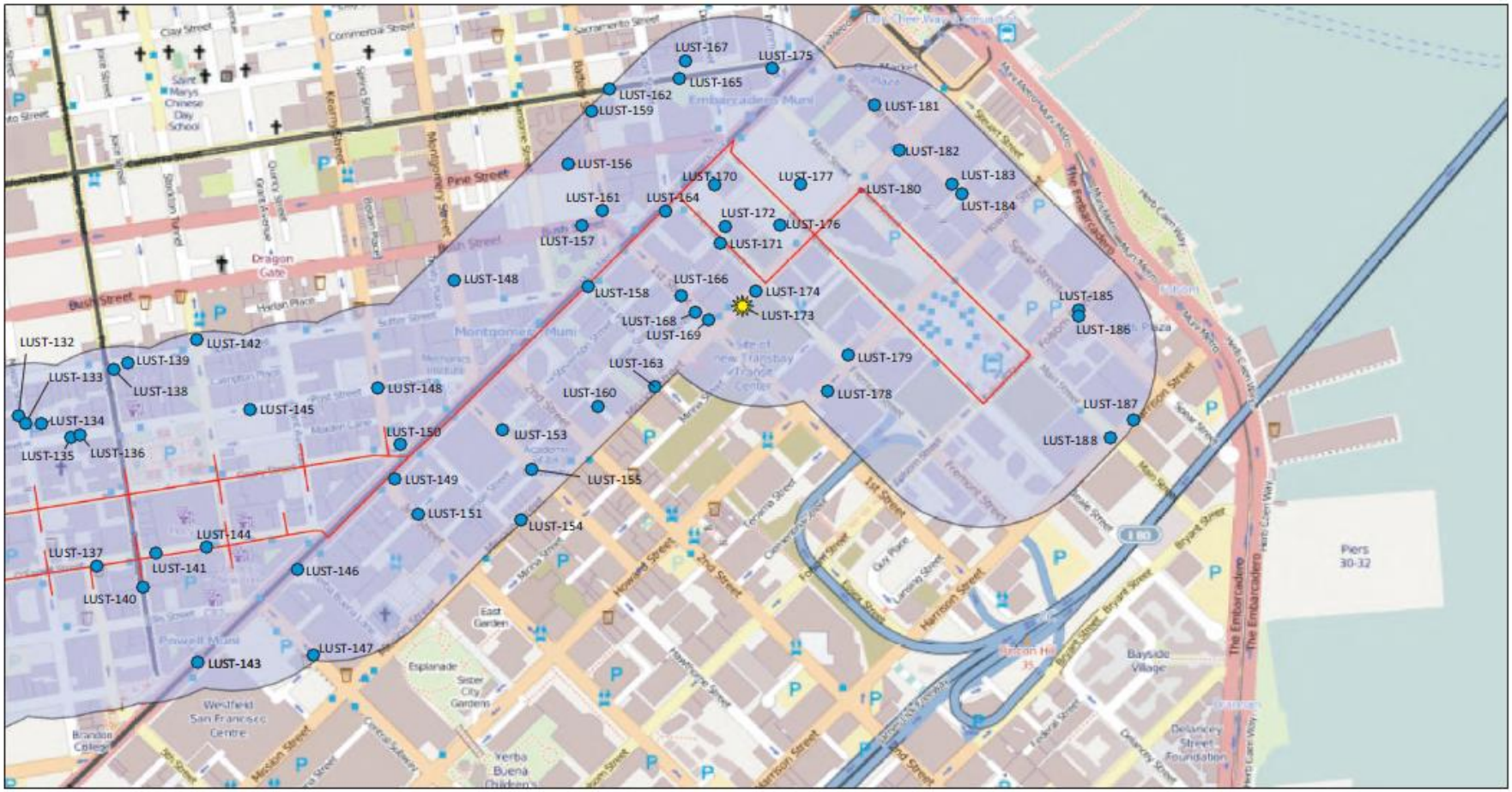
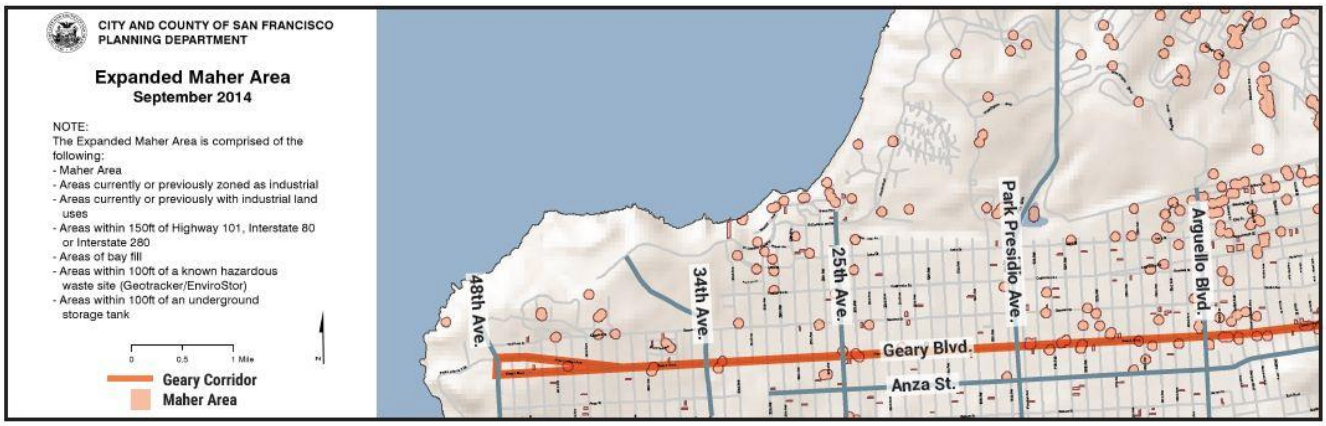


Figure 4.8-3 San Francisco Maher Map



4.8.3 | Methodology

Current land uses of the Geary corridor were assessed from a site reconnaissance performed on August 6, 2013. Also in 2013, a hazardous release records search (or ISA) was conducted for the project. The ISA included a review of standard environmental database listings of federal and state regulatory agencies that are responsible for recording release incidents of spills, soil, and other groundwater contamination. The ISA also identified transfer, storage, or disposal facilities that handle hazardous materials within the Geary corridor. Additionally, the ISA identified known or potential sources of hazardous materials releases that could potentially affect soils and/or groundwater beneath the Geary corridor. 2013 is therefore used as the environmental baseline for purposes of hazardous material evaluation.

The alternatives have the potential to result in construction period effects as noted below.

Construction-Related Effects

- Ground disturbing activities.
- Importing dirt and fill.

Operational Effects

The identified hazards and hazardous materials along the Geary corridor exist for all of the alternatives. Proposed construction earthwork activities are common to all of the alternatives and influence the level of exposure risks to such materials. However, each alternative would have varying levels of risk based on the anticipated construction areas and excavation depths as described below.

4.8.4 | Environmental Consequences

Overall, Table 4.8-1 summarizes the associated risk-level reported for the types of hazardous material releases and/or contamination within the Geary corridor, as determined by the Initial Site Assessment. In general, "high" risk land uses or conditions have potential for major remedial requirements (such as a pesticide manufacturing plant), "medium" risk land uses or conditions are those where contamination is likely but the level of contamination and remedial requirements are fairly well defined (such as gas stations or aerially deposited lead), and "low" risk land uses or conditions are the most routine or least likely hazardous materials conditions.[2]

Due to the long history of heavy vehicular activity along the Geary corridor, the soil in the medians may likely be contaminated with ADL from the exhaust of cars burning leaded gasoline. Additionally, due to the age of existing structures and urban history of the Geary corridor, lead-based paint may have been used on streetscape features. All bus shelters in the Geary corridor were replaced between 2009 and 2015, and therefore bus shelters are unlikely to contain lead-based paint or coatings, and the risk of exposure to lead paint during construction is considered to be low.

[2] Caltrans Environmental Handbook. Chapter 10. Available at: http://www.dot.ca.gov/ser/vol1/sec3/physical/ch10haz/chap10.htm#laws_reg_guidance.

This section describes potential impacts and benefits to hazards and hazardous materials. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 4.8.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding impacts to hazards and hazardous materials in the Draft EIS/EIR.

Table 4.8-1 Associated Risk Levels within the Geary Corridor

TYPE OF HAZARDOUS MATERIAL	LOW RISK	MEDIUM RISK	HIGH RISK
Reported hazardous material releases		X	
Aerially-deposited lead		X	
Contaminants in historic fill materials	X		
Naturally-occurring asbestos from bedrock		X	
Lead-based paint and asbestos containing materials on structures	X		
Lead and hexavalent chromium in yellow paint striping	X		

Source: Baseline Environmental Consulting, 2013

4.8.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: ANALYSIS OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe impacts related to hazards and hazardous materials during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe effects related to hazards and hazardous materials relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: Retention of the existing Webster Street pedestrian bridge would substantially reduce the extent of ground disturbance at this location, thereby reducing the risk of exposure to subsurface hazards and hazardous materials in this area. Therefore, retention of the bridge would not result in any new or more severe construction-period hazards exposure or risk.

Operation: As risks of exposure to hazards and hazardous materials are primarily related to construction and other ground-disturbing activities, operation of the project including the modification to retain the existing Webster Street pedestrian bridge would not pose a risk of uncovering hazardous materials. Therefore, this modification would not result in any new or more severe impacts related to hazards and hazardous materials during operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: Retention of the existing bus stops between Spruce and Cook streets would reduce the extent of construction activities and ground disturbance in the sidewalk areas at this location, thereby reducing the risk of exposure to hazards and hazardous materials in this area. Therefore, retention of the existing stops would not result in any new or more severe construction-period hazards exposure or risk.

Operation: As risks of exposure to hazards and hazardous materials are primarily related to construction and other ground-disturbing activities, operation of the project including the modification to retain the existing bus stops between Spruce and Cook streets would not pose a risk of uncovering hazardous materials. Therefore, this modification would not result in any new or more severe impacts related to hazards and hazardous materials during operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: Construction of additional pedestrian improvements would result in ground disturbance similar to that which would occur throughout the corridor. New pedestrian crossing bulbs typically require excavation to about 1.5 feet below ground surface; this minimal excavation would not be likely to expose/excavate substantial new quantities of contaminated soil and/or groundwater. To the extent any excavation uncovers hazardous material, all activities would be subject to the same minimization measures identified below in Section 4.8.5, which effectively avoid/minimize the potential for adverse effects. Therefore, this modification would not result in any new or more severe impacts related to hazards and hazardous materials during construction.

Operation: As risks of exposure to hazards and hazardous materials are primarily related to construction and other ground-disturbing activities, operation of the project including the modification to include additional pedestrian enhancements throughout the corridor would not pose a risk of uncovering hazardous materials. Therefore, this modification would not result in any new or more severe impacts related to hazards and hazardous materials during operation.

Addition of BRT Stops at Laguna Street

Construction: Construction of combined BRT/local stops at Laguna Street would result in the type of ground disturbance similar to that which would occur throughout the corridor, including excavation to create a base for the proposed transit boarding islands. All construction activity would be subject to the same minimization measures identified below in Section 4.8.5, which effectively avoid/minimize the potential for adverse effects. Therefore, this modification would not result in any new or more severe impacts related to hazards and hazardous materials during construction.

Operation: As risks of exposure to hazards and hazardous materials are primarily related to construction and other ground-disturbing activities, operation of the project including the modification to add BRT stops at Laguna Street would not pose a risk of uncovering hazardous materials. Therefore, this modification would not result in any new or more severe impacts related to hazards and hazardous materials during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: Retention of the existing bus stops at Collins Street would reduce the extent of construction activities and ground disturbance at this location, thereby reducing the risk of exposure to hazards and hazardous materials in this area. Therefore, retention of the existing stops would not result in any new or more severe construction-period hazards exposure or risk.

Operation: As risks of exposure to hazards and hazardous materials are primarily related to construction and other ground-disturbing activities, operation of the project including the modification to retain the existing bus stops at Collins Street would not pose a risk of uncovering hazardous materials. Therefore, this modification would not result in any new or more severe impacts related to hazards and hazardous materials during operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activates but would simply shift about half of it one block to the west. This modification would result in ground disturbance similar to that which would occur throughout the corridor; all such activities would be subject to the same minimization measures identified below in Section 4.8.5. Therefore, this modification would not result in any new or more severe impacts related to hazards and hazardous materials during construction.

Operation: As risks of exposure to hazards and hazardous materials are primarily related to construction and other ground-disturbing activities, operation of the project including the modification to shift the westbound bus lane transition one block to the west would not pose a new or more severe risk of uncovering hazardous materials. Therefore, this modification would not result in any new or more severe impacts related to hazards and hazardous materials during operation.

4.8.4.2 CONSTRUCTION EFFECTS

4.8.4.2.1 NO BUILD ALTERNATIVE – CONSTRUCTION EFFECTS

Under the No Build Alternative, transit and transportation facilities and services would remain unaltered except for changes that are currently planned or programmed to be implemented on the Geary corridor by 2020. .Proposed physical improvements on the Geary corridor by 2020 include modifications to road surface and curbs to provide better access for pedestrians. The No Build Alternative does not propose any modification to existing medians, but would require ground-disturbing activities from pavement resurfacing projects, pedestrian crossing bulb construction, curb ramp construction, etc. Such projects could potentially result in increased risk of exposure to hazardous materials. However, the potential for this increased risk is reduced by existing state and local regulatory requirements.

Alternative 3 and Alternative 3-Consolidated would require removal of medians, trees, and landscaping for the center-running bus-only lanes. Thus, Alternative 3 and 3-Consolidated would require the most ground-disturbing activities

4.8.4.2.2 BUILD ALTERNATIVES – CONSTRUCTION EFFECTS

Alternative 2 (Side-Lane BRT) proposes bus-only lanes in the rightmost lane of the Geary corridor. All BRT stations from 34th Avenue to Van Ness Avenue under Alternative 2 would be located on bus bulbs. Alternative 2 would not disturb existing medians, but would require ground-disturbing activities from pavement resurfacing projects, pedestrian crossing bulb construction, curb ramp construction, etc. Such projects could potentially result in increased risk of exposure to hazardous materials. Any hazardous materials encountered would be disposed of in accordance with applicable, federal, state, and local regulations.

Alternative 3 (Center-Lane BRT with Dual Medians and Passing Lanes) and Alternative 3-Consolidated (Center-Lane BRT with Dual Medians and Consolidated Bus Service) would convert the existing center lane to a bus-only lane. The existing medians, trees, and landscaping would be removed for the center-running bus lanes and new medians would be installed. Construction activities would potentially result in exposure risk from hazardous materials, ADL in the soil, naturally-occurring asbestos, lead, and other environmental concerns, listed in Table 4.8-1, as it would have the most ground-disturbing activities and construction in comparison to the other alternatives.

Additionally under Alternative 3 and 3-Consolidated, at Fillmore Street, the Geary corridor would be raised to create an at-grade roadway. This work would involve filling the existing underpass, thereby creating a new roadbed, removing part of the retaining walls, relocating existing utilities, and decommissioning the existing pump station. As a result, the proposed Fillmore underpass would involve importing of dirt and fill materials. All construction activities, including filling, would therefore trigger a requirement to comply with Section 2.4.53(d) of the City Public Works Code to ensure that fill materials are clean.

The Hybrid Alternative/LPA combines various segments of Alternatives 2 and 3-Consolidated and thus would have both side-running and center-running bus-only lanes, depending on location. Stations and stops would be located in the median where the bus lane is center-running and at bus bulbs where the bus lane is side-running. As a result, Hybrid Alternative/LPA would only disturb existing medians where the center-running bus lane would occur between 27th/28th Avenue and Palm Avenue. Construction activities would potentially result in exposure risk from hazardous materials, ADL in the soil, naturally-occurring asbestos, lead, and other environmental concerns, listed in Table 4.8-1, especially in areas where the Hybrid Alternative/LPA would remove existing medians. However, the Hybrid Alternative/LPA would avoid some potential risks to hazardous materials exposure associated with the Fillmore Street underpass, as the Fillmore Street underpass would remain in place.

Prior to excavation and construction, adherence to hazardous material guidelines for collection; disposal, handling, release, and treatment of hazardous material; site remediation; and worker safety and training would be required. In constructing any of the build alternatives, SFMTA, in consultation with SFDPH, would develop, prescribe, and update such hazardous material guidelines. The guidelines shall require any of the alternatives to comply with all federal, state, and local laws regarding hazardous material, including the Maher Ordinance.

4.8.4.3 | OPERATIONAL EFFECTS

4.8.4.3.1 NO BUILD ALTERNATIVE – OPERATIONAL EFFECTS

Under the No Build Alternative, transit and transportation facilities and services would remain unaltered except for changes that are currently planned or programmed to be implemented on the Geary corridor by 2020.

Adverse effects related to hazards and hazardous material are mostly due to construction and other ground-disturbing activities that would increase the potential risk of exposure to hazardous materials. Under the No Build Alternative, Geary bus service would continue and existing parking, through traffic, and turning vehicle-movements would remain unchanged. While improved bus technology, signaling, and pedestrian facilities would be in place, the risk of uncovering hazardous materials from operation of these improvements would be low.

4.8.4.3.2 BUILD ALTERNATIVES – OPERATIONAL EFFECTS

Implementation of the build alternatives would include designated bus-only lanes, improved bus service, enhanced bus technology, and installation of transit signal priority. Additionally, the build alternatives would include improved pedestrian facilities for safety, such as pedestrian crossing bulbs, curb ramps, and improved bus station amenities. Operation of these features would not pose a risk of uncovering hazardous materials as most risks associated with hazards and hazardous materials are related to construction.

4.8.4.4 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, after the No Build Alternative, Alternative 2 and the Hybrid Alternative/LPA would have the least potential to encounter hazardous materials during construction, followed by Alternatives 3 and 3-Consolidated. Once operational, none of the project alternatives would pose a risk of uncovering hazardous materials.

4.8.5 | Avoidance, Minimization, and/or Mitigation Measures

The following measures would be incorporated into the project to reduce or eliminate hazardous material-related effects. These measures are necessary in addition to compliance with all pertinent federal, state, and local regulations regarding hazardous materials.

4.8.5.1 | CONSTRUCTION MEASURES

MIN-HZ-C1. Prior to construction, a limited Preliminary Site Investigation shall be performed to investigate hazardous materials concerns related to soil, groundwater, and construction materials on the Geary corridor, as identified in this section.

Areas where soils will be disturbed during construction shall be sampled and tested for contaminants specific to the hazardous materials concerns identified in that location. Soil analytical results shall be screened against the Regional Water Board's Environmental Screening Levels and other applicable risk-based standards to determine appropriate actions to ensure the protection of construction workers, future site users, and the environment and also be screened against state and federal hazardous waste thresholds to determine soil management options. Representative

samples of exposed shallow soils shall be collected within 30 feet of the edge of the roadway and analyzed for total lead and soluble lead. For example, aerially-deposited lead is a potential concern throughout the Geary corridor, while naturally-occurring asbestos is potentially present in only a small portion of the Geary corridor. Accordingly, samples in all areas shall be analyzed for total and soluble lead; samples from excavation areas overlying serpentinite bedrock shall also be analyzed for asbestos. Additional investigation may be required to fully evaluate potential hazardous materials issues if concerns are identified during the Preliminary Site Investigation. All environmental investigations at the project shall be provided to project contractors, so the findings may be incorporated into their Health and Safety and Hazard Communication Programs.

MIN-HZ-C2. Prior to construction, groundwater shall be collected in areas near reported hazardous materials release sites and analyzed for TPH and volatile organic compounds if project excavations were to extend into the groundwater in those areas. Hazardous materials release sites that have affected groundwater near the Geary corridor are located at 3675 Geary Boulevard, 450 Mission Street, and 2130 O'Farrell Street.

Additional hazardous materials releases may occur or be discovered in the future. Therefore, an updated review of regulatory agency records shall be conducted prior to the groundwater investigation, to ensure that groundwater that will be encountered during construction is properly investigated.

MIN-HZ-C3. A Hazardous Building Materials survey shall be conducted prior to construction. The survey shall minimally sample traffic paint and structures to be demolished or modified.

MIN-HZ-C4. Based on the findings and recommendations of the Preliminary Site Investigation, the project may need to implement special soil, groundwater, and construction materials management and disposal procedures for hazardous materials, as well as construction worker health and safety measures during construction. In addition to the findings and recommendations of the Preliminary Site Investigation, the following measures shall be implemented prior to construction.

- Groundwater from dewatering of excavations, if any, should be stored in Baker tank(s) during construction activities and the water should be characterized prior to disposal or recycling.
- A construction risk management plan should be implemented by contractors with procedures for identifying and mitigating potentially unreported releases of hazardous materials.

4.8.5.2 | OPERATIONAL MEASURES

Operation of any of the build alternatives would not include ground-disturbing activities that would increase the risk of exposure of hazards and hazardous materials. As a result, no operational avoidance, minimization, and/or mitigation measures are required.

4.9 Hydrology and Water Quality

This section summarizes the potential for the project alternatives to adversely affect hydrologic and water resources. The section includes measures to avoid, minimize, and mitigate effects to such resources. The analysis is based on review of preliminary project design documents, publicly available regional hydrologic resources from federal, state, and local sources, and policy documents, such as the City of San Francisco *Better Streets Plan* (2011).

The pink area in the above map denotes the San Francisco Francisco Bay Area groundwater basin

4.9.1 | Regulatory Setting

4.9.1.1 | FEDERAL REGULATIONS

4.9.1.1.1 CLEAN WATER ACT [33 U.S.C. SECTION 1251 ET SEQ.]

The major federal legislation governing water quality is the Clean Water Act (CWA). The objective of the CWA is "to restore and maintain the chemical, physical, and biological integrity of the nation's waters" (CWA, Section 101(a)). The CWA prohibits point discharges of pollutants to waters of the United States, unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The U.S. Environmental Protection Agency (US EPA) has granted the State of California primacy in administering and enforcing the provisions of the CWA and the NPDES Permit Program. The State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards issue both general and individual NPDES permits for certain activities that may result in discharges of pollutants to surface waters (discussed in more detail below).

Sections 303 and 304 of the CWA require states to promulgate water quality standards, criteria, and guidelines. Section 303(d) specifically regulates impaired water bodies and requires each state to identify waters that will fail to achieve water quality standards even after maintaining effluent standards, and to enact improvement plans. Each state must develop load-based (rather than concentration based) limits called total maximum daily loads (TMDL) for each water body and pollutant for which water quality is considered impaired.

Section 404 of the CWA limits the amount of dredged or fill material that can be placed into waters of the United States, including wetlands. Section 401 of the CWA stipulates that any action that requires a federal license or permit and that may result in a discharge of pollutants into waters of the United States also requires a water quality certification.

4.9.1.1.2 EXECUTIVE ORDER 11988: FLOODPLAIN MANAGEMENT

Executive Order 11988, as amended, was issued in 1977 and requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Executive Order 13690 had amended Executive Order 11988, but was revoked by a subsequent Executive Order in August 2017. Executive Order 11988 remains in place as of January 2018.

4.9.1.2 | STATE REGULATIONS

4.9.1.2.1 PORTER-COLOGNE WATER QUALITY CONTROL ACT [CALIFORNIA WATER CODE SECTION 13000 ET SEQ.]

The Porter-Cologne Water Quality Control Act established the SWRCB and divided the state into nine regional basins, each with a water board. The SWRCB is the primary state agency responsible for protecting the quality of the state's surface and groundwater supplies, while the regional boards are responsible for developing and enforcing water quality objectives and implementation plans.

4.9.1.3 | LOCAL REGULATIONS

4.9.1.3.1 REGIONAL WATER QUALITY CONTROL BOARD

The Geary corridor lies within the jurisdiction of the San Francisco Bay Regional Water Quality Control Board (Water Board), which has adopted the *San Francisco Bay Basin Water Quality Control Plan* (Basin Plan) to implement plans, policies, and provisions for water quality management. The Water Board is responsible for protecting the beneficial uses of water resources within the San Francisco Bay Region using planning, permitting, and enforcement authorities to meet this responsibility. The Water Board adopted its Basin Plan in 1995 and most recently amended it in December 2011.

The Water Board is also responsible for administration and enforcement of NPDES permits for San Francisco. These include the Construction General Permit (Order 2009-0009-DWQ) which covers development that disturbs one or more acre and the permits governing City sewer discharges to both oceanside (Order R2-2009-0062) and bayside (Order R2-2008-0007) waters, as well as Waste Discharge Requirements for the City's wastewater treatment facilities (Order R2-2002-0073).

4.9.1.3.2 SAN FRANCISCO LAWS, REGULATIONS, AND POLICIES

The San Francisco Public Utilities Commission (SFPUC) is responsible for managing water and wastewater services within San Francisco. SFPUC has developed the *Sewer System Master Plan*, which describes and implements an Integrated Urban Watershed Management approach for managing wastewater, stormwater, and biosolid collection and treatment. SFPUC has also developed *Stormwater Design Guidelines*, which apply to development within San Francisco. These guidelines encourage the use of low-impact design (LID) to comply with stormwater management requirements. LID measures are designed to reduce and delay the volumes and peak flows of stormwater reaching the San Francisco sewer system, thereby reducing combined sewer discharges, preventing flooding, and improving water quality.

Regulations included in the San Francisco Green Building Ordinance (enacted as part of the San Francisco Building Code) address stormwater management by seeking to reduce impervious cover, promote infiltration, and capture and treat 90 percent of the runoff from an average annual rainfall event using acceptable Best Management Practices (BMPs). These regulations require that projects implemented on previously developed sites reduce runoff from existing levels. These requirements apply to any project that disturbs more than 5,000 square feet of impervious surface, but do not apply to surface pavement maintenance activities or utility repair work.

RESOURCES

For more information on the Clean Water Act, visit:
http://www2.epa.gov/laws-regulations/summary-clean-water-act

To learn more about California Water Boards, visit:
www.waterboards.ca.gov

To learn more about the Better Streets Plan, visit:
http://www.sf-planning.org/ftp/BetterStreets/index.htm

Tree Basin – an example of LID that allows stormwater runoff to infiltrate into the soil, thereby reducing runoff volume and peak flows.

Any of the build alternatives would be expected to disturb at least 5,000 square feet of impervious surface area and would likely be required to adhere to the San Francisco Green Building Ordinance.

Article 2.4 of the San Francisco Public Works Code contains detailed requirements for excavation within the public right-of-way. These include requiring that transit projects within the public right-of-way incorporate LID stormwater facilities consistent with SFPUC *Stormwater Design Guidelines* to the maximum extent practicable and feasible (Article 2, Section 2.4.13(7)).

The *Better Streets Plan* was developed to provide a unified set of standards, guidelines, and implementation strategies for San Francisco's pedestrian environment, the portion of the streetscape outside of vehicle lanes. Section 6.2 describes a number of stormwater control elements that may be incorporated into development projects. These include permeable paving, bioretention facilities, swales, channels and runnels, infiltration trenches, infiltration boardwalks, vegetated gutters, and vegetated buffer strips. By incorporating these elements early in project design, such features may become integral, aesthetic parts of the streetscape, in addition to serving their stormwater management role.

Standard streetscape improvements outlined in the *Better Streets Plan*

4.9.2 | Affected Environment

4.9.2.1 | HYDROLOGIC SETTING

As shown in Figure 4.9-1, the western part of the Geary corridor is located in the Sunset and Richmond watersheds; the eastern part is in the Channel and North Shore watersheds. There are no natural surface water bodies, wetlands, or streams in the Geary corridor. The Geary corridor is almost entirely covered with impervious surfaces, with the exception of landscaped center medians and some street trees and landscaping on sidewalks. There are no waters of the United States in the Geary corridor or that would be affected by modifications to the Geary corridor. Therefore, neither a Section 404 permit nor a Section 401 water quality certification would be required for any of the project alternatives.

In general, stormwater runoff in the City is captured by the network of 23,000 catch basins within the City's combined sewer system. From there, water is transported via transport/storage structures to City water treatment plants (Figure 4.9-2). The Oceanside and Southeast treatment plants operate year-round, while the North Point Wet Weather facility operates only when heavy rains occur. These plants provide full secondary treatment of dry-weather flows and the equivalent of primary treatment prior to discharge to the Pacific Ocean or San Francisco Bay, which are the receiving waters for runoff from the Geary corridor (Figure 4.9-2).

Central and South San Francisco Bay has been designated as an impaired water body under Section 303(d) of the CWA. TDMLs have been established for mercury and are being developed for other contaminants. Table 4.9-1 illustrates pollutant stressors identified in Central and South San Francisco Bay.

DEFINITIONS

WATERSHED: An area of land where all of the water that is under it – or rains off of it – goes into the same outlet

IMPAIRED WATER BODY: A waterbody (i.e., stream reaches, lakes, waterbody segments) with chronic or recurring monitored violations of the applicable numeric and/or narrative water quality criteria

Table 4.9-1 Federal 303(d) List of Impairments for Central and South San Francisco

POLLUTANT STRESSOR	POTENTIAL SOURCE	CURRENT STATUS
Chlordane	Nonpoint source	TMDL required
DDT	Nonpoint source	TMDL required
Dieldrin	Nonpoint source	TMDL required
Dioxin Compounds	Atmospheric deposition	TMDL required
Exotic species	Ballast water	TMDL required
Furan compounds	Atmospheric deposition	TMDL required
Mercury	Atmospheric deposition, industrial point sources, municipal point sources, natural sources, nonpoint source, resource extraction	Being addressed by EPA-approved TMDLS
PCBs	Unknown nonpoint source	TMDL required
Selenium	Agriculture, exotic species, industrial point sources, and natural sources	TMDL required

TMDL – total maximum daily load; PCBs – polychlorinated biphenyls

4.9.2.2 | FLOODPLAINS

Per Figure 4.9-3, the Geary corridor is not within any mapped flood hazard zone, nor is it in an area that would be inundated by the failure of a dam or reservoir.

The Geary corridor is not located within any mapped flood hazard zones nor is it located in an area that would be inundated by the failure of a dam or reservoir

It is anticipated that coastal flooding hazards will increase in the future as a result of sea level rise generated by global climate change. However, the Geary corridor is not in an area projected to be affected by the 16-inch sea level rise anticipated by 2050, or the 55-inch sea level rise anticipated by 2100.[1] These future modeling years are beyond the scope of analysis for purposes of this Draft EIS/EIR.

4.9.2.3 | GROUNDWATER SETTING

As shown on Figure 4.9-4, the western portion of the Geary corridor is located within the Lobos and Westside groundwater basins, while the eastern portion is located in the Downtown San Francisco basin. The Basin Plan states that groundwater from these basins has existing beneficial uses for municipal, domestic, and agricultural water supply and potential beneficial uses for industrial process and service water supply.

A review of California Geologic Survey (CGS) data indicates that depth to groundwater is typically about 50 feet below ground surface (bgs) in the western portion of the Geary corridor, rising to about 10 to 30 feet bgs in the eastern portion. Groundwater may be encountered at shallower depths, particularly during seasonal variations and other variations related to localized groundwater use.

At the Geary Boulevard underpass of Fillmore Street, an underground pump station extracts groundwater to keep the underpass from flooding. This creates a localized depression in groundwater levels. Depth of groundwater at this location is naturally

[1] San Francisco Bay Conservation and Development Commission. *San Francisco Bay Scenarios for sea level rise*. Available at: http://www.bcdc.ca.gov/planning/climate_change/index_map.shtml.

about 14 feet bgs, but pumping draws it down to about 30 feet bgs. Based on available data, this groundwater depression appears to extend approximately 40 to 50 feet north and south of Geary Boulevard, but may extend further.

Groundwater flow direction would be expected to vary with topography. In general, groundwater in the Lobos and Westside basins would be expected to flow to the west-northwest, toward the Pacific Ocean, while groundwater in the Downtown basin would be expected to flow to the east, toward San Francisco Bay.

4.9.3 | Methodology

The alternatives were evaluated for potential effects related to hydrology and water quality within the broader hydrological landscape of the region, as previously described. The alternatives have the potential to result in construction period and/or operational period effects as noted below.

Construction-Related Effects

- Change in impervious surface area
- Soil disturbance/excavation
- Change in groundwater elevation

Operational-Related Effects

- Changes in quantity/quality of stormwater runoff

Potential effects related to the hydrologic systems and activities listed above were evaluated in terms of changes to the impervious surface areas, stormwater runoff modification and requirements, quantities of soil disturbance and excavation, and changes to groundwater elevations and any groundwater demand.

The analysis considered the hydrologic environment existing in the Geary corridor and its surrounding hydrologic area.

4.9.4 | Environmental Consequences

The following section evaluates the potential for adverse hydrology and water quality effects to occur from the alternatives and determines whether any of the alternatives would result in an adverse effect related to hydrology and water quality. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 4.9.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding hydrology impacts in the Draft EIS/EIR.

4.9.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);

3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any any new or more severe hydrology effects during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe effects to hydrology and water quality relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: Because the retention of the existing Webster Street bridge would reduce the level of construction (i.e., demolition) in this location, the potential for adverse effects to water quality, such as construction-period runoff, would be reduced. Therefore, this modification would not result in any new or more severe impacts to hydrology and water quality during construction.

Operation: The modification to retain the Webster Street bridge would not increase the amount of impervious surfaces relative to what was described in the Draft EIS/EIR, the existing bridge would not be demolished. Therefore, this modification would not result in any new or more severe impacts to hydrology and water quality during operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: Because the retention of the existing bus stops between Spruce and Cook streets would reduce the level of construction in this location, the potential for adverse effects to water quality, such as construction-period runoff, would be reduced. Therefore, this modification would not result in any new or more severe impacts to hydrology and water quality during construction.

Operation: The modification to no longer add BRT stops between Spruce and Cook streets would not increase the amount of impervious surfaces relative to what was described in the Draft EIS/EIR, as the existing local/express bus stops would remain in place. Therefore, this modification would not result in any new or more severe impacts to hydrology and water quality during operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: The installation of additional pedestrian improvements would require additional locations throughout the corridor for excavation (approximately 1.5 feet in depth), but adherence to standard construction practices and best management practices would limit the potential for substantial additional quantities of construction-period runoff. The expected maximum depth of excavation (1.5 feet) would not be expected to affect any below-ground water resources, as such resources are typically found at much greater depths. Therefore, this modification would not result in any new or more severe impacts to hydrology and water quality during construction.

Operation: Operation of additional pedestrian enhancements would not increase the amount of impervious surfaces relative to what was described in the Draft EIS/EIR, as pedestrian enhancements would be located on paved areas within the

existing transportation right of way. Therefore, this modification would not result in any new or more severe impacts to hydrology and water quality during operation.

Addition of BRT Stops at Laguna Street

Construction: The addition of BRT stops at Laguna Street would entail the removal of existing bus shelter structures on the sidewalks and construction of new transit islands. Construction activities would be similar to those which would occur for construction of other BRT stops along the Geary corridor. Adherence to the SWPPP, best management practices, and minimization measures identified in Section 4.9.5 would limit the potential for substantial additional quantities of construction-period runoff at Laguna Street. Therefore, this modification would not result in any new or more severe impacts to hydrology and water quality during construction.

Operation: Operation of BRT stops at Laguna Street would not increase the amount of impervious surfaces relative to what was described in the Draft EIS/EIR, as the transit islands would be located on paved areas within the existing transportation right-of-way. Therefore, this modification would not result in any new or more severe impacts to hydrology and water quality during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: Because the retention of the existing bus stops at Collins Street would reduce the level of construction in this location, the potential for worsened effects to water quality, such as construction-period runoff, would be reduced. Therefore, this modification would not result in any new or more severe impacts to hydrology and water quality during construction.

Operation: The modification to retain the existing local/express bus stops at Collins Street would not increase the amount of impervious surfaces relative to what was described in the Draft EIS/EIR, as the existing local/express bus stops would remain in place. Therefore, this modification would not result in any new or more severe impacts to hydrology and water quality during operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities but would simply shift about half of it one block to the west. Therefore, this modification would not result in any new or more severe impacts to hydrology and water quality during construction.

Operation: The relocation of the westbound bus lane transition would not increase the amount of impervious surfaces relative to what was described in the Draft EIS/EIR, as the modification would occur on the existing paved roadway surface. Therefore, this modification would not result in any new or more severe impacts to hydrology and water quality during operation.

4.9.4.2 | CONSTRUCTION EFFECTS

4.9.4.2.1 NO BUILD ALTERNATIVE - CONSTRUCTION EFFECTS

Improvements associated with the No Build Alternative are comprised of physical infrastructure and transit service changes associated with other City projects that are either planned or programmed to be implemented in the Geary corridor by the year 2020.

Excavation presents the greatest potential for adverse hydrologic effects during construction. None of the No Build improvements would require extensive excavation, so no adverse effects to hydrology/water quality would be anticipated.

4.9.4.2.2 BUILD ALTERNATIVES HYDROLOGIC EFFECTS - CONSTRUCTION EFFECTS

The Geary corridor is almost entirely covered with impervious surfaces, with the exception of existing landscaped center medians and tree and landscape plantings along sidewalks. Table 4.9-2 shows the estimated areas of disturbed soil during construction and the changes in impervious surface area that would result from implementation of each of the build alternatives. Disturbed soil area includes only those areas where native soil or fill material would be exposed during construction and does not include areas where construction activities would not penetrate the pavement.

Table 4.9-2 Disturbed Soil and Impervious Surface Areas Under Project Alternatives[a]

PROJECT SEGMENT	DISTURBED SOIL AREA (ACRES)[b]			IMPERVIOUS SURFACE AREA (ACRES)			
					CHANGES IN IMPERVIOUS SURFACE AREA		
	ALTERNATIVE 2	ALTERNATIVE 3 OR 3-CONSOLIDATED	HYBRID ALTERNATIVE /LPA	EXISTING IMPERVIOUS SURFACES (ACRES)	ALTERNATIVE 2	ALTERNATIVE 3 OR 3-CONSOLIDATED	HYBRID ALTERNATIVE /LPA
48th Ave - 33rd Ave	0.0	0.0	0.0	15.3	0.0	0.0	0.0
33rd Ave - 27th Ave	0.2	0.1	0.2	5.9	0.0	-0.1	-0.1
27th Ave - Jordan Ave	0.5	6.8	6.5	24.6	0.0	-0.4	-0.3
Palm Ave - Baker St/Broderick St	0.5	3.6	0.7	13.1	-0.1	-0.1	-0.1
Baker St/Broderick St - Scott St/Pierce St	0.2	1.5	0.2	4.2	0.0	0.1	0.0
Scott St/Pierce - Laguna St	0.4	3.6	0.4	7.9	0.0	-0.3	0.0
Laguna St - Cleary Ct/Gough St	0.0	0.2	0.0	1.3	0.0	0.0	0.0
Cleary Ct/Gough St - Van Ness Ave	0.0	0.0	0	5.1	0.0	0.0	0.0
Van Ness Ave - Market St	1.0	1.2	1.0	17.0	0.0	0.0	0.0
Market St-Transbay Terminal	0.0	0.0	0.0	5.6	0.0	0.0	0.0
TOTAL	2.8	17.0	9.0	100	-0.1	-0.9	-0.5

a Areas are approximate and may change as project design progresses. Totals may not match the sum of the segments due to rounding.
b Disturbed soil area includes all planned areas of construction that will disturb native soil and fill within the study area.
Source: C. Subrizi, personal communication, October, 2013

As shown in Table 4.9-2, Alternative 2 (Side-Lane BRT) would require a relatively small area of soil disturbance (about 3 acres).

In comparison, Alternatives 3 (Center-Lane BRT with Dual Medians and Passing Lanes) and 3-Consolidated (Center-Lane BRT with Dual Medians and Consolidated Bus Service) would disturb the greatest soil area (about 17 acres) due to removal of existing landscape medians and construction of new dual medians, which have a combined width greater than the existing single median.

The Hybrid Alternative/LPA would disturb about 9 acres of soil, less than Alternatives 3 and 3-Consolidated, but more than Alternative 2.

4.9.4.2.3 BUILD ALTERNATIVES WATER QUALITY EFFECTS– CONSTRUCTION EFFECTS

The greatest potential for adverse effects to water quality would be during construction, when soils are exposed and may be entrained in runoff, resulting in sediment in the combined sewer system as well as erosion within the study area. Each of the build alternatives would require excavation, though Alternatives 3 and 3-Consolidated would require the most extensive earthmoving activities due to the filling of the Fillmore underpass. Implementation of a Storm Water Pollution Prevention Plan (SWPPP) that identifies construction site BMPs required under the Construction General NPDES Permit would minimize potential effects for each of the build alternatives.

4.9.4.2.4 BUILD ALTERNATIVES GROUNDWATER EFFECTS – CONSTRUCTION EFFECTS

With a few exceptions relative to Alternatives 3, 3-Consolidated and the Hybrid Alternative/LPA, as described below, generally shallow excavations (approximately 5 to 10 feet deep) would be required for the installation of physical project features of all of the build alternatives. Such features include bus stop amenities, landscaping features, and related equipment. Based on the groundwater depths presented in Section 4.9.2.3, excavation to these relatively shallow depths would be highly unlikely to encounter groundwater. Groundwater elevation may fluctuate from existing conditions as a result of any low-impact development improvements (rain gardens, etc.) that may be implemented as part of any build alternative. Should groundwater be encountered during excavation activities, consistent with all applicable federal and state regulations, the water would be pumped from the excavated area, contained and treated before being discharged, most likely to the existing local (combined) sewer system. SFPUC requires a batch discharge permit prior to commencement of discharge to the combined sewer system.

Figure 4.9-1 Watershed Map

Figure 4.9-1: Watershed Map

Figure 4.9-2 City Combined Sewer System

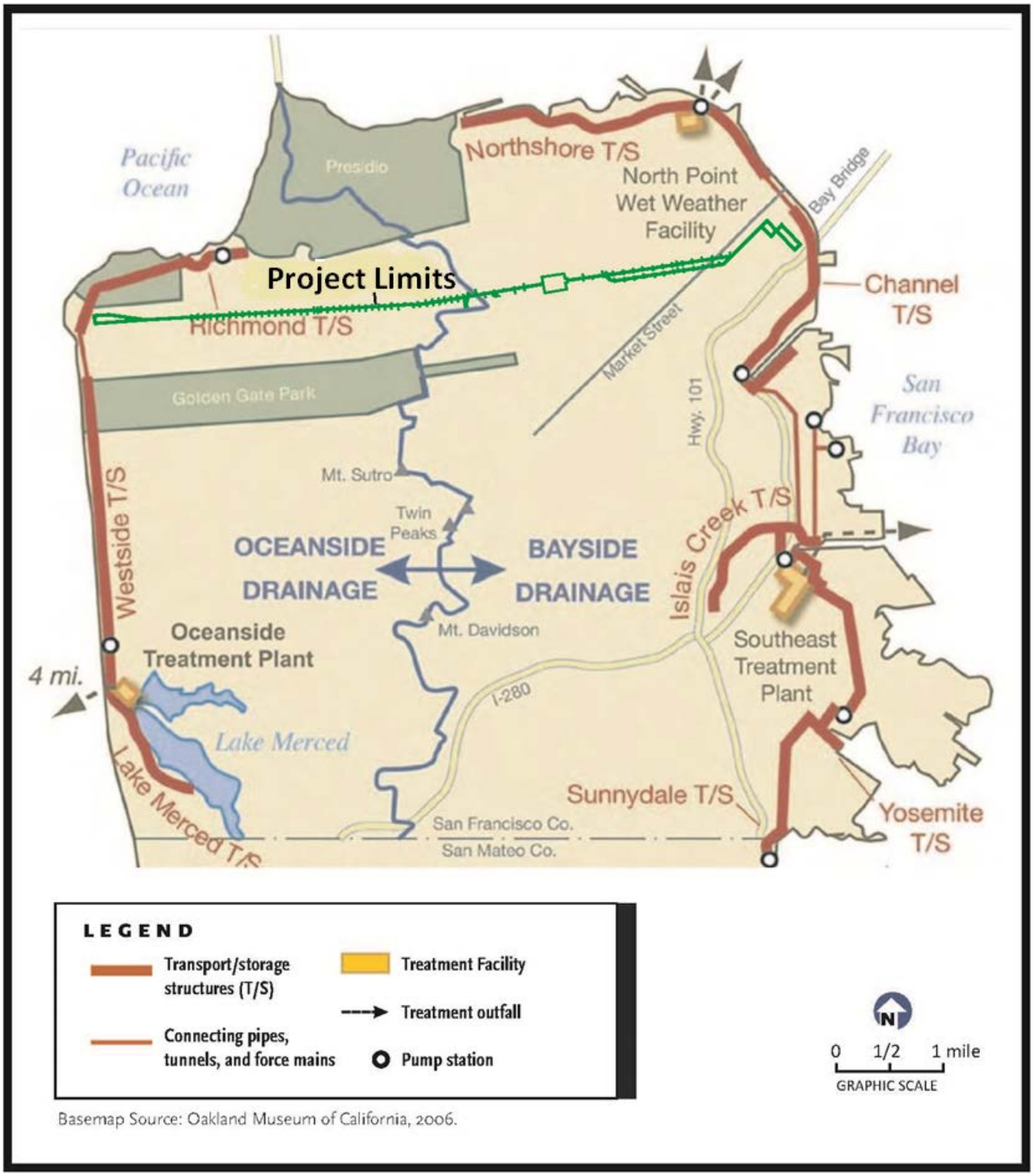


Figure 4.9-3 Flood Hazard Areas

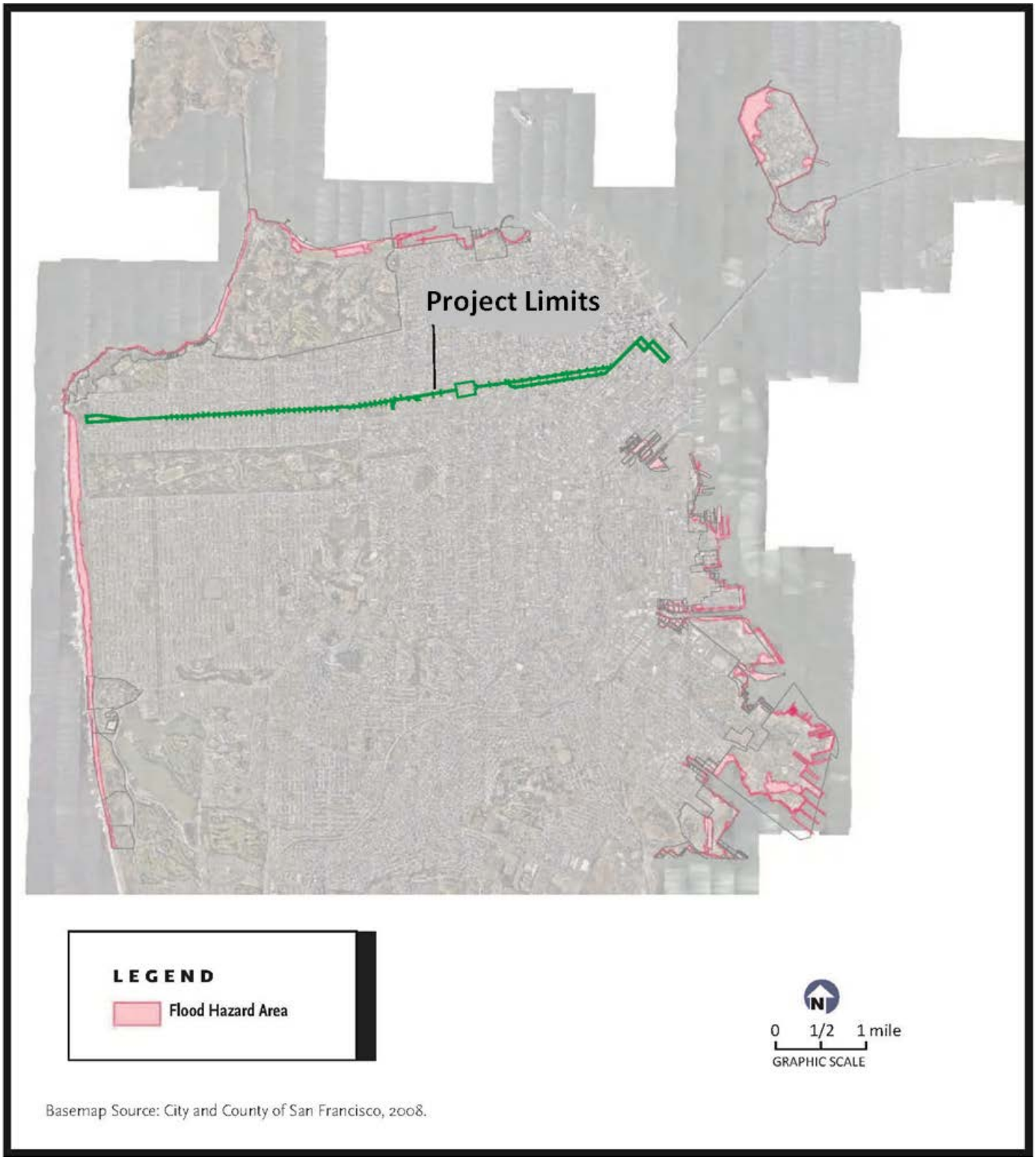
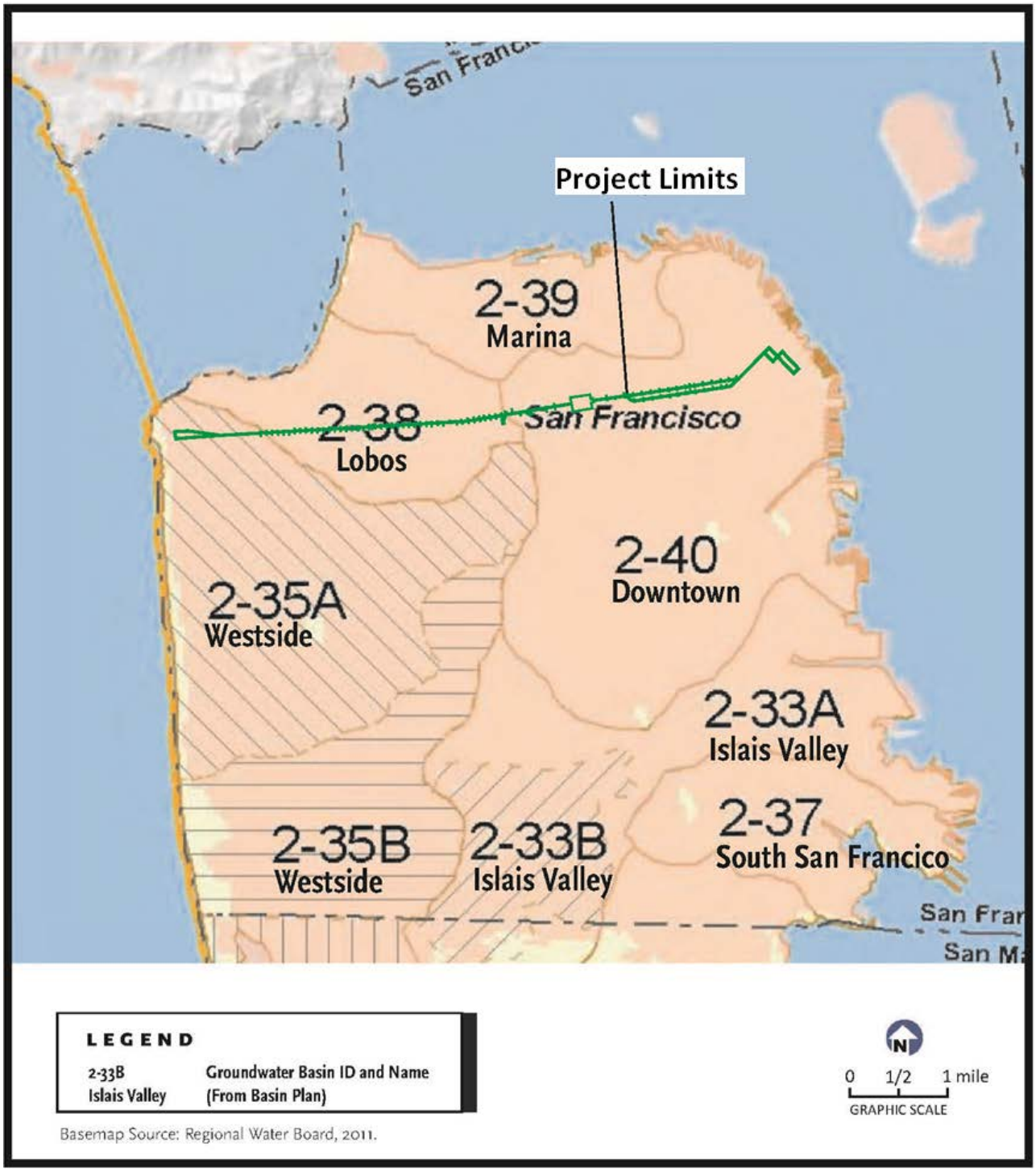


Figure 4.9-4 Groundwater Basins



It is assumed Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA would also require two sewer line relocations in the western part of the Geary corridor. As described in Section 2.3.4.2, the sewer infrastructure in this location is at a relatively shallow depth. However, in this area, depth to groundwater is approximately 50 feet below ground surface, far deeper than the sewer infrastructure. As noted in Section 4.6.3.2.5, some other utility relocations may be necessary where conflicts with new bus facilities might result. However, such relocations would be lateral - utilities would be relocated to nearby sites. Therefore, no adverse groundwater effects would be anticipated from sewer or utility relocation.

Alternatives 3 and 3-Consolidated would involve filling the underpass at Fillmore Street and decommissioning the existing pump station north of Geary Boulevard. These actions would allow groundwater in the immediate vicinity of the pump station to return to its natural elevation. This would result in a beneficial effect to groundwater resources, as the amount of groundwater available for beneficial uses in the study area would increase. However, allowing the groundwater elevation in this area to rise from its current level (approximately 30 feet bgs) to its natural elevation (14 feet bgs), has the potential to adversely affect underground structures (at depths greater than 14 feet bgs) located within two blocks of the pump station. Such structures include building basements and utility trenches. A groundwater rise in this area could lead to adverse effects including but not limited to water intrusion and related building and property damage. Groundwater elevation may rise further as a result of any LID improvements that may be implemented as a part of the project.

In November 2013, such potentially affected underground buildings and structures were identified by a site reconnaissance and review of available City records. Potentially affected structures were considered to be those constructed after 1961, when the underpass was opened, and with subterranean levels deeper than 15 or 20 feet bgs. Only buildings within two blocks of the pump station were considered, as the groundwater elevation beyond that distance is not affected by the pump station and thus would not be affected by removal of the pump station.

The site reconnaissance and review determined that utilities were not deeper than ten feet, and therefore would not be affected by a rise in groundwater level to around 14 feet bgs. Seven buildings within two blocks of the pump station and constructed after 1961 were determined to have subterranean levels, all of which are used for vehicle parking. Subterranean levels at one of those buildings, 1811 Post Street, did not extend below 10 feet bgs, and therefore would not be affected.

The remaining six buildings listed below could potentially be affected by a rise in groundwater elevation as a result of the discontinuation of pumping. An avoidance measure and a minimization measure have been identified below to address potential adverse effects to these buildings.

- 1489 and 1610 Webster Street
- 1510 Eddy Street
- 1475 Fillmore Street
- 1410 Steiner Street
- 1730 O'Farrell Street

4.9.4.3 | OPERATIONAL EFFECTS

4.9.4.3.1 NO BUILD ALTERNATIVE- OPERATIONAL EFFECTS

Improvements associated with the No Build Alternative are comprised of physical infrastructure and transit service changes associated with other City projects that are either planned or programmed to be implemented in the Geary corridor by the year 2020. Under the No Build Alternative, stormwater would continue to flow from impervious surfaces into existing catch basins. Operation of the various components of the No Build Alternative would not require water use, nor would they increase impervious areas; therefore, there would be no adverse effect to hydrology or water quality.

Under the No Build and all build alternatives, stormwater would continue to flow from existing impervious surfaces into existing catch basins. Some catch basins would be relocated to accommodate bus bulbs and other improvements

4.9.4.3.2 BUILD ALTERNATIVES HYDROLOGIC EFFECTS - OPERATIONAL EFFECTS

Under all build alternatives, stormwater would continue to flow from impervious surfaces into existing catch basins, although some catch basins would be relocated to accommodate bus bulbs and other improvements. Additional catch basins would need to be constructed in medians at the downstream ends of the blocks in areas with center-running buses to prevent point flows across the travel lanes.

As shown in Table 4.9-2, Alternative 2 would result in slightly less impervious surface area than existing conditions. Opportunities to implement stormwater management elements would be limited to areas of replacement pavement along the edge of the roadway. Pervious paving and infiltration planters may be constructed in these areas to capture runoff, which could result in a slight beneficial effect to stormwater runoff quality.

Because they would disturb the greatest soil area Alternatives 3 and 3-Consolidated would therefore have the greatest opportunity to incorporate stormwater control elements. Like Alternative 2, these alternatives would reduce impervious surface area by about 0.7 acre (about 30,000 square feet). As these alternatives would incorporate new landscaped medians along new center running bus lanes, each would offer opportunities to incorporate rain gardens and biotreatment swales in addition to pervious paving and infiltration planters.

The Hybrid Alternative/LPA would reduce impervious surface area by about half an acre (about 17,500 square feet) from current conditions.

Implementation of stormwater retention and treatment features required under City ordinances and the *Better Streets Plan* would be possible under all build alternatives and would result in slight, but beneficial effects to storm drainage in the Geary corridor, as there would be a net decrease in impervious surface area and no substantial localized increases that might increase flow to a specific area of the City combined sewer system.

The Geary corridor is not located within a mapped flood hazard zone, and would not be subject to flooding hazards due to reservoir failure, tsunamis, or projected sea level rise. Therefore, neither the No Build Alternative nor any of the build alternatives would result in any adverse flood-related effects.

DEFINITIONS

RAIN GARDENS: Landscaped detention or bioretention features in a street designed to provide initial treatment of stormwater runoff

BIOTREATMENT SWALES: Long, narrow landscaped depressions primarily used to collect and convey stormwater and improve water quality

PERVIOUS PAVING: An alternative to standard paving to help reduce stormwater runoff volumes by reducing impervious surface and providing temporary storage and/or groundwater recharge through infiltration

INFILTRATION PLANTERS: Stormwater facilities that double as landscape features but are designed to combine stormwater runoff control and treatment with aesthetic landscaping and architectural detail

4.9.4.3.3 BUILD ALTERNATIVES WATER QUALITY EFFECTS – OPERATIONAL EFFECTS

Project landscaping would be incorporated into stormwater control, as described above. Although the use of fertilizers, herbicides, and pesticides on that landscaping has the potential to affect runoff quality, adherence to existing City policies and the avoidance and minimization measures in Section 4.9.5 would lessen these potential effects. Each of the build alternatives would require the pruning and removal of existing street trees located on sidewalks. Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA would also affect trees in the Geary Boulevard median, in locations where BRT would be located in center lanes. Mature trees provide water quality benefits as they capture and retain stormwater in their canopies, transfer water to the atmosphere via evapotranspiration, and their extensive root systems promote stormwater infiltration. There may be a period of reduced water quality between when mature trees are removed and when replacement tree plantings grow to maturity. However, this effect would not be adverse due to overall landscaping improvements with these alternatives, and would subside over time as replacement trees mature.

Stormwater runoff generated by the build alternatives would be required to be retained and treated under existing City laws and policies, as described in Section 4.9.3.1. In addition, because that runoff would be conveyed to City treatment facilities and treated in accordance with existing permits and Waste Discharge Requirements, no water quality standards or Waste Discharge Requirements would be exceeded due to project runoff.

4.9.4.3.4 BUILD ALTERNATIVES GROUNDWATER EFFECTS – OPERATIONAL EFFECTS

Groundwater use is anticipated to be low for the operation of any of the build alternatives. Once operational, the various project components and new BRT service will have little to no effect on groundwater as these improvements do not require water.

4.9.4.4 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, the No Build Alternative and Alternative 2 would have the least potential to affect water quality during construction, followed by the Hybrid Alternative/LPA. Similarly, Alternatives 3 and 3-Consolidated would have the greatest increase in impervious surface area and reduced water quality once operational.

4.9.5 | Avoidance, Minimization, and/or Mitigation Measures

4.9.5.1 | CONSTRUCTION MEASURES

With implementation of the avoidance and minimization measures, no adverse effects related to water quality would result from any of the build alternatives

BMPs required to be implemented during construction under the Construction General Permit would apply to all build alternatives and would include measures to prevent soil erosion and entrainment of sediment in stormwater runoff.

In compliance with the City Integrated Pest Management Policy (City Municipal Code Section 300), prevention and non-chemical control methods shall be employed in maintaining landscaping in the study area, including monitoring for pests before treating, and using the least-hazardous chemical pesticides, herbicides, and fertilizers possible and only as a last resort.

Preparation and implementation of a SWPPP during project construction will minimize or avoid adverse effects to water quality. Completion of an SWPPP for the National Pollutant Discharge Elimination System (NPDES) General Permit will be required for construction of each build alternative and for earthwork activities under the No Build Alternative, if applicable. The SWPPP will address adverse water quality effects associated with construction activities, including identification of all drainage facilities onsite, placement of appropriate stormwater and non-stormwater pollution controls and BMPs, erosion and sediment control, spill response and containment plans, inspection scheduling, maintenance, and training of all construction personnel onsite.

The SWPPP will specify how construction-related adverse stormwater effects would be mitigated throughout the project site through:

- The appropriate treatment of overflow stormwater during construction, including inlet protection devices, temporary silt fencing, soil stabilization measures, street sweeping, stabilized construction entrances, and temporary check dams;
- Lining storage areas; and
- Proper and expeditious disposal of items to be removed, such as landscaping, curb bulb waste, existing bus stop shelters, and demolished streetlights and signal poles.

Assuming adherence to these and other federal, state, and local regulations, the following additional measures have been identified to avoid, minimize, or mitigate for adverse effects to hydrology and water quality.

MIN-HY-C1. Any construction work that adversely affects the combined sewer system will require coordination with SFPUC, and construction-related activities shall be consistent with the SFPUC's *Keep it on Site, Pollution Prevention Guide for the Construction Industry*.[2]

MIN-HY-C2[3]. Should Alternatives 3 or 3-Consolidated be selected, either would result in a potentially adverse structural effect to nearby buildings from the raising of the groundwater levels in the vicinity of the Fillmore Street pump station during construction. One of two measures would be implemented to address the adverse effect:

A-HY-C3a. To avoid the effect, maintain existing pumping regime by maintaining the existing pump station north of Geary or similar pump to keep groundwater in the vicinity of the Fillmore Street area at current (unchanged) elevations.

-or-

[2] San Francisco Public Utilities Commission. *Keep it on Site, Pollution Prevention Guide for the Construction Industry*. Available at: http://sfwater.org/modules/showdocument.aspx?documentid=4622.

[3] As noted in Chapter 2, the lead agency has selected the Hybrid Alternative/LPA as the preferred alternative. Measures MIN-HY-C2, A-HY-C3a, and MM-HY-C3b would have been applicable only to Alternatives 3 and 3-Consolidated. None of these three measures therefore appear in the Mitigation Monitoring and Reporting Program (Appendix M).

MM-HY-C3b. To mitigate the effect, prior to the cessation of pumping at the existing pump station, a detailed groundwater study shall be performed by a qualified professional to determine the effects of groundwater rise on potentially affected structures and utilities. The study shall take into account the potential implementation of any project-related LID improvements in the vicinity. If the projected rise in groundwater levels may bring these structures or utilities into contact with groundwater, an evaluation of those structures or utilities shall be performed by a licensed structural engineer. Remedial measures determined to be necessary by the structural engineer, which may include waterproofing of foundations and subterranean walls and/or additional enhancements and performance standards such as underslab drainage or other features to resist increased hydrostatic pressure as a result of the elevated groundwater level, shall be implemented prior to the cessation of pumping to minimize structural affects to surrounding buildings.

4.9.5.2 | OPERATIONAL MEASURES

Existing City laws and policies require the use of LID to reduce the quantity of stormwater runoff, to less than existing conditions, and treat the runoff to remove urban pollutants, to the extent practicable and feasible. Based on preliminary design, it is anticipated that permeable paving, infiltration planters, swales, and rain gardens may be practicable and feasible.

Stormwater management tools set forth in the San Francisco *Better Streets Plan* and SFPUC *Stormwater Design Guidelines* shall be incorporated into the project design to the maximum extent practicable and feasible. Major considerations for specific elements shall be streetscape geometry, topography, soil type and compaction, groundwater depth, subsurface utility locations, building laterals, maintenance costs, and pedestrian safety. Based on preliminary design, permeable paving, infiltration planters, swales, and rain gardens may be practicable and feasible for the study area; however, incorporation of such features is unknown at this time and thus there is no certainty whether any beneficial effects would occur.

Implementation of the following measure under each build alternative would reduce and minimize the project's effects to stormwater quality and facilities:

MIN-HY-1. Landscape areas shall be designed to minimize and reduce total runoff. Any irrigation and fertilizers shall be used to the minimum extent practicable and feasible.

4.10 Air Quality and Greenhouse Gases

This section considers the potential of the project alternatives to result in adverse emissions of air pollutants including greenhouse gases (GHGs). Information in this section was drawn from a project-specific air quality and GHG report, which is included as Appendix G and is on file with the San Francisco County Transportation Authority (SFCTA).

4.10.1 | Regulatory Setting

4.10.1.1 | FEDERAL

United States Environmental Protection Agency

The Federal Clean Air Act (CAA) governs air quality in the United States. The United States Environmental Protection Agency (EPA) is responsible for enforcing the CAA. EPA is also responsible for establishing the National Ambient Air Quality Standards (NAAQS). NAAQS are required under the 1977 CAA and subsequent amendments. EPA regulates emission sources that are under the exclusive authority of the federal government, such as aircraft, ships, and certain types of locomotives. EPA has jurisdiction over emission sources outside state waters (e.g., beyond the outer continental shelf) and establishes various emission standards, including those for vehicles sold in states other than California.[1]

Air quality in the United States is governed by the Federal Clean Air Act (CAA). EPA is responsible for enforcing the CAA

Information on the National Ambient Air Quality Standards can be found here: http://www.epa.gov/air/criteria.html

Under the CAA, NAAQS have been established for seven major air pollutants:

- carbon monoxide
- ozone
- nitrogen dioxide
- sulfur dioxide
- particulate matter 2.5 microns or less in diameter ($PM_{2.5}$)
- particulate matter 10 microns or less in diameter (PM_{10})
- lead

The CAA requires EPA to designate areas as *attainment*, *nonattainment*, or *maintenance* (previously nonattainment and currently attainment) for each criteria pollutant based on whether the NAAQS have been achieved. Table 4.10-1 summarizes both federal and state standards (state standards further discussed below).

[1] Automobiles sold in California must meet stricter emission standards established by California Air Resources Board (CARB).

DEFINITIONS

Ozone is a colorless gas resulting from the interaction of two other pollutants and sunlight

Respirable particulate matter consists of very small particles that are inhalable, such as dust stirred up by vehicles

Fine particulate matter consists of even smaller particles, usually resulting from fuel combustion

Carbon monoxide is an odorless, colorless gas formed by incomplete combustion of fuels, almost exclusively from vehicles, power plants, and industrial activities

Nitrogen dioxide results from the interaction of another pollutant and oxygen, and contributes to the formation of ozone and respirable particulate matter

Sulfur dioxide is a colorless, pungent gas formed primarily by combustion of fossil fuels such as coal and oil used in power plants and industrial operations

Lead is a heavy metal that may be a part of particulate matter, resulting from lead smelting, battery recycling, and manufacturing

Visibility reducing particles consist of tiny solid particles surrounded by droplets of liquid, and created by hazy conditions

Sulfates are mineral salts containing sulfur, resulting from the decay of plants and animals and certain industrial processes

Hydrogen sulfide is a colorless, pungent gas occurring in coal pits, gas wells and as a product of decaying sulfur-containing organic matter, such as in sewers

Table 4.10-1 Federal and State Air Quality Standards and Attainment Status, San Francisco Bay Area

		FEDERAL (NAAQS)[2]		CALIFORNIA[1]	
POLLUTANT	AVERAGING PERIOD	STANDARDS[3]	ATTAINMENT STATUS	STANDARDS	ATTAINMENT STATUS
Ozone	1-hour	No federal standard	No federal standard[5]	0.09 ppm (180 µg/m³)	Nonattainment
	8-hour	0.075 ppm (147 µg/m³)	Nonattainment[4]	0.070 ppm (137 µg/m³)	Nonattainment[9]
Respirable particulate matter (PM_{10})	24-hour	150 µg/m³	Unclassified	50 µg/m³	Nonattainment
	Annual Arithmetic Mean	No federal standard	No federal standard	20 µg/m³	Nonattainment[7]
Fine particulate matter ($PM_{2.5}$)	24-hour	35 µg/m³ [10]	Nonattainment	No state standard	No state standard
	Annual Arithmetic Mean	12 µg/m³	Attainment	12 µg/m³	Nonattainment[7]
Carbon monoxide	8-hour	9 ppm (10 mg/m³)	Attainment/ Maintenance[6]	9.0 ppm (10 mg/m³)	Attainment
	1-hour	35 ppm (40 mg/m³)	Attainment/ Maintenance	20 ppm (23 mg/m³)	Attainment
Nitrogen dioxide	Annual Arithmetic Mean	53 ppb (100 µg/m³)	Attainment	0.030 ppm (57 µg/m³)	Attainment
	1-hour	100 ppb[11] (188 µg/m³) /a/	Unclassified	0.18 ppm (338 µg/m³)	Attainment
Sulfur dioxide[12]	24-hour	0.14 ppm (365 µg/m³)	Attainment	0.04 ppm (105 µg/m³)	Attainment
	1-hour	75 ppb (196 µg/m³)	Attainment	0.25 ppm (655 µg/m³)	Attainment
Lead[13]	30-day average	--	Attainment	1.5 µg/m³	Attainment
	Calendar Quarter	1.5 µg/m³	Attainment	No state standard	No state standard
	Rolling 3-Month Average	0.15 µg/m³	--[14]	No state standard	No state standard
Visibility reducing particles	8-hour	No federal standard		Extinction coefficient of 0.23 per kilometer[8]	Unclassified
Sulfates	24-hour	No federal standard		25 µg/m³	Attainment
Hydrogen sulfide	1-hour	No federal standard		0.03 ppm (42 µg/m³)	Unclassified

Notes: 1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, suspended particulate matter - PM_{10}, and visibility reducing particles are values that are not to be exceeded. The standards for sulfates, Lake Tahoe carbon monoxide, lead, hydrogen sulfide, and vinyl chloride are not to be equaled or exceeded. If the standard is for a 1-hour, 8-hour or 24-hour average (i.e., all standards except for lead and the PM_{10} annual standard), then some measurements may be excluded. In particular, measurements are excluded that ARB determines would occur less than once per year on the average. The Lake Tahoe CO standard is 6.0 ppm, a level one-half the national standard and two-thirds the state standard.

2. National standards shown are the "primary standards" designed to protect public health. National standards other than for ozone, particulates and those based on annual averages are not to be exceeded more than once a year. The 1-hour ozone standard is attained if, during the most recent three-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than one. The 8-hour ozone standard is attained when the 3-year average of the 4th highest daily concentrations is 0.075 ppm (75 ppb) or less. The 24-hour PM_{10} standard is attained when the 3-year average of the 99th percentile of monitored concentrations is less than 150 µg/m3. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of 98th percentiles is less than 35 µg/m³.

Except for the national particulate standards, annual standards are met if the annual average falls below the standard at every site. The national annual particulate standard for PM_{10} is met if the 3-year average falls below the standard at every site. The annual $PM_{2.5}$ standard is met if the 3-year average of annual averages spatially-averaged across officially designed clusters of sites falls below the standard.

3. National air quality standards are set by US EPA at levels determined to be protective of public health with an adequate margin of safety.

4. Final designations effective July 20, 2012.

5. The national 1-hour ozone standard was revoked by U.S. EPA on June 15, 2005.

6. In April 1998, the Bay Area was redesignated to attainment for the national 8-hour carbon monoxide standard.

7. In June 2002, CARB established new annual standards for $PM_{2.5}$ and PM_{10}.

8. Statewide VRP Standard (except Lake Tahoe Air Basin): Particles in sufficient amount to produce an extinction coefficient of 0.23 per kilometer when the relative humidity is less than 70 percent. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.

9. The 8-hour CA ozone standard was approved by the Air Resources Board on April 28, 2005 and became effective on May 17, 2006.

10. On January 9, 2013, EPA issued a final rule to determine that the Bay Area attains the 24-hour $PM_{2.5}$ national standard. This EPA rule suspends key SIP requirements as long as monitoring data continues to show that the Bay Area attains the standard. Despite this EPA action, the Bay Area will continue to be designated as "non-attainment" for the national 24-hour $PM_{2.5}$ standard until such time as the Air District submits a "redesignation request" and a "maintenance plan" to EPA, and EPA approves the proposed redesignation.

11. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100ppm (effective January 22, 2010).

12. On June 2, 2010, the U.S. EPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. The existing 0.030 ppm annual and 0.14 ppm 24-hour SO_2 NAAQS however must continue to be used until one year following U.S. EPA initial designations of the new 1-hour SO_2 NAAQS. EPA expects to designate areas by June 2012.

13. ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure below which there are no adverse health effects determined.

14. National lead standard, rolling 3-month average: final rule signed October 15, 2008. Final designations effective December 31, 2011.

Source: CARB, Ambient Air Quality Standards, June 4, 2013. CARB, Area Designation Maps, March 2014

In addition to the above "criteria pollutants," the air toxics provisions of the Clean Air Act (CAA) require EPA to develop and enforce regulations to protect the public from exposure to airborne contaminants that are known to be hazardous to human health. In accordance with Section 112 of the CAA, EPA establishes National Emission Standards for Hazardous Air Pollutants (NESHAP). The list of hazardous air pollutants (HAP), or "air toxics" includes specific compounds that are known or suspected to cause cancer or other serious health effects. Asbestos was one of the first hazardous air pollutants regulated under the air toxics program, and EPA established the Asbestos NESHAP. It is intended to minimize the release of asbestos fibers during activities involving the handling of asbestos. It specifies work practices to be followed during renovation, demolition, or other abatement activities when friable asbestos is involved.

DEFINITION

ROGs/NO_x: Reactive Organic Gases and Nitrogen Oxides are not criteria air pollutants and thus are not monitored. However, both are considered precursors of ozone, which is a criteria pollutant

The CAA requires the EPA to promulgate vehicle or fuel standards containing reasonable requirements that control toxic emissions, at a minimum to benzene and formaldehyde. Performance criteria were established to limit mobile-source emissions of toxics, including benzene, formaldehyde, and 1,3-butadiene. In addition, Section 219 of the CAA requires certain urban bus systems (those in areas with the most severe ozone nonattainment conditions) to use reformulated gasoline to further reduce mobile-source emissions.

The U.S. Supreme Court has ruled that carbon dioxide (CO_2), a greenhouse gas (GHG) is also an air pollutant as defined under the CAA, and that EPA has the authority to regulate emissions of GHGs. Further discussion federal regulations on GHG follows below.[2]

Transportation Conformity

Transportation conformity is an analysis required to ensure that federally supported highway and transit project activities are consistent with the purpose of the state Implementation Plan (SIP).[3] Regional conformity for a given project is analyzed by discussing if a proposed project is included in a conforming Regional Transportation Plan (RTP) or Transportation Improvement Plan (TIP) with substantially the same

[2] *Massachusetts v. Environmental Protection Agency* ([2007] 549 U.S. 05-1120).

[3] CAA Section 176(c) (42 U.S.C. 7506(c)).

design concept and scope that was used for the regional conformity analysis. Project level conformity is analyzed by discussing if a proposed project would cause localized exceedances of carbon monoxide, $PM_{2.5}$, and/or PM_{10} standards, or if it would interfere with "timely implementation" of Transportation Control Measures called out in the (SIP).

Mobile Source Air Toxics (MSAT)

In addition to NAAQS for criteria pollutants, the CAA identified a list of 188 urban air toxics, alternatively known as toxic air contaminants (TACs). In its final ruling in March 2001, EPA narrowed this list to a group of 21 mobile-source air toxics (MSAT).[4] From this list of 21 MSATs, EPA identified six priority MSATs: benzene, formaldehyde, acetaldehyde, diesel particulate matter/diesel exhaust organic gases, acrolein, and 1,3-butadiene. To address emissions of MSATs, EPA has introduced a number of measures targeting cleaner fuels and cleaner engines.

In March 2001, EPA issued regulations requiring the producers of urban air toxics to decrease emissions of these pollutants by target dates in 2007 and 2020. As a result, on-highway emissions of benzene, formaldehyde, 1,3-butadiene and acetaldehyde will be reduced by amounts ranging from 67 percent to 76 percent between 1990 and 2020. On-highway diesel particulate matter (DPM) emissions will be reduced by 90 percent. These reductions are expected as a result of the national mobile source control programs, including:

- The reformulated gasoline program;
- A new threshold for the toxic content of gasoline;
- The national low-emission vehicle standards;
- The Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements; and
- The heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements.

These predicted improvements are expected to result in net emission reductions, even after anticipated growth in vehicle miles traveled (VMT) is taken into account.

Mandatory Greenhouse Gas Reporting Rule

In 2009, EPA issued a final rule for mandatory reporting of GHGs from large GHG emissions sources in the United States. In general, this national reporting requirement will provide EPA with accurate and timely GHG emissions data from facilities that emit 25,000 metric tons or more of carbon dioxide per year. This publically available data will allow the reporters to track their own emissions, compare them to similar facilities, and aid in identifying cost effective opportunities to reduce emissions in the future. Reporting is at the facility level, except that certain suppliers of fossil fuels and industrial greenhouse gases along with vehicle and engine manufacturers will report at the corporate level. An estimated 85 percent of the total US GHG emissions, from approximately 10,000 facilities, are covered by this final rule.[5]

[4] Control of Emissions of Hazardous Air Pollutants from Mobile Sources, 66 F.R. 17235.
[5] BAAQMD, *CEQA Air Quality Guidelines*, June 2010.

Endangerment and Cause or Contribute Findings for Greenhouse Gases under Clean Air Act Section 202(a)

In December 2009, the EPA Administrator signed two distinct findings regarding greenhouse gases under Section 202(a) of the Clean Air Act.

> **Endangerment Finding**: The Administrator found that the current and projected concentrations of the six key GHGs (i.e., carbon dioxide, methane, nitrogen dioxide, hydrofluorocarbons, perflurorocarbons, and sulfur hexafluoride) in the atmosphere threaten the public health and welfare of current and future generations.
>
> **Cause or Contribute Finding**: The Administrator found that the combined emissions of these GHGs from new motor vehicles and motor vehicle engines contribute to the GHG pollution which threatens public health and welfare.

These finding were necessary prerequisites for implementing GHG emissions standards for vehicles. In collaboration with the National Highway Traffic Safety Administration (NHTSA), EPA finalized emission standards for light-duty vehicles (2012-2016 model years) in May of 2010 and heavy-duty vehicles (2014-2018 model years) in August of 2011.

Council on Environmental Quality Guidelines

In August 2016, the Council on Environmental Quality (CEQ) provided final guidance for federal agencies on how to consider the effects of GHG emissions and climate change in NEPA documents. Pursuant to Executive Order 13783, "Promoting Energy Independence and Economic Growth," as of March 28, 2017, the CEQ has withdrawn its final guidance for further consideration.[6] The withdrawal of the final guidance does not change any law, regulations, or otherwise legally binding requirements.

4.10.1.2 | STATE

California Air Resources Board

In addition to being subject to the requirements of CAA, air quality in California is also governed by more stringent regulations under the California Clean Air Act (CCAA). In California, the CCAA is administered by CARB at the state level and by the air quality management districts and air pollution control districts at the regional and local levels. CARB is responsible for meeting the state requirements of the CAA, administering the CCAA, and establishing the California Ambient Air Quality Standards (CAAQS). The CCAA requires all air districts in the state to endeavor to achieve and maintain the CAAQS. CAAQS are generally more stringent than the corresponding federal standards and incorporate additional standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. CARB is responsible for setting emission standards for vehicles sold in California and for other emission sources, such as consumer products and certain off-road equipment. CARB established passenger vehicle fuel specifications. CARB oversees the functions of local air pollution control districts and air quality management districts,

[6] Council on Environmental Quality. March 28, 2017. *Final Guidance for Greenhouse Gases and Climate Change.* Accessed November 7, 2017 at **https://ceq.doe.gov/guidance/ceq_guidance_nepa-ghg-climate_final_guidance.html**.

which, in turn, administer air quality activities at the regional and county levels. Table 4.10-1 summarizes state standards.

The CCAA requires CARB to designate areas within California as either attainment or non-attainment for each criteria pollutant based on whether the CAAQS have been achieved. Under the CCAA, areas are designated as non-attainment for a pollutant if air quality data shows that a state standard for the pollutant was violated at least once during the previous three calendar years. Exceedances that are affected by highly irregular or infrequent events are not considered violations of a state standard and are not used as a basis for designating areas as nonattainment.

State Toxic Air Contaminant Programs

California regulates Toxic Air Contaminants (TACs) primarily through the Tanner Air Toxics Act (AB 1807) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588).

AB 1807 sets forth a formal procedure for CARB to designate substances as TACs. This includes research, public participation, and scientific peer review before CARB can designate a substance as a TAC. To date, CARB has identified over 21 TACs, including diesel exhaust particulate. Once a TAC is identified, CARB then adopts air toxics control measures (ATCM) for sources that emit that particular TAC.

None of the TACs identified by CARB have a "safe threshold;" exposure to these TACs is therefore considered in terms of long-term elevated health risk.

AB 2588 requires that existing facilities that emit toxic substances above specified levels:

- Prepare a toxic emission inventory;
- Prepare a risk assessment if emissions are significant;
- Notify the public of significant risk levels; and
- Prepare and implement risk reduction measures.

CARB has adopted diesel exhaust control measures and more stringent emission standards for various on-road mobile sources of emissions, including transit buses and certain other diesel-powered equipment.

In February 2000, CARB adopted a new public transit bus fleet rule and emission standards for new urban buses. These rules and standards provide for more stringent emission standards for some new urban bus engines, zero-emission bus demonstration and purchase requirements applicable to transit agencies, and reporting requirements with which transit agencies must demonstrate compliance with the urban transit bus fleet rule. Milestones include the low sulfur diesel fuel requirement, and tighter emission standards for heavy-duty diesel trucks and off-road diesel equipment nationwide.

Over time, the replacement of older vehicles will result in a vehicle fleet that produces substantially less TACs than under current conditions. Mobile-source emissions of TACs (e.g., benzene, 1,3-butadiene, diesel PM) have been reduced significantly over the last decade, and will be reduced further in California through a progression of regulatory measures (e.g., Low Emission Vehicle/Clean Fuels and Phase II reformulated gasoline regulations) and control technologies. With

implementation of CARB's Risk Reduction Plan, it is expected that diesel PM concentrations will be reduced by 85 percent by 2020 from year 2000 levels.[7] Adopted regulations are also expected to continue to reduce formaldehyde emissions from cars and light-duty trucks. As emissions are reduced, it is expected that risks associated with exposure to the emissions will also be reduced.

Assembly Bill 1493 (AB 1493)

AB 1493 requires the development and adoption of regulations to achieve "the maximum feasible reduction of greenhouse gases" emitted by noncommercial passenger vehicles, light-duty trucks, and other vehicles used primarily for personal transportation in the state. In 2009, CARB adopted amendments to the AB 1493 regulations that reduce greenhouse gas (GHG) emissions in new passenger vehicles from 2009 through 2016. These amendments are part of California's commitment toward a nation-wide program to reduce new passenger vehicle GHGs from 2012 through 2016.

Executive Order (E.O.) S-3-05

This order established state GHG emission targets of 1990 levels by 2020 (the same as AB 32, enacted later and discussed below) and 80 percent below 1990 levels by 2050. It calls for the Secretary of the Cal/EPA to be responsible for coordination of state agencies and progress reporting.

In response to the E.O., the Secretary of the Cal/EPA created the Climate Action Team (CAT). California's CAT originated as a coordinating council organized by the Secretary for Environmental Protection.

Assembly Bill 32 (AB 32), California Global Warming Solutions Act of 2006

AB 32 focuses on reducing GHG emissions in California, and requires CARB to adopt rules and regulations that would achieve greenhouse gas emissions equivalent to statewide levels in 1990 by 2020. To achieve this goal, AB 32 mandates that CARB establish a quantified emissions cap, institute a schedule to meet the cap, implement regulations to reduce statewide GHG emissions from stationary sources, and develop tracking, reporting, and enforcement mechanisms to ensure that reductions are achieved. Because the intent of AB 32 is to limit 2020 emissions to the equivalent of 1990, it is expected that the regulations would affect many existing sources of GHG emissions.

AB 32 charges CARB with the responsibility to monitor and regulate sources of GHG emissions in order to reduce those emissions. In 2007, CARB adopted a series of early action measures to reduce GHG emissions. Among these, transportation-related measures included complying with a low carbon fuel standard, reducing refrigerant loss from motor vehicle air conditioning maintenance, and promoting proper tire inflation in vehicles.

CARB has determined that the total statewide aggregated GHG 1990 emissions level and 2020 emissions limit is 427 million metric tons of CO_2e. The 2020 target reductions are currently estimated to be 174 million metric tons of CO_2e.

[7] BAAQMD. June 2010. *CEQA Air Quality Guidelines.*

AB 32 Climate Change Scoping Plan

The CARB AB 32 Scoping Plan contains the main strategies to achieve the 2020 emissions cap. The Scoping Plan was developed by CARB with input from the CAT and proposes a comprehensive set of actions designed to reduce overall carbon emissions in California, improve the environment, reduce oil dependency, diversify energy sources, and enhance public health while creating new jobs and improving the state economy. The GHG reduction strategies contained in the Scoping Plan include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a cap-and-trade system. Two of several key approaches for reducing greenhouse gas emissions to 1990 levels by 2020 include:

- Establishing targets for transportation-related GHG emissions for regions throughout California, and pursuing policies and incentives to achieve those targets; and
- Adopting and implementing measures to reduce transportation sector emissions, including California's measures.

CARB has also developed the GHG mandatory reporting regulation, which required reporting beginning on January 1, 2008 pursuant to requirements of AB 32. The regulations require reporting for certain types of facilities that make up the bulk (up to 94 percent) of the stationary source emissions in California.

In February 2014, CARB published a draft Proposed First Update to the Climate Change Scoping Plan. This Update identifies the next steps for California's leadership on climate change and updates statewide emissions reduction targets.

As part of the Update, CARB is proposing to revise the 2020 statewide limit to 431 million metric tons of CO_2e, an approximately one percent increase from the original estimate. The 2020 business-as-usual (BAU) forecast in the Update is 509 million metric tons of CO_2e. The state would need to reduce those emissions by 15 percent to meet the new limit of 431 million metric tons.

Executive Order (E.O.) S-1-07

This E.O. established a Low-Carbon Fuel Standard (LCFS) and directed the Secretary for Environmental Protection to develop and propose protocols for measuring the "life-cycle carbon intensity" of transportation fuels.

4.10.1.3 | REGIONAL

The Bay Area Air Quality Management District (BAAQMD) attains and maintains air quality conditions in the San Francisco Bay Area Air Basin (Air Basin) through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. BAAQMD has jurisdiction over an approximately 5,600-square-mile area of the San Francisco Bay Area (Bay Area), including all of San Francisco County.

The BAAQMD established a climate protection program to reduce pollutants that contribute to global climate change and affect air quality in the Air Basin. The climate protection program includes measures that promote energy efficiency, reduce vehicle miles traveled, and develop alternative sources of energy all of which

assist in reducing emissions of GHG and in reducing air pollutants that affect the health of residents. BAAQMD also seeks to support current climate protection programs in the region and to stimulate additional efforts through public education and outreach, technical assistance to local governments and other interested parties, and promotion of collaborative efforts among stakeholders.

The clean air strategy of the BAAQMD includes the preparation of plans for the attainment of ambient air quality standards, adoption and enforcement of rules and regulations concerning sources of air pollution, and issuance of permits for stationary sources of air pollution. The BAAQMD also inspects stationary sources of air pollution and responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements programs and regulations required by the CAA and the CCAA.

The BAAQMD last updated its CEQA Guidelines between 2009 and 2011 (BAAQMD 2010b). This is an advisory document that offers guidance to the Lead Agency, consultants, and project applicants for addressing air quality in environmental documents.[8] The handbook contains the following applicable components:

- Criteria and thresholds for determining whether a project may have a significant adverse air quality effect;
- Specific procedures and modeling protocols for quantifying and analyzing air quality effects;
- Methods available to mitigate air quality effects; and
- Information for use in air quality assessments and environmental documents that will be updated more frequently such as air quality data, regulatory setting, climate, and topography.

As stated above, the BAAQMD prepares plans to attain ambient air quality standards in the Air Basin. The BAAQMD prepares ozone attainment plans (OAP) for the national ozone standard and clean air plans (CAP) for the California standard both in coordination with the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG).

With respect to applicable air quality plans, the BAAQMD prepared the 2017 CAP to address nonattainment of the national one- and eight-hour ozone standard in the Air Basin. The three purposes of the 2017 CAP are to: 1) reduce emissions and decrease ambient concentrations of harmful pollutants, 2) safeguard public health by reducing exposure to air pollutants that pose the greatest health risk, and 3) reduce greenhouse gas emissions to protect the climate. To achieve the three core purposes of the 2017 CAP, the control strategies proposed are designed to:

- Reduce emissions of ozone precursors, PM, air toxics, and greenhouse gases;

[8] The preparers of this Draft EIS/EIR have reviewed the evidence used to formulate the BAAQMD CEQA Guidelines including BAAQMD's May 2010 staff report recommending the adoption of the thresholds and its attachments, and conclude that substantial evidence supports the continued use of BAAQMD's 2010 thresholds of significance as thresholds of significance for air quality and greenhouse gas effects in this Draft EIS/EIR.

- Continue progress toward attainment of state ozone standards;
- Reduce transport of ozone precursors to neighboring air basins;
- Protect public health by reducing population exposure to the most harmful air pollutants; and
- Protect the climate.

Similarly, the BAAQMD prepared the 2017 CAP to address nonattainment of the CAAQS.

The BAAQMD has regulated TACs since the 1980s. At the local level, air pollution control or management districts may adopt and enforce CARB's control measures. Under BAAQMD Regulation 2-1 (General Permit Requirements), Regulation 2-2 (New Source Review), and Regulation 2-5 (New Source Review of Toxic Air Contaminants), all nonexempt sources that possess the potential to emit TACs are required to obtain permits from BAAQMD. Permits may be granted to these operations if they are constructed and operated in accordance with applicable regulations, including new source review standards and ATCMs. The BAAQMD limits emissions and public exposure to TACs through a number of programs. The BAAQMD prioritizes TAC-emitting stationary sources based on the quantity and toxicity of the TAC emissions and the proximity of the facilities to sensitive receptors.

CARB defines naturally occurring asbestos (NOA) as a TAC. NOA is located in many parts of California and is commonly associated with certain rocks found in the Bay Area.[9] BAAQMD's NOA program requires that the applicable notification forms be submitted by qualifying operations in accordance with the procedures detailed in the ATCM *Inspection Guidelines Policies and Procedures*. The ATCM requires regulated operations engaged in road construction and maintenance activities, construction and grading operations, and quarrying and surface mining operations in areas where NOA is likely to be found, to employ the best available dust mitigation measures to reduce and control dust emissions.

In addition, the BAAQMD has adopted Regulation 11, Rule 2 which addresses asbestos demolition renovation, manufacturing, and standards for asbestos containing serpentine. The purpose of Regulation 11, Rule 2 is to control emissions of asbestos to the atmosphere during demolition, renovation, milling and manufacturing and establish appropriate waste disposal procedures.[10]

4.10.1.4 | LOCAL

San Francisco General Plan Air Quality Element

The San Francisco General Plan includes an Air Quality Element.[11] Relevant objectives include the following:

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[9] California Geological Survey. 2002. *Guidelines for Geologic Investigations of Naturally Occurring Asbestos in California*. California Department of Geology's Special Publication 124. Retrieved from: http://www.conservation.ca.gov/cgs/minerals/hazardous_minerals/asbestos/Documents/Asbestos_Guidelines_SP124.pdf. Last accessed April 14, 2014.

[10] BAAQMD. October 1998. *Regulation 11, Rule 2*.

[11] City and County of San Francisco General Plan. 1997. Air Quality Element. Updated 2000. Retrieved from: http://www.sf-planning.org/ftp/General_Plan/I10_Air_Quality.htm. Last accessed October 16, 2013.

Objective 1:	Adhere to state and federal standards and regional programs.
Objective 2:	Reduce mobile sources of air pollution through implementation of the Transportation Element of the San Francisco General Plan.
Objective 3:	Decrease the air quality impacts of development by coordination of land use and transportation decisions.
Objective 4:	Improve air quality by increasing public awareness regarding the negative health effects of pollutants generated by stationary and mobile sources.
Objective 5:	Minimize particulate matter emissions from road and construction sites.
Objective 6:	Link the positive effects of energy conservation and waste management to emission reductions.

San Francisco Health Code Construction Dust Control Ordinance

The San Francisco Health Code Article 22B and San Francisco Building Code §106A.3.2.6 collectively constitute the City's Construction Dust Control Ordinance. The Construction Dust Control Ordinance requires that all site preparation work, demolition, or other construction activities within the City that have the potential to create dust or to expose or disturb more than 10 cubic yards or 500 square feet of soil comply with specific dust control measures whether or not the activity requires a permit from the Department of Building Inspection (DBI). For projects over one-half acre, the Construction Dust Control Ordinance requires that the project sponsor submit a Dust Control Plan for approval by the San Francisco Department of Public Health (DPH) prior to issuance of a building permit by the DBI.

San Francisco Health Code Clean Construction Ordinance

This ordinance requires clean construction practices for all City projects that entail 20 or more cumulative days of construction. The ordinance requires that off-road equipment and off-road engines with 25 horsepower or greater: 1) be fueled by higher grade biodiesel fuel; and 2) if used more than 20 hours, either meet or exceed federal "Tier 2" emissions standards for off-road engines or operate with the most effective verified diesel emission control technology. The requirement does not apply to portable or stationary generators (engines). As of October 2014, this ordinance was under review.

Local GHG Reduction Strategies

The San Francisco Department of the Environment and the San Francisco Public Utilities Commission (SFPUC) prepared a Climate Action Plan (CAP).

The City's *Strategies to Address Greenhouse Gas Emissions* presents an assessment of policies, programs, and ordinances that collectively represent San Francisco's qualified GHG reduction in compliance with the BAAQMD's recommendations. The Strategies to Address Greenhouse Gas Emissions identifies a number of actions that the City has taken in support of the CAP, and mandatory requirements and incentives that have measurably reduced GHG emissions. These include, but are not limited to, increases in the energy efficiency of new and existing buildings, installation of solar panels on building roofs, implementation of a green building strategy, adoption of a zero waste strategy, a construction and demolition debris recovery ordinance, a solar energy generation subsidy, incorporation of alternative fuel vehicles in municipal transportation fleet (including buses and taxis), and a

mandatory composting ordinance. The strategy also identifies 42 specific regulations intended reduce GHG emissions of proposed development projects.

Greenhouse Gas Reduction Ordinance

This ordinance establishes the following GHG emission reduction limits for San Francisco and the target dates by which they must be achieved. Reductions from 1990 levels and target years are noted below.

- 25 percent by 2017
- 40 percent by 2025
- 80 percent by 2050

4.10.2 | Affected Environment

4.10.2.1 | LOCAL CLIMATE

The peninsula region extends from northwest of San Jose to the Golden Gate Bridge. The Santa Cruz Mountains run up the center of the peninsula, with elevations exceeding 2000 feet at the southern end, decreasing to 500 feet in South San Francisco. Coastal towns experience a high incidence of cool, foggy weather in the summer. Cities in the southeastern peninsula experience warmer temperatures and fewer foggy days because the marine layer is blocked by the ridgeline to the west. San Francisco lies at the northern end of the peninsula. Because most of San Francisco's topography is below 200 feet, marine air is able to flow easily across most of the City, making its climate cool and windy.

At the northern end of the peninsula in San Francisco, pollutant emissions are high, especially from motor vehicle congestion. Localized pollutants, such as carbon monoxide, can build up in "urban canyons." Winds are generally fast enough to carry the pollutants away before they can accumulate. In the vicinity of the Geary corridor, the average wind speed is approximately 10 miles from the northwest.[12]

The annual average temperature in the Geary corridor is approximately 57°F.[13] The Geary corridor area experiences an average winter temperature of approximately 52°F and an average summer temperature of approximately 60°F. Total precipitation in the Geary corridor averages approximately 21 inches annually. Precipitation occurs mostly during the winter and relatively infrequently during the summer.

4.10.2.2 | AIR QUALITY

The federal and state governments have established ambient air quality standards for outdoor concentrations of six common pollutants, called criteria pollutants, to protect public health. The criteria pollutant standards have been set at levels above which concentrations could be harmful to human health and welfare. These standards are designed to protect the most sensitive persons from illness or discomfort.

[12] As recorded at the San Francisco/International Airport Wind Monitoring Station.
[13] As recorded at the San Francisco Mission Dolores Station.

Pollutants and Effects Overview

Other air quality issues of concern in the Air Basin include nuisance effects of odors and dust. Objectionable odors may be associated with a variety of pollutants. Odors rarely have direct health effects, but they can be unpleasant and can lead to anger and concern over possible health effects among the public. Each year the BAAQMD receives thousands of citizen complaints about objectionable odors.[14]

Similarly, nuisance dust may be generated by a variety of sources including quarries, agriculture, grading and construction. Dust emissions can contribute to increased ambient concentrations of PM_{10}, and can also contribute to reduced visibility and soiling of exposed surfaces.

4.10.2.2.1 AIR MONITORING DATA

The BAAQMD monitors air quality conditions at 23 locations throughout the Bay Area. The closest air monitoring station to the Geary corridor is the Arkansas Street Monitoring Station, about 7.7 miles from the intersection of 48th Avenue and Geary Boulevard, and 3.8 miles from the intersection of Divisadero Street and Geary Boulevard. Historical data from this station was used to characterize existing conditions within the vicinity of the Geary corridor and to establish a baseline for estimating future conditions with and without implementation of the build alternatives. Table 4.10-2 summarizes ambient air quality conditions recorded during the 2009 to 2013 period.

Table 4.10-2 2009-2013 Ambient Air Quality Data in Project Vicinity

		NUMBER OF DAYS ABOVE STATE STANDARD				
POLLUTANT	POLLUTANT CONCENTRATION & STANDARDS	2009	2010	2011	2012	2013
Ozone	Maximum 1-hr Concentration (ppm)	0.07	0.08	0.07	0.07	0.07
	Days > 0.09 ppm (State 1-hr standard)	0	0	0	0	0
	Maximum 8-hr Concentration (ppm)	0.06	0.05	0.05	0.05	0.06
	Days > 0.07 ppm (State 8-hr standard)	0	0	0	0	0
	Days > 0.075 ppm (Federal 8-hr standard)	0	0	0	0	0
Carbon Monoxide	Maximum 1-hr concentration (ppm)	4.3	1.8	1.8	2	n/a
	Days > 20 ppm (State 1-hr standard)	0	0	0	0	
	Days > 35 ppm (Federal 1-hr standard)	0	0	0	0	
	Maximum 8-hr concentration (ppm)	2.9	1.4	1.2	1.2	
	Days > 9.0 ppm (State 8-hr standard)	0	0	0	0	
	Days > 9.0 ppm (Federal 8-hr standard)	0	0	0	0	n/a
Nitrogen Dioxide	Maximum 1-hr Concentration (ppm)	0.06	0.09	0.09	0.12	0.07
	Days > 0.18 ppm (State 1-hr standard)	0	0	0	0	0
	Days > 0.100 (Federal 1-hr standard)	0	0	0	**1**	0
Respirable Particulate Matter (PM_{10})	Maximum 24-hr Concentration (µg/m³)	36.0	39.7	45.6	50.6	41.9
	Estimated Days > 50 µg/m³ (State 24-hr standard)	0	0	0	0	*
	Estimated Days > 150 µg/m³ (Federal 24-hr standard)	0	0	0	**1**	*
Fine Particulate Matter ($PM_{2.5}$)	Maximum 24-hr Concentration (µg/m³)	36	45	48	36	48.5
	Estimated Days > 35 µg/m³ (Federal Standard)	**1**	**3**	**2**	**1**	2

Notes: ROG and NOx are not monitored pollutants but combine to form ozone. n/a stands for data not available. * means there was insufficient data available to determine the value.

Bolded text = exceeds standard

Source: CARB, Historical Data by Year, available at http://www.arb.ca.gov/adam/welcome.html, last accessed October 15, 2014.

[14] As recorded at the San Francisco Mission Dolores Station.

Relative to other roadways throughout San Francisco, the Geary corridor has a high level of air pollution from transportation sources and associated high levels of air pollution health risks.

In addition to monitoring criteria air pollutants, both the BAAQMD and CARB operate TAC monitoring networks in the Air Basin. These stations measure 10 to 15 TACs, depending on the specific station. The TACs selected for monitoring are those that have traditionally been found in the highest concentrations in ambient air, and therefore tend to be substantial contributors to community health risk. The BAAQMD operates an ambient TAC monitoring station at its 16th and Arkansas streets facility, which is the only monitoring site for air toxics in the City.

TACs are generally defined as those contaminants that are known or suspected to cause serious health problems, but do not have a corresponding ambient air quality standard. TACs are also defined as an air pollutant that may increase a person's risk of developing cancer and/or other serious health effects; however, the emission of a toxic chemical does not automatically create a health hazard. Other factors, such as the amount of the chemical; its toxicity, and how it is released into the air, the weather, and the terrain, all influence whether the emission could be hazardous to human health. TACs are emitted by a variety of industrial processes such as petroleum refining, electric utility and chrome plating operations, commercial operations such as gasoline stations and dry cleaners, and motor vehicle exhaust and may exist as PM_{10} and $PM_{2.5}$ or as vapors (gases). TACs include metals, other particles, gases absorbed by particles, and certain vapors from fuels and other sources.

The emission of toxic substances into the air can be damaging to human health and to the environment. Human exposure to these pollutants at sufficient concentrations and durations can result in cancer, poisoning, and rapid onset of sickness, such as nausea or difficulty in breathing. Other less measurable effects include immunological, neurological, reproductive, developmental, and respiratory problems. Pollutants deposited onto soil or into lakes and streams affect ecological systems and eventually human health through consumption of contaminated food. The carcinogenic potential of TACs is a particular public health concern because many scientists currently believe that there is no "safe" level of exposure to carcinogens. Any exposure to a carcinogen poses some risk of contracting cancer.

Table 4.10-3 shows ambient concentrations of carcinogenic TACs measured at the Arkansas Street station and the estimated cancer risks from lifetime (i.e., 70 years) exposure to these substances. When TAC measurements at this station are compared to ambient concentrations of various TACs for the Bay Area as a whole, the cancer risks associated with mean TAC concentrations in the City are similar to those for the Bay Area. Therefore, the estimated average lifetime cancer risk resulting from exposure to TAC concentrations measured at the Arkansas Street air monitoring station do not appear to be any greater than for the Bay Area as a region.

Table 4.10-3 Measurements of Carcinogenic Toxic Air Contaminants Concentrations at Arkansas Street Station and Estimated Cancer Risk from Lifetime Exposure

SUBSTANCE	CONCENTRATION	CANCER RISK PER MILLION[A]
Gaseous TACS	(PPB)	
Acetaldehyde	0.68	2
Benzene	0.23	19
1,3-Butadiene	0.044	13
Para-Dichlorobenzene	0.15	10
Carbon Tetrachloride	0.088	21
Ethylene Dibromide	0.006	3
Formaldehyde	1.32	8
Perchloroethylene	0.018	0.4
Methylene Chloride	0.12	0.3
Methyl Tertiary Butyl Ether (MTBE)	0.26	0.3
Chloroform	0.023	0.5
Trichloroethylene	0.01	0.1
Particulate TACs	(ng/m^3)	
Chromium (Hexavalent)	0.05	10

Notes: All values are from BAAQMD 2012 monitoring data from the Arkansas Street station, except for Para-Dichlorobenzene (2006), Ethylene Dibromide (1992), MTBE (2003).

ppb=parts per billion; ng/m^3 = nanograms per cubic meter

[A] Cancer risks were estimated by applying published unit risk values to the measured concentrations.

Source: California Air Resources Board (CARB), Ambient Air Toxics Summary, 2011a. Information available online at: http://www.arb.ca.gov/adam/toxics/sitesubstance.html. Last accessed February 20, 2013.

4.10.2.2.2 SENSITIVE RECEPTORS

Some land uses are considered more sensitive to changes in air quality than others, depending on the population groups and the activities involved. CARB has identified the following groups who are most likely to be affected by air pollution: children under 14, the elderly over 65 years of age, athletes, and people with cardiovascular and chronic respiratory diseases. Typically, sensitive receptors include residences, schools, playgrounds, child-care centers, athletic facilities, long-term health care facilities, rehabilitation centers, convalescent centers, and retirement homes. All sensitive receptors discussed above are located in proximity to the Geary corridor.

4.10.3 | Methodology

The alternatives were evaluated for potential air quality effects in terms of several considerations, including conformity with the CAA, daily construction emissions, passenger vehicle emissions, and pollutant concentrations and dispersion.

To assess transportation conformity with the CAA, regional and project-level air quality conformity analyses were conducted. Regional conformity was determined by reviewing the current RTP and TIP to establish whether the project is incorporated and thus covered for regional conformity. To determine project-level conformity hot spot analyses were conducted for carbon monoxide and particulate matter (PM_{10} and $PM_{2.5}$).

Daily construction emissions were assessed for all build alternatives by comparing estimated emissions of criteria air pollutants against regional significance thresholds. An analysis was also completed to assess health risks using the same methodology as was used for daily construction emissions. Exposure parameters and risk calculation equations were obtained from the BAAQMD guidance document *Recommended Methods and Modeling Local Risks and Hazards* (May 2011). It is anticipated that highest health risk would be associated with bringing Fillmore Street to grade under Alternative 3 and 3-Consolidated as this work would result in by far the highest level of construction intensity in terms of equipment use and truck activity and by extension, this activity would result in the highest health-related risks. In comparison, all other build alternative construction activities would be of substantially lower intensity/shorter duration. Accordingly, analysis of the Fillmore Street work proposed in Alternatives 3 and 3-Consolidated provides a worst-case scenario of potential health risks associated with any of the build alternatives.

Pollutant concentrations and dispersion was modeled using AERMOD, which considered two source locations: 1) side of the roadway for Alternative 2 and 2) the center lane for Alternative 3, 3-Consolidated, and the Hybrid Alternative/LPA.

Passenger vehicle emissions were estimated using VMT and traffic speed data. Emission rates were obtained from the CARB EMFAC2011 Motor Vehicle Emissions Inventory Model. Existing and future emissions from buses were also estimated using EMFAC2011, which also accounted for the use of emission control technology.

To determine the potential public health effects related to operation, pollutant concentrations were estimated in two steps: 1) Dispersion modeling was used to estimate total volatile organic compound (VOC) and PM_{10} concentrations, and 2) individual organic or particulate TAC concentrations were calculated using emissions profiles to determine total VOC and PM_{10} estimates. Similarly to construction-related emissions, operational TAC concentrations were also estimated using the air dispersion model AERMOD with model options for 1-hour maximum and annual average concentrations selected. Two source locations were considered in the dispersion modeling: 1) side of the roadway for Alternative 2, and 2) the center lane for Alternative 3, 3-Consolidated, and the Hybrid Alternative/LPA. Meteorological data from the BAAQMD Mission Bay-San Francisco Monitoring Station was used to represent local conditions.

The maximum incremental cancer risk from exposure to diesel particulate matter was calculated by estimating exposure to carcinogenic chemicals and multiplying the dose (which is the exposure and duration of the pollutant) times the cancer potency factor (a metric that estimates risk associated with exposure to a carcinogen).

The potential for exposure to result in chronic and acute non-cancer effects is evaluated by comparing the estimated annual and hourly average air concentrations to the chemical-specific non-cancer chronic reference exposure levels (RELs). The chronic REL is the inhalation exposure concentration at which no adverse chronic health effects would be anticipated following exposure. When calculated for a single chemical, the comparison yields a ratio termed a hazard quotient.

This analysis considered year 2020 No Build conditions as the environmental baseline against which future conditions were compared. Year 2020 was used as the baseline so as to more accurately compare the build alternatives taking into account future traffic conditions given the length of time between issuing the Notice of Preparation (2008) and the anticipated opening year of the project (2020).

4.10.4 | Environmental Consequences

This section summarizes effects of the project alternatives on regional and local air quality. The various regulatory requirements described in Section 4.10.1 above require consideration of potential consequences through several means. Accordingly, this section is organized as follows:

- Section 4.10.4.1: Hybrid Alternative/LPA Modifications - Analysis of Potential Additive Effects since Publication of the Draft EIS/EIR
- Section 4.10.4.2: Transportation Conformity with Federal Clean Air Act
- Section 4.10.4.3: Consistency with Applicable Air Quality Plan
- Section 4.10.4.4: No Build Alternative Construction Effects
- Section 4.10.4.5: Build Alternatives Construction Effects, including:
    - Air Quality and Greenhouse Gas Emissions
    - Health Risks/Toxic Air Contaminants
    - Odors
- Section 4.10.4.6: No Build Alternative Operational Effects
- Section 4.10.4.7: Build Alternatives Operational Effects, including:
    - Air Quality and Greenhouse Gas Emissions
    - Health Risks/Toxic Air Contaminants
    - Odors

This section also describes potential impacts and benefits for air quality. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 4.10.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding air quality impacts in the Draft EIS/EIR.

4.10.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;

4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe air quality impacts during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe air quality impacts relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: Retention (i.e., no demolition) of the Webster Street bridge would substantially reduce temporary construction activity (and associated construction-period emissions) in this area. Therefore, this modification would not result in any new or more severe air quality impacts during construction.

Operation: Because this modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3), anticipated long-term operational benefits regarding air quality and GHG emissions over the No Build Alternative would still be expected.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: This change would result in no new BRT stops being constructed in this area, which would in turn substantially reduce the amount of project-related construction in this area. The reduction in the extent of construction would not result in any new or more severe air quality impacts during construction.

Operation: Because this modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3), it would retain anticipated benefits regarding air quality and GHG emissions over the No Build Alternative. Therefore, this modification would not result in any new or more severe air quality impacts during operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: Construction of additional pedestrian improvements would require the same type of construction activity associated with other similar elements of the project. Each new pedestrian crossing bulb entails a relatively shallow excavation (1.5 feet) and a short work period duration (4-6 days). Although the proposed modification increases the number of new pedestrian crossing bulbs (from 65 as proposed in the Draft EIS/EIR to 91), the added bulbs would be widely dispersed throughout the 6.5-mile Geary corridor and would be constructed over time (within the various project phases). In the context of other elements of the Hybrid Alternative/LPA, any additional air quality impacts associated with construction at these locations would be marginal in their contribution to the project's overall emissions. Therefore, this modification would not result in any new or more severe air quality impacts during construction.

Operation: Neither the previously proposed nor the newly proposed pedestrian crossing bulbs would introduce any further change in traffic lane configurations, turning movements, or bus operations relative to what was described in the Draft EIS/EIR. Accordingly, with the inclusion of the additional pedestrian

improvements, the Hybrid Alternative/LPA would retain anticipated benefits regarding air quality and GHG emissions over the No Build Alternative. Therefore, this modification would not result in any new or more severe air quality impacts during operation.

Addition of BRT Stops at Laguna Street

Construction: Construction of additional BRT stops on new transit islands at Laguna Street would require the same type of construction activity associated with other similar elements of the project. The two new islands would require minor excavation and temporary lane reductions, similar in nature to the other project elements proposed for construction elsewhere along the corridor. Accordingly, the additional construction period air quality effects associated with these would, in the context of the construction of the Hybrid Alternative/LPA as a whole be marginal/negligible. Therefore, this modification would not result in any new or more severe air quality impacts during construction.

Operation: Implementation of this modification would increase the average end-to-end travel time of the inbound and outbound BRT service by about 49 seconds, compared to the Hybrid Alternative as analyzed in the Draft EIS/EIS. As this modification would not substantially affect bus operations by increasing travel delay, relative to what was described in the Draft EIS/EIR (see Section 3.3), it would retain anticipated benefits regarding air quality and GHG emissions over the No Build Alternative. Therefore, this modification would not result in any new or more severe air quality impacts during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: Temporary and localized air quality impacts would be reduced in the Collins Street area due to reduced construction and demolition activities at this location. Therefore, this modification would not result in any new or more severe noise and vibration impacts during construction.

Operation: Because this modification would not alter traffic signal timing, and no changes in traffic lane alignment are proposed, retention of existing bus stops would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3). Anticipated benefits regarding air quality and GHG emissions over the No Build Alternative would be maintained. Therefore, this modification would not result in any new or more severe air quality impacts during operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities but would simply shift about half of it one block to the west. This modification would alter roadway striping and the location of the transit signal queue jump, but would not require additional median removal or other intensive construction activities beyond what was described in the Draft EIS/EIR and, thus, would not create new or more severe air quality effects. Therefore, this modification would not result in any new or more severe noise and vibration impacts during construction.

DEFINITION

POAQC: The EPA Transportation Conformity Guidance defines a POAQC as any project in a place with a significant number of diesel vehicles or that will lead to a significant increase in diesel vehicles, including:

- **Highway projects;**
- **Projects affecting intersections with poor traffic flow;**
- **New or expanded bus or rail terminals and transfer points with diesel vehicles congregating in one place; and**
- **Projects in places or categories identified in the $PM_{2.5}$ or PM_{10} implementation plan as sites of possible violation.**

Operation: Because this modification would not add or remove bus stops or bus-only lanes, no change to travel time would result. As relocation of the transition would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3), it would retain anticipated benefits regarding air quality and GHG emissions over the No Build Alternative. Therefore, this modification would not result in any new or more severe air quality impacts during operation.

4.10.4.2 | TRANSPORTATION CONFORMITY WITH FEDERAL CLEAN AIR ACT

Transportation conformity is required under CAA section 176(c) (42 U.S.C. 7506(c)) to ensure that federally supported highway and transit project activities are consistent with the purpose of the SIP. Conformity to the purpose of the SIP means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS. EPA's transportation conformity rule (40 CFR 51.390 and Part 93) establishes the criteria and procedures for determining whether transportation activities conform to the SIP. Under the criteria, transportation projects must demonstrate conformity on regional and local levels.

4.10.4.2.1 REGIONAL CONFORMITY

The current RTP is the *2040 Plan for the San Francisco Bay Area* (MTC 2017). The RTP includes the Geary Corridor Bus Rapid Transit project. Both FHWA and the lead agency made a regional conformity determination for the current RTP in July 2017.

The Geary BRT project is also included in the 2017 TIP. FHWA and FTA determined the TIP to conform to the SIP on August 23, 2017.

The design, concept, and scope of the build alternatives are consistent with the project descriptions in the RTP and TIP, and also with the "open to traffic" assumptions of the regional emissions analysis MTC conducted in association with its adoption of the RTP. Therefore, the build alternatives are considered to have demonstrated regional conformity.

4.10.4.2.2 PROJECT CONFORMITY

Carbon Monoxide Hotspot Analysis

To demonstrate conformity, a project must not cause or contribute to new localized carbon monoxide violations or increase the frequency or severity of existing carbon monoxide violations. According to the BAAQMD, air quality monitors have not recorded an air exceedance of the federal carbon monoxide standards since at least 1994. Carbon monoxide concentrations throughout the state have steadily declined over time as vehicle engines have become more efficient and less polluting. The BAAQMD has recognized this trend and completed technical analyses that indicate that there is no potential for a carbon monoxide hotspot to occur when:

- Project traffic would not increase traffic volumes at affected intersections to more than 44,000 vehicles per hour; or
- Project traffic would not increase traffic volumes at affected intersections to more than 24,000 vehicles per hour where vertical and/or horizontal mixing is substantially limited (e.g., tunnel, parking garage, bridge underpass, natural

or urban street canyon, below-grade roadway). The fact that the Geary corridor study area is a highly developed urban area with multi-story buildings and contains streets with canyon-like air dispersion characteristics means that this criterion may be applied to certain blocks along the Geary corridor and some of its parallel streets.

None of the alternatives (build or no build) would increase traffic volumes at any intersection in the traffic study area to more than 24,000 vehicles per day.[15] There is therefore no potential for a new localized carbon monoxide violation and further analysis of carbon monoxide concentrations is not required.

$PM_{2.5}$/PM_{10} Hotspot Analyses

Qualitative PM hotspot analysis is required under the EPA Transportation Conformity rule for Projects of Air Quality Concern (POAQC). Projects that are not POAQC are not required to complete a detailed PM hotspot analysis.

The build alternatives are not considered POAQC because they do not meet the definition of a POAQC as defined in EPA's Transportation Conformity Guidance. The build alternatives would not increase the percentage of diesel vehicles on the roadway, do not involve a bus or rail terminal that significantly increases diesel vehicles, and are not identified in the SIP as a possible $PM_{2.5}$ or PM_{10} violation site. The build alternatives have undergone Interagency Consultation (IAC). IAC participants concurred that the build alternatives are not POAQC (refer to Appendix G).

4.10.4.3 | CONSISTENCY WITH APPLICABLE AIR QUALITY PLAN

The most recently adopted air quality plan for the Air Basin is the 2017 Clean Air Plan (2017 CAP).[16] In determining consistency with the 2017 CAP this analysis considers whether the project would: (1) support the primary goals of the 2017 CAP, (2) include applicable control measures from the 2017 CAP, and (3) disrupt or hinder implementation of control measures identified in the 2017 CAP.

The primary goals of the 2017 CAP are to attain all state and national air quality standards, eliminate disparities among Bay Area communities in cancer health risk from toxic air contaminants, and reduce Bay Area greenhouse gas (GHG) emissions 40 percent below 1990 levels by 2030 and 80 percent below 1990 levels by 2050. The discussion of GHG emissions presented demonstrated that the build alternatives would comply with the applicable provisions of the City's Greenhouse Gas Reduction Strategy.

A key objective of the project purpose is to improve transit conditions in the Geary corridor, and thus attract a greater portion of commuters to use bus instead of private passenger vehicles.

The 2017 CAP control strategies consist of the following:

- 40 Stationary Source Control Measures
- 23 Transportation Control Measures
- 2 Energy Control Measures
- 4 Buildings Control Measures
- 4 Agriculture Control Measures
- 3 Natural and Working Lands Control Measures
- 4 Waste Management Control Measures
- 2 Water Control Measures
- 3 Super-GHG Control Measures

[15] The traffic study area includes not only Geary Street/Boulevard but also portions of O'Farrell Street and other streets.

[16] BAAQMD. 2017. Bay Area 2017 Clean Air Plan. Available online at: **http://www.baaqmd.gov/~/media/files/planning-and-research/plans/2017-clean-air-plan/attachment-a_-proposed-final-cap-vol-1-pdf.pdf?la=en**. Last accessed December 21, 2017.

Implementation of any of the build alternatives, including the No Build Alternative, would result in short-term criteria pollutant emissions during construction.

However, replacement of standard motor coaches with diesel-hybrid electric buses would result in a decrease in several pollutants over the long-term. The analysis herein illustrates that neither construction nor operation of any of the project alternatives would result in emissions of criteria air pollutants that would impede attainment of air quality standards. The construction and operational health risk assessment demonstrates that implementation of any of the project alternatives would not substantially increase risks to public health.

As none of the build alternatives would result in substantial, long-term increases in criteria air pollutants, would not expose receptors to substantial pollutant concentrations, and would not result in substantial, long-term increases in GHG emissions, all of the project alternatives would support the primary goals of the 2017 CAP.

The measures most applicable to the project alternatives are transportation control measures (TCMs), which are strategies to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions as well as use of more advanced and less polluting fleet of vehicles. The 2017 CAP includes 23 TCMs to improve transit service, improve system efficiency, encourage sustainable travel behavior, support focused growth, and implement pricing strategies. In particular, the TCMs have been updated to support and complement critical land use and transportation strategies outlines in *Plan Bay Area*.[17] Implementation of the project alternatives would be consistent with the following 2017 CAP TCMs:

> **TCM TR3 Local and Regional Bus Service** - Fund local and regional bus projects, including operations and maintenance.
>
> **TCM TR5 Transit Efficiency and Use** – Improve transit efficiency and make transit more convenient for riders through continued operation of 511 Transit, full implementation of Clipper fare payment system and the Transit Hub Signage Program.
>
> **TCM TR9 Bicycle and Pedestrian Access and Facilities** – Encourage planning for bicycle and pedestrian facilities in local plans, e.g., general and specific plans, fund bike lanes, routes, paths and bicycle parking facilities.
>
> **TCM TR10 Land Use Strategies** – Support implementation of *Plan Bay Area*, maintain and disseminate information on current climate action plans and other local best practices, and collaborate with regional partners to identify innovative funding mechanisms to help local governments address air quality and climate change in their general plans.

[17]Metropolitan Transportation Commission. July 2017. Final Plan Bay Area 2040. Available online at: **https://mtc.ca.gov/sites/default/files/Final_Plan_Bay_Area_2040.pdf**. Last accessed December 21, 2017.

An evaluation of the 2017 CAP's 85 control measures determined that none of the project alternatives would disrupt or hinder implementation of any of the CAP's 85 control measures.

For the reasons stated above, the project alternatives (build and No Build) would be consistent with the most recent air quality plan that shows how the region will improve ambient air quality and achieve state and federal ambient air quality standards.

4.10.4.4 | NO BUILD ALTERNATIVE – CONSTRUCTION EFFECTS

Under the No Build Alternative, transit and transportation facilities and services would remain unaltered except for changes that are currently planned or programmed to be implemented in the Geary corridor by 2020. These projects have already undergone or will undergo individual environmental review, in which construction effects would be analyzed. Given the relatively small scale of the improvements comprising the No Build Alternative, no adverse effects relative to regional emissions, health risks and toxic air contaminants, asbestos, or odors are expected to result from construction.

4.10.4.5 | BUILD ALTERNATIVES – CONSTRUCTION EFFECTS

4.10.4.5.1 AIR QUALITY AND GREENHOUSE GAS EMISSIONS – CONSTRUCTION EFFECTS

Construction activity would generate air pollutant emissions from various sources, including equipment engines, truck engines, and earthwork activity. All build alternatives would be required to comply with San Francisco Health Code Article 22B and San Francisco Building Code §106A.3.2.6, which collectively constitute the City's Construction Dust Control Ordinance (adopted in July 2008). Recycled water would be required for use for dust control activities under City Ordinance 175-91. The build alternatives would further be required to comply with Section 6.25 of Chapter 6 of the San Francisco Administrative Code (Clean Construction Ordinance), which requires clean construction practices for all City projects that consist of 20 or more cumulative days of construction. The Clean Construction Ordinance requires that off-road equipment and off-road engines with 25 horsepower or greater: 1) be fueled by biodiesel fuel grade B20 or higher; and 2) if used more than 20 hours, either meet or exceed Tier 2 emissions standard for off-road engines or operate with the most effective verified diesel emission control technology. The requirement does not apply to portable or stationary generators (engines). Compliance with these regulations would control fugitive dust emissions and substantially reduce exhaust emissions associated with standard construction equipment.

From an air quality perspective (e.g., equipment use), the majority of construction activity would be similar for the various alternatives. However, construction activity associated with bringing Fillmore Street to grade (Alternatives 3 and 3-Consolidated) would generate the maximum daily emissions as a result of additional truck and equipment activity. Regional construction emissions associated with the project alternatives are presented in Table 4.10-4 for Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA. Table 4.10-4 also includes emissions for Alternative 2, which represents a typical segment that includes fewer truck trips and less equipment activity than needed to bring Fillmore Street to grade level. Accordingly, Alternative 2 is projected to result in lower daily levels of emissions. As shown in Table 4.10-4, each of the build alternatives is projected to generate daily emissions

of criteria pollutants below applicable thresholds. Therefore, none of the alternatives would result in an adverse effect regarding construction period emissions.

Table 4.10-4 Estimated Daily Construction Emissions for all Build Alternatives

	POUNDS PER DAY			
CRITERIA POLLUTANT OR OZONE PRECURSOR	REACTIVE ORGANIC GASES	NO_X	PM_{10}	$PM_{2.5}$
Alternative 2				
General Construction Emissions	5	21	1	1
Roadway Striping	3	--	--	--
Regional Significance Threshold	54	54	82	54
Exceed Threshold?	No	No	No	No
Alternative 3				
General Construction Emissions	6	41	1	1
Roadway Striping	3	--	--	--
Regional Significance Threshold	54	54	82	54
Exceed Threshold?	No	No	No	No
Alternative 3-Consolidated				
General Construction Emissions	6	41	1	1
Roadway Striping	3	--	--	--
Regional Significance Threshold	54	54	82	54
Exceed Threshold?	No	No	No	No
Hybrid Alternative/LPA				
General Construction Emissions	6	37	1	1
Roadway Striping	3	--	--	--
Regional Significance Threshold	54	54	82	54
Exceed Threshold?	No	No	No	No

Source: CARB, 2011b and TAHA, 2014

4.10.4.5.2 HEALTH RISK AND TOXIC AIR CONTAMINANTS –CONSTRUCTION EFFECTS

It is anticipated that highest risk to public health would be associated with bringing Fillmore Street to grade under Alternatives 3 and 3-Consolidated. This segment would experience the highest level of construction intensity in terms of equipment use and truck activity. As shown in Table 4.10-5, construction activity would not generate emissions that would exceed the BAAQMD health risk significance thresholds. Construction activity associated with Alternative 2 or a typical segment for Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA would result in lower risks. Therefore, implementation of the build alternatives would not result in adverse effects related to construction health risk.

Table 4.10-5 Construction Health Risk Assessment

HEALTH RISK TYPE	UNIT OF MEASUREMENT	FILLMORE STREET	THRESHOLD
Excess Cancer Risk (per million)	Probability per one million population	0.83	10
Chronic Health Risk	Health Index	0.05	1
Acute Health Risk	Health Index	0.40	1
Increase in PM Concentration	Annual Average ($\mu g/m^3$)	0.25	0.3

Source: TAHA, 2014

Asbestos-Containing Materials and Naturally Occurring Asbestos

Asbestos has not been identified in the existing roadway surface that would be removed during the construction process. The use of asbestos in asphalt was discontinued in May of 1979; streets comprising the Geary corridor have been demolished and repaved since that date.

According to the California Geologic Survey, naturally-occurring asbestos has been identified in San Francisco County

As a part of an ongoing study, the U.S. Geological Survey (USGS) identifies and maps reported occurrences of asbestos in the United States.[18] It is not anticipated that construction activity would encounter naturally occurring asbestos. Moreover, the City's Construction Dust Control Ordinance would effectively control unanticipated naturally occurring asbestos exposure through a variety of required control measures including watering.[19]

Therefore, the only components of the build alternatives to potentially involve exposure of asbestos would be the demolition of the pedestrian bridges at Webster Street and Steiner Street; in addition, Alternatives 3 and 3-Consolidated would decommission an existing below-grade pump station, including removal of a portion of its structure which could contain asbestos.

Accordingly, **c**onstruction contractors shall comply with BAAQMD Regulation 11 (Hazardous Pollutants) Rule 2 (Asbestos Demolition, Renovation, and Manufacturing). The requirements for demolition activities include removal standards, reporting requirements, and mandatory monitoring and record keeping.

4.10.4.5.3 ODORS – CONSTRUCTION EFFECTS

Equipment exhaust and paving activities would result in odor emissions for each of the build alternatives. Odors would be localized and generally confined to the construction area. Each build alternative would utilize typical construction techniques, and the odors would be typical of most construction sites and temporary in nature. Construction activity would not cause an odor nuisance, and construction odors would not result in any adverse effects for any of the build alternatives.

4.10.4.6 | NO BUILD ALTERNATIVE – OPERATIONAL EFFECTS

Under the No Build Alternative, transit and transportation facilities and services would remain unaltered except for changes that are currently planned or programmed to be implemented in the Geary corridor by 2020 Most of these improvements would have a negligible effect on operational air pollutant emissions. However, one planned improvement is the replacement of current diesel buses with lower emissions diesel hybrid electric buses. This aspect of the No Build Alternative would represent a beneficial effect relative to existing conditions in terms of both

[18] U.S. Geological Survey (USGS). 2011. Van Gosen, B.S., and Clinkenbeard, J.P. California Geological Survey Map Sheet 59. Reported Historic Asbestos Mines, Historic Asbestos Prospects, and Other Natural Occurrences of Asbestos in California. Open - File Report 2011 - 1188 Website: http://pubs.usgs.gov/of/2011/1188/. Last accessed October 15, 2014.

[19] According to the USGS Survey Map for Asbestos in California, the following areas in the County of San Francisco have been identified with asbestos occurrence:
1) U.S. Mint area, located 1 mile to the south of the Geary corridor; 2) Potrero Hill area, located 2 miles to the south of the Geary corridor; 3) Fort Point-Presidio area, located 2 mile to the northwest of the Geary corridor; and 4) Hunter Points Area, located approximately 5 miles to the southwest of the Geary corridor.

criteria air pollutants and greenhouse gas emissions. However, compared to the build alternatives, criteria air pollutant and GHG emissions would be the greatest under the No Build Alternative for forecast years 2020 and 2035 (refer to Table 4.10-6). The No Build Alternative would have no adverse effects on health risks and toxic air contaminants or odors.

4.10.4.7 | BUILD ALTERNATIVES – OPERATIONAL EFFECTS

4.10.4.7.1 CRITERIA AIR POLLUTANT AND GREENHOUSE GAS EMISSIONS – OPERATIONAL EFFECTS

Table 4.10-6 below summarizes regional operational period criteria air pollutant and GHG emissions for each of the build alternatives. Regional emissions are based on changes to countywide VMT, as each of the project alternatives have the potential to influence the regional transportation network. The table reflects expected emissions of criteria pollutants and GHGs that are likely to be emitted by the build alternatives. Therefore, certain criteria pollutants that are not associated with bus or auto emissions (including but not limited to sulfur dioxide and lead) are not reflected in the table. VMT and speed estimates were included in the air quality modeling.[20] Model outputs are estimated calculations of pollutants and greenhouse gases in terms of projected tons or metric tons per year.

Implementation of any of the build alternatives would generate operational emissions associated with a shift in regional passenger VMT and new buses servicing the Geary corridor. The operational analysis focused on estimating emissions associated with changes to transit and non-transit VMT. SFCTA estimated citywide passenger-vehicle VMT for various scenarios with and without implementation of the build alternatives. Tables 4.10-6 and 4.10-7 below summarize these estimates.

Table 4.10-6 Criteria Pollutant and GHG Emissions – Operational Effects

	TONS PER YEAR				
EMISSIONS BY ALTERNATIVE	REACTIVE ORGANIC GAS	NITROGEN OXIDES	PM_{10}	$PM_{2.5}$	CARBON DIOXIDE EQUIVALENT (METRIC TONS)
2020					
No Build Alternative	73.8	306.4	168.6	73.8	1,373,485
Alternative 2 Emissions	0.0	0.0	-0.2	-0.1	+127
Regional + Alternative 2 Emissions	*73.8*	*306.4*	*168.4*	*73.7*	*1,373,612*
Alternative 3 Emissions	-0.1	-0.3	-0.3	-0.2	-1,301
Regional + Alternative 3 Emissions	*73.7*	*306.1*	*168.3*	*73.6*	*1,372,184*
Alternative 3-Consolidated Emissions	-0.2	-0.6	-0.5	-0.2	-2,501
Regional + Alternative 3 Consolidated Emissions	*73.6*	*305.8*	*168.1*	*73.6*	*1,370,984*
Hybrid Alternative/LPA Emissions	-0.1	-0.3	-0.3	-0.2	-1,168
Regional + Hybrid Alternative/LPA Emissions	*73.7*	*306.1*	*168.3*	*73.6*	*1,373,317*

[20] CARB EMFAC2011 Motor Vehicle Emissions Inventory Model.

EMISSIONS BY ALTERNATIVE	TONS PER YEAR				
	REACTIVE ORGANIC GAS	NITROGEN OXIDES	PM_{10}	$PM_{2.5}$	CARBON DIOXIDE EQUIVALENT (METRIC TONS)
2035					
No Build Alternative	85.5	354.9	195.4	85.5	1,591,020
Alternative 2 Emissions	-0.1	-0.2	-0.4	-0.2	-1,816
Regional + Alternative 2 Emissions	*85.4*	*354.7*	*195.0*	*85.3*	*1,589,204*
Alternative 3 Emissions	-0.1	-0.4	-0.5	-0.2	-2,957
Regional + Alternative 3 Emissions	*85.4*	*354.5*	*194.9*	*85.3*	*1,588,063*
Alternative 3-Consolidated Emissions	-0.2	-0.8	-0.8	-0.4	-5,712
Regional + Alternative 3 Consolidated Emissions	*85.3*	*354.1*	*194.6*	*85.1*	*1,585,308*
Hybrid Alternative/LPA Emissions	-0.2	-0.8	-0.8	-0.4	-5,841
Regional + Hybrid Alternative/LPA Emissions	*85.3*	*354.1*	*194.6*	*85.1*	*1,585,179*

Note: the incremental project emissions show an increase (+) or decrease (-) in comparison to the No Build Alternative. This table does not represent all of the criteria air pollutants, only those that are reasonably expected to result from the project alternatives.

Source: CARB, 2011b and TAHA, 2014

Table 4.10-7 Regional VMT and Traffic Speed Data Under the No Build and Build Alternatives

SCENARIO	REGIONAL VEHICLE MILES TRAVELED (VMT)	AVERAGE SPEED (MILES PER HOUR)
EXISTING CONDITIONS		
2020 No Build Alternative	9,220,000	21
2020 Alternative 2	9,210,000	21
2020 Alternative 3	9,200,000	21
2020 Alternative 3-Consolidated	9,190,000	21
Hybrid Alternative/LPA	9,200,000	21
FUTURE YEAR BUILDOUT		
2035 No Build Alternative	11,160,000	17
2035 Alternative 2	11,140,000	17
2035 Alternative 3	11,130,000	17
2035 Alternative 3-Consolidated	11,120,000	17
Hybrid Alternative/LPA	11,120,000	17

Source: SFCTA, March 2014

Alternative 2: Side-Lane BRT

Alternative 2 and all other build alternatives also include the replacement of current diesel buses with lower emissions diesel hybrid electric models.

By the year 2020, Alternative 2 would result in modest decreases in countywide emissions of PM but no measurable decrease in other criteria pollutants. However, GHG emissions would increase by less than 1 percent relative to existing conditions. The increase is likely due to a combination of factors, including the removal of left turns along the Geary corridor.

By 2035, both PM and criteria pollutants would drop modestly relative to the No Build Alternative. Moreover, GHG emissions would decrease by 1,816 metric TPY relative to the 2035 No Build Alternative. This is a result of increased ridership associated with a mature transit system and various cumulative projects that will feed riders into the system. Therefore, Alternative 2 would result in long-term benefits in reducing both criteria pollutants and GHG emissions.

Alternative 3: Center-Lane BRT with Dual Medians and Passing Lanes

Alternative 3 operational criteria pollutant and GHG emissions are shown in Table 4.10-6. Countywide near-term (2020) regional criteria pollutant emissions would decrease modestly for all criteria pollutants compared to the 2020 No Build Alternative. GHG emissions would decrease by approximately 1,300 metric TPY of CO2e compared to the No Build Alternative. These reductions in emissions would result in a beneficial effect under Alternative 3 by 2020.

Regarding far-term (2035), emissions for all of the analyzed pollutants would decrease when comparing Alternative 3 to the 2020 No Build Alternative. This is a result of increased ridership associated with a mature transit system and various cumulative projects that will feed riders into the system. Therefore, Alternative 3 would result in a beneficial effect related to operational criteria pollutant and GHG emissions by 2035.

Alternative 3-Consolidated: Center-Lane BRT with Dual Medians and Consolidated Bus Service

Alternative 3-Consolidated operational criteria pollutant and GHG emissions are shown in Table 4.10-6. Near-term (2020) countywide regional criteria air pollutant emissions would decrease modestly in 2020 compared to the No Build Alternative. Criteria pollutant emissions reduction would be greater under Alternative 3-Consolidated for reactive organic gases, nitrogen oxides, and PM_{10} than under any of the other build alternatives. GHG emissions would decrease by approximately 2,500 metric TPY compared to the No Build Alternative. This is the greatest reduction in GHGs for any of the build alternatives. Therefore, Alternative 3-Consolidated would result in the greatest beneficial effect related to operational criteria pollutant and GHG emissions by 2020.

By 2035, both criteria air pollutant and GHG emissions would decrease further compared to the No Build Alternative. Therefore, Alternative 3-Consolidated would result in a beneficial effect related to operational criteria pollutant and GHG emissions by 2035.

Hybrid Alternative/LPA

Hybrid Alternative/LPA operational emissions are shown in Table 4.10-6. Countywide regional criteria pollutant and GHG emissions would decrease in 2020 and 2035 compared to the No Build Alternative. GHG emissions would decrease by 5,841 metric TPY by 2035, representing a greater reduction in GHGs compared to the No Build Alternative. Therefore, the Hybrid Alternative/LPA would result in a beneficial effect related to operational criteria pollutant and GHG emissions in both the near- and far-term.

4.10.4.7.2 HEALTH RISK AND TOXIC AIR CONTAMINANTS – OPERATIONAL EFFECTS

An analysis was completed to assess health risk associated with increased bus activity. Health risks were estimated on a local level in the portion of the Geary corridor where the build alternatives would generate the highest increase in bus emissions (Geary Boulevard between Masonic Avenue and Collins Street).[21]

The analysis indicated that Alternative 2 would result in a higher risk than the other build alternatives. This is because Alternative 2 would have fully side-running bus-only lanes; project-related emissions sources (buses) would be located closer to the sensitive receptors than the other build alternatives which include substantial components of center-running bus-only lanes, where emission sources would be in the center of the Geary corridor and thus would have somewhat greater opportunity to disperse prior to reaching any sensitive receptor. Table 4.10-8 therefore shows the risk associated with Alternative 2.

As shown in Table 4.10-8, the carcinogenic, chronic, and acute risks, along with the annual average $PM_{2.5}$ concentration would be less than the BAAQMD significance thresholds. Therefore, none of the project alternatives would result in an adverse effect related to health risk.

Table 4.10-8 Operational Health Risk Assessment

HEALTH RISK TYPE	UNIT OF MEASUREMENT	THRESHOLD	MAXIMUM HEALTH RISK
EXCESS CANCER RISK	PROBABILITY PER ONE MILLION POPULATION	10	2
CHRONIC HEALTH RISK	HEALTH INDEX	1.0	0.001
ACUTE HEALTH RISK	HEALTH INDEX	1.0	0.004
INCREASE IN PM2.5 CONCENTRATION	AVERAGE ANNUAL (MG/M^3)	0.3	0.005

Source: TAHA, 2014

4.10.4.7.3 ODORS – OPERATIONAL EFFECTS

Land uses and industrial operations that are associated with odor complaints include wastewater treatment plants, landfills, confined animal facilities, composting stations, food manufacturing plants, refineries, and chemical plants. None of the build alternatives include any land use or activity that typically generates adverse odors.

4.10.4.8 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, all build alternatives would conform to BAAQMD health risk thresholds. The Hybrid Alternative/LPA and Alternative 3-Consolidated would have the greatest beneficial air quality impacts in terms of reduced operational pollutants and emissions, followed by Alternative 3, then Alternative 2. The No Build Alternative would perform the worst in terms of short- and long-term operational GHG emissions. Each of the build alternatives would reduce GHG emissions at year 2035 by about 1,820 to over 5,840 metric tons of carbon dioxide equivalent per year (see Table 4.10-6). Moreover, the build alternatives would be projected to result in decreased emissions of criteria pollutants and TACs relative to the No Build Alternative. As also shown in Table 4.10-6, the No Build Alternative would result in year 2035 criteria pollutant and TAC emissions

[21] This analysis accounts only for the increase in number of bus trips; the precise increase in number of private vehicles on a given segment cannot be estimated.

ranging from about 85 metric tons per year for reactive organic gases (ROG) and small particulate matter ($PM_{2.5}$) to about 195.4 metric tons per year of large particulate matter (PM_{10}) and nearly 355 metric tons per year of nitrogen oxide (NOx). Each of the build alternatives would result in reduced levels of each of these criteria pollutants and TACs ranging from 0.1 to 0.8 metric tons per year.

4.10.5 | Avoidance, Minimization, and/or Mitigation Measures

4.10.5.1 | CONSTRUCTION MEASURES

With adherence to City ordinances and regulations regarding construction, such as the Construction Dust Control Ordinance, none of the alternatives would result in any adverse effects during construction related to emissions of air pollutants and GHGs. Therefore, no additional construction-period avoidance, minimization, or mitigation measures would be necessary.

4.10.5.2 | OPERATIONAL MEASURES

As described in Section 4.10.4.7, the build alternatives would generally decrease regional VMT and thus would be projected to result in decreased emissions of criteria pollutants, GHGs, and TACs relative to the No Build Alternative. Therefore, no operational avoidance, minimization, or mitigation measures would be required.

4.11 Noise and Vibration

Noise is generally defined as unwanted sound. The degree to which noise can affect the human environment ranges from levels that interfere with speech and sleep (annoyance and nuisance) to levels that cause adverse health effects (hearing loss and psychological effects).

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Vibration can be a serious concern, causing buildings to shake and rumbling sounds to be heard.

This section evaluates the potential for construction and operation of the project alternatives to result in substantial increases in noise and/or vibration. Information in this section was drawn from a project-specific noise analysis. This analysis is included as Appendix H and is on file with the San Francisco County Transportation Authority (SFCTA).

Human response to noise is subjective and can vary greatly from person to person. Factors that influence individual response include the intensity, frequency, the pattern of noise, and the amount of background noise

High levels of vibration may cause physical personal injury or damage to buildings. However, ground-borne vibration levels rarely affect human health

4.11.1 | Regulatory Setting

This section summarizes applicable federal, state, and local regulations regarding noise and vibration.

4.11.1.1 | FEDERAL

4.11.1.1.1 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)

The federal Noise Control Act of 1972 (Act) addressed the issue of noise as a threat to human health and welfare, particularly in urban areas. In response to the Act, EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (1974). According to these recommendations, under ideal conditions, the yearly average L_{eq} (defined at right) should not exceed 55 dBA outdoors and 45 dBA indoors in noise-sensitive areas, i.e., residential areas (refer to this page's sidebar for definitions of terms). EPA identified an increase of 5 dBA as an adequate margin of safety relative to a baseline noise exposure level of 55 dBA L_{dn} before a noticeable increase in adverse community reaction would be expected. EPA does not promote these recommendations as universal standards or regulatory goals with mandatory applicability to all communities, but instead as advisory exposure levels below which there would be no reason to suspect that there would be risk from any of the identified health or welfare effects of noise.

4.11.1.1.2 FEDERAL TRANSIT ADMINISTRATION (FTA)

FTA has developed guidance to evaluate noise effects from operation of surface transportation modes (i.e., passenger cars, trucks, buses, and rail) in the *FTA Transit Noise Impact and Vibration Assessment* (FTA Assessment; 2006). Mass transit projects receiving FTA funding are required to use these guidelines to predict and assess potential noise and vibration effects. FTA extended EPA's incremental impact criteria to higher baseline ambient levels. As ambient levels increase, smaller and

DEFINITIONS

EQUIVALENT CONTINUOUS NOISE LEVEL (L_{eq}): The average noise level on an energy basis for any specific time period. The L_{eq} for one hour is the energy average noise level during the hour

DAY-NIGHT AVERAGE SOUND PRESSURE LEVEL (L_{dn}): A 24-hour L_{eq} with an adjustment to reflect the greater sensitivity of most people to nighttime noise. The adjustment is a 10-dBA penalty for all sound that occurs during the nighttime hours of 10:00 p.m. to 7:00 a.m.

DECIBEL (dB): The standard unit of measurement for sound

dBA: The "A-weighted scale," abbreviated dBA, reflects the normal hearing sensitivity range of the human ear. On this scale, the range of human hearing extends from approximately 3 to 140 dBA

smaller increments of noise above the baseline are recommended to limit community annoyance. This is because in areas with high ambient noise, it takes a smaller increase in noise to attain the same percentage increase in highly annoyed people as a larger increase in noise in areas with low ambient noise.

FTA has identified three categories of noise-sensitive land uses.

- **Category 1** are tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use. Also included are recording studios and concert halls.
- **Category 2** are residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
- **Category 3** are institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

4.11.1.2 | STATE

4.11.1.2.1 GOVERNOR'S OFFICE OF PLANNING AND RESEARCH

The Governor's Office of Planning and Research *General Plan Guidelines* (Guidelines; 2003) promote the use of L_{dn} for evaluating the compatibility of various land uses with respect to their noise exposure. The Guidelines provide ranges of community noise exposure for specific types of land use that are "normally acceptable," "conditionally acceptable," "normally unacceptable," and "clearly unacceptable." The Guidelines provide each local community some flexibility in setting local noise standards that allow for the variability in community preferences and existing ambient noise levels.

- "Normally acceptable" for a given land use category implies that the interior noise levels would be acceptable to the occupant without the need for any special structural acoustic treatment.
- "Conditionally acceptable" indicates that new development of a given type should be undertaken only after a detailed analysis of the noise reduction requirements has been made and needed noise insulation features included in the design; conventional construction but with closed windows and fresh air supply systems or air conditioning will normally suffice.
- "Normally unacceptable" indicates that new development of a given type should generally be discouraged unless a detailed analysis of the noise reduction requirements is made and any identified noise insulation features are included in the design.
- "Clearly unacceptable" indicates that new development of a given type should generally not be undertaken.

4.11.1.2.2 CALIFORNIA NOISE INSULATION STANDARDS

The California Building Code and Title 24 of the California Code of Regulations establish uniform noise insulation standards for residential projects. For limiting noise from exterior sources, these regulations establish an interior standard of 45 dBA L_{dn} in any habitable room and, where such units are proposed in areas subject to exterior noise levels greater than 60 dBA L_{dn}, a demonstration of how dwelling units have been designed to meet this interior standard is also required. If the interior noise level depends on windows being closed, the design for the structure must also include a heating, ventilation, and air conditioning system that will provide for adequate fresh air ventilation as specified by the California Building Code.

4.11.1.3 | LOCAL

4.11.1.3.1 SAN FRANCISCO NOISE CONTROL ORDINANCE[1]

Pertinent noise requirements of San Francisco include:

- **Residential Property Noise Limits**. No person shall produce or allow to be produced a noise level more than 5 dBA above the ambient noise level.
- **Public Property Noise Limits**. No person shall produce or allow to be produced a noise level more than 10 dBA above the local ambient at a distance of 25 feet or more.
- **Fixed Residential Interior Noise Limits**. In order to prevent sleep disturbance, protect public health and prevent the environment from progressive deterioration due to increasing use and influence of mechanical equipment, no fixed noise source may cause the noise level measured inside any dwelling unit to exceed 45 dBA between the hours of 10:00 p.m. to 7:00 a.m. or 55 dBA between the hours of 7:00 a.m. to 10:00 p.m. with windows open.

Regarding noise related to construction activities, Section 2907 of the San Francisco Police Code states that it shall be unlawful for any person to operate any powered construction equipment if the operation of such equipment emits noise level above 80 dBA when measured at a distance of 100 feet from such equipment. However, this provision is not applicable to impact tools and equipment with exhaust mufflers that are approved by the Director of Public Works or the Director of Building Inspection. Section 2908, Construction Work at Night states that it shall be unlawful for any person to erect, construct, demolish, excavate, alter or repair any building or structure between the hours of 8:00 p.m. and 7:00 a.m. if the noise level created would result in the ambient noise level to increase by 5 dBA. Exemption to these time limits may be granted by permit from the Director of Public Works or the Director of Building Inspection.

San Francisco Public Works Code and Department of Public Works Orders

Article 2.4 of the Public Works Code governs excavation within public right-of-way (ROW) areas under the jurisdiction of San Francisco Public Works (SFPW). The article requires any person excavating in the public ROW to obtain an excavation permit and comply with Orders and Regulations of SFPW.

[1] City and County of San Francisco Police Code Article 29, Section 2909.

Order No. 176,707 (Regulations for Excavating and Restoring Streets in San Francisco) establishes rules and regulations for excavating and restoring streets that are under SFPW jurisdiction. This order requires contractors to conduct their operations in a manner that causes the least possible noise consistent with normal construction efficiency. Any operation or the use of any equipment that makes excessive or unusual noise is not allowed. Compressors must have effective mufflers and be mounted and insulated to the maximum extent feasible to minimize noise.

San Francisco Municipal Transportation Agency (SFMTA) Blue Book

The "Blue Book" is as guide for doing work in San Francisco streets that is applicable to City agencies (SFPW, SFMTA, San Francisco Public Utilities Commission [SFPUC], Port of San Francisco, etc.), utility crews, private contractors, and others performing work on City streets. The Blue Book's main purpose is to establish rules so that work can be done safely and in a way that will cause the least possible interference with pedestrians, bicycle, transit and other vehicular traffic. In addition to the regulations in this manual, a contractor is responsible for complying with all City, state, and federal codes, rules, and regulations. The Blue Book requires a Night Noise Permit for any construction work done between the hours of 8:00 p.m. and 7:00 a.m. in the roadway or sidewalk area.

San Francisco General Plan – Environmental Protection Element

Within the Environmental Protection Element of the San Francisco General Plan, there are several policies aimed at reducing transportation-related noise, to minimize the impacts of noise, and to promote land uses that are compatible with various transportation noise levels.

4.11.2 | Affected Environment

4.11.2.1 | FUNDAMENTALS OF SOUND

This analysis discusses sound levels in terms of Equivalent Noise Level (L_{eq}) and Day Night Noise Level (L_{dn})

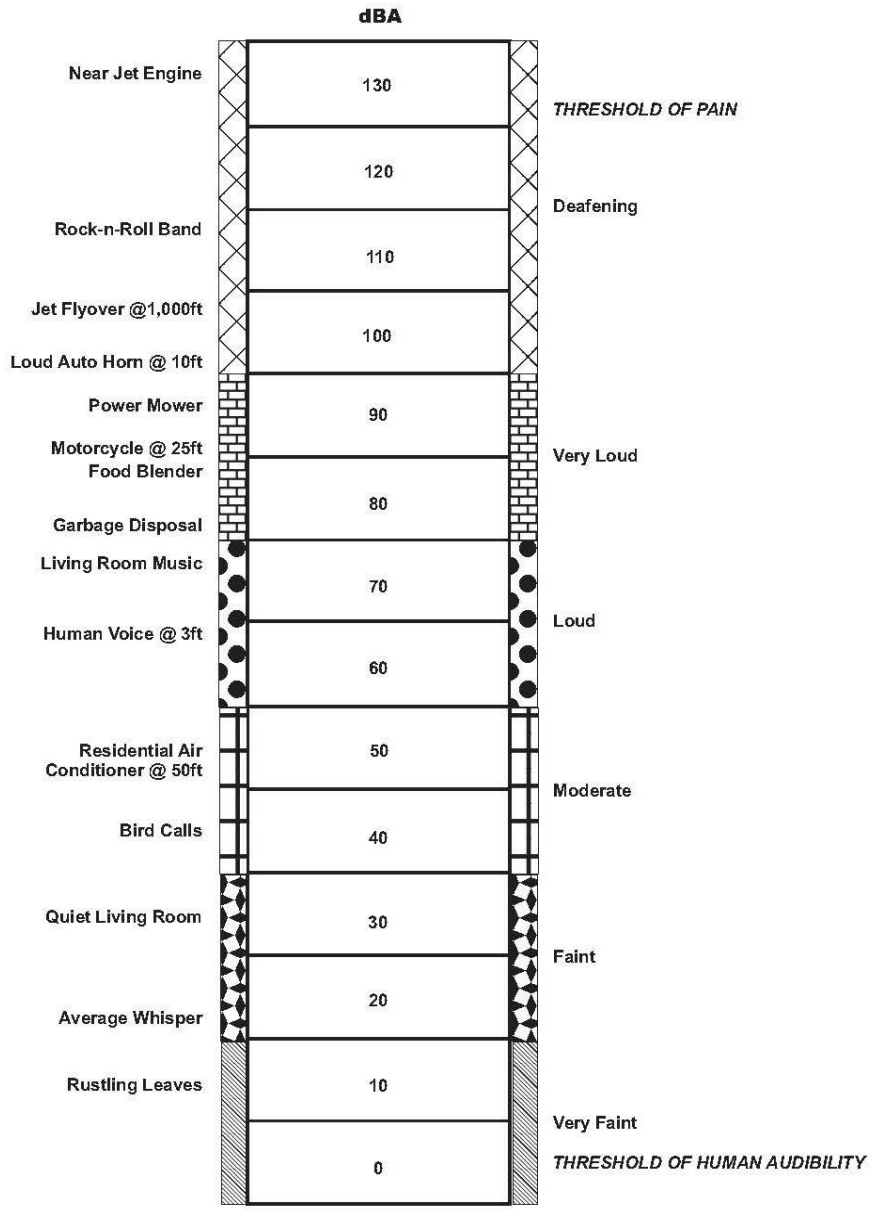
Sound is technically described in terms of the loudness (amplitude) and frequency (pitch) of the sound. The standard unit of measurement for sound is the decibel (dB). The human ear is not equally sensitive to sound at all frequencies. The "A-weighted scale," abbreviated dBA, reflects the normal hearing sensitivity range of the human ear. On this scale, the range of human hearing extends from approximately 3 to 140 dBA. Figure 4.11-1 provides examples of A-weighted noise levels from common sounds.

This analysis discusses sound levels in terms of Equivalent Noise Level (L_{eq}) and Day Night Noise Level (L_{dn}).

L_{eq} is the average noise level on an energy basis for any specific time period. The L_{eq} for one hour is the energy average noise level during the hour. The average noise level is based on the energy content (acoustic energy) of the sound. L_{eq} can be thought of as the level of a continuous noise which has the same energy content as the fluctuating noise level. The equivalent noise level is expressed in units of dBA.

L_{dn} is a 24-hour L_{eq} with an adjustment to reflect the greater sensitivity of most people to nighttime noise. The adjustment is a 10-dBA penalty for all sound that occurs during the nighttime hours of 10:00 p.m. to 7:00 a.m. The effect of the penalty is that in the calculation of L_{dn}, any event that occurs during the nighttime hours is equivalent to ten of the same event during the daytime hours.

Figure 4.11-1 A-Weighted Decibel Scale



SOURCE: Cowan, James P., *Handbook of Environmental Acoustics*

4.11.2.1.1 | AUDIBLE NOISE CHANGES

Studies have shown that the smallest perceptible change in sound level for a person with normal hearing sensitivity is approximately 3 dBA. A change of at least 5 dBA would be noticeable and would likely evoke a community reaction. A 10-dBA increase is subjectively heard as a doubling in loudness and would cause a community response.

Noise levels decrease as the distance from the noise source to the receiver increases. Noise generated by a stationary noise source, or "point source," will decrease by approximately 6 dBA over hard surfaces (e.g., reflective surfaces such as parking lots or smooth bodies of water) and 7.5 dBA over soft surfaces (e.g., absorptive surfaces such as soft dirt, grass, or scattered bushes and trees) for each doubling of the distance. For example, if a noise source produces a noise level of 89 dBA at a reference distance of 50 feet, then the noise level would be 83 dBA at a distance of 100 feet from the noise source, 77 dBA at a distance of 200 feet, and so on. Noise generated by a mobile source will decrease by approximately 3 dBA over hard surfaces and 4.5 dBA over soft surfaces for each doubling of the distance.

Sound measurements were taken to determine existing ambient daytime off-peak noise levels in the vicinity of the Geary corridor. Noise measurements were conducted at 11 sites for duration of 20 minutes each

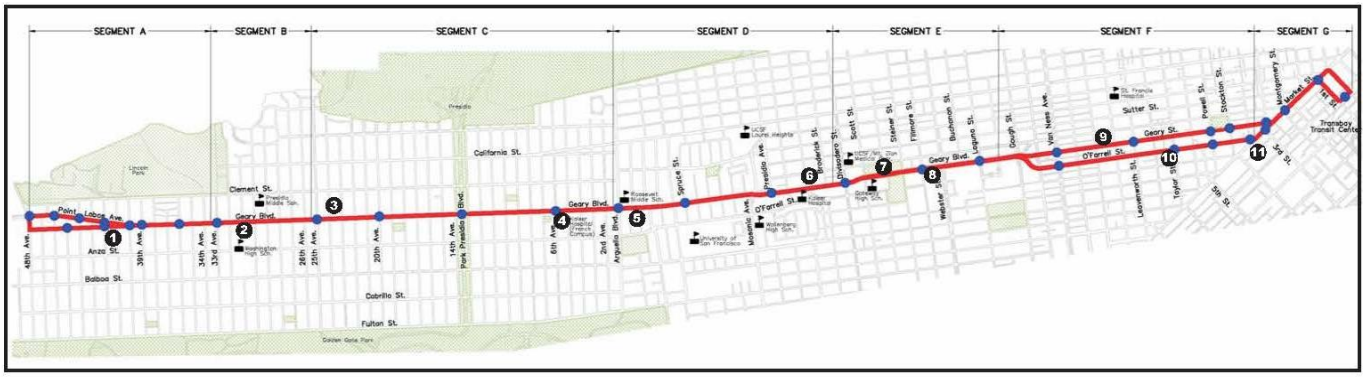
Generally, noise is most audible when traveling by direct line-of-sight. Barriers, such as walls, berms, or buildings between the source and the receiver can greatly reduce noise levels from the source since sound can only reach the receiver by bending over the top of the barrier (diffraction). Such barriers can reduce sound levels by up to 20 dBA. However, if a barrier is not high or long enough to break the line-of-sight from the source to the receiver, its effectiveness is greatly reduced.

4.11.2.1.2 | EXISTING NOISE ENVIRONMENT

The noise environment in the Geary corridor is comprised mostly of pass-by noise from automobiles, buses, and trucks, occasional motor vehicle horn noise, and clatter from street-level pedestrian and commercial activities. Noise monitoring locations were chosen to best represent existing noise sources and volumes throughout the Geary corridor. The presence of substantial institutional receptors, large blocks of receptors, and areas with different traffic volumes or other noise differentiators were key factors used in selecting monitoring locations so as to ensure an accurate representation of existing conditions. Figure 4.11-2 shows noise monitoring locations.[2]

[2] The ambient noise environment was monitored in 2011. The Geary corridor was, and remains, a fully built urban area. It is not anticipated that existing 2014 conditions have changed substantially such that they would significantly alter monitored noise levels. Therefore, the monitored noise accurately represents typically urban noise levels along the Geary corridor.

Figure 4.11-2 Noise Monitoring Locations



LEGEND:

- Existing 38-L Route
- Existing 38-L Stops
- Parks, Open Space
- Schools, Hospitals
- Noise Monitoring Locations

1. Single- and Multi-Family Residences
2. George Washington High School
3. St. Monica's Rectory and School
4. Kaiser Permanente Hospital (French Campus)
5. Institute on Aging
6. Hamilton Memorial Church
7. Hamilton Recreation Center
8. Sleep Quest Inc.
9. Alhambra Apartments
10. Super 8 Motel
11. Four Seasons Hotel

APPROX. SCALE

N

0 1,000 2,000 FEET

SOURCE: Jacobs Engineering Group, 2011 and TAHA, 2013.

Table 4.11-1 shows measured existing ambient sound levels at the selected locations, and each location's associated FTA's land use categories for transit noise impacts (see 4.11.1.1.2 above). Existing noise levels are typical for an urbanized area along an arterial roadway, ranging between 64.3 and 73.6 dBA L_{eq}.[3]

Table 4.11-1 Existing Noise Levels

MONITOR NUMBER	NOISE MONITORING LOCATION	FTA LAND USE CATEGORY	SOUND LEVEL (DBA, LEQ) OCTOBER 25, 2011	SOUND LEVEL (DBA, LEQ) OCTOBER 26, 2011
1	Single- and Multi-Family Residences	2	64.3	66.5
2	George Washington High School	3	68.8	66.4
3	St. Monica's Rectory and School	3	69.2	68.0
4	Kaiser Permanente Medical Center	2	73.1	72.3
5	Institute on Aging	2	73.6	72.5
6	Hamilton Memorial Church	3	71.1	71.8
7	Hamilton Recreation Center	3	71.4	71.0
8	Sleep Quest Inc.	2	67.5	69.2
9	Alhambra Apartments	2	68.8	68.2
10	Super 8 Hotel	2	70.8	68.1
11	Four Seasons Hotel and Residence	2	n/a	71.1

"n/a" = Noise level was not available at this location.

Source: Terry A. Hayes Associates Inc., 2014

4.11.2.1.3 | SENSITIVE RECEPTORS

For the Geary corridor, receptors that require further noise analysis are those within 200 feet of the source and with unobstructed views of the source, and those within 100 feet of the source and with intervening buildings between the receptor and source

Residences, schools, hospitals, guest lodging, libraries and some passive recreation areas would each be considered noise- and vibration-sensitive and may warrant unique measures for protection from intruding noise. As shown in Table 4.11-1, only category 2 and 3 land uses are present in the Geary corridor study area.

FTA has established noise screening criteria to identify sensitive receptors that may be affected by transit projects. FTA guidance prescribes sensitive receptor screening distances for noise impacts that are dependent on transit mode type, rail type, and other factors. A 200-foot screening distance applies to buses that travel in dedicated transit lanes where no intervening buildings are present, whereas a 500 foot screening distance is recommended for buses that travel in mixed-flow travel lanes without any intervening structures. Given that the only portion of the Geary corridor where buses would travel in mixed-flow travel lanes would be between 34th and 48th Avenues, the noise analysis uses the screening criteria for buses traveling in dedicated bus-only lanes because this portion of the corridor is lined with many intervening structures that would attenuate noise effects. Sensitive receptors within 200 feet of the noise source and with unobstructed views of the noise source, as well as those within 100 feet of the source but with intervening buildings between the

[3] The California Department of Transportation Technical Noise Supplement (November 2009) states that the 24-hour L_{dn} is typically within 2 dBA of the peak hour L_{eq}. This statement is supported by the 2011 Van Ness BRT noise analysis where the average L_{dn} was within 2.7 dBA of the peak hour L_{eq}. Therefore, when necessary, the monitored L_{eq} was adjusted and increased by 2.7 dBA to obtain the existing L_{dn} for the peak period.

receptor and source were used.[4] These types of land uses and structures are present throughout the Geary corridor.

Table 4.11-7 below lists sensitive receptors along the Geary corridor that are within the noise screening criteria. Since there are numerous single- and multi-family residences located adjacent to the north and south Geary corridor, these residences have been grouped together as clusters.

4.11.2.2 | VIBRATION

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration effects to buildings and is usually measured in inches per second. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (Vdb) is commonly used to measure RMS. The decibel notation acts to compress the range of numbers required to describe vibration.

DEFINITION

ROOT MEAN SQUARE AMPLITUDE (RMS): RMS is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (Vdb) is commonly used to measure RMS

4.11.2.2.1 EFFECTS OF VIBRATION

In contrast to noise, ground-borne vibration is not a phenomenon that most people experience every day. The background vibration velocity level in residential areas is usually 50 RMS or lower, well below the threshold of perception for humans which is around 65 RMS. Most perceptible indoor vibration is caused by sources within buildings, such as operation of mechanical equipment, movement of people or slamming of doors. Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains and traffic on rough roads. If the roadway is smooth, the vibration from traffic is rarely perceptible.

There are no stationary sources of vibration located within the Geary corridor. Heavy-duty trucks can generate ground-borne vibrations that vary depending on vehicle type and weight, and pavement conditions. However, vibration levels from adjacent roadways are not typically perceptible at the project site.

4.11.2.2.2 VIBRATION SENSITIVE RECEPTORS

FTA has identified three categories of vibration-sensitive land uses.

- **Category 1** receptors are highly sensitive to vibration and typical land uses include vibration-sensitive research and manufacturing, hospitals with vibration-sensitive equipment and university research operations.
- **Category 2** receptors include all residential land uses and buildings where people sleep, such as hotels and hospitals.
- **Category 3** receptors include schools, churches, other institutions and quiet offices that do not have not have vibration-sensitive equipment, but still have the potential for activity interference.

[4] Sensitive receptors do exist beyond the 200 foot screening distance used in some portion of the Geary corridor. But, given that there are no adverse effects within the 200 foot screening distance, the nature of noise is such that noise would attenuate at further distances, so sensitive receptors in the larger geography would not be adversely affected.

4.11.3 | Methodology

The alternatives were evaluated for potential noise and vibration effects in terms of several considerations, including land use, noise changes, bus lane type, construction equipment, etc. The alternatives have the potential to result in construction period and/or operational period effects as noted below.

Construction-Related Effects

- Use of heavy equipment in construction and demolition

Operational-Related Effects

- Changes in noise from bus activity

Potential noise and vibration related effects associated with the items listed above were evaluated in terms of project-related change in transit vehicle frequencies and the introduction of transit vehicles to new bus-only lanes based on projected baseline conditions at the project's opening year of 2020.

Projected bus speed and the distance of bus-only lanes from sensitive receptors are important criteria in determining noise changes associated with the project alternatives.

Table 4.11-2 summarizes FTA noise impact criteria. These criteria are based on a comparison of the existing outdoor noise levels and the future outdoor noise levels from implementation of a given project (here, the build alternatives). Some land use activities are more sensitive to noise than others, such as parks, churches and residences, as compared to industrial and commercial uses. The Assessment has identified three categories of sensitive land uses.

Table 4.11-2 Land Use Categories And Metrics For Transit Noise Impact Criteria

LAND USE CATEGORY	NOISE METRIC (DBA)	DESCRIPTION OF LAND USE CATEGORY
1	Outdoor $L_{eq}(h)/a/$	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use. Also included are recording studios and concert halls.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $L_{eq}(h)/a/$	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

L/a/ Leq for the noisiest hour of transit-related activity during hours of noise sensitivity.

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, May 2006

The noise impact criteria for human annoyance are based on a comparison of the ambient and future outdoor noise levels. The criteria include activity interference caused by the transit project alone and annoyance due to the change in the noise environment caused by implementation of the build alternatives. The following two impact levels are included in the FTA criteria, as shown in Table 4.11-3:

- **Moderate Impact**. The change in the existing noise level is noticeable to most people, but may not be sufficient to cause strong, adverse reactions from the community. In this range, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These other factors may include the predicted increase over existing noise levels, the type and number of noise-sensitive land uses affected, existing outdoor- indoor sound insulation, and the cost effectiveness of mitigating noise to more acceptable levels.
- **Severe Impact**. A substantial percentage of people would be highly annoyed by the additional or new noise and noise mitigation will be specified unless there is no practical method of mitigating the noise.

Table 4.11-3 Noise Levels Defining Impact for Transit Project

EXISTING NOISE EXPOSURE L_{eq}(H) OR Ldn (dBA) /a/	PROJECT NOISE IMPACT EXPOSURE, L_{eq}(H) OR L_{dn} (dBA) /a/					
	CATEGORY 1 OR 2 SITES			CATEGORY 3 SITES		
	NO IMPACT	MODERATE IMPACT	SEVERE IMPACT	NO IMPACT	MODERATE IMPACT	SEVERE IMPACT
61	<59	59-64	>64	<64	64-69	69
62	<59	59-64	>64	<64	64-69	69
63	<60	60-65	>65	<65	65-70	70
64	<61	61-65	>65	<66	66-70	70
65	<61	61-66	>66	<66	66-71	71
66	<62	62-67	>67	<67	67-72	72
67	<63	63-67	>67	<68	68-72	72
68	<63	63-68	>68	<68	68-73	73
69	<64	64-69	>69	<69	69-74	74
70	<65	65-69	>69	<70	70-74	74
71	<66	66-70	>70	<71	71-75	75
72	<66	66-71	>71	<71	71-76	76
73	<66	66-71	>71	<71	71-76	76
74	<66	66-72	>72	<71	71-77	77
75	<66	66-73	>73	<71	71-78	78
76	<66	66-74	>74	<71	71-79	79
77	<66	66-74	>74	<71	71-79	79
>77	<66	66-75	>75	<71	71-80	80

/a/ Ldn is used for land use where nighttime sensitivity is a factor; Leq during the hour of maximum transit noise exposure is used for land use involving only daytime activities.

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006

On street segments with two-way traffic, noise levels were modeled from the curbline of the rightmost lane to the nearest sensitive receptors. For one way traffic street segments, noise levels were modeled from the curbline of the rightmost lane and from the left edge of the rightmost curb lane depending on the location of the closet sensitive receptor. Bus noise on all segments was assessed based on existing noise levels in the area and posted speed limits. A maximum noise level analysis was

completed for the area near Fillmore Street that accounted for this portion of Geary Boulevard being raised to street level in Alternatives 3 and 3-Consolidated. This scenario generates the maximum noise level as all vehicle activity would be closer to adjacent land uses than currently with the existing underpass area.

4.11.4 | Environmental Consequences

An assessment was conducted to calculate project noise and vibration levels for the project alternatives, during both operational and construction phases. This section is organized as follows to address all pertinent regulatory requirements.

- Section 4.11.4.1: Hybrid Alternative/LPA Modifications –Analysis of Potential Additive Effects since Publication of the Draft EIS/EIR
- Section 4.11.4.2: No Build Alternative - Construction Period Noise and Vibration
- Section 4.11.4.3: Build Alternatives - Construction Period Noise
- Section 4.11.4.4: Build Alternatives - Construction Period Vibration
- Section 4.11.4.5: No Build Alternative - Operational Period Noise and Vibration
- Section 4.11.4.6: Build Alternatives - Operational Period Noise
- Section 4.11.4.7: Build Alternatives - Operational Period Vibration

This section describes potential impacts and benefits for noise and vibration. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 4.11.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding noise and vibration impacts in the Draft EIS/EIR.

4.11.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: ANALYSIS OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe noise and vibration impacts during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe noise and vibration impacts relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: Retaining the Webster Street bridge would reduce demolition in this area, and thus substantially reduce anticipated construction-period noise and vibration in the immediate vicinity. This modification would not result in any new or more severe noise and vibration impacts during construction.

Operation: This modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3); buses would not operate any closer to nearby sensitive receptors than previously envisioned. Therefore, this modification would not result in any new or more severe noise and vibration impacts during operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: Since no new BRT stops would be constructed in this area, construction period noise would be substantially reduced relative to what was assumed in the Draft EIS/EIR. Therefore, this modification would not result in any new or more severe noise and vibration impacts during construction.

Operation: This modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3); the only change would be that BRT buses would pass by this block rather than make stops. This would result in BRT buses passing by at higher speeds, which may increase operational noise levels at this location. However, already being situated on a busy transportation corridor, BRT buses passing by would represent a marginal change in the existing noise environment. Therefore, this modification would not result in any new or more severe noise and vibration impacts during operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: Construction of additional pedestrian improvements would increase short-term noise levels in the areas where such improvements would be implemented. However, the relatively short duration of such activities (4-6 days) and their location within the public right-of-way limits the potential for these additional improvements to increase the severity of any previously identified construction-period noise effects. Therefore, this modification would not result in any new or more severe noise and vibration impacts during construction.

Operation: This modification would not affect bus operations, lane configurations, or turning movements relative to what was described in the Draft EIS/EIR (see Section 3.3). Therefore, this modification would not result in any new or more severe noise and vibration impacts during operation.

Addition of BRT Stops at Laguna Street

Construction: Construction of the in-street boarding platforms at Laguna Street would increase short-term noise levels in this area, but the relatively short duration of such activities (2-3 weeks) and their location within the public right-of-way limits the potential for these additional improvements to increase the severity of any previously identified construction-period noise effects. Therefore, this modification would not result in any new or more severe noise and vibration impacts during construction.

Operation: This modification would have more buses making stops at Laguna Street; the Draft EIS/EIR anticipated noise levels associated with side-running bus lanes with only local buses making stops. Since the modification would result in the bus-only lanes being further from the face of curb and BRT buses would typically make stops (as demand warrants), this modification would likely reduce operational noise levels in this area from what was described in the Draft EIS/EIR and would not foreseeably result in any new or more severe noise and vibration impacts during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: Since existing stops would be maintained at this location, construction noise and vibration would be reduced. This modification would not result in any new or more severe noise and vibration impacts during construction.

Operation: This modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3). Instead of all buses passing by Collins Street, local and express buses would make stops. This modification would therefore somewhat reduce operational noise levels from the operational pattern described in the Draft EIS/EIR.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the level of construction activities but would simply shift about half of it one block to the west. This modification would alter roadway striping and the location of the transit signal queue jump, but would not require additional median removal or other intensive construction activities beyond what was described in the Draft EIS/EIR and, thus, would not create new or more severe noise and vibration effects. Therefore, this modification would not result in any new or more severe noise and vibration impacts during construction.

Operation: This modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3). Therefore, this modification would not result in any new or more severe noise and vibration impacts during operation.

4.11.4.2 | NO BUILD ALTERNATIVE – CONSTRUCTION PERIOD NOISE AND VIBRATION

Under the No Build Alternative, transit and transportation facilities and services would remain unaltered except for changes that are currently planned or programmed to be implemented in the Geary corridor by 2020 (see Section 2.2.2). Construction period noise and vibration would likely occur for the various transportation and infrastructure improvement projects included in the No Build Alternative. Construction of these projects would be subject to the same City regulations (the Noise Ordinance, DPW Article 2.4, and DPW Order 176,607) as the build alternatives. As such, construction of the No Build improvements would not be expected to result in adverse construction-related noise or vibration effects.

4.11.4.3 | BUILD ALTERNATIVES - CONSTRUCTION PERIOD NOISE

With adherence to the San Francisco Noise Ordinance, temporary construction period noise associated with all of the build alternatives would not result in adverse effects

The FTA Assessment does not include standardized criteria for assessing construction noise effects but instead states that local noise ordinances may be used. Accordingly, construction activity would be subject to pertinent aspects of the San Francisco Noise Ordinance, DPW Article 2.4, and DPW Order 176,707:

- Any construction between the hours of 8 p.m. and 7 a.m. shall not produce noise levels in excess of 5 dBA above the ambient noise level at the property line, unless a special permit is approved by SFPW.
- Limit noise from any individual piece of construction equipment, except impact tools, to 80 dBA at 100 feet.

Construction of the any of the project alternatives would result in temporary increases in ambient noise levels on an intermittent basis. The increases in noise would occur during construction, the duration of which would depend on the alternative selected and any phasing (see Section 4.15 regarding construction duration and phasing information). Noise levels would fluctuate depending on the construction phase, equipment type and duration of use, distance between the noise source and receptor, and presence or absence of noise attenuation barriers. Perceived noise would also fluctuate depending on time of day. Some nighttime work is anticipated as a means of helping keep the Geary corridor operational during daytime hours.

Construction activities typically require the use of various types of heavy equipment. Table 4.11-4 lists typical noise levels from various types of construction equipment.

Table 4.11-4 Typical Noise Levels From Construction Equipment

	NOISE LEVEL (DBA)	
NOISE SOURCE	50 FEET	100 FEET
Air Compressor	81	75
Back Hoe	80	74
Compactor	82	76
Concrete Mixer	85	79
Concrete Pump	82	76
Crane Mobile	83	77
Concrete Vibrator	76	70
Drill Rig Truck	79	76
Dump Truck	88	82
Generator	81	75
Jack Hammer	88	82
Loader	85	79
Paver	77	71
Pneumatic Tool	85	79
Roller	74	68
Saw	76	70

Source: Federal Transit Administration, 2006

4.11.4.3.1 | ALTERNATIVE 2 - CONSTRUCTION EFFECTS

As shown on Table 4.11-4 above, the expected noise levels from construction equipment would exceed 80 dBA at 100 feet from dump trucks and jack hammering. With adherence to the San Francisco Noise Ordinance, which includes limiting the noise levels from individual pieces of construction equipment to 80 dBA at a distance of 100 feet, equipping impact tools with both intake and exhaust mufflers, and obtaining a noise permit for night work from SFPW, these temporary construction noise effects would not be adverse.

While the build alternatives would be required to adhere to the Noise Ordinance and construction equipment noise would not be anticipated to exceed 80 dBA at 100 feet, some construction-related activities nonetheless have potential to result in disturbance and annoyance effects on nearby sensitive receptors. To this end, minimization measures are incorporated herein to provide for noise monitoring throughout construction as well as the implementation of additional sound-attenuating measures (including but not limited to sound walls, management of truck routes, etc.) that are necessary to minimize adverse effects.

Build Alternative 2 includes demolition and removal of the pedestrian bridges at Webster and Steiner Streets, including all above- and below-ground bridge components. The bridge at Webster Street is located as close as 15 feet to residential uses; the bridge at Steiner Street is located approximately 60 feet from residences.

Bridge demolition and removal would expose sensitive receptors to temporary noise increases during active demolition. The primary source of noise associated with bridge removal would be from jack hammers and similar impact equipment. Jack hammers generate a noise level of approximately 88 dBA at 50 feet, or 82 dBA at 100 feet. Section 2907(b) of the San Francisco Police Code states that it shall be unlawful for any person to operate any powered construction equipment if the operation of such equipment emits noise level above 80 dBA when measured at a distance of 100 feet from such equipment. However, this provision is not applicable to impact tools and equipment fitted with intake and exhaust mufflers recommended by the manufacturers and approved by the Director of Public Works or the Director of Building Inspection as best accomplishing maximum noise attenuation. In addition, pavement breakers and jackhammers are required to be equipped with acoustically attenuating shields or shrouds recommended by the manufacturers and approved by the Director of Public Works or the Director of Building Inspection as best accomplishing maximum noise attenuation. With adherence to the San Francisco Noise Control Ordinance the temporary construction noise generated would not result in any adverse effects.

All build alternatives may result in noise levels in excess of 80 dBA at 100 feet due to removal of pedestrian bridges at Webster and Steiner Streets. However, with adherence to the aforementioned provisions of the San Francisco Noise Ordinance, these temporary construction noise effects would not be adverse.

4.11.4.3.2 ALTERNATIVES 3 AND 3-CONSOLIDATED - CONSTRUCTION EFFECTS

The same general construction methods described for Alternative 2 would be used to build the physical elements of Alternatives 3 and 3-Consolidated, although Alternatives 3 and 3-Consolidated would entail more intensive construction of bus-only lanes and medians in the center of Geary Boulevard west of Gough Street. This activity would be further from sensitive receptors compared to Alternative 2, which would construct bus-only lanes closer to the edge of the street.

These alternatives would also include the conversion of the Fillmore Street underpass to a conventional, at-grade intersection (which in turn involves the filling and/or removal of the existing pump station, demolition of the existing grade separation structure, and rebuilding of the roadway). As previously discussed, the expected noise levels from construction equipment could exceed 80 dBA at 100 feet. With adherence to the San Francisco Noise Ordinance, equipping impact tools with both intake and exhaust mufflers, and obtaining a noise permit for night work from SFPW, temporary construction noise effects would not be adverse.

4.11.4.3.3 HYBRID ALTERNATIVE/LPA – CONSTRUCTION EFFECTS

The Hybrid Alternative/LPA consists of different components from Alternatives 2, 3, and 3-Consolidated, thus the focus of construction activity would not be concentrated in one particular section of the street right-of-way. Therefore, the Hybrid Alternative/LPA would be represented by the range of construction activity covered between the three build alternatives. However, given that the Hybrid Alternative/LPA would not remove the Webster Street pedestrian bridge, nor would it construct a new BRT station at Spruce-Cook or remove existing stops at Collins Street, construction-period noise impacts would be reduced relative to the other build alternatives.

With adherence to the San Francisco Noise Ordinance, equipping impact tools with both intake and exhaust mufflers, and obtaining a noise permit for night work from SFPW, temporary construction noise effects would not be adverse.

4.11.4.4 | BUILD ALTERNATIVES - CONSTRUCTION PERIOD VIBRATION

The vibration from most rubber-tired construction vehicles moving slowly through the construction area would not be expected to result in adverse vibration effects. Impact equipment, such as vibratory rollers, hoe rams, small bulldozers loaded trucks, and jackhammers would be used during construction for utility relocation, asphalt removal and repaving and the construction of project elements. Construction of the build alternatives would not require construction activities, such as pile driving or underground tunneling that produce high levels of vibration.

DEFINITION

CATEGORY I: Reinforced concrete buildings with steel or timber (no plaster)

CATEGORY II: Engineered concrete and masonry buildings (no plaster)

CATEGORY III: Non-engineered timber and masonry buildings

CATEGORY IV: Buildings extremely susceptible to vibration damage

FTA has developed impact criteria for four types of buildings. Commercial type multiple-storied structures are generally represented by Categories I and II. Typical wood-framed residences fall under Category III, while any structurally fragile buildings (i.e., more likely to be historical in nature) fall under Category IV. The impact criteria are presented in Table 4.11-5. The vibration levels generated by construction equipment are shown in Table 4.11-6. FTA then calculated the distances at which vibration effects would likely occur according based on the criteria presented in Table 4.11-3. Table 4.11-6 also shows the results of those

calculations as classified per building category. The distances shown are the maximum distances at which short-term construction vibration impacts may occur.

Table 4.11-5 Construction Vibration Damage Criteria

BUILDING CATEGORY	PPV (IN/SEC)	APPROXIMATE VIBRATION VELOCITY LEVEL (L_V)
I. Reinforced-concrete, steel or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006

Table 4.11-6 Vibration Velocities for Construction Equipment

EQUIPMENT	PPV AT 25 FEET (INCHES/SECOND)	IMPACT DISTANCE FOR BUILDING CATEGORY, (FT)			
		I	II	III	IV
Vibratory Roller	0.210	14	19	25	36
Hoe Ram	0.089	7	11	14	20
Large Bulldozer	0.089	7	11	14	20
Jackhammer	0.035	4	5	7	11
Loaded Trucks	0.076	7	10	13	18
Small Bulldozer	0.003	1	1	2	2

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006

4.11.4.4.1 ALTERNATIVE 2 - CONSTRUCTION EFFECTS

Vibration effects from equipment used during installation of right-of-way improvements as well as associated utility relocation/demolition activities could potentially cause physical damage or alteration to historic properties, affect existing underground infrastructure, or cause annoyance among nearby sensitive receptors.

Historic properties are typically considered more sensitive to vibration owing to their construction methods, ornamentation, age, fragility, or other factors. Table 4.11-6 above shows the distances at which vibration impacts would be projected to occur by vibration level and historic building type.

As shown in Table 4.11-6, the most sensitive buildings are potentially susceptible to vibration-related effects at peak-particle velocities (PPV) of 0.12 inches per second. Vibratory rollers, commonly used in road building, have a PPV of 0.21 inches per second. Per Table 4.11-6, vibratory rollers could have adverse effects on "class III" historic properties when used at a distance of 25 feet; "class IV" properties, generally the most susceptible to vibration, could be adversely affected by vibratory roller use at a distance of 36 feet. In comparison, other typical vibration-causing equipment, like a jackhammer, would have somewhat lower potential to affect historic properties. As shown in Table 4.11-6, jackhammers would have adverse effects if used within 11 feet of a class IV property or 7 feet of a class III property.

Since Alternative 2 construction would be focused on side-running lanes, which would be less than 36 feet from most buildings fronting on the Geary corridor, there is a potential to affect nearby historic properties. Fifty-three historic properties have been identified along the Geary corridor; however, adherence to minimization measures incorporated herein would avoid or lessen any such effects such that no adverse effect would be expected to occur. Minimization includes employing site-specific, low-vibration construction methods near sensitive resources.

In addition, construction vibration could potentially affect existing SFPUC infrastructure within the project's area of influence, including subsurface brick sewers that are concentrated in the northern and eastern parts of the City.[5] However, prior to construction within the public ROW, SFMTA is required to obtain permits from SFPW in accordance with Article 2.4 of the Public Works Code. As part of the plan check process, SFPUC, the agency responsible for maintaining the City's sewer system, reviews the plans. If SFPUC determines that the proposed construction work may damage the older brick sewers, SFPW may impose specific conditions as part of the permit process to eliminate the potential for damage. Adherence to such conditions imposed pursuant to Article 2.4 would avoid or minimize any such potential adverse effects to brick sewers.

Potential annoyance related to vibration would be addressed through a minimization measure incorporated herein. Specifically, the project construction plan would include a program for accepting and addressing noise and construction-related complaints. Contact information for the Project Manager, Resident Engineer, and Contractor would be posted on site, with direction to call if there are any concerns. Complaints would be logged and tracked to ensure they are addressed.

4.11.4.4.2 ALTERNATIVES 3 AND 3-CONSOLIDATED - CONSTRUCTION EFFECTS

The same general construction methods described for Alternative 2 would be used to build the physical elements of Alternatives 3 and 3-Consolidated, although Alternatives 3 and 3-Consolidated would entail more intensive construction of bus-only lanes and medians in the center of Geary Boulevard west of Gough Street. These alternatives would also include the conversion of the Fillmore Street underpass to a conventional, at-grade intersection (which in turn involves the filling and/or removal of the existing pump station, demolition of the existing grade separation structure, and rebuilding of the roadway). A vibratory roller has the greatest potential to generate a vibration impact during the Fillmore Street conversion process. As shown in Table 4.11-6, a vibratory roller generates a vibration level of 0.210 inches per second. The vibratory roller would operate at least 30 feet from structures along Geary Boulevard, and would not exceed the vibration damage criteria shown in Table 4.11-5 for Category I, II, and III buildings. The vibratory roller would exceed the damage criterion when operated within 36 feet of Category IV structurally fragile buildings (i.e., more likely to be historical in nature). However, no Category IV buildings have been identified near the Fillmore Street conversion construction area. Such activities would be further from sensitive receptors than in Alternative 2. Accordingly, construction vibration effects for

[5] City and County of San Francisco. (2010). 2030 Sewer System Master Plan Task 500 Technical Memorandum NO. 506 Collection System Rehabilitation Program.

Alternatives 3 and 3-Consolidated would be generally similar to those described for Alternative 2, including for historic properties.

4.11.4.4.3 HYBRID ALTERNATIVE/LPA - CONSTRUCTION EFFECTS

Because the Hybrid Alternative/LPA is composed of a mix of elements drawn from Alternatives 2, 3, and 3-Consolidated, the focus of construction activity would not be concentrated in one particular section of the street ROW. Therefore, the Hybrid Alternative/LPA would be represented by the range of construction activity covered between the three build alternatives. Similar to Alternatives 2, 3, and 3-Consolidated, construction activity for the Hybrid Alternative/LPA would likely result in vibration effects for vibration-intensive construction activity located as close as 36 feet to certain historic structures. Section 4.11.5 below identifies avoidance, minimization, and mitigation measures to address such effects.

Similar to Alternatives 2, 3, and 3-Consolidated, SFPW may impose specific conditions as part of the permit process to eliminate the potential for damage to subsurface brick sewers during plan checks for construction activity. No adverse construction vibration effects to subsurface brick sewers would occur.

4.11.4.5 | NO BUILD ALTERNATIVE - OPERATIONAL NOISE AND VIBRATION EFFECTS

Under the No Build Alternative, transit and transportation facilities and services would remain unaltered except for changes that are currently planned or programmed to be implemented in the Geary corridor by 2020. These projects have previously or will soon undergo individual environmental review in which operational noise effects would be analyzed. Given the relatively small scale of the infrastructure improvements, it is unlikely that any adverse operational noise or vibration effects would result.

4.11.4.6 | BUILD ALTERNATIVES: OPERATIONAL PERIOD NOISE

Under Alternative 2, bus headways would be 5.5 minutes during peak hours and 7.5 minutes during midday hours and 7.5 to 20 minutes during evening and nighttime hours. Operational noise levels were calculated using the operation schedule, speed, and distance to the proposed operating lane (bus-only or mixed-flow, depending on location). Table 4.11-7 summarizes all relevant project information used in assessing future noise effects with the FTA transit noise model. The Table identifies the sensitive receptors along the Geary corridor (described further at 4.11.2.1.3 above). Project-related noise levels at these receptor sites would not exceed FTA significance criteria. The maximum expected noise increase is 1 dBA, which is not perceptible to the human ear. Thus, Alternative 2 operational noise would not result in any adverse effect, as shown in Table 4.11-3.

Noise levels modeled for Alternative 2, described above, represent "worst case" conditions, as the levels are measured at the closest points to sensitive receptors. Moreover, bus headways for Alternative 3 would be the same as identified for in Alternative 2. Noise levels identified in Table 4.11-7 would thus also be the maximum range for Alternative 3. Noise levels associated with Alternative 3 would not exceed the FTA significance criteria. Thus, Alternative 3 operational noise would not result in any adverse effect.

Headways for Alternative 3-Consolidated would be shorter than those for Alternatives 2 and 3. In other words, buses would run more frequently. However, noise levels in Table 4.11-7 would also apply as the maximum range. This is because Alternative 2 would have buses running closest to sensitive receptors. Therefore, similar to Alternative 3, Alternative 3-Consolidated operational noise would not result in any adverse effect.

Because the Hybrid Alternative/LPA consists of various components adapted from Alternatives 2, 3, and 3-Consolidated, the distance from bus operating lane to sensitive receptors would be represented by the range of operational noise covered between the other three build alternatives. Therefore, the expected noise levels shown in Table 4.11-7 would also apply for the Hybrid Alternative/LPA. Project-related noise levels would not exceed the FTA significance criteria. Thus, Hybrid Alternative/LPA operational noise would not result in any adverse effect.

4.11.4.7 | BUILD ALTERNATIVES - OPERATIONAL PERIOD VIBRATION

Vibration impact criteria relate to the potential to result in human annoyance; the criteria are based on the frequency of vibration-causing events. For example, residences that experience frequent events (defined as more than 70 vibration events of the same source per day), may be exposed to vibration levels of up to 72 VdB without experiencing an adverse effect.

Bus operations do not generally contribute to adverse vibration effects. Rubber tires and suspension systems provide vibration isolation, which limit the dispersion of ground-borne vibration. When buses cause effects such as rattling of windows, the source is almost always airborne noise. Most problems with bus-related vibration can be directly related to a discontinuity in the road surface, such as a bump, expansion joint, or pothole.[6] Such discontinuities would be unlikely, as the road would be rehabilitated/resurfaced (see Section 2.3.3). As such, the potential for bus-related vibration would be decreased compared to existing roadway conditions.

None of the build alternatives would involve other significant stationary sources of ground-borne vibration, such as heavy equipment operations. Operational ground-borne vibration in the Geary corridor would be generated by vehicular travel on the local roadways. However, similar to existing conditions, project-related traffic vibration levels would not be perceptible by sensitive receptors. Thus, operational vibration would not result in an adverse effect for any of the build alternatives.

[6] Federal Transit Administration. (2006). Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06.

Table 4.11-7 Operational Noise Effects

RECEPTOR	FTA NOISE-SENSITIVE LAND USE CATEGORY	NOISE LEVELS (LDN OR LEQ)					INCREASE (DBA)	ADVERSE EFFECT /BA/
			EXISTING + PROJECT /C/					
		EXISTING	PROJECT NOISE /A/	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED		
Residential Cluster 1 (48th Ave to 34th Ave)	2	68	62	69	69	69	1	No
Residential Cluster 2 (34th Ave to 27th Ave)	2	71	61	71	71	71	0	No
Residential Cluster 3 (27th Ave to Arguello Blvd)	2	72	60	72	72	72	0	No
Residential Cluster 4 (Arguello Blvd to Broderick)	2	74	64	74	74	74	0	No
Residential Cluster 5 (Broderick to Scott St)	2	74	61	74	74	74	0	No
Residential Cluster 6 (Scott St to Laguna St)	2	71	63	72	72	72	1	No
Residential Cluster 7 (Laguna St to Gough St)	2	71	61	71	71	71	0	No
Residential Cluster 8 (Gough St to Van Ness Ave)	2	72	64	72	73	73	1	No
Residential Cluster 9 (Van Ness Ave to Taylor St)	2	72	60	72	72	72	0	No
Sutro Heights Park	3	65	41	65	65	65	0	No
Seventh Day Adventist Church	3	65	56	66	66	66	1	No
Ka Ming Head Start	3	68	51	68	68	68	0	No
Ta Kioh Buddhist Temple	3	68	51	68	68	68	0	No
Holy Virgin Cathedral	3	68	51	68	68	68	0	No
St. Monica's Church and School	3	69	51	69	69	69	0	No
Eastern Catholic Center	3	69	51	69	69	69	0	No
First Burmese Baptist Church	3	69	45	69	69	69	0	No
Golden Gate Christian Church	3	69	45	69	69	69	0	No
Kaiser Permanente French Campus	2	73	51	73	73	73	0	No
Holt Labor Library	3	73	53	73	73	73	0	No
Institute of Aging	3	73	51	73	73	73	0	No
Roosevelt Middle School	3	73	46	73	73	73	0	No
Star of the Sea School	3	73	46	73	73	73	0	No
Park Presidio United Methodist	3	73	51	73	73	73	0	No
Geary Parkway Motel	2	76	60	76	76	76	0	No
Sinai Memorial Chapel	3	71	53	71	71	71	0	No
UCSF /Children's Hospital Medical Offices	3	73	53	73	73	73	0	No

RECEPTOR	FTA NOISE-SENSITIVE LAND USE CATEGORY	NOISE LEVELS (LDN OR LEQ)					INCREASE (DBA)	ADVERSE EFFECT /BA/
			EXISTING + PROJECT /C/					
		EXISTING	PROJECT NOISE /A/	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED		
Kaiser Permanente Medical Center	2	71	55	71	71	71	0	No
Hamilton Memorial Church	3	71	55	71	71	71	0	No
Presidio Street Surgery Center	2	71	47	71	71	71	0	No
UCSF Medical Center at Mt. Zion	2	71	47	71	71	71	0	No
Western Addition Library	3	71	52	71	71	71	0	No
Sleep Quest	2	68	55	68	68	68	0	No
NorCal Presbyterian Senior Housing	2	71	61	71	71	71	0	No
Jones Methodist Church	3	71	49	71	71	71	0	No
Gateway High School	3	71	52	71	71	71	0	No
Cathedral of St. Mary	3	68	45	68	68	68	0	No
Hotel Kabuki	2	71	63	72	72	72	1	No
Monarch Hotel	2	71	57	69	69	69	0	No
Charlie's Hotel	2	71	61	71	71	71	0	No
Opal Hotel	2	71	57	71	71	71	0	No
Archdiocese of San Francisco	3	68	55	68	68	68	0	No
Hamilton Square Baptist Church	3	68	57	68	68	68	0	No
St. Marks	3	68	50	68	68	68	0	No
First Unitarian	3	68	48	68	68	68	0	No
Cathedral of St. Mary	3	68	40	68	68	68	0	No
Union Square Park	3	69	56	69	69	69	0	No
Graystone Hotel	2	72	62	72	72	72	0	No
Stratford Hotel	2	72	58	72	72	72	0	No
Villa Florence Hotel	2	72	56	72	72	72	0	No
Handlery Union Square	2	71	58	71	71	71	0	No
Fusion Hotel	2	72	48	72	72	72	0	No
Hotel Nikko	2	71	63	72	72	72	1	No
Hilton Towers	2	71	60	71	71	71	0	No
Clift Hotel	2	71	57	71	71	71	0	No

RECEPTOR	FTA NOISE-SENSITIVE LAND USE CATEGORY	NOISE LEVELS (LDN OR LEQ)					INCREASE (DBA)	ADVERSE EFFECT /BA/
			EXISTING + PROJECT /C/					
		EXISTING	PROJECT NOISE /A/	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED		
Hotel Monaco	2	71	57	71	71	71	0	No
Hotel G	2	71	63	72	72	72	1	No
Westin St. Francis Hotel	2	71	61	71	71	71	0	No
Hotel Diva	2	71	63	72	72	72	1	No
Warwick Regis Hotel	2	71	63	72	72	72	1	No
King George Hotel	2	71	50	71	71	71	0	No
Hotel Adagio	2	71	64	72	72	72	1	No
Hotel California	2	71	64	72	72	72	1	No
Abby Hotel	2	71	64	72	72	72	1	No
Adante Hotel	2	71	63	72	72	72	1	No
Hotel Union	2	71	58	71	71	71	0	No
Motel 6	2	71	57	71	71	71	0	No
California Hotel	2	71	63	72	72	72	1	No
Alexis Park Hotel	2	71	48	71	71	71	0	No
Civic Center Inn	2	71	48	71	71	71	0	No
Hartland Hotel	2	71	58	71	71	71	0	No
Hotel President	2	71	58	71	71	71	0	No
Ambika Hotel	2	71	58	71	71	71	0	No
Edgeworth Hotel	2	71	58	71	71	71	0	No
Luz Hotel	2	71	58	71	71	71	0	No
Admiral Hotel	2	71	57	71	71	71	0	No
Sweden House	2	71	62	72	72	72	1	No
America’s Best Value Inn	2	71	62	72	72	72	1	No
Layne Hotel	2	71	49	71	71	71	0	No
Halcyon Hotel	2	71	50	71	71	71	0	No
Beresford Arms	2	71	48	71	71	71	0	No
Nazareth Hotel	2	71	58	71	71	71	0	No
Coast Hotel	2	71	57	71	71	71	0	No

RECEPTOR	FTA NOISE-SENSITIVE LAND USE CATEGORY	NOISE LEVELS (LDN OR LEQ)					INCREASE (DBA)	ADVERSE EFFECT /BA/
			EXISTING + PROJECT /C/					
		EXISTING	PROJECT NOISE /A/	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED		
Columbia Hotel	2	71	63	72	72	72	1	No
Super 8 Motel	2	71	63	72	72	72	1	No
Gateway Inn	2	71	57	71	71	71	0	No
Serrano Hotel	2	71	58	71	71	71	0	No
Union Square Hostel	2	71	52	71	71	71	0	No
Touchstone Hotel	2	71	63	72	72	72	1	No
Union Square Plaza	2	71	63	72	72	72	1	No
Adelaide Hostel	2	71	49	71	71	71	0	No
Hotel Mark Twain	2	71	47	71	71	71	0	No
San Francisco Hostel	2	71	57	71	71	71	0	No
Hotel Union Square	2	72	44	72	72	72	0	No
St. Moritz Hotel	2	72	57	72	72	72	0	No
Four Seasons Hotel	2	72	60	72	72	72	0	No
Palace Hotel	2	72	60	72	72	72	0	No
Herbert Hotel	2	72	63	73	73	73	1	No
Acer Hotel	2	71	57	71	71	71	0	No
Aldrich Hotel	2	71	47	71	71	71	0	No
Fifth Church of Christ Scientist	3	69	55	69	69	69	0	No
Fashion Institute of Design Merchandising	3	68	54	68	68	68	0	No
UC Berkeley Extension	3	69	52	69	69	69	0	No
University of Phoenix	3	69	52	69	69	69	0	No

/A/ Project Level Noise models Alternative 2 as the worst case scenario since the side-running lane has the closest distance to sensitive receptors. Bus noise levels were assumed as posted speed limits.

/B/ Effect is measured against the Noise Criteria for land use type. () indicates that an adverse effect would only occur for that Build Alternative.

/C/ Hybrid Alternative/LPA noise levels are represented by noise levels for Alternatives 2, 3, and 3-Consolidated, depending on location. Please see section 4.11. 3.2.5 for more information.

Note - Noise levels modeled for Alternative 2, described above, represent the worst case conditions as the levels are measured at the closest points to sensitive receptors. Moreover, headways for Alternative 3 and 3-Consolidated are evaluated as identified for in Alternative 2.

Source: Terry A. Hayes Associates Inc., 2014

4.11.4.8 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, the No Build Alternative would have the lowest level of construction period noise and vibration, followed by Alternative 2, the Hybrid Alternative/LPA and then Alternatives 3 and 3-Consolidated. Operational period noise would be largely similar among the build alternatives, although Alternative 2 and the Hybrid Alternative/LPA would each feature areas of side-running bus only lanes that would bring bus activity closer to sensitive receptors on either side of the Geary corridor. None of the build alternatives, however, would result in any operational period adverse effects.

4.11.5 Avoidance, Minimization and/or Mitigation Measures

4.11.5.1 | CONSTRUCTION MEASURES

MIN-NOISE-C1. A Vibration Reduction and Minimization Plan shall be developed to avoid construction vibration damage using all reasonable and feasible means available. The Plan shall provide a procedure for establishing thresholds and limiting vibration values for structures with a potential to be adversely affected. The following steps shall be taken in development of the location-specific vibration reduction plan:

- Potential vibration-sensitive structures shall be identified using the distance impact thresholds in the final engineering drawings;
- Vibration-sensitive structures shall be individually assessed to identify the structure's ability to withstand the loads and displacements due to construction vibrations;
- Construction related vibration in proximity to identified vibration-sensitive historic structures shall not be allowed to exceed the recommended levels set forth in pertinent FTA guidance;
- Peak particle velocities shall be monitored and recorded near sensitive receptors identified where the highest vibration producing activities occur;
- Rubber tired instead of tracked vehicles shall be used near vibration sensitive areas;
- Pavement breaking shall be prohibited during nighttime hours; and
- Residents within 300 feet of areas where construction activities and pavement breaking will take place shall be notified at least two weeks in advance of the proposed activity through the media and mail. A program shall be implemented to receive and respond to public complaints regarding vibration during construction.

MIN-NOISE-C2. Project construction shall implement best practices in equipment noise control, including the following:

- Use newer equipment with improved noise muffling and ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational. Newer equipment will generally be quieter in operation than older equipment. All construction equipment should be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding).

- Perform all construction in a manner that minimizes noise. Utilize construction methods or equipment that will provide the lowest level of noise effects.

- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes.

- Impact tools and equipment, such as jack hammers, shall have intake exhaust mufflers and acoustically attenuating shields or shrouds recommended by the manufacturers and approved by the Director of Public Works or the Director of Building Inspection.

MIN-NOISE-C3: Project construction will conduct truck loading, unloading, and hauling operations so that noise and vibration are kept to a minimum by carefully selecting routes to avoid passing through residential neighborhoods to the greatest possible extent.

MIN-NOISE-C4: Perform independent noise monitoring in sensitive areas, as needed, to demonstrate compliance with applicable noise limits. Require contractors to modify and/or reschedule their construction activities if monitoring determines that maximum limits are exceeded at residential land uses per the City Noise Ordinance.

MIN-NOISE-C5: Temporary sound walls, curtains, or other noise canceling technologies may be used in locations where sensitive receptors could experience construction-related noise exceedances.

4.11.5.2 | OPERATIONAL MEASURES

The No Build Alternative and build alternatives are not expected to have adverse effects related to noise and vibration. As no adverse effects are expected, no avoidance, minimization, or mitigation measures for operations would be required.

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4.12 Energy

This section addresses the direct and indirect effects of the project alternatives on energy consumption. *Direct* energy consumption includes the fuel required for passenger vehicles (i.e., automobiles, vans, and light trucks), heavy trucks (i.e., three or more axles), and transit buses that travel on the corridor. *Indirect* energy consumption includes fossil fuel expenditures required to construct the project alternatives using various equipment and materials. This section summarizes the differences in energy use between baseline conditions (No Build Alternative) and the build alternatives.

DEFINITION

Direct Energy Consumption: Fuel required to operate passenger vehicles, heavy trucks, and transit buses

Indirect Energy Consumption: energy consumed in construction and maintenance

4.12.1 | Regulatory Setting

This section provides an overview of the federal, state, and local regulations and policies relevant to energy usage and the analysis of adverse effects associated with the project.

4.12.1.1 | FEDERAL REGULATIONS

4.12.1.1.1 THE ENERGY POLICY AND CONSERVATION ACT OF 1975

The Energy Policy and Conservation Act was enacted for the purpose of serving the nation's energy demands and promoting feasible conservation methods. Most relevant to this analysis, this Act mandated vehicle economy standards.

4.12.1.1.2 ALTERNATIVE MOTOR FUELS ACT OF 1988

The Alternative Motor Fuels Act amended a portion of the Energy Policy and Conservation Act to encourage the use of alternative fuels, including electricity. This Act directed the Secretary of Energy to ensure that the maximum practicable number of federal passenger automobiles and light duty trucks be alcohol-powered vehicles, dual energy vehicles, natural gas-powered vehicles or natural gas dual-energy vehicles.

4.12.1.1.3 ENERGY POLICY ACT OF 1992

The Energy Policy Act of 1992 was intended to reduce dependence on imported petroleum and improve air quality by addressing all aspects of energy supply and demand, including alternative fuels, renewable energy and energy efficiency. This Act encouraged the use of alternative fuels through both regulatory and voluntary activities and through the approaches carried out by the U.S. Department of Energy. The Act requires federal, state, and alternative fuel provider fleets to acquire alternative fuel vehicles. The Department of Energy's Clean Cities initiative was established in response to this Act to implement voluntary alternative fuel vehicle deployment activities.

RESOURCE

To see more information on the Energy Policy Act, go to: http://energy.gov/eere/femp/articles/energy-policy-act-2005

4.12.1.1.4 ENERGY POLICY ACT OF 2005

The Energy Policy Act of 2005 introduced grant programs, demonstration and testing initiatives, and tax incentives to promote alternative fuels and the production/use of advanced vehicles. This Act also amended various regulations, including fuel economy testing procedures and Energy Policy Act of 1992 requirements for federal, state, and alternative fuel provider fleets.

4.12.1.1.5 ENERGY INDEPENDENCE AND SECURITY ACT OF 2007

The Energy Independence and Security Act of 2007 (EISA) included provisions designed to increase energy efficiency and the availability of renewable energy. Key provisions of EISA include:

- The Corporate Average Fuel Economy (CAFE), which set a target of 54.5 miles per gallon for the combined fleet of cars and light trucks by model year 2025.
- The Renewable Fuels Standard, which set a modified standard that starts at 9 billion gallons in 2008 and rises to 36 billion gallons by 2022.
- The Energy Efficiency Equipment Standards, which includes a variety of new standards for lighting and for residential and commercial appliance equipment.
- The Repeal of Oil and Gas Tax Incentives, which includes repeal of two tax subsidies in order to offset the estimated cost to implement the CAFE provision.

4.12.1.2 | STATE REGULATIONS

The California Environmental Quality Act (CEQA) is the principal statute mandating the environmental evaluation of projects in California;[1] Appendix F of the CEQA Guidelines serves as the relevant guidance for energy evaluation. Appendix F states that EIRs are required to include a discussion of a proposed project's potential energy implications, with particular emphasis on avoiding or reducing inefficient, wasteful, and unnecessary consumption of energy. The Final EIR certified in 2017 complied with these regulations.

4.12.1.2.1 CALIFORNIA ENERGY COMMISSION

ACRONYM

CEC: California Energy Commission

The California Energy Commission (CEC) is the State's primary energy policy and planning agency. The CEC has five major responsibilities: (1) forecasting future energy needs and keeping historical energy data, (2) licensing thermal power plants 50 megawatts or larger, (3) promoting energy efficiency through appliance and building standards, (4) developing energy technologies and supporting renewable energy, and (5) planning for and directing the State's response to energy emergency. The CEC is required to prepare a biennial integrated energy policy report assessing major energy trends and issues facing the state's electricity, natural gas, and transportation fuel sectors.[2] The report also provides policy recommendations to conserve resources, protect the environment, and ensure reliable, secure and diverse energy supplies.

[1] California Public Resources Code Sections 21000-21177; California Code of Regulations Title 14, Division 6, Chapter 3, Section 15000-15387.
[2] California Energy Commission. SB 1389, Chapter 568, Statutes of 2002

The CEC also administers the Alternative and Renewable Fuel and Vehicle Technology Program. The Program awards grants, revolving loans, loan guarantees and other appropriate measures to qualified entities to develop and deploy innovative fuel and vehicle technologies that will help achieve California's petroleum reduction, air quality, and climate change goals, without adopting or advocating any one preferred fuel or technology. In addition to funding alternative fuel and vehicle projects, the Program also funds workforce training to prepare the workforce required to design, construct, install, operate, produce, service and maintain new fuel vehicles.

4.12.1.2.2 CALIFORNIA PUBLIC UTILITIES COMMISSION

The California Public Utilities Commission (CPUC) regulates privately owned electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation companies as well as investor-owned electric and natural gas utilities.

ACRONYMS

CPUC: California Public Utilities Commission

MTC: Metropolitan Transportation Commission

BAAQMD: Bay Area Air Quality Management District

4.12.1.2.3 STATE TRANSPORTATION PLAN

The California Department of Transportation (Caltrans) is required to prepare a State Transportation Plan every five years. The first Plan was completed in 2016. The Plan addresses how the State will achieve maximum feasible emissions reductions, taking into consideration the use of alternative fuels, new vehicle technology and tailpipe emissions reductions.

4.12.1.2.4 CALIFORNIA CODE OF REGULATIONS

Title 13 (Sections 2020, 2022, and 2022.1) of the California Code of Regulations (CCR), known as the Fleet Rule, includes vehicle requirements to reduce diesel particulate matter emissions from fleets operated by public agencies and utilities. The Fleet Rule for public agencies and utilities includes exhaust emission standards for new urban bus engines and vehicles. The regulation also promotes advanced technologies such as zero-emission buses.

4.12.1.3 | REGIONAL REGULATIONS

4.12.1.3.1 METROPOLITAN TRANSPORTATION COMMISSION

The Metropolitan Transportation Commission (MTC) certified a program-level EIR for *Plan Bay Area 2040*[3] in July 2017. The EIR concluded that, while total energy consumption is projected to increase due to the region's anticipated population and housing increase by 2040, *Plan Bay Area 2040* would reduce per capita energy consumption and net consumption of automotive fuel relative to existing conditions. One of the regional transportation projects accounted for in *Plan Bay Area 2040* was the implementation of bus rapid transit and transit preferential streets programs throughout San Francisco.

[3] Metropolitan Transportation Commission. July 2017. Final Plan Bay Area 2040. Available online at: **https://mtc.ca.gov/sites/default/files/Final_Plan_Bay_Area_2040.pdf**. Last accessed December 21, 2017.

4.12.1.3.2 BAY AREA AIR QUALITY MANAGEMENT DISTRICT CLIMATE PROTECTION PROGRAM

The Bay Area Air Quality Management District (BAAQMD) established a Climate Protection Program to promote energy efficiency, reduce vehicle miles traveled, and develop alternative sources of energy.

4.12.1.4 | LOCAL REGULATIONS

The Environmental Protection Element of the San Francisco *General Plan* includes a series of policies intended to promote efficient use of energy resources. These policies call for both direct and indirect strategies to limit energy consumption and reduce use of scarce energy resources.

4.12.2 | Affected Environment

In 2010, California residents consumed over 18 billion gallons of gasoline and diesel fuel

Statewide, there are over 26 million cars and one million trucks on California roads and highways. Roughly half of the energy California residents consume is for transportation. In 2010, California residents consumed over 18 billion gallons of gasoline and diesel fuel (CEC 2013).

Transportation energy consumption within the Geary corridor includes the fuel required for passenger vehicles (i.e., automobiles, vans, and light trucks), heavy trucks (i.e., three or more axles), and transit buses. A mix of natural gas, electricity, gasoline, and diesel fuel provide the energy source for transportation within the Geary corridor. Passenger vehicles primarily utilize gasoline as fuel, where heavy trucks primarily utilize diesel fuel. Natural gas can be used by motor vehicles (i.e., passenger and heavy truck), but it is also commonly a fuel used in heating facilities and manufacturing or processing. Electricity can be used for motor vehicles; however, most motor vehicles within the Geary corridor depend on gasoline and diesel fuel.

New Muni Hybrid Electric Bus

Trolley buses, cable cars, streetcars, and light rail vehicles, which comprise more than half of Muni's transit fleet, use electrical power for operation. Muni's electric fleet operates with power that is generated by the San Francisco Public Utilities Commission (SFPUC) Hetch Hetchy hydroelectric facility. Under City agreements, Hetch Hetchy provides power to Muni, which is transmitted to the electric fleet through Muni's traction power substations and overhead contact system.

DEFINITION

***Btu*: British Thermal Units are a standard measure of energy content.**

One gallon gasoline = 116,090 Btus

One gallon diesel = 128,450 Btus

Table 4.12-1 shows the existing annual vehicle miles traveled within San Francisco as a whole and corresponding energy usage. As shown in the table, the overwhelming majority of transportation-related energy use in San Francisco stems from autos. Together, autos and bus use result in an annual energy consumption of 8,909 million MBtus (MBtu = 1000 British thermal units [BTUs]). BTUs are a standard measure of energy content. A gallon of gasoline and diesel are equivalent to approximately 116,090 and 128,450 BTUs, respectively.

Table 4.12-1 Existing Transportation Related Energy Use

	ANNUAL VMT (MILLIONS)			ENERGY EQUIVALENT IN MILLION MBTUS
	AUTO	BUS	TOTAL	
San Francisco	3,055	1.932	3,056	8,909

Source: Terry A. Hayes Associates Inc., 2013

4.12.3 | Methodology

DEFINITION

Vehicle Miles Traveled (VMT): Used as the primary measure of travel activity on roadways and can be an indicator of changes in travel demand across the region. In transit, the number of vehicle miles operated on a given router or line or network during a specific time period

The alternatives were evaluated for potential effects related to energy in terms of several considerations, including annual vehicle miles traveled (VMT) and fuel consumption rates. The alternatives have the potential to result in construction period and/or operational period effects as noted below.

Construction-Related Effects

- Fossil fuel consumption
- Construction materials and supplies

Operational-Related Effects

- Annual VMT of buses

4.12.3.1 DIRECT ENERGY USE

Energy used to operate transportation systems is typically referred to as *direct energy* consumption. This includes energy used by vehicles transporting people or goods (propulsion energy), plus energy used to operate facilities such as transit stations, amenities, and other system elements. Over the life of a transportation project, direct energy consumption is usually the largest component of the project's total energy use. The direct energy analysis for the build alternatives was based on projected changes to regional VMT for the opening year 2020 and horizon year 2035. In assessing direct energy use, consideration was given to the annual VMT for buses and the variation of fuel consumption rates by vehicle type. Bus fuel usage is expressed in terms of gallons of gasoline. Energy consumption is presented in gallons of gasoline and Btus/MBtus.

4.12.3.2 INDIRECT ENERGY USE

The proposed build alternatives would also require energy to construct and maintain the project. Energy consumed in construction and maintenance is referred to as *indirect energy* usage. Indirect energy consumption also applies to automobile VMT within the study area, which the build alternatives could influence. Construction includes that energy used by construction equipment and other activities at the worksite, in addition to the energy used to manufacture the equipment, materials, and supplies, and to transport them to the worksite. Energy for maintenance includes that for day-to-day upkeep of equipment and systems, as well as the energy embedded in any replacement equipment, materials, and supplies.

4.12.4 | Environmental Consequences

The following section compares estimated energy use under the different alternatives to determine whether any of the alternatives could encourage activities that would use or waste large amounts of energy. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 4.12.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding energy impacts in the Draft EIS/EIR.

4.12.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: ANALYSIS OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe energy effects during construction and operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe energy impacts relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: Retention of the existing Webster Street bridge would reduce the extent of construction and, hence, construction-period energy consumption. Therefore, this modification would not result in any new or more severe energy impacts during construction.

Operation: This modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3). Therefore, this modification would not result in any new or more severe energy impacts during operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: Retention of the existing bus stops between Spruce and Cook streets would reduce the extent of construction and, hence, construction-period energy consumption. Therefore, this modification would not result in any new or more severe energy impacts during construction.

Operation: This modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3). Therefore, this modification would not result in any new or more severe energy impacts during operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: Construction of additional pedestrian improvements would increase construction-period energy consumption. However, associated construction activities, equipment utilized, and duration of construction would be similar to those occurring throughout the corridor (see Section 4.15.1.6). Given this, the corridor-

wide increase in energy consumption associated with this change would not be substantial. Therefore, this modification would not result in any new or more severe energy impacts during construction.

Operation: This modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3). Therefore, this modification would not result in any new or more severe energy impacts during operation.

Addition of BRT Stops at Laguna Street

Construction: Construction of BRT stops at Laguna Street would increase construction-period energy consumption. However, construction activities associated with installing transit island BRT stops at this location would not be unlike activities occurring throughout the corridor and the increase in construction period energy would not be substantial. Therefore, this modification would not result in any new or more severe energy impacts during construction.

Operation: This modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3). Therefore, this modification would not result in any new or more severe energy impacts during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: Retention of the existing bus stops at Collins Street would reduce the extent of construction and, hence, construction-period energy consumption. Therefore, this modification would not result in any new or more severe energy impacts during construction.

Operation: This modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3). Therefore, this modification would not result in any new or more severe energy impacts during operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities but would simply shift about half of it one block to the west, which would involve the same level of construction-period energy consumption as previously analyzed. Therefore, this modification would not result in any new or more severe energy impacts during construction.

Operation: This modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3). Therefore, this modification would not result in any new or more severe energy impacts during operation.

4.12.4.2 | CONSTRUCTION

Construction of the build alternatives would require *indirect* consumption of fossil fuels, labor, and construction materials. Construction includes energy used by construction equipment and other activities at the worksite (i.e., median removal, excavation, paving), in addition to the energy used to manufacture the equipment, materials, and supplies to transport them to the worksite. Energy for maintenance includes that for day-to-day upkeep of equipment and systems, as well as energy

embedded in any replacement equipment, materials, and supplies. These expenditures would be, for the most part, irrecoverable; however, they are not in short supply, and their use would not have an adverse effect upon continued availability of these resources.

The buses that serve Geary are currently and will in the future be diesel-powered

4.12.4.3 | OPERATIONS

Table 4.12-2 presents estimated operational energy use for all alternatives in 2020 and 2035. Specific discussions for each alternative are presented below. Automobile VMT is considered indirect energy use and any changes that would occur to automobile VMT would be an indirect effect of the project. In general, because the automobile VMT of the build alternatives do not vary significantly coupled with a small fraction of total energy used by transit vehicles (less than 0.5 percent of the total energy), the build alternatives would have little to no effect on auto vehicles energy supply and consumption.

Table 4.12-2 Energy Use – Build and No Build Alternatives; 2020 and 2035

Each build alternative would change energy consumption by less than 0.1% in 2020

Each build alternative would have a minor beneficial effect on energy consumption in 2035

2020	ANNUAL VMT (MILLIONS)			REGIONAL ENERGY EQUIVALENT IN MILLION MBTUS	INCREASE/ DECREASE RELATIVE TO NO BUILD	% CHANGE FROM NO BUILD
	AUTO	BUS	TOTAL			
No Build Alternative	3,186	1.9	3,188	9,291	-	-
Alternative 2 (Side-Lane BRT)	3,184	2.6	3,186	9,298	+7	+0.1%
Alternative 3 (Center-Lane BRT with Dual Medians and Passing Lanes)	3,180	2.6	3,183	9,288	-3	-<0.1%
Alternative 3-Consolidated (Center-Lane with Dual Medians and Passing Lanes)	3,178	2.5	3,180	9,280	-11	-0.1%
Hybrid Alternative/LPA	3,181	2.5	3,183	9,289	-3	-<0.1%
2035	**ANNUAL VMT (MILLIONS)**			**ENERGY EQUIVALENT IN MILLION MBTUS**	**INCREASE/ DECREASE RELATIVE TO NO BUILD**	**% CHANGE FROM NO BUILD**
	AUTO	**BUS**	**TOTAL**			
No Build Alternative	3,857	1.9	3,859	8,998	-	-
Alternative 2	3,850	2.6	3,853	8,998	+0	+<0.01%
Alternative 3	3,848	2.6	3,851	8,993	-5	-0.1%
Alternative 3-Consolidated)	3,843	2.5	3,845	8,979	-19	-0.2%
Hybrid Alternative/LPA	3,842	2.5	3,845	8,979	-19	-0.2%

Source: Terry A. Hayes Associates Inc., 2014

4.12.4.3.1 NO BUILD ALTERNATIVE

Transportation energy use of the No Build Alternative is projected to be 9,291 million MBtus in 2020, dropping to 8,998 million MBtus in 2035. The reduction from 2020 to 2035 can be attributed to the expected conversion inherent in the No Build Alternative to a more fuel efficient fleet of vehicles by 2035.

4.12.4.3.2 BUILD ALTERNATIVES

As indicated in Table 4.12-2, transportation energy use of Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA is projected to drop slightly relative to the No Build Alternative both in 2020 and in 2035. The reductions in direct energy use would be considered small but beneficial effects. These reductions are attributable to the projected increases in bus VMT associated with these build alternatives, which in turn take into account network operating characteristics of the alternatives. Alternative 2 is projected to result in a minimal increase in energy use in 2020 and a small decrease by 2035. The fully side-running nature of bus-only lanes in Alternative 2 would have less pronounced effects on network operating characteristics, and in turn, less change to VMT and energy use. Notwithstanding, Alternative 2's projected increase in energy use for the year 2020 would not be adversely effected, because fuels are not in short supply and the relatively small percentage of increased energy use would not substantially affect total supply.

4.12.4.4 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, Alternative 3-Consolidated and the Hybrid Alternative/LPA would have the greatest benefits to short- and long-term operational energy usage, followed by Alternative 3 and the No Build Alternative. Alternative 2 would perform the worst in terms of projected 2020 and 2035 operational energy usage. The project alternatives would vary in the level of construction intensity but none would result in any adverse energy effects.

4.12.5 | Avoidance, Minimization, and/or Mitigation Measures

None of the build alternatives would result in adverse effects requiring avoidance, minimization, or mitigation measures.

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4.13 Biological Resources

This section discusses pertinent regulations and existing conditions relative to biological resources and potential effects to such resources resulting from the project alternatives. This discussion was informed in part by a tree survey prepared in 2013. The survey is included in Appendix I and is on file at the San Francisco County Transportation Authority (SFCTA).

RESOURCES

For more information on federal and state environmental laws and regulations, reference the following links:

CLEAN WATER ACT SECTION 401

www.epa.gov/wetlands/regs/sec401.cfm

CLEAN WATER ACT SECTION 404

www.epa.gov/wetlands/regs/sec404.cfm

FEDERAL ENDANGERED SPECIES ACT OF 1973

http://www.fws.gov/endangered/laws-policies/index.html

MIGRATORY BIRD TREATY ACT

http://www.fws.gov/laws/lawsdigest/migtrea.html

EXECUTIVE ORDER 13112 – INVASIVE SPECIES

www.invasivespeciesinfo.gov/laws/execorder.shtml

CALIFORNIA ENDANGERED SPECIES ACT OF 1984

www.dfg.ca.gov/habcon/cesa

PORTER-COLOGNE ACT

www.waterboards.ca.gov/laws_regulations/docs/portercologne.pdf

4.13.1 | Regulatory Setting

This following discussion provides an overview of federal, state, and local laws, regulations, ordinances, and policies relevant to biological resources that may occur within the study area.

4.13.1.1 | FEDERAL REGULATIONS

4.13.1.1.1 ENDANGERED SPECIES ACT OF 1973[1]

The Endangered Species Act (ESA) of 1973 requires federal agencies, in consultation with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS), to ensure that actions authorized, funded, or implemented are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat. While USFWS has jurisdiction over plants, wildlife, and non-marine fish, NMFS has jurisdiction over anadromous fish, marine fish, and marine mammals. For actions involving a federal approval or federal funding, Section 7(a) of the ESA requires that agencies consult with USFWS and/or NMFS to ensure that their actions are not likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of critical habitat. Under Section 7 consultation, incidental "take" may be authorized for federal actions through issuance of a Biological Opinion (BO) by USFWS and/or NMFS. A BO will typically include measures to minimize adverse effects, such as permanently protecting land, restoring habitat, or relocating plants or animals.

4.13.1.1.2 CLEAN WATER ACT SECTION 404 AND 401

Section 404 of the Clean Water Act (CWA) regulates discharge of dredged and fill material into waters of the U.S. Responsibility for administering and enforcing Section 404 is shared by the United States Army Corps of Engineers (USACE) and Environmental Protection Agency (EPA). Responsibility for jurisdictional determinations and permitting decisions associated with waters of the U.S. generally falls to USACE.

[1] 16 U.S.C. Section 1531 et seq.

Section 401 of the CWA requires a water quality certification from the State Water Quality Control Board or Regional Water Quality Control Board (RWQCB) when a project requires a federal license or permit and would result in a discharge to waters of the U.S. Issuance of water quality certification by RWQCB is considered a discretionary action that requires review under California Environmental Quality Act (CEQA) and considers effects on all waters of the U.S. and wetlands within a project's study area.

4.13.1.1.3 MIGRATORY BIRD TREATY ACT[2]

DEFINITIONS

TAKE:

Endangered Species Act

Harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct

California Endangered Species Act

The hunting, pursuing, catching, capturing, or killing (or attempt to hunt, pursue, catch, capture, or kill)

The Migratory Bird Treaty Act (MBTA) enacts the provisions of treaties between the U.S., Great Britain, Mexico, Japan, and the former Soviet Union, which authorizes the U.S. Secretary of the Interior to protect and regulate the take of migratory birds. USFWS is responsible for overseeing compliance with the MBTA. The MBTA establishes protection measures for migratory birds, their occupied nests, and their eggs.[3] Most actions that result in a taking or the permanent or temporary possession of a protected species constitute violations of the MBTA. The MBTA prohibits activities that cause abandonment of a nest and/or loss of reproductive effort. Inactive nests are not protected by the MBTA; such nests may be removed during the non-nesting season.

4.13.1.1.4 EXECUTIVE ORDER (EO) 13112 - INVASIVE SPECIES

EO 13112 is intended to combat the spread of invasive vegetation (weeds). If an action has potential to spread or promote invasive species, the EO requires implementation of all feasible and prudent measures to minimize such spread.

4.13.1.2 | STATE REGULATIONS

4.13.1.2.1 CALIFORNIA ENDANGERED SPECIES ACT OF 1984[4]

The California Endangered Species Act (CESA) established a policy to conserve, protect, restore, and enhance threatened or endangered species and their habitats. CESA mandates that state agencies not approve projects that would jeopardize the continued existence of threatened or endangered species, if reasonable and prudent alternatives are available that would avoid jeopardy. CESA also requires that a lead agency conduct an endangered species consultation with the California Department of Fish and Wildlife (CDFW), if a project could affect a state-listed species. CESA generally coincides with the main provisions of the ESA and with Section 2080 of the California Fish and Game Code that prohibits the taking, possession, purchase, sale, and import or export of endangered, threatened, or candidate species, unless otherwise authorized by permit or in the regulations. Under Section 2081, the CDFW may authorize take of endangered, threatened, or candidate species through issuance of permits or a memorandum of understanding. In addition to endangered, threatened, and candidate classifications, various provisions of the Fish and Game Code identify "fully protected" animals.[5] There is no provision to take any fully protected species except for scientific research.

[2] 16 USC 703.
[3] 16 USC 703, 50 CFR 21, 50 CFR 10.
[4] California Fish and Game Code Sections 2050-2098.
[5] California Fish and Game Code Sections 3511, 4700, 5050, 5515.

4.13.1.2.2 PORTER-COLOGNE WATER QUALITY CONTROL ACT OF 1969[6]

The Porter-Cologne Water Quality Control Act is the major water quality control law for California. It authorizes the State to implement the provisions of the CWA through RWQCB. Section 13263 of this act authorizes RWQCB to regulate discharges of waste and fill material to waters of the state, including "isolated" waters and wetlands that may not be jurisdictional under USACE. RWQCB does this through the issuance of waste discharge requirements. If USACE authorizes the placement of fill in waters of the U.S. under a nationwide or an individual permit, then the applicant is required to obtain a Section 401 Water Quality Certification, or a waiver, from RWQCB. Additional information on this regulation can be found in Section 4.9 (Hydrology and Water Quality).

4.13.1.3 | LOCAL REGULATIONS

4.13.1.3.1 URBAN FORESTRY ORDINANCE[7]

San Francisco Public Works (SFPW) established guidelines for implementation of tree protection within the City/County limits through an Urban Forestry Ordinance (Article 16) of the Public Works Code. Removal of any Protected Trees requires a permit. All permit applications that could potentially affect a protected tree must include a Planning Department "Tree Protection and Planting Checklist." The Tree Protection and Planting Checklist is the applicant's legal declaration of the status of all trees on the property, and must include the size of the trunk diameter and canopy dripline in relation to the proposed project. All permit applications are reviewed by SFPW, and an inspector is sent out to evaluate the trees planned for removal. If any activity is to occur within the drip line area of a tree, prior to issuance of a building permit, a tree protection plan is to be prepared by an International Society of Arboriculture-certified arborist and is to be submitted to SFPW for review and approval. For each tree removed, SFPW requires planting of a replacement tree.[8] The following defines what SFPW considers Protected Trees.

- **Landmark Trees**. Landmark Trees have the highest level of protection. These trees meet criteria for age, size, shape, species, location, historical association, visual quality, or other contribution to San Francisco's character and have been found worthy of landmark status after Urban Forestry Council and Board of Supervisors public hearings. Temporary landmark status is also afforded to nominated trees currently undergoing the public hearing process. SFPW maintains a list of all Landmark Trees.

- **Significant Trees**. Significant Trees are located on private property, but within 10 feet of the public right-of-way and must also meet one of the following requirements: a) 20 feet or greater in height; b) 15 feet or greater canopy width, or c)12 inches or greater diameter of trunk measured at 4.5 feet above grade.

DEFINITION

Drip line:

The outermost circumference of a tree canopy where water drips from and onto the ground

Looking west toward a New Zealand Christmas tree on Geary Boulevard between 40th Avenue and 41st Avenue

Looking west toward a Tawhiwhi tree on Geary Boulevard between 20th Avenue and 21st Avenue

[6] California Water Code, Section 13020.
[7] Director's Bulletin No. 2006-01.
[8] SFPW, Street Tree Removal Permitting Process. Available at: http://www.sfdpw.org/index.aspx?page=656.

- **Street Trees**. Street Trees are trees within the public right-of-way. Street Trees may be maintained by either the adjacent property owner or the City/County of San Francisco. All Street Trees are protected by the City, even if not considered Significant.

4.13.2 | Affected Environment

DEFINITION

For the purposes of this Draft EIS/EIR, the term "special-status species" refers to plant and wildlife species protected under the ESA or CESA or listed in the CNDDB, CDFW, and/or CNPS databases

The study area for biological resources includes the roadway medians and sidewalks that contain natural resources within the Geary corridor. For purposes of this analysis, this includes all areas between building fronts along the corridor. The study area is fully urbanized environment, with little or no indigenous vegetation. No riparian habitats, wetlands, or other special habitats exist in the study area.

Vegetation. Existing vegetation within the study area generally consists of non-native ornamental trees and shrubs along the sidewalks and within the Geary Boulevard median. Most of the trees are ornamental species and are not native to California. A tree survey conducted in support of this analysis (on file with SFCTA) noted 1,958 trees from 60 species within the study area. In order of frequency, these include London plane (*Platanus acerifolia*), New Zealand Christmas tree (*Metrosideros excelsa*), Victorian box (*Pittosporum undulatum*), Indian laurel fig (*Ficus microcarpa*), brisbane box (*Tristania conferta*), Canary Island pine (*Pinus canariensis*), and Monterey cypress (*Cupressus macrocarpa*). No substantial invasive species populations (i.e. weeds) were observed in the study area.

DEFINITIONS

SENSITIVE SPECIES: Refers to all of the taxa included in the CNDDB regardless of their legal or protection status. This includes:

- **Plants and animals legally protected under the California and Federal Endangered Species Acts or under other regulations;**
- **Plants and animals considered sufficiently rare by the scientific community to qualify for such listing; or**
- **Plants and animals considered to be sensitive because they are unique, declining regionally or locally, or are at the extent of their natural range.**

Wildlife. Trees and shrubs can provide marginal suitable refuge for bird species during seasonal nesting and migration periods. San Francisco is located within the Pacific Flyway, which is a major north-south travel route for migratory birds in North America. Some common bird species found within the City/County limits include Anna's hummingbird (*Calypte anna*), house finch (*Carpodacus mexicanus*), Brewer's blackbird (*Euphagus cyanocephalus*), mourning dove (*Zenaida macroura*), American crow (*Corvus branchyrhyncos*), red-tailed hawk (*Buteo jamaicensis*), and Cooper's hawk (*Accipiter cooperii*).

Sensitive Species. Sensitive species include:

- Plants and animals legally protected under the ESA and/or CESA or other regulations;
- Plants and animals considered sufficiently rare by the scientific community to qualify for such listing;
- Plants and animals considered to be sensitive because they are unique, declining regionally or locally, or are at the extent of their natural range.

Searches of relevant databases revealed a list of 32 plant and 21 wildlife special-status species that could potentially be found in or near the study area. Of these, 12 are listed as federally threatened or endangered (seven plant species and five wildlife species). Seven are listed as State Endangered (five plant species and two wildlife species). The remaining plant species have special status under the CNPS. The remaining four wildlife species are considered to be Species of Special Concern by CDFW.

While none of the special-status species are to known to occur within the study area, five special-status and one CESA fully protected wildlife species are known to have occurred within 0.5 mile of the study area. Table 4.13-1 lists all of the special-status animal species that are known to have occurred within 0.5 mile of the study area. One is federally listed as threatened and a Species of Special Concern (California red-legged frog [*Rana aurora draytonii*]), two are state listed as Endangered (California black rail [*Laterallus jamaicensis coturniculus*] and bank swallow [*Riparia riparia*]), and two are listed as Species of Special Concern (Western pond turtle [*Emys marmorata*] and American badger [*Taxidea taxus*]). Of these species, one is considered to be extirpated[9] (California black rail), two others are historic occurrences (bank swallow and American badger), and the remaining species are known to occur within Golden Gate Park, which is approximately 0.5 mile south of the study area (Western pond turtle and California red-legged frog). The peregrine falcon (*Falco peregrinus*) is a fully protected species that is known to nest on buildings in urban settings. An active peregrine falcon nest is located adjacent to the study area on the roof of the Pacific Gas and Electric Building at the corner of Beale Street and Mission Street.[10]

Table 4.13-1 Special-Status Animal Species Within ½ Mile of Study Area

SPECIES COMMON NAME	FEDERAL STATUS	STATE STATUS	CDFW STATUS	EXTIRPATED (Y/N)	HISTORIC OCCURRENCE (Y/N)
Western pond turtle	--	--	Species of Special Concern	No	No
California black rail	--	Endangered	--	Yes	Yes
California red-legged frog	Threatened	--	Species of Special Concern	No	No
Bank swallow	--	Endangered	--	No	Yes
American badger	--	--	Species of Special Concern	No	Yes
American peregrine falcon	--	--	Fully Protected	No	Yes

Source: Jacobs, 2014

There are 18 special-status plant species that are known to occur within 0.5 mile of the study area. However, nine of these species are historical occurrences. The remaining nine plant species are considered to be extirpated (Francisco manzanita [*Arctostaphylos franciscana*], Presidio manzanita [*Arctostaphylos montana* ssp. *ravenii*], Marin Western flax [*Hesperolinon congestum*], San Francisco lessingia [*Lessingia germanorum*], and the San Francisco Bay spineflower [*Chorizanthe cuspidata* var. *cuspidata*]) or are to occur in non-developed preserved habitats, such as the Presidio (San Francisco campion [*Silene verecunda* ssp. *verecunda*]), Golden Gate Park (San Francisco popcornflower [*Plagiobothrys difusus*]), or Point Lobos (San Francisco gumplant [*Grindelia hirsutula* var. *maritime*]) and Kellog's horkelia (*Horkelia cuneata* var. *sericiea*) (CNDDB 2013).

[9] Historic occurrences are considered species that haven't been seen in over 30 years.
[10] CNDDB 2013 and Santa Cruz Predatory Research Group 2014.

Table 4.13-2 Special-Status Plant Species for the Study Area

SPECIES COMMON NAME	FEDERAL STATUS	STATE STATUS	CNPS STATUS	EXTIRPATED (Y/N)	HISTORIC OCCURRENCE (Y/N)
Franciscan Manzanita	--	--	1B.1	Yes	No
Presidio manzanita	Endangered	Endangered	1B.1	Yes	No
Bristly sedge	--	--	2.1	Yes	Yes
San Francisco Bay spineflower	--	--	1B.2	Yes	No
Round-headed chinese-houses	--	--	1B.2	No	Yes
Blue coast Gilia	--	--	1B.1	Yes	Yes
Dark-eyed gilia	--	--	1B.2	Yes	Yes
San Francisco gumplant	--	--	3.2	No	No
White seaside tarplant	--	--	1B.2	No	Yes
Marin Western flax	Threatened	Endangered	1B.1	Yes	No
Kellog's Horkelia	--	--	1B.1	No	No
Beach layia	Endangered	Endangered	1B.1	Yes	Yes
Rose leptosiphon	--	--	1B.1	Yes	Yes
San Francisco lessingia	Endangered	Endangered	1B.1	Yes	No
Marsh microseris	--	--	1B.2	Yes	Yes
Choris' popcornflower	--	--	1B.2	No	Yes
San Francisco popcorn flower	--	Endangered	1B.1	No	No
San Francisco campion	--	--	1B.2	No	No

CNPS Status
1A – Plants presumed extinct in California.
1B – Plants rare, threatened, or endangered in California and elsewhere.
2 – Plants rare, threatened, or endangered in California, but more common elsewhere.
3 – Plants about which we need more information – a review list.
CNPS threat code extensions
.1 – Seriously endangered in California.
.2 – Fairly endangered in California.
.3 – Not very endangered in California.

Source: Jacobs, 2014

4.13.3 | Methodology

The alternatives were evaluated for potential effects to biological resources based on a literature review and a pedestrian survey. Potential effects are assumed for those resources that may exist within the biological study area. The data sources reviewed were the:

- California Natural Diversity Database (CNDDB) for USGS (United States Geological Survey) San Francisco North 7.5-minute quadrangle and the surrounding four quadrangles within a 5-mile buffer around the study area (Hunters Point, Oakland West, Point Bonita, and San Francisco South) (CNDDB 2013);

- California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants database for the USGS San Francisco North 7.5-minute quadrangle and the surrounding four quadrangles within a 5-mile buffer around the study area (Hunters Point, Oakland West, Point Bonita, and San Francisco South) (CNPS 2013);
- USFWS Threatened and Endangered Species database for San Francisco County (USFWS 2013a);
- USFWS Critical Habitat Mapper (USFWS 2013b);
- USFWS Wetlands Mapper (USFWS 2013c);
- NMFS Essential Fish Habitat Mapper (NMFS 2013b); and
- NMFS Critical Habitat Mapper (NMFS 2013a).

A pedestrian survey of the study area was conducted by qualified biologist(s) from April through June 2013. The pedestrian survey was conducted in tandem with a tree survey, conducted by qualified arborist(s).

The alternatives have the potential to result in construction period effects as noted below.

Construction-Related Effects

- Ground disturbing activities
- Tree removal/potential disruption to migratory bird species

Operational Effects

Some degree of tree removal and construction activity would occur under each build alternative. However, each alternative would have varying levels of effect based on the extent of ground disturbance, tree removal, and other construction activities.

4.13.4 | Environmental Consequences

This section describes potential impacts and benefits for biological resources. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 4.13.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding impacts to biological resources in the Draft EIS/EIR.

4.13.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);

3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe impacts to biological resources during construction and operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe impacts to biological resources relative to what was disclosed in the Draft EIS/EIR.

Retention of the Webster Street Pedestrian Bridge

Construction: The modification to retain the Webster Street bridge would not require any additional tree removal beyond that described in the Draft EIS/EIR. (Demolishing the bridge would not have entailed the removal of any trees.) This modification would reduce construction activity at this location. Therefore, this modification would not result in any new or more severe impacts to biological resources during construction.

Operation: No operational-period effects were identified in the Draft EIS/EIR for the Hybrid Alternative. Retention of the bridge would not introduce any new biological resources to the immediate area and thus would not result in any new or more severe impacts to biological resources during operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction: Thirteen trees that were proposed for removal on the block of Geary Boulevard between Spruce and Cook streets to accommodate the proposed BRT stops under the Hybrid Alternative analyzed in the Draft EIS/EIR would now no longer need to removed, as the existing bus stops would now remain. As a result, there would be no need to implement any protections to bird species/nests covered by the MBTA. Overall, this modification would not result in any new or more severe impacts to biological resources during construction.

Operation: No operational-period effects were identified in the Draft EIS/EIR for the Hybrid Alternative. Removing the proposed BRT stops and maintaining the existing local/express stops would not introduce any new biological resources to the immediate area and thus would not result in any new or more severe impacts to biological resources during operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction: The modification to construct additional pedestrian improvements throughout the Geary corridor would not require any tree removal beyond that described in the Draft EIS/EIR. While this modification would require additional localized construction activities, all would take place on paved roadway areas within the existing transportation right of way. Therefore, this modification would not result in any new or more severe impacts to biological resources during construction.

Operation: No operational-period effects were identified in the Draft EIS/EIR for the Hybrid Alternative. Adding pedestrian crossing and safety improvements, all of which would be constructed entirely within the existing paved right-of-way, would

not introduce any new biological resources to the immediate area and thus would not result in any new or more severe impacts to biological resources during operation.

Addition of BRT Stops at Laguna Street

Construction: The modification to add BRT stops at Laguna Street would not require any tree removal beyond that described in the Draft EIS/EIR. This modification would include construction of transit islands, which would occur in the existing transportation right of way on the paved roadway surface. Transit islands may increase the potential for introduction of noxious plants if they are landscaped, though the project would be subject to the measures described in Section 4.13.5 – adherence to which would successfully avoid the introduction of such species. Therefore, this modification would not result in any new or more severe impacts to biological resources during construction.

Operation: No operational-period effects were identified in the Draft EIS/EIR for the Hybrid Alternative. Adding BRT stops at Laguna Street, which would be constructed entirely within the existing paved right-of-way, would not introduce any new biological resources to the immediate area and thus would not result in any new or more severe impacts to biological resources during operation.

Retention of Existing Local and Express Stops at Collins Street

Construction: The modification to retain the existing bus stops at Collins Street would reduce construction activity at this location. Therefore, this modification would not result in any new or more severe impacts to biological resources during construction.

Operation: No operational-period effects were identified in the Draft EIS/EIR for the Hybrid Alternative. Retaining existing local and express stops at Collins Street would not introduce any new biological resources to the immediate area and thus would not result in any new or more severe impacts to biological resources during operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction: Relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities but would simply shift about half of it one block to the west. Construction of center-running bus lanes requires the removal of the existing landscaped median, which in turn would require the removal of existing trees. The tree survey completed for the Draft EIS/EIR (see Appendix I) determined that no tree removal would be necessary to construct the westbound bus lane transition as originally proposed between 26th and 27th avenues. The modification to relocate the westbound bus lane transition between 27th and 28th avenues would not require any additional tree removal in this area either. This modification would include similar construction activities as described in the Draft EIS/EIR. Therefore, this modification would not result in any new or more severe impacts to biological resources during construction.

Operation: No operational-period effects were identified in the Draft EIS/EIR for the Hybrid Alternative. This modification to the transition would not introduce any new biological resources to the immediate area and thus would not result in any new or more severe impacts to biological resources during operation.

4.13.4.2 | CONSTRUCTION EFFECTS

4.13.4.2.1 NO BUILD ALTERNATIVE – CONSTRUCTION EFFECTS

The No Build Alternative is comprised of several physical infrastructure and transit service changes associated with other previously approved City projects that are either planned or programmed to be implemented in the Geary corridor by 2020. Construction of these improvements would be within public right-of-way areas. In some locations, the No Build Alternative could require tree removal during construction, during which potential effects to migratory birds could result.

4.13.4.2.2 BUILD ALTERNATIVES – CONSTRUCTION EFFECTS

Construction of any of the build alternatives would have a potential to directly affect biological resources. None of the previously discussed special-status species (Tables 4.13-1 and 4.13-2) are known to occur within the study area; therefore, there would be no construction-related effects to these species. Furthermore, due to the developed nature of the area, no habitat exists for certain special status species (western pond turtle and California red-legged frog). Therefore, potential adverse construction period effects to biological resources are expected to be limited to:

- Trees protected under the Urban Forestry Ordinance;
- Birds, their nests, and eggs as protected under the MBTA; and
- Potential for introduction or increases in noxious weeds associated with ground disturbance activities, as considered under EO 13112.

- The study area has no special-status species that could be affected by the project
- The study area does include trees that could host nesting birds that are protected by the MBTA;
- Effects associated with project construction activities are expected to be limited to:
  - The removal of protected trees
  - Birds, their nests, and eggs as protected under the MBTA
  - Introduction of noxious weeds
- No indirect or operational effects are anticipated

While the Geary corridor does not contain native plant assemblages, several landscape trees would likely be removed under each of the build alternatives. The following presents the biological effects associated with construction of each of the build alternatives.

Effects to Trees. Each build alternative would have the direct effect of removing a number of trees, including some Significant Trees. None of the build alternatives would remove any Landmark Trees.

- **Alternative 2 (Side-Lane BRT):** A total of 156 trees would be removed. Of these, 86 are Significant Trees.
- **Alternative 3 (Center-Lane BRT with Dual Medians and Passing Lanes):** A total of 253 trees would be removed. Of these, 154 are Significant Trees.
- **Alternative 3-Consolidated (Center-Lane BRT with Dual Medians and Consolidated Bus Service):** A total of 268 trees would be removed. Of these, 168 are Significant Trees.
- **Hybrid Alternative/LPA:** A total of 182 trees would be removed. Of these, 118 are Significant Trees.

Effects to Migratory Birds. Trees are a resource of biological value as they can serve as nesting habitat for migratory birds. There is a potential to directly affect migratory birds or their eggs and nests during project construction. Direct effects to nesting birds could come from tree or shrub removal or from noise, vibration, or activity (e.g., human presence) during nesting season.

Each build alternative includes planting of new trees, at least one tree replaced for each tree removed. Even though each build alternative would plant a comparable number of trees, tree removal and new plantings would have the short-term indirect effect of resulting in somewhat less capacity to host bird nests during the time that newly planted trees would grow in size and thus have greater capacity to host nests.

Effects from Weeds. Project construction could increase the potential introduction of unwanted plants in the landscaped areas. This could occur through introduction of noxious species into the seed palette used in revegetation of the corridor, or from seed entering the area from wind- or animal-borne sources.

4.13.4.3 | OPERATIONAL EFFECTS

The Geary corridor does not contain any wetlands, water bodies, or riparian habitat; therefore, provisions of the CWA and California Fish and Game Code would not apply. No threatened, endangered, or other regulated or sensitive species and no sensitive habitats are known to occur within the Geary corridor (refer to Tables 4.13-1 and 4.13-2). Therefore, provisions of the ESA and CESA are not applicable to this project.

Given that the study area is located entirely within an urban (developed) environment with little or no indigenous vegetation, it is unlikely that any sensitive or special-status species would be affected by the No Build Alternative or the build alternatives. Furthermore, none of the special-status plant and animal species are known or expected to occur within the Geary corridor.

Operational activities associated with the build alternatives are not expected to result in increased disturbance to migratory birds or other biological resources in the Geary corridor. As such, no indirect or operational effects are anticipated.

4.13.4.4 | COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, all project alternatives are similar in that they would occur within the same urban (developed) environment. The No Build Alternative would have the least potential for tree removal, followed by Alternative 2, the Hybrid Alternative/LPA, then Alternative 3. Alternative 3-Consolidated would remove the greatest number of trees.

4.13.5 | Avoidance, Minimization, and/or Mitigation Measures

4.13.5.1 | CONSTRUCTION MEASURES

To minimize adverse effects from the removal of existing trees and landscaping and weeds during construction, the following measures and permit requirements shall be incorporated into the project design for each build alternative.

MIN-BO-C1. Mature trees shall be preserved and incorporated into the project landscape plan as feasible, as well as the planting of replacement trees and landscaping. For each tree removed, a replacement tree is required.

MIN-BO-C2. To preclude potential effects under the MBTA, tree removal shall occur outside nesting bird season (February 1 through August 31). Regardless of time of year, preconstruction surveys shall be performed prior to tree removal to determine occurrence of nesting birds. If active protected bird nests are encountered during preconstruction surveys, no-disturbance buffers would be created around active protected bird and/or raptor nests during the breeding season, or until it is determined that all young have fledged. Typical buffers include 500 feet for raptors and 50 feet for passerine nesting birds. The size of the buffer zones and types of construction activities restricted in these areas may be further modified during consultation with CDFW, and shall be based on existing noise and human disturbance levels at the project site. Nests initiated during construction are presumed to be unaffected, and no buffer will be necessary. The "take" of any individual protected birds shall be prohibited. Monitoring of active nests when construction activities encroach upon established buffers may be required by CDFW.

MIN-BO-C3. Seed palettes used for revegetation of disturbed areas shall be reviewed to prevent introduction of invasive species to the site. Follow-up site maintenance shall include a protocol for landscaping staff to recognize weeds and perform maintenance in a manner that prevents weed establishment.

4.13.5.2 | OPERATIONAL MEASURES

Given that operational activities associated with all of the build alternatives are not expected to result in increased disturbance to migratory birds or other biological resources in the Geary corridor, no adverse operational effects are anticipated. Therefore, no avoidance, minimization, or mitigation measures are needed.

4.14 Environmental Justice

This section describes the potential for the build alternatives to result in disproportionately high or adverse human health or environmental effects to minority or low-income populations (environmental justice, or "EJ", communities).

4.14.1 | Regulatory Setting

4.14.1.1 | EXECUTIVE ORDER 12898

In response to concerns over environmental effects to minority and low-income populations, the Executive Office of the President of the United States established a formal federal policy on environmental justice in February 1994 with Executive Order (EO) 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*). EO 12898 calls on federal agencies to identify and address any disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority populations and low-income populations. The general principles of EO 12898 are as follows:

- Avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority and low income populations.
- Ensure the full and fair participation of all potentially affected communities in the transportation decision-making process.
- Prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

4.14.1.2 | DEPARTMENT OF TRANSPORTATION ORDER 5610.2

In April 1997, the U.S. Department of Transportation (DOT) issued an Order on Environmental Justice (DOT Order 5610.2), establishing procedures for its operating administrations, including the Federal Transit Administration (FTA), to comply with EO 12898 and to promote environmental justice principles as part of its mission. On May 10, 2012, DOT issued Order 5610.2(a), *Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, which clarifies certain aspects of the original DOT Order 5610.2, including the definitions of "minority" populations in compliance with the Office of Management and Budget's Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity of October 30, 1997. The revisions clarify the distinction between a Title VI analysis and an environmental justice analysis conducted as part of a National Environmental Policy Act (NEPA) review, and affirm the importance of considering environmental justice principles as part of early planning activities in order to avoid disproportionately high and adverse effects. The DOT Order 5610.2(a) maintains the original Order's general framework and procedures and DOT's commitment to promoting the principles of environmental justice in all DOT programs, policies, and activities.

DEFINITION

ENVIRONMENTAL JUSTICE (U.S. Environmental Protection Agency definition): The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies

4.14.1.3 | FEDERAL TRANSIT ADMINISTRATION CIRCULAR 4703.1

In August 2012, FTA issued Environmental Justice Policy Guidance for FTA Recipients[1] to update and further refine the approach to the analysis of environmental justice in its NEPA documents. In particular, the Circular encourages non-traditional data gathering techniques to identify distinct minority and/or low-income communities (as well as tribal interest) in a given study area.

4.14.2 | Affected Environment

DEFINITION

For the purpose of the environmental justice analysis, the study area is consists of the Geary corridor plus approximately a one-half mile radius around it

The study area is defined as an approximate one-half mile radius of the Geary corridor, which includes the full travel length of the existing 38 Rapid and 38 Local buses from Geary Boulevard and 48th Avenue to the Transbay Transit Center on First and Mission streets.

Race and income are socioeconomic characteristics critical to the consideration of a project's effects on minority and/or low-income populations. For purposes of implementing EO 12898 and DOT Order 5610.2(a), the Council on Environmental Quality (CEQ) guidance provides the following definitions for minority and low-income populations[2]:

- **Minority**: Any individual who is a member of any of the following Census-defined races or ethnicities: Black, Asian, American Indian and Alaskan Native, Native Hawaiian or Other Pacific Islander, and Hispanic.
- **Low-income:** Any person whose household income is at, or below, the U.S. Census Bureau's annual statistical poverty thresholds, which are based upon the Department of Health and Human Services (HHS) poverty guidelines.

4.14.2.1 | MINORITY AND LOW INCOME POPULATIONS

This subsection identifies and describes study area environmental justice (EJ) populations. Similar to San Francisco as a whole, the study area has a population that is both ethnically and socioeconomically diverse.

4.14.2.1.1 MINORITY POPULATIONS

DEFINITIONS

MINORITY: People of the following Census-defined races/ethnicities: Black, Asian, American Indian, and Alaskan Native, Native Hawaiian, or other Pacific Islander, and Hispanic

LOW-INCOME: Households whose income is at or below the US department of Health and Human Services (HHS) Poverty Guidelines

The CEQ guidance states that minority populations should be identified where the minority population of the affected area either:

- exceeds 50 percent of the area's population, or
- is meaningfully greater than the minority percentage in the general population or geographic unit of analysis.

2010 U.S. Census data and 2012 American Community Survey (ACS) were used to identify the minority populations. Approximately 53 percent of all study area residents are members of minority populations (i.e., non-white), as compared to an approximately 58 percent minority population citywide. Although the overall study area population has a slightly lower percentage of minority residents than San Francisco as a whole, the study area includes many Census block groups that meet the definition of EJ populations for minority populations. Table 4.14-1 and Figure

[1] FTA Circular 4703.1, August 15, 2012.
[2] CEQ, Environmental Justice Guidance under the National Environmental Policy Act, December 10, 1997

4.14-1 respectively list and depict 2010 U.S. Census block groups and the minority population within each. In Table 4.14-1, shading indicates a minority population at or above 50 percent of the total population in the Census block group.

As illustrated in the figure, 2010 Census block groups with high percentages of minority populations can be found along virtually the entire Geary corridor. Of the 160 Census block groups within the study area for the EJ analysis, more than half of the Census block groups have minority populations greater than 50 percent of the total population of the Census block. The areas with Census block groups with the highest percentages of minority populations and are considered EJ communities include the Western Addition, Downtown/Civic Center, Chinatown, and South of Market neighborhoods. The Japantown, Fillmore, and Tenderloin neighborhoods are also largely comprised of minority and low-income populations. Japantown and the Fillmore are parts of the larger Western Addition community and the Tenderloin is part of the larger Downtown/Civic Center community. Japantown consists of both residences and a commercial area. A portion of this commercial area is not represented as an EJ area by the Census block group data because it has a low residential population and is part of the same block group (tract 11000, block 2) as a high-rise senior residential building, The Sequoias San Francisco, resulting in a minority population percentage lower than 50 percent. However, field reconnaissance confirms that the block group contains Japantown Peace Plaza, a public space serving as a center of the Japantown community and hosting many neighborhood cultural events, as well as the Japan Center Malls, which contain numerous small businesses that are an integral part of the Japantown community. Therefore, for the purposes of this analysis, the entirety of the Japantown area is considered a minority community.

4.14.2.1.2 LOW-INCOME POPULATIONS

DOT Order 5610.2(a) defines a low-income person as a person whose median household income is at or below the Department of Health and Human Services (HHS) poverty guidelines. A low income population is defined in the order as "any readily identifiable group of low-income persons who live in geographic proximity.

The 2012 HHS poverty guidelines for the annual income of a single-person household is $11,170, plus $3,960 for each additional household occupant. Based on 2012 American Community Survey (ACS) household size and income data, both San Francisco (as a whole) and the study area (also as a whole) have median household incomes of $73,802 and $66,448, respectively.

Because the HHS poverty guidelines are national averages that do not account for geographical differences in the cost of living, a different threshold may be used, and is encouraged by FTA Circular 4703.1, as long as the threshold is not selectively implemented and is inclusive of all persons at or below the HHS poverty guidelines. As a way to account for the higher cost of living in San Francisco, this analysis identifies households in the study area with 2012 household incomes levels up to 150 percent of the HHS poverty level. This locally developed threshold is consistent with the FTA Circular 4703.1 and Public Law 112-141 which defines "low-income individual" to mean "an individual whose family income is at or below 150 percent of the poverty line. This threshold is more inclusive than the HHS poverty guidelines.

Based on 2012 ACS household size and income data, the annual income for a household at 150 percent of the 2012 HHS poverty guidelines ranges from $16,755 for a single-person household to $34,575 for a four-person household.

In the City and County of San Francisco, the overall percentage of households with incomes below the amounts shown 150 percent of the HHS poverty guidelines in the year 2012 is 21 percent. Figure 4.14-3 and Table 4.14-1 show Census block groups that have a greater percentage of households of such households than the citywide total of 21 percent. In Table 4.14-1, shaded cells indicate that the percentage of such people in the Census block group exceeds the City/Countywide level of 21 percent. These block groups are analyzed in this document as containing low-income populations. As shown in Figure 4.14-3, these Census block groups are somewhat more concentrated in the eastern portion of the corridor.

The Draft EIS/EIR identified low-income populations by comparing the median income of each block group to the HHS poverty guideline. The method for identifying low-income populations has been updated to the method described above to further ensure that no such populations are overlooked. This methodological refinement resulted in additional block groups being identified as having low-income populations, but all but one of them are located in areas not directly adjoining Geary (in other words they are within the study area but do not include any portion of Geary Boulevard/Street). This methodology refinement furthered the identification of low-income communities, but did not change the conclusions of the EJ analysis from the Draft EIS/EIR as shown in Section 4.14.4.

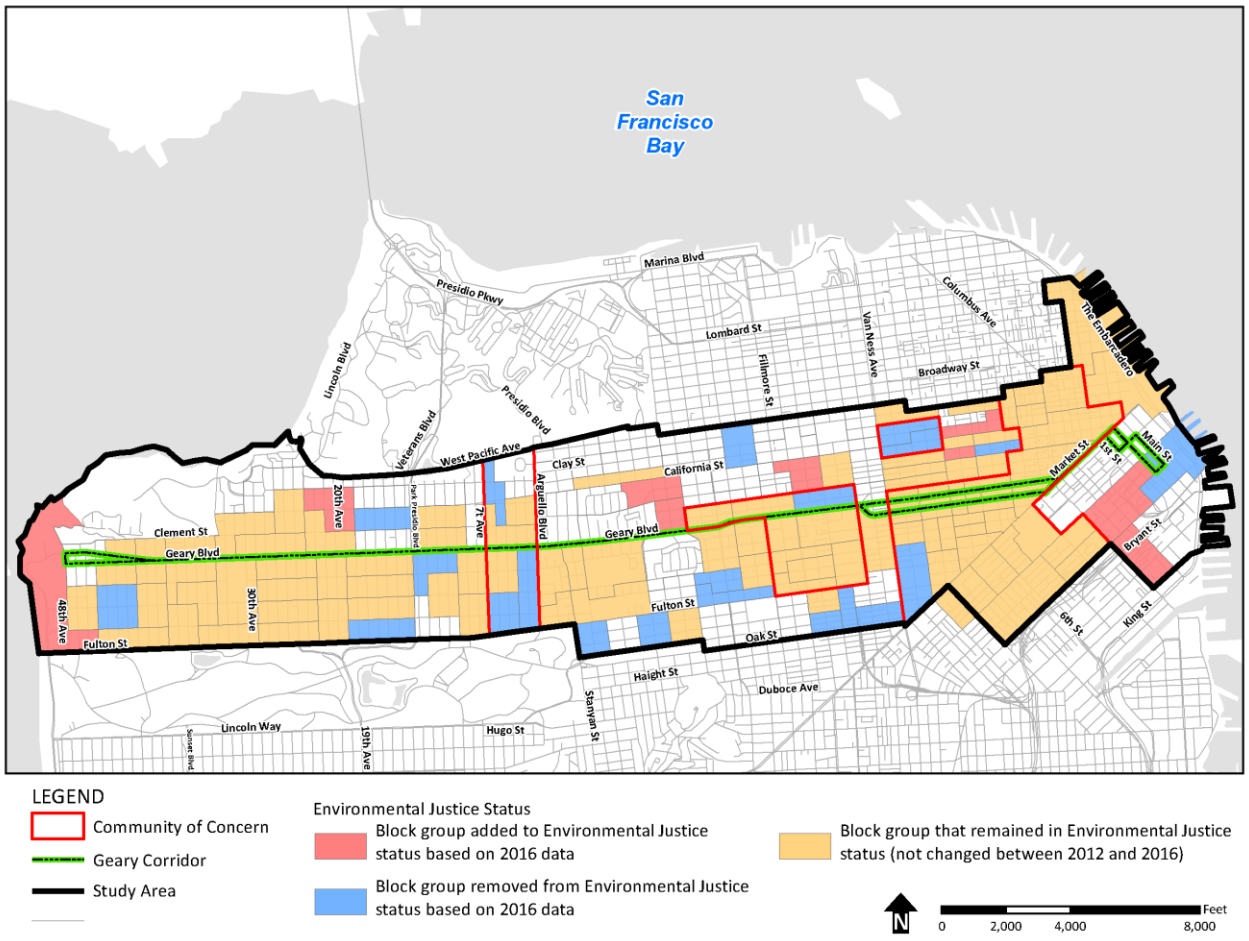
4.14.2.1.3 DATA VALIDATION

2012 ACS data was the most recent household income and ethnicity data available at the time of Draft EIS/EIR preparation. Since then, 2016 ACS has become available. To determine whether the locations of EJ populations have substantially changed between 2012 and 2016, the analysis of comparing household incomes in the study area Census block groups to the HHS poverty guidelines, as well as locating block groups with minority populations of 50 percent or more, was repeated using the 2016 data. Some of the block groups in the study area that were identified as having low-income or minority populations using year 2012 data would no longer be identified as such by the year 2016 data. Likewise, some block groups not previously identified as having EJ populations using 2012 data would be identified as having EJ populations using 2016 data. Overall, the clusters of low-income and minority block groups appear in the same areas using both 2012 and 2016 data, and the locational patterns are similar.

Changes in EJ block groups between 2012 and 2016 data are shown in Figure 4.14-2. Using 2012 data, a total of 113 block groups are identified as EJ, and using 2016 data, a total of 101 block groups are identified as EJ. Using the 2016 data, 9 new block groups were identified as EJ communities and 21 block groups are no longer identified as EJ communities. Using 2016 data, immediately adjacent to the Geary Corridor, three areas of EJ communities are no longer identified as EJ and one additional community is now identified as EJ. These changes along the corridor are often adjacent or are within a larger area still identified as EJ (Figure 4.14-1). It should also be noted that some of the block groups that have changed from EJ to non-EJ in Figure 4.14-1 contain a low population density. For example, the block group at the far western edge of the study area contains mostly parkland.

The overall frequency and distribution of EJ communities along the corridor remains similar from 2012 to 2016. On the whole, less of the study area and fewer of the corridor-adjoining block groups are identified as containing EJ populations by the 2016 data. Therefore, a smaller proportion of the effects described in Section 4.14.4 below would occur in EJ communities, but the corridor remains predominately EJ. Therefore, the conclusions from the Draft EIS/EIR remain the same in the Final EIS.

Figure 4.14-1 Comparison of 2012 and 2016 EJ Block Groups



Environmental Justice status for one Census block group (tract 176.01, block group 1) is determined only from ACS 2008-2012. ACS 2012-2016 does not contain sufficient information to determine Environmental Justice status.

Table 4.14-1 Census Block Group Analysis

CENSUS TRACT	BLOCK GROUP	TOTAL POPULATION[A]	PERCENT MINORITY	PERCENT OF POPULATION AT OR BELOW 150% HHS POVERTY GUIDELINES (2012)
105	1	944	49	22.01
105	2	1741	33	7.10
110	3	2030	54	13.73
111	1	2166	54	21.29
111	2	2084	52	23.78
111	3	914	50	47.40
112	1	1430	59	27.26
112	2	1152	32	14.86
112	3	704	36	20.71
113	2	1533	79	49.74
117	1	807	71	25.96
117	2	976	61	58.56
118	1	1500	93	54.92
119.01	1	898	38	2.32
119.01	2	1510	47	26.47
119.02	1	1947	47	34.91
119.02	2	651	41	26.01
120	1	1983	48	35.68
120	2	1850	59	35.61
120	1	2725	47	26.29
120	2	1108	56	25.46
122.01	1	2699	63	37.98
122.01	2	1868	65	40.54
122.02	1	2986	65	45.30
123.01	1	1521	68	73.91
123.01	2	1213	69	48.65
123.02	1	1763	53	22.49
123.02	2	1310	63	58.43
124.01	1	1945	70	49.39
124.01	2	3130	79	61.48
124.02	1	1060	57	42.89
124.02	2	981	40	23.50
124.02	3	1933	65	64.12
125.01	1	3788	67	65.49
125.01	2	1547	62	71.46
125.02	1	1960	78	70.27
125.02	2	1861	82	68.57
131.01	2	2186	29	4.35

CENSUS TRACT	BLOCK GROUP	TOTAL POPULATION[A]	PERCENT MINORITY	PERCENT OF POPULATION AT OR BELOW 150% HHS POVERTY GUIDELINES (2012)
131.02	1	1355	24	5.89
133	1	683	13	8.95
133	2	1018	19	9.86
133	3	1089	25	39.56
133	4	766	17	1.69
133	5	676	18	6.28
134	1	777	22	22.57
134	2	1425	24	13.85
134	3	1397	16	6.51
135	1	1247	24	9.39
135	2	1309	28	9.95
151	1	1619	33	13.43
151	2	874	50	5.63
152	1	1738	42	27.02
152	2	1389	39	9.15
152	3	807	38	6.08
153	1	938	29	21.16
153	2	1102	36	4.51
154	1	735	31	1.70
154	2	1144	36	7.72
154	3	1382	47	18.71
154	4	831	34	3.35
154	5	1529	28	2.57
155	1	1611	54	19.02
155	2	1333	54	22.64
155	3	678	63	22.28
156	1	723	55	6.08
156	2	1193	39	23.06
156	3	812	44	30.57
157	1	1380	46	13.01
157	2	1900	37	15.15
157	3	1571	50	9.39
157	4	2981	52	13.01
158.01	1	406	78	23.20
158.01	2	1684	57	25.46
158.01	3	1504	63	39.69
158.02	1	1357	35	21.57
158.02	2	1608	36	29.77
159	1	2081	63	32.30

CENSUS TRACT	BLOCK GROUP	TOTAL POPULATION[A]	PERCENT MINORITY	PERCENT OF POPULATION AT OR BELOW 150% HHS POVERTY GUIDELINES (2012)
159	2	2269	64	42.37
160	1	2465	50	21.49
161	1	858	95	19.02
161	2	1564	61	50.14
161	3	1150	79	45.93
161	4	1794	71	63.40
162	1	668	38	15.73
162	2	985	43	32.23
162	3	888	38	32.52
163	1	1062	73	61.37
163	2	1122	48	30.78
163	3	2109	39	16.45
164	1	2063	37	20.12
164	2	1715	38	18.81
165	1	1572	38	35.86
165	2	1101	32	21.51
165	3	1329	35	8.18
165	4	1081	27	21.77
176.01[A]	1	39	54	100.00
176.01	2	2801	67	53.94
176.01	3	2743	66	34.61
176.01	5	1365	72	48.11
178.01	1	1457	84	82.53
178.01	2	2042	67	45.05
178.02	1	3215	53	40.85
401	1	855	30	20.97
401	2	1061	51	24.82
401	3	1358	58	36.87
401	4	814	44	26.14
402	1	1602	48	13.40
402	4	1412	42	19.31
426.01	1	1559	59	44.33
426.01	2	2128	49	11.47
426.02	1	954	49	7.06
426.02	2	1086	42	8.67
426.02	3	1203	48	38.39
427	1	1728	54	13.06
427	2	1816	59	13.46
427	3	1782	55	22.96

CENSUS TRACT	BLOCK GROUP	TOTAL POPULATION[A]	PERCENT MINORITY	PERCENT OF POPULATION AT OR BELOW 150% HHS POVERTY GUIDELINES (2012)
428	1	1095	33	9.66
428	2	700	24	4.27
428	3	581	24	5.24
451	1	2171	57	34.25
451	2	1382	58	17.33
451	3	1443	66	19.85
452	1	1670	60	21.23
452	2	1533	57	29.00
452	3	944	47	10.29
452	4	1127	59	13.10
452	5	1200	59	25.92
476	1	1360	60	31.57
476	2	1317	63	2.79
476	3	1031	65	23.65
476	4	1429	54	15.13
477.01	1	1504	59	22.14
477.01	2	1520	65	21.10
477.01	3	1310	66	15.49
477.02	1	1153	68	6.16
477.02	2	1276	63	9.43
477.02	3	1395	55	19.62
478.01	1	1122	61	20.42
478.01	2	1198	66	13.44
478.01	3	1685	66	18.78
478.02	1	1052	53	11.17
478.02	2	1137	62	21.64
478.02	3	1467	69	18.50
479.01	1	1060	66	12.46
479.01	2	1537	45	16.37
479.01	3	1462	62	17.43
479.01	4	1316	66	21.09
479.01	5	1025	53	11.91
479.02	1	959	45	3.33
479.02	2	1374	57	16.07
479.02	3	1203	64	30.28
611	1	993	86	51.11
611	2	2194	99	62.81
615	1	1902	42	6.92
615	2	1415	46	8.59

CENSUS TRACT	BLOCK GROUP	TOTAL POPULATION[A]	PERCENT MINORITY	PERCENT OF POPULATION AT OR BELOW 150% HHS POVERTY GUIDELINES (2012)
615	3	1911	52	12.58
615	4	1829	46	4.14
615	5	809	48	17.91
615	6	3636	42	14.71
9802	1	320	33	16.13
Study Area		233,795	53	26
San Francisco		805,235	58	21

A U.S. Census data, 2010.

Shaded cells indicate the Census Block Group meets the definition of an environmental justice population as outlined in Section 4.14.3.

Source: 2010 US Census and US HHS 2012 data

4.14.2.1.4 COMMUNITIES OF CONCERN

As shown in Figures 4.14-2 and 4.14-3, EJ communities within the study area also generally coincide with areas that the Metropolitan Transportation Commission (MTC) has defined as "Communities of Concern." These occur in the Western Addition, Downtown/Civic Center, Chinatown, and South of Market neighborhoods. MTC defines Communities of Concerns as communities exceeding four or more of the thresholds listed below, or that have concentrations of both low-income and minority populations. The following are the MTC threshold factors:

- 70 percent are minority residents
- 30 percent have incomes of 200 percent or less than the U.S. Census poverty level
- 20 percent of residents have limited English-speaking proficiency
- 10 percent do not own a car (i.e., transit dependent)
- 10 percent are seniors aged 75 and over
- 25 percent are persons with a disability
- 20 percent are single-parent families
- 15 percent are cost-burdened renters[3]

As shown in Figures 4.14-2 and 4.14-3, the Communities of Concern generally overlap the areas identified as having low-income and/or minority populations using the Census data methodology described above. Consistent with FTA's guidance on EJ,[4] the Communities of Concern information is included to provide additional context. The Communities of Concern reflect other factors such as transit dependence (low automobile ownership), which are outside identification of low-income and minority population. Therefore, the Communities of Concern information was provided as additional description of the corridor, but was not used in delineation of EJ communities.

[3] Plan Bay Area: Technical Summary of Preferred Scenario Equity Analysis Methodology, 2012. Pg. 2. Available at: http://www.onebayarea.org/pdf/Appendices_5-4-12/Appendix_F_Equity_Analysis_Methodolgy_Preferred_Scenario.pdf.
[4] FTA Circular 4703.1, August 15, 2012.

4.14.3 | Methodology

U.S. Census 2010 data (Census data) were used to identify the location of minority and low-income populations. Census data were supplemented with 2012 ACS data for income information. For uniform comparison of minority and low-income populations within the study area, all Census data was collected at the Census block group level, which is the finest grain of comparative data available. In addition to the data analysis, field reconnaissance was conducted in the study area to verify and supplement the analytical findings.[5]

For the purposes of this analysis, EJ populations are considered to be the people living in Census block groups which have at least one of the following demographic characteristics:

- Minority population is 50 percent or greater (see Section 4.14.2.1.1 above)
- The percentage of people with incomes that are 150 percent or less of 2012 HHS Poverty Guidelines or exceeds the percentage of such people in the City and County of San Francisco as a whole (21 percent as of 2012) (see Section 4.14.2.1.2 above)

As reflected in shaded cells of Table 4.14-1, of the 160 Census block groups in the study area, 60 have both minority and low income EJ populations. A separate 29 Census block groups have EJ populations based solely on minority population; another 24 are EJ populations based on low-income. Based on the foregoing, the Western Addition, Downtown/Civic Center, Chinatown, and South of Market are EJ communities. These communities include distinct EJ populations, such as the Tenderloin in the Downtown/Civic Center area and Japantown and the Fillmore in the Western Addition.

Consistent with DOT Order 5610.2(a), the analysis examines whether an alternative will result in a disproportionately high and adverse effect on human health or the environment on EJ populations. A disproportionately high and adverse effect is defined in DOT Order 5610.2(a) as an adverse effect that:

i. is predominantly borne by a minority population and/or a low-income population, or
ii. will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population.

To determine whether the build alternatives could result in any such disproportionate effects within the study area, each of the build alternatives' adverse effects on minority and/or low-income populations were compared to the adverse effects on non-minority and non-low-income populations in the study area. The analysis also compares the alternative's benefits experienced by minority and/or low-income populations as compared to non-minority and non-low-income populations.

[5] Regional population and income data provided by the Association of Bay Area Governments (ABAG) was also used to further verify *Census Tract data*; ABAG does not provide data at the *Census Block Group* level.

As noted above, well over half of the Census block groups in the study area include one or two types of EJ populations. Therefore, most of the Geary corridor is considered to include EJ populations and thus that any impacts of the build alternatives would thus be disproportionately borne by EJ populations. Accordingly, the following analysis focuses with particularity on whether such effects would be disproportionately high and adverse.

Figure 4.14-2 Minority Populations in the Study Area

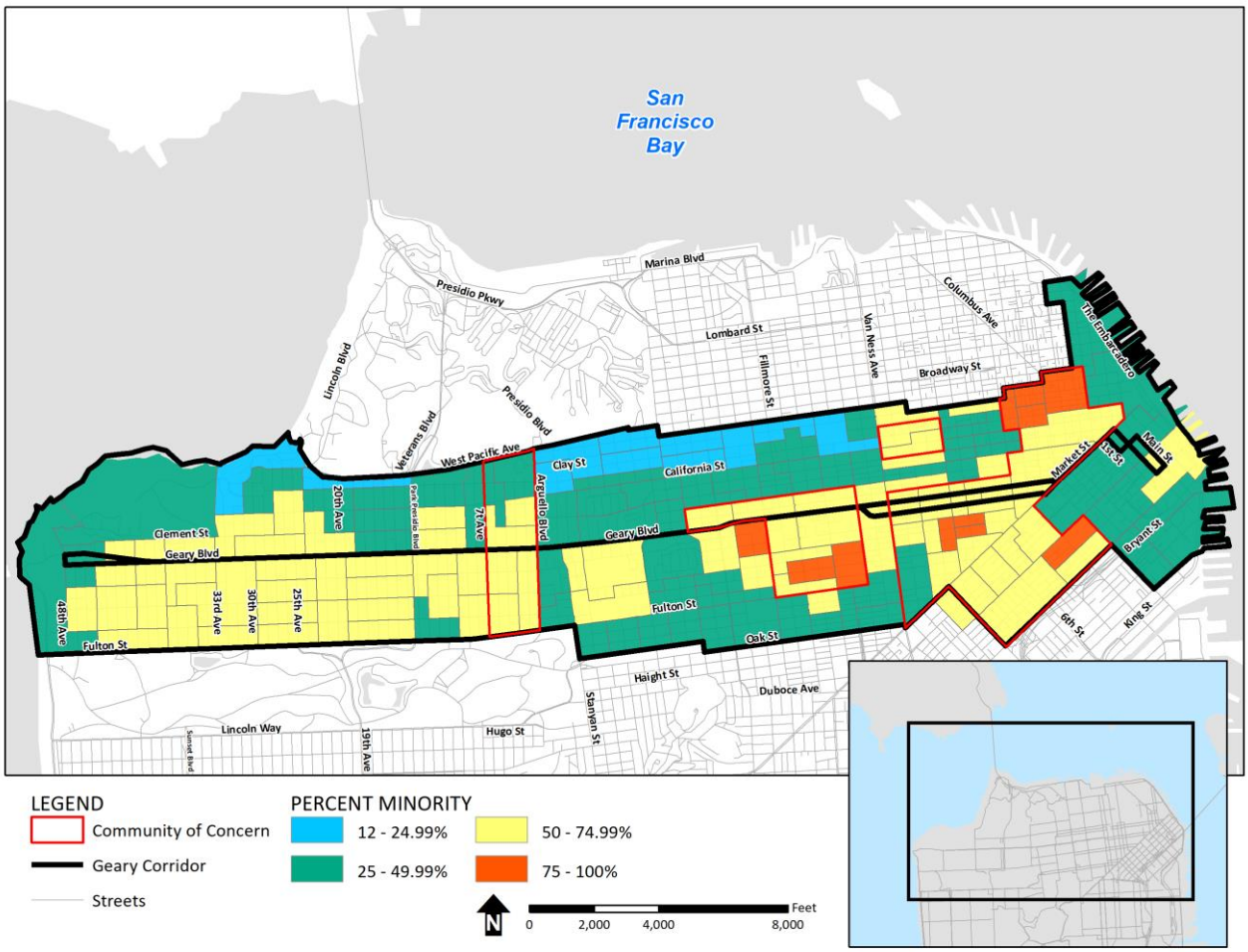
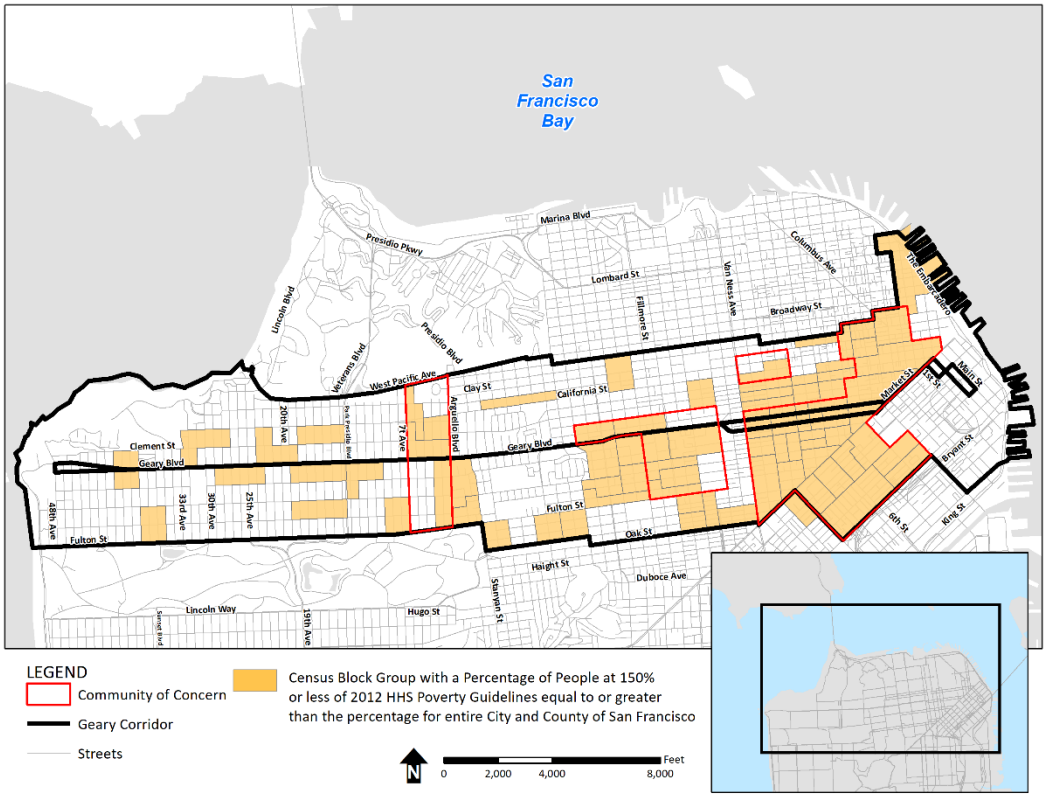


Figure 4.14-3 Low-Income Populations in the Study Area



Consistent with FTA's Circular, the San Francisco County Transportation Authority (SFCTA) and San Francisco Municipal Transportation Agency (SFMTA) also sought to engage members of the community, with emphasis on EJ communities. Over half of the Census block groups in the Geary corridor include EJ populations; so virtually all of the outreach performed was inclusive of EJ populations. During the project development and planning phases, SFCTA and SFMTA convened briefings and announcements with key stakeholder groups to better understand concerns at a more granular level. In communities with high numbers of non-English speakers, information was provided in multiple languages (including Chinese, Japanese, Korean, Russian, Spanish, Filipino, and Vietnamese). The project team convened meetings and/or briefings with over 65 local community, neighborhood, business, advocacy, and interest groups over the course of project development process and used that input to shape the alternatives carried forward into this document.

In addition, project open houses in and near the Japantown, Fillmore, and Tenderloin neighborhoods, which are a part of the larger Western Addition and Downtown/Civic Center EJ communities and are largely comprised of EJ populations (both minority and low income).[6] The Japantown, Fillmore, and Tenderloin neighborhoods are therefore included in the EJ communities analyzed in Section 4.14.4. The project's Citizens Advisory Committee (CAC), which provided a

[6] See Chapter 8, Public Participation, for full details on public meetings. A scoping meeting was held in the Tenderloin neighborhood in December 2008. In June 2012, a community meeting on alternatives was held in Japantown. In December 2013/January 2014, further open house meetings were held in the Tenderloin and Japantown.

sustained forum for public input, included designated seats for representatives of specific neighborhoods along the corridor, including the Japantown/Fillmore and Tenderloin/Downtown communities. The project team conducted a door-to-door survey of over 500 corridor merchants, including those in EJ communities, to gather their feedback. Two visualization kiosks, one of which was installed in the Japantown community, included a short survey for passers-by to share opinions on the project. The local agencies have maintained multi-lingual and multifaceted engagement through all stages of alternatives development, evaluation, and after certification of the Final EIR.

Efforts were undertaken to consider comments the community and EJ population in the refinement of the alternatives and measures to avoid and minimize impact. The Hybrid Alternative as described in the Draft EIS/EIR called for the bridge to be demolished and the existing local bus stop to be removed and not replaced. As noted in comments on the Draft EIS/EIR (see Appendix L, Master Response 1b), comments from residents of the Fillmore/Japantown neighborhoods (both of which are largely comprised of EJ populations) communities, and families associated with a school in Japantown and senior residential facilities near Laguna Street expressed concern about these proposed actions. Suggestions were received to retain the Webster Street pedestrian overcrossing and to add a BRT stop at Laguna Street. In this Final EIS, the Hybrid Alternative/LPA was modified to retain the Webster Street bridge and to add BRT stops at Laguna Street to directly respond to these concerns.

Refer to Chapter 8.0 for more information regarding project related outreach efforts and public participation and Chapter 10 for the alternatives development process.

4.14.4 | Environmental Consequences

This section discusses whether any project impacts would be disproportionately high and adverse to EJ populations, taking into consideration 1) the implementation of avoidance, minimization, and/or mitigation measures and 2) any offsetting benefits of the project that would be realized by EJ populations.

As noted above, the majority of the study area contains EJ populations. As such, most of the environmental effects of the project alternatives would be predominantly borne by EJ communities. However, as discussed in the following subsections, these environmental effects occur across the study area and similar effects occur in environmental EJ and non-EJ communities. Mitigation measures would also be implemented, with similar type and quality throughout the study area, in both EJ and non-EJ communities. Therefore, following the implementation of mitigation and the consideration of off-setting benefits, the build alternatives would not result in disproportionately high or adverse effects in EJ communities.

4.14.4.1 ENVIRONMENTAL TOPIC AREAS WITH NO ADVERSE EFFECTS

For several environmental topic areas, the build alternatives would result in beneficial effects. Such beneficial effects include improved access to transit service, improved travel times, increased transit capacity, reliability and connectivity between residential areas, community facilities, employment centers, and local businesses, particularly for higher densities of minority and low-income populations in the eastern portion of the Geary corridor.

Other benefits include an enhanced visual environment and landscape, improved air quality, decreased pedestrian crossing distances, pedestrian-scale lighting, median-width changes, improved bus shelters and bulbouts, and other urban design features.

In summary, as presented in Chapters 3 and 4 of this document, the build alternatives would have no adverse effects in the following environmental topic areas.

- Transit Operations
- Pedestrian and Bicycle Transportation
- Parking
- Land Use
- Growth
- Cultural Resources
- Utilities
- Geology and Soils
- Energy
- Biological Resources

Since the project alternatives would not have any adverse effects in the above-listed topic areas, there would be no disproportionate adverse effects to EJ populations.

The analysis in Chapter 3 demonstrates that there would be no adverse effects related to transit operations, pedestrian and bicycle facilities, or parking. However, because Geary BRT is a transportation project, the project alternatives would result in extensive changes to the transportation network in the study area, including in EJ communities. Although the build alternatives would have no adverse effects in the three transportation related topics noted above, subsection 4.14.4.11 discusses EJ considerations related to these topics given the scale of the transportation network changes that would result from the proposed alternatives.

4.14.4.2 ENVIRONMENTAL TOPIC AREAS WITH NO ADVERSE EFFECTS WITH IMPLEMENTATION OF AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

For the following topic areas, the build alternatives were shown to have adverse effects prior to the implementation of avoidance, minimization, and/or mitigation measures. Further details regarding these conclusions are provided in their respective sections of Chapters 3 and 4. With one exception noted below, these adverse effects are related only to construction.

- Community Impacts
- Visual Resources
- Hazards and Hazardous Materials
- Hydrology and Water Quality (construction and operation)

- Air Quality and Greenhouse Gas Emissions
- Noise and Vibration
- Loading Spaces

With the implementation of avoidance, minimization, and/or mitigation measures, no adverse effect would remain within these environmental topic areas. These topic areas are further discussed in subsequent subsections (starting at 4.14.4.5) to discuss details regarding EJ populations.

4.14.4.3 ENVIRONMENTAL TOPIC AREA WITH ADVERSE EFFECTS FOLLOWING IMPLEMENTATION OF AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

As shown in preceding sections of Chapters 3 and 4 of this document, automobile transportation is the only environmental topic area where an adverse effect would remain following implementation of feasible avoidance, minimization, and mitigation measures.

This topic is further discussed in subsection 4.14.4.11 below for evaluation of whether the effect would be disproportionately high and adverse on EJ populations.| Hybrid Alternative/Locally Preferred Alternative Modifications: Potential Additive Effects since Publication of the Draft EIS/EIR

As discussed in Section 2.2.7.6, the Hybrid Alternative/Locally Preferred Alternative (LPA) now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

- Retention of the Webster Street pedestrian bridge;
- Removal of proposed bus rapid transit (BRT) stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
- Addition of more pedestrian crossing and safety improvements;
- Addition of BRT stops at Laguna Street;
- Retention of existing local and express stops at Collins Street; and
- Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether the refined Hybrid Alternative/Locally Preferred Alternative would result in any new or more severe EJ impacts during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe EJ impacts relative to what was disclosed in the Draft EIS/EIR.

The modifications to the Hybrid Alternative/LPA would be located within or near EJ communities.

Retention of the Webster Street Pedestrian Bridge

Construction and Operation: Environmental justice populations are located on the north and south sides of Geary near this modification. Retaining the bridge at this location would provide the benefit of enhanced pedestrian access across Geary. As described in several preceding sections of this Final EIS, the retention of the

Webster Street bridge would not result in any new or more severe impacts with regard to community impacts, visual resources, hazards and hazardous materials, hydrology and water quality, air quality and GHG emissions, noise and vibration, or transportation and transit. Therefore, this modification would not have the ability to result in any new or more severe effects to EJ communities relative to what was described in the Draft EIS/EIR during construction or operation.

Removal of Proposed BRT Stops between Spruce and Cook Streets

Construction and Operation: Environmental justice populations are located on the south side of Geary Boulevard near this modification. As described in several preceding sections of this Final EIS, the retention of the existing bus stops between Spruce and Cook streets would not result in any new or more severe impacts with regard to community impacts, visual resources, hazards and hazardous materials, hydrology and water quality, air quality and GHG emissions, noise and vibration, or transportation and transit. Although this community would not be served by BRT buses at the Spruce-Cook stop, overall transit access would not be substantially diminished because local and express services would still be provided. Moreover, this change would preserve curbside parking and loading on this block. Therefore, this modification would not result in any new or more severe effects generally or to EJ communities specifically relative to what was described in the Draft EIS/EIR during construction or operation.

Addition of More Pedestrian Crossing and Safety Improvements

Construction and Operation: As described in several preceding sections of this Final EIS, the additional pedestrian enhancements would not result in any new or more severe impacts with regard to community impacts, visual resources, hazards and hazardous materials, hydrology and water quality, air quality and GHG emissions, noise and vibration, or transportation and transit. Additional pedestrian improvements would require the removal of approximately 25 additional parking spaces both within and not within EJ populations (see Section 4.14.4.11 below). While the additional pedestrian enhancements would be constructed in various locations along the 6.5-mile Geary corridor, including in areas within or adjacent to EJ populations, the effects of pedestrian crossing bulb construction and operation would be similar in both EJ and non-EJ populations, so this modification would not result in any new or more severe effects to parking corridor-wide or in the Japantown/Fillmore area, either generally or specifically to EJ communities relative to what was described in the Draft EIS/EIR during construction or operation.

Addition of BRT Stops at Laguna Street

Construction and Operation: Environmental justice communities are located on the north and south sides of Geary near this modification. Adding BRT stops at this location would provide the benefit of enhanced transit access to and from this area.

This modification would require the removal of approximately 14 parking spaces in the immediate area (see Section 4.14.4.11 below). As described in several preceding sections of this Final EIS, the addition of BRT stops at Laguna Street would not result in any new or more severe impacts with regard to community impacts, visual resources, hazards and hazardous materials, hydrology and water quality, air quality and GHG emissions, noise and vibration, or transportation and transit. Therefore, this modification would not result in any new or more severe effects generally or

specifically to EJ communities relative to what was described in the Draft EIS/EIR during construction or operation.

Retention of Existing Local and Express Stops at Collins Street

Construction and Operation: Environmental justice populations are located on the south side of Geary near this modification. Retaining local and express stops at this location would provide the benefit of enhanced transit access. This modification would preclude the addition of approximately eight parking spaces that could have been added if the bus stops were removed. As described in several preceding sections of this Final EIS, the retention of the existing bus stops at Collins Street would not result in any new or more severe impacts with regard to community impacts, visual resources, hazards and hazardous materials, hydrology and water quality, air quality and GHG emissions, noise and vibration, or transportation and transit. Therefore, this modification would not result in any new or more severe effects generally or specifically to EJ populations relative to what was described in the Draft EIS/EIR during construction or operation.

Relocation of the Westbound Center- to Side-Running Bus Lane Transition

Construction and Operation: Environmental justice communities (minority populations) are located on the north and south sides of Geary near this modification. As described in several preceding sections of this Final EIS, the relocation of the westbound bus-only lane transition would not result in any new or more severe impacts with regard to community impacts, visual resources, hazards and hazardous materials, hydrology and water quality, air quality and GHG emissions, noise and vibration, or transportation and transit. Therefore, this modification would not result in any new or more severe effects generally or specifically to EJ communities relative to what was described in the Draft EIS/EIR during construction or operation.

4.14.4.4 | COMMUNITY IMPACTS

As analyzed in Section 4.2 of this Final EIS, the build alternatives would not result in adverse community impacts with operation of the build alternatives. In addition, Alternative 3 (Center-Lane BRT with Dual Medians and Passing Lanes) and Alternative 3-Consolidated (Center-Lane BRT with Dual Medians and Consolidated Bus Service) would have beneficial effects on community cohesiveness for EJ communities through the proposed filling of the Fillmore Street underpass, which currently acts as a barrier in the Fillmore/Japantown areas, as described in Section 4.2.4.4. Therefore, the build alternatives would not result in a disproportionate adverse effect to EJ populations with operation of the build alternatives.

However, the build alternatives would have an adverse construction period effect related to temporary traffic increases and parking in construction areas, which could disrupt access to public facilities, parks, businesses, and residences within the Geary corridor (shown in Table 4.2-7 through Table 4.2-9). Temporary adverse effects during construction, including partial sidewalk closures and detours, would likely affect patrons and employees of businesses along the Geary corridor, and would occur in a similar nature and magnitude in both EJ communities and non-EJ communities.

With implementation of mitigation, adverse effects would be avoided and minimized. The same type, level and quality of mitigation would be implemented in EJ and non-EJ communities. For example, construction of bus stops in EJ communities would temporarily affect access to nearby destinations, in similar nature and magnitude to construction of bus stops in non-EJ communities.

Section 4.2.5.1 reflects inclusion of a minimization measure that would eliminate the adverse effect during construction. The measure requires preparation of a transportation management plan (TMP) that includes traffic rerouting, a detour plan, and public information procedures. The TMP will be developed with participation from local agencies, other major project proponents in the area, local communities, business associations, and affected drivers. The TMP would cover the entire project corridor wherever needed to minimize construction effects, and TMPs of similar type and quality would be applied in both EJ communities and non-EJ communities. As there would be no adverse effect after application of this measure, there would be no disproportionate adverse effect to EJ populations.

While the communities along the corridor would bear the impacts of construction, the EJ communities adjacent to the corridor would realize benefits under any of the build alternatives through improved access to transit service, improved air quality, and improved travel times, particularly for higher densities of minority and low-income populations in the eastern portion of the Geary corridor, as discussed in Section 2.3.1 and Section 4.10. Businesses along the corridor will experience most of the project's construction impacts. However, those businesses would be expected to benefit from operation of the project through a potential increase in customers as a result of improved connectivity between residential areas, community facilities, employment centers, and local businesses. With the consideration of offsetting benefits and the implementation of mitigation, the build alternatives would not result in a disproportionate adverse effect.

4.14.4.5 | VISUAL RESOURCES

Operational effects to visual resources would not be adverse, and therefore would not result in a disproportionate adverse effect. As summarized on Table 4.4-1 in Section 4.4.4, implementation of the build alternatives is expected to enhance the visual quality along the corridor and provide a benefit to both EJ and non-EJ communities. The primary visual changes would result from the coloring of BRT lanes and the introduction of new BRT stops on bulb-out sidewalk extensions. At these stops, new shelters, decorative lighting, custom paving associated with the bulbouts and dedicated bus lanes, and tree planting would be placed on widened passenger areas (bus bulbs) created by extending the sidewalk into the existing parking lanes. Under Alternatives 3 (Center-Lane BRT with Dual Medians and Passing Lanes) and 3-Consolidated (Center-Lane BRT with Dual Medians and Consolidated Bus Service) as well as in a smaller portion of the corridor under the Hybrid Alternative/LPA, existing center medians would be replaced with dedicated center-running BRT lanes. These would be separated from auto traffic by continuous raised, landscaped medians and BRT platforms. The existing center medians and associated landscaping lost to the center BRT lanes would be replaced by extensive landscape planting in the adjoining new center-running medians, with a substantial net increase in the amount of landscaping in the Geary corridor. These beneficial effects would be experienced in both EJ and non-EJ communities since both exist along the portions of the corridor that would have center-running BRT lanes in each

of these alternatives. In addition, visual improvements such as tree replacement would be applied throughout the corridor, as described in detail in Section 4.4.4.3.2.

Section 4.4 of this Final EIS concluded that the build alternatives would have an adverse construction period effect. This effect would be corridor-wide, since it relates to the use of construction equipment, stockpiling of materials, and other visual signs of construction, including portable message signs and night lighting, all of which would be located within public right-of-way areas where new project elements would be constructed (the entire length of the Geary corridor between Market Street to 34th Avenue). While evidence of construction activity may be noticeable to area residents, transit riders, and other viewer groups, such visual disruptions would be short term and are a common feature of the urban environment. As discussed in Section 2.3.3, construction of the build alternatives would require varying levels of tree removal, during which a temporary decline in visual quality would occur. These effects would be similar in nature and magnitude in both EJ and non-EJ communities. For example, in both EJ and non-EJ communities, construction equipment would be visible and existing trees may be removed. In the long-term, EJ communities would benefit from the visual enhancement provided by the project's new facilities and landscaping.

The most intensive construction associated with the build alternatives involves the construction of new center-running bus lanes, which requires removal of existing planted medians. Alternatives 3 and 3-Consolidated included particularly intensive center-lane construction through the Fillmore/Japantown areas (which include EJ populations), where the grade of Geary would be raised out of its current expressway configuration. Notably, the Hybrid Alternative/LPA does not include center-lane construction in this area.

To ensure that construction throughout the corridor and in the Fillmore/Japantown area does not result in an adverse effect, project construction will be phased to reduce the period of disruption at any particular location to the shortest practical length of time. This will be particularly relevant to the Fillmore overpass area. Additionally, construction staging and storage areas will be screened by visually opaque screening wherever they will be exposed to public view for extended periods of time. The same type, level, and quality of mitigation for common construction-period effects would be applied in both EJ and non-EJ communities. For example, wherever construction occurs, construction areas would be screened from public view. In the Fillmore/Japantown area, where more intense construction is required and EJ communities are present, the mitigation described above would be applied and would ensure that no adverse effect would occur.

Section 4.4.5.1 reflects inclusion of the measure described above, which would eliminate the adverse effect. As there would be no adverse effects after mitigation, there would be no disproportionate adverse effect to any EJ population. The implementation of mitigation measures would be similar both EJ and non-EJ communities. With the consideration of the offsetting benefit of the long-term visual enhancement of the corridor and the implementation of mitigation measures, the build alternatives would not result in no disproportionate adverse effect to EJ populations.

4.14.4.6 | HAZARDS AND HAZARDOUS MATERIALS

Operational effects would not be adverse, and therefore would not result in a disproportionate adverse effect.

Section 4.8 of this Final EIS concluded that the build alternatives would have an adverse construction period effect. Construction activities would potentially result in exposure risk from hazardous materials, aerially deposited lead in the soil, naturally-occurring asbestos, lead, and other environmental concerns, listed in Table 4.8-1, especially in areas where the Hybrid Alternative would remove existing medians. These effects would be similar in nature and magnitude in both EJ and non-EJ communities. For example, excavation would be required in both EJ and non-EJ communities, and would carry a similar risk of exposure to aerially deposited lead in both EJ and non-EJ communities. However, the Hybrid Alternative would avoid some potential risks to hazardous materials exposure associated with the Fillmore Street underpass, as the Fillmore Street underpass would remain in place. This would avoid a potential effect in an area with EJ populations.

Under Alternative 3 and 3-Consolidated the Geary corridor would be raised at Fillmore Street to create an at-grade roadway. This area includes EJ populations in the Fillmore/Japantown neighborhoods. This work would involve filling the existing underpass, thereby creating a new roadbed, removing part of the retaining walls, relocating existing utilities, and decommissioning the existing pump station. As a result, the proposed Fillmore underpass would involve importing of dirt and fill materials. This effect would only occur in this area, and would be within an EJ community. However, mitigation described below would be implemented in this location to ensure adverse effects do not occur.

Filling the Fillmore underpass would require compliance with Section 2.4.53(d) of the City Public Works Code to ensure that fill materials are clean. This requirement would ensure that effects related to the Fillmore Street construction activities are not adverse. This measure would be applied uniquely in the Fillmore Street area, which primarily includes EJ communities. In this case, EJ communities would benefit from additional mitigation that would not occur in non-EJ communities. Additionally, filling of the Fillmore underpass would result in beneficial effects to EJ communities, described in Section 4.14.4.5 above and in detail in Section 4.2.4.4.

Section 4.8.5.1 reflects inclusion of minimization measures that would eliminate adverse construction period effects along the corridor. Prior to excavation and construction, adherence to hazardous material guidelines for collection; disposal, handling, release, and treatment of hazardous material; site remediation; and worker safety and training would be required. A Preliminary Site Investigation would be performed to verify the presence of hazardous materials in soil, groundwater, and construction materials on the Geary corridor. Areas throughout the corridor where soils would be disturbed during construction will be sampled and tested for hazardous materials. Any hazardous materials encountered would be disposed of in accordance with applicable, federal, state, and local regulations. The same type, level and quality of mitigation would be applied in both EJ and non-EJ communities. For example, excavation would be required in both EJ and non-EJ communities, and soil samples would be tested from both EJ and non-EJ communities to identify any potentially hazardous materials. With the implementation of mitigation, the build

alternatives would have no adverse effects; therefore, there would be no disproportionate adverse effect to EJ populations.

4.14.4.7 | HYDROLOGY AND WATER QUALITY

Section 4.9 of this Final EIS concluded that the build alternatives would have adverse construction and operational effects. Construction of any of the build alternatives could result in effects related to soil erosion, stormwater runoff, and effects to the existing sewer system. These effects would be temporary and occur corridor-wide in both EJ and non-EJ communities. The effect would occur in a similar nature and magnitude in both EJ and non-EJ communities. For example, wherever excavation occurs, temporary effects to stormwater runoff could occur. Similar types and amounts of excavation is proposed in both EJ and non-EJ communities.

In addition, Alternatives 3 and 3-Consolidated would involve filling the underpass at Fillmore Street and decommissioning an existing underground pump station. This work would occur in an area with EJ populations. These components of Alternatives 3 and 3-Consolidated would allow groundwater elevation in the area to rise to a level that could potentially reach underground portions of six nearby structures, resulting in an adverse effect. This effect would primarily occur in EJ communities. However, specific mitigation would be implemented wherever needed, and in EJ communities in particular, to avoid this adverse effect. Additionally, filling of the Fillmore underpass would result in beneficial effects to EJ communities, described in Section 4.14.4.5 above and in detail in Section 4.2.4.4.

Should Alternatives 3 or 3-Consolidated be selected, one of two measures would be implemented to address this adverse effect. The effect may be avoided by maintaining the existing pump station or a similar pump to keep groundwater in the vicinity of the Fillmore Street area at current (unchanged) elevations. Alternatively, a detailed groundwater study will be performed to determine the effects of groundwater rise on potentially affected structures and utilities. Remedial measures may be identified, and would be implemented to minimize structural affects to surrounding buildings. This measure would specifically serve the area surrounding the pump station, which includes an EJ community, and would ensure that that effects described above are not adverse.

Operation of any of the build alternatives would have an adverse effect on stormwater runoff throughout the corridor. This effect would be similar throughout the corridor in both EJ and non-EJ communities; where new impervious surfaces are added, increased stormwater could occur. New impervious surfaces would be added of a similar type and magnitude in both EJ and non-EJ communities. A minimization measure has been developed to avoid this adverse effect and requires landscaped areas be designed to minimize and reduce total stormwater runoff. The type, level, and quality of this mitigation would be the same in both EJ communities and non-EJ communities. For example, landscaped areas would be installed in both EJ and non-EJ communities. The precise design of landscaped areas would depend on physical conditions along the corridor, which vary. However, the most appropriate landscaping to fulfil the intent of this mitigation measure would be used in both EJ and non-EJ communities. This measure would avoid adverse operational effects.

Section 4.9.5 reflects inclusion of the minimization measures described above that would eliminate these construction and operational period adverse effects across the entire corridor. As there would be no adverse effects after mitigation, and considering the offsetting benefits, there would be no disproportionate adverse effect to any EJ population.

4.14.4.8 | AIR QUALITY AND GREENHOUSE GAS EMISSIONS

As summarized on Table 4.10-2 in Section 4.10, none of the project alternatives would result in substantial, long-term increases in criteria air pollutants, would not expose receptors to substantial pollutant concentrations, and would not result in substantial, long-term increases in GHG emissions. As discussed in Section 4.10, the build alternatives would result in beneficial long-term reductions in the emissions of criteria pollutants and greenhouse gases. The build alternatives would be consistent with the most recent air quality plan that shows how the region will improve ambient air quality and achieve state and federal ambient air quality standards. All project alternatives, including the No Build Alternative, also include the replacement of current diesel buses with lower emissions diesel hybrid electric models. Operational effects of the build alternatives would not be adverse, and therefore they would not result in a disproportionately high and adverse effect to EJ communities.

The majority of construction activity would be similar for all of the project alternatives. Temporary and localized air quality impacts related to the construction of additional BRT stops and BRT stops at new transit islands such as at Laguna Street stops under the Hybrid Alternative/LPA, and additional pedestrian improvements, would be similar in nature and magnitude along the Geary corridor in both EJ and non-EJ communities. For example, construction would require excavation which can result in airborne dust. Similar types and amounts of excavation is proposed in both EJ and non-EJ communities.

However, construction activity associated with filling the Fillmore Street underpass (Alternatives 3 and 3-Consolidated) would generate the highest amounts of criteria air pollutant emissions as a result of additional truck and equipment activity. This portion of the study area includes EJ populations. While construction period effects would be most intense in this area, criteria pollutants would still be below applicable thresholds (discussed in Section 4.10.1), therefore the effect would not be adverse and no disproportionate adverse effect to EJ communities would occur.

Section 4.10.4.5 of this Final EIS concluded that the build alternatives would have an adverse construction period effect related to potential release or exposure to asbestos if pedestrian bridges containing asbestos building materials are demolished. Demolition of the pedestrian bridges at Steiner Street (all build alternatives) and Webster Street (retained as part of the Hybrid Alternative/LPA) could result in the release of/exposure to asbestos. In addition, Alternatives 3 and 3-Consolidated would decommission an existing below-grade pump station, including removal of a portion of its structure which could contain asbestos. This area includes EJ populations. However, with implementation of measures described below, the effect would not be adverse, and EJ communities would realize the benefits from these construction activities as described in Section 4.14.4.5 above.

With adherence to City ordinances and regulations regarding construction, including the demolition of pedestrian bridges, no adverse effect would occur. Adherence to the relevant ordinances would be applied in both EJ communities and non-EJ

communities. This avoidance measure would ensure that an equal type, level, and quality of avoidance is applied in both EJ and non-EJ communities. For example, construction activities requiring compliance with the Construction Dust Control Ordinance would occur in both EJ and non-EJ communities, and compliance with the ordinance would be carried out in both EJ and non-EJ communities. Section 4.10.5.1 reflects inclusion of the measure described about that would avoid adverse air quality effects. With the implementation of mitigation measure and considering the offsetting benefits of the air quality improvement as discussed in Section 4.10, there would be no disproportionate adverse effect on EJ populations.

4.14.4.9 | NOISE AND VIBRATION

Section 4.11 of this Final EIS concluded that the build alternatives would have an adverse construction period effect, but operational effects would not be adverse. Therefore, the build alternatives would not result in a disproportionate adverse effect related to operational noise and vibration.

Construction noise effects would be corridor-wide and occur in a similar nature and magnitude in both EJ and non-EJ communities. For example, physical improvements associated with the build alternatives (the Geary corridor between Market Street and 34th Avenue) would result in temporary increases in ambient noise levels and vibration levels on an intermittent basis. Similar types and magnitudes of construction activity would occur in both EJ and non-EJ communities, such as excavation, paving, and lane striping. Since the effect is corridor-wide, it would not occur with greater intensity in EJ communities than in non-EJ communities, and would not be disproportionately adverse.

The most intensive construction associated with the build alternatives involves filling the Fillmore Street underpass to bring the roadway to street level (Alternatives 3 and 3-Consolidated). This would involve the filling and/or removal of the existing pump station, demolition of the existing grade separation structure, and rebuilding of the roadway. The expected noise levels from construction equipment could exceed 80 dBA at 100 feet. The area within the 100-foot radius consists of EJ communities. Therefore, this effect would primarily occur in areas with EJ populations. The minimization measures described below would ensure this effect is not adverse, and the filling of the underpass would result in benefits to the immediate area as described in Section 4.14.4.5, resulting in beneficial effects to EJ communities.

Section 4.11.5.1 reflects inclusion of minimization measures that would eliminate adverse effects during construction. These measures include preparation of a Vibration Reduction and Minimization Plan, best management practices for noise control such as equipment mufflers, avoiding residential areas for construction haul routes wherever feasible, independent noise monitoring in sensitive areas, and the use of additional noise canceling technologies in locations where sensitive receptors could experience construction-related noise exceedances. This measure would be applied in both EJ communities and non-EJ communities. For example, wherever construction equipment is used, mufflers would be employed to reduce noise. Construction equipment with mufflers would be used in both EJ and non-EJ communities. This measure would ensure that operational effects are not adverse.

EJ communities adjacent to the corridor would realize benefits under any of the build alternatives through improved access to transit service, improved air quality, and improved travel times, particularly for higher densities of minority and low-income populations in the eastern portion of the Geary corridor, as discussed in Section 2.3.1 and Section 4.10. With the consideration of offsetting benefits and the implementation of mitigation, the build alternatives would not result in a disproportionate adverse effect.

4.14.4.10 | TRANSPORTATION AND TRANSIT

Transit Operations

As noted in Section 4.14.4.1 above, there would be no adverse effect related to Transit Operations, but this discussion is provided for greater context in terms of EJ populations. When comparing 2012 and 2016 data for EJ populations in the study area, some communities that were identified as EJ are no longer EJ, and some new communities are identified as EJ adjacent to or within larger EJ communities. The analysis below remains valid in its discussion of relative effects to EJ communities and comparison of those effects to non-EJ community effects. Similarly, the discussion of mitigation measures accurately represents the type, level, and quality of mitigation in EJ and non-EJ communities.

All of the build alternatives would result in improved transit reliability, travel time savings, and passenger waiting/boarding experiences relative to the No Build Alternative. The build alternative improvements would benefit all within the study area, including EJ populations. For example, as described in Section 3.3.4.5, throughout the corridor all build alternatives would reduce BRT bus travel times by about 15 to 35 percent in 2035 compared with Rapid bus travel time in the No Build Alternative. The Hybrid Alternative/LPA would be slightly faster than Alternative 2, although slightly slower than Alternatives 3 and 3-Consolidated. Therefore, the build alternative improvements would be beneficial for residents in the vicinity of the Geary corridor.

Temporary disruptions to transit service during construction would affect all portions of the Geary corridor where new physical improvements are proposed (Market Street to 34tth Avenue). Accordingly, all transit users would experience these temporary disruptions. Disruptions would be of a similar nature and magnitude in both EJ and non-EJ communities. Construction notices in multiple languages, consistent with SFMTA practices, would be provided throughout the Geary corridor.

Automobile Traffic

All of the build alternatives are expected to result in adverse effects to automobile traffic circulation, as described in Section 3.4 (Automobile Traffic). When comparing 2012 and 2016 data for EJ populations in the study area, some communities that were identified as EJ are no longer EJ, and some new communities are identified as EJ adjacent to or within larger EJ communities. The analysis below remains valid in its discussion of relative effects to EJ communities and comparison of those effects to non-EJ community effects. Similarly, the discussion of mitigation measures accurately represents the type, level, and quality of mitigation in EJ and non-EJ communities.

As shown in Figure 4.14-4 and 4.14-5 and as summarized in Table 4.14-2, the different build alternatives would have differing numbers of intersections with unacceptable level of service in 2035 (LOS E or LOS F; see Section 3.4.4 for further details). These intersections would occur in a mix of locations relative to EJ populations.

As shown in Table 4.14-2, the No Build Alternative would result in the highest number of affected intersections either fully (8) or partially (11) within EJ populations, as defined from the 2012 Census data. Of the 21 total intersections that would operate at an unacceptable level of service in 2035, just 2 would be located outside EJ populations. As shown in Figure 4.14-2 and 4.14-3, the majority of the project corridor includes EJ communities, therefore, the majority of project intersections are within EJ communities.

In comparing 2012 and 2016 data for EJ populations, the overall frequency of intersection impacts entirely within, partially within, or entirely outside of EJ communities is consistent. Due to shifts in block groups becoming EJ or no longer being considered an EJ community, there would be slightly fewer affected intersections entirely within EJ communities, and slightly more affected intersections in non-EJ communities (see Table 4.14-3).

Relative to the No Build Alternative, in which 19 affected intersections would be entirely or partially within EJ populations, the build alternatives would result in a range of 5 to 9 such affected intersections in 2035. These intersections are listed in Section 3.4.2. For the Hybrid Alternative/LPA, five intersections would operate at an unacceptable level of service in partially EJ and non-EJ communities and three intersections would operate at an unacceptable level of service in entirely EJ communities. The traffic effects would be similar at the impacted intersections. Moreover, all of the build alternatives would substantially improve operations at the affected intersections relative to the No Build Alternative. Therefore, the traffic impact would not be disproportionately high and adverse.

DEFINITION

LEVEL OF SERVICE (LOS): A qualitative assessment of a road's operating conditions. This term refers to a standard measurement used by transportation officials which reflects the relative ease of traffic flow on a scale of A to F, with free-flow being rated LOS-A and congested conditions rated as LOS-F

Mitigation measures would include corridor-wide and site-specific intervention to reduce the effect where feasible. At some intersections, site-specific mitigation is not feasible due to physical constraints and/or tradeoffs in which improving automobile operations would negatively affect pedestrian safety or other modes. Where site-specific mitigation is feasible, mitigation measures to reduce the effect to the extent feasible would be implemented in both EJ and non-EJ communities. For reasons articulated at Section 3.4.5, no feasible measures are available to fully avoid adverse effects at these intersections. Mitigation measures such as removing on-street parking or otherwise increasing vehicular capacity were considered and deemed infeasible or contrary to the project goal of improving pedestrian conditions. Other projects in San Francisco have followed a similar approach. For example, the Van Ness Avenue Bus Rapid Transit project EIS/EIR considered the possibility of increasing vehicular capacity by removing on-street parking to mitigate adverse effects on traffic but similarly determined that doing so was infeasible or contrary to its project purpose. Instead, as with the Geary BRT build alternatives, the Van Ness Avenue BRT project includes broader mitigation measures not associated with any specific delay, such as implementation of a TMP during construction.

Table 4.14-2 Adverse Traffic Effects in 2035 Resulting from each Build Alternative, 2012 Census Data

	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/ LPA
Total Number of Intersections Studied	78 (same for all Alternatives)				
Number of LOS-Affected Intersections	21	5	9	9	8
Number of LOS-Affected Intersections in **non-EJ** Communities[1]	2	0	0	0	0
Number of LOS-Affected Intersections Partially Within **EJ** Communities[2]	11	2	5	5	5
Number of LOS-Affected Intersections in entirely **EJ** Communities[3]	8	3	4	4	3

Note: LOS-affected intersections are those with LOS E-F. Includes both signalized and unsignalized intersections.

1 Intersections that are located 100% outside of EJ communities.

2 Intersections that include 1 or more corners that are located within EJ communities.

3 Intersections that are located 100% within EJ communities.

Table has been updated since Draft EIS/EIR.

Source: Fehr & Peers, 2013 and Circlepoint, 2017.

Table 4.14-3 Adverse Traffic Effects in 2035 Resulting from each Build Alternative, 2016 Census Data

	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/ LPA
Total Number of Intersections Studied	78 (same for all Alternatives)				
Number of LOS-Affected Intersections	21	5	9	9	8
Number of LOS-Affected Intersections in **non-EJ** Communities[1]	2	0	1	0	0
Number of LOS-Affected Intersections Partially Within **EJ** Communities[2]	9	3	4	5	6
Number of LOS-Affected Intersections in entirely EJ Communities[3]	10	2	4	4	2

Note: LOS-affected intersections are those with LOS E-F. Includes both signalized and unsignalized intersections.

1 Intersections that are located 100% outside of EJ communities.

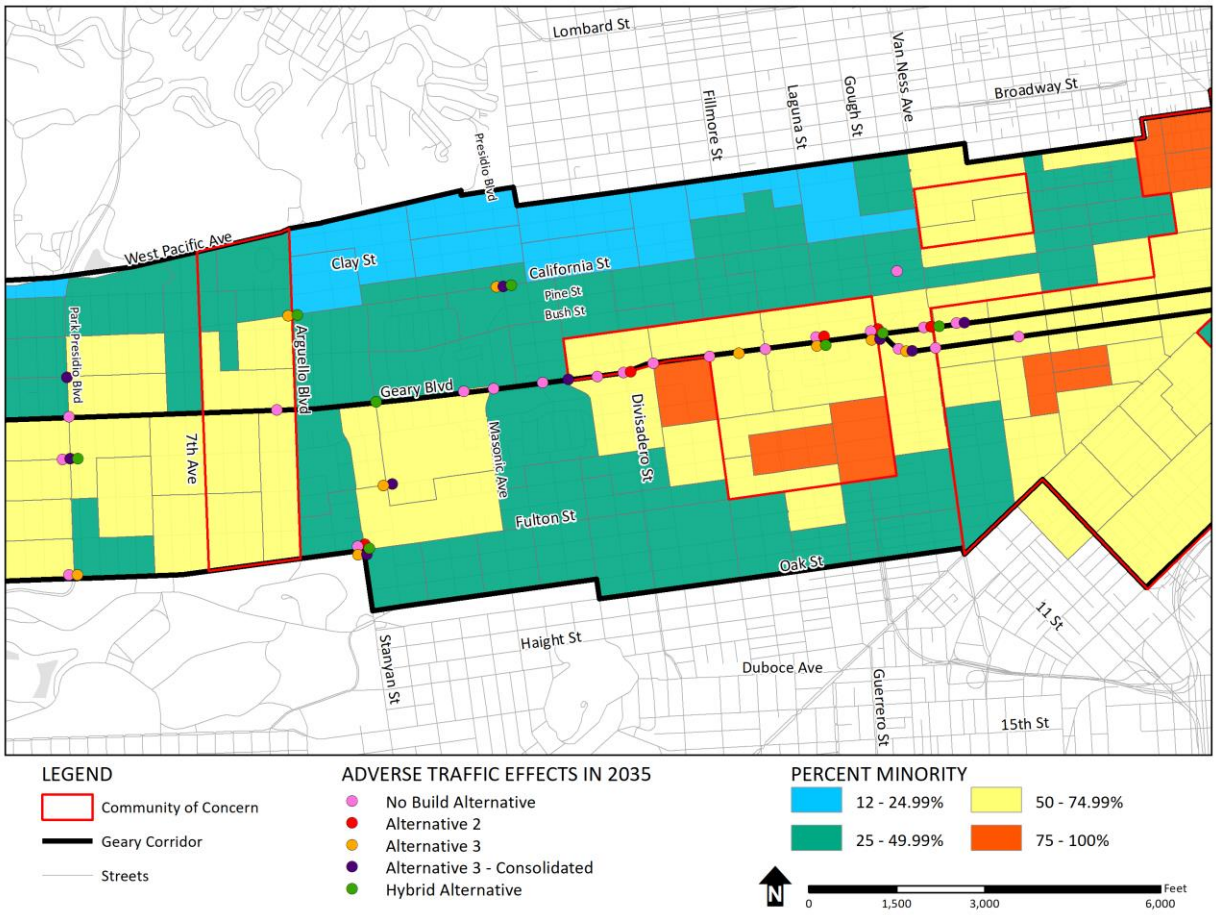
2 Intersections that include 1 or more corners that are located within EJ communities.

3 Intersections that are located 100% within EJ communities.

Table has been updated since Draft EIS/EIR.

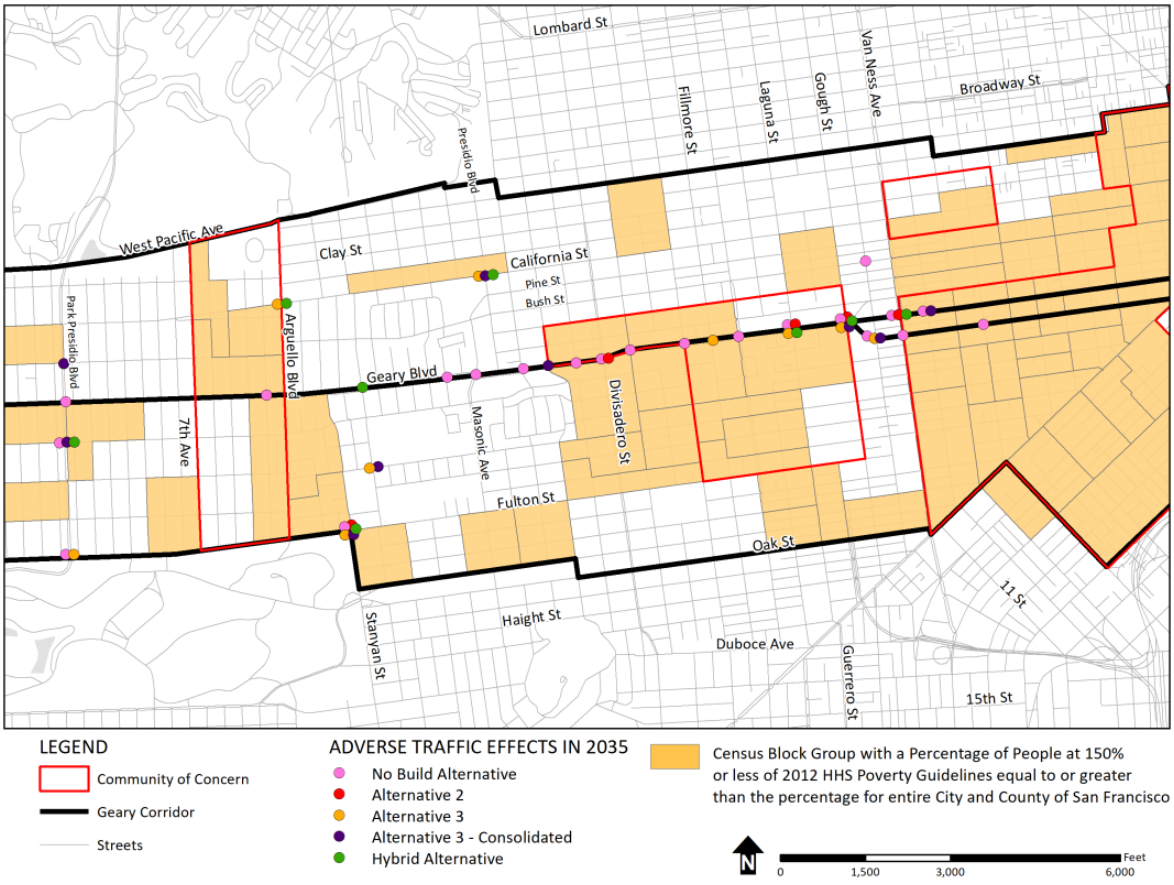
Source: Fehr & Peers, 2013 and Circlepoint, 2018.

Figure 4.14-4 Census Block Groups with Minority Environmental Justice Populations and Adverse Traffic Effects in 2035



Note: Figure revised from Draft EIS/EIR.

Figure 4.14-5 Census Block Groups with Low Income Populations and Adverse Traffic Effects in 2035



Note: Figure revised from Draft EIS/EIR.

Pedestrian and Bicycle Transportation

As noted in Section 4.14.4.1 above, there would be no adverse effect related to pedestrian and bicycle transportation, but this discussion is provided for greater context in terms of EJ populations.

Implementation of the proposed build alternatives would change the design characteristics of the Geary corridor, including: decreased pedestrian crossing distances, addition of pedestrian-scale lighting, median-width changes, improved bus shelters and bulb-outs, and other urban design features that would create a safer and more pleasant pedestrian experience. These features would be similar in type and quality in both EJ and non-EJ communities. Pedestrian delay may increase under Alternatives 3 and 3-Consolidated due to new and improved protected left turn signal phasing for automobiles. However, the new signal phasing would improve pedestrian safety at such intersections. Moreover, improved signal phasing is proposed throughout the corridor. Protected left turn signal phasing is proposed in the center-running BRT sections of the corridor under Alternatives 3 (Center-Lane BRT with Dual Medians and Passing Lanes) and 3-Consolidated (Center-Lane BRT

with Dual Medians and Consolidated Bus Service) as well as in the Hybrid Alternative/LPA. These sections of the corridor includeboth EJ and non-EJ communities in each of these alternatives.

The build alternatives propose consolidation of bus stops as an element of improving overall transit system speed and performance. Chapter 3.5 of this Final EIS evaluated the build alternatives for the potential to result in increased walking distances. SFCTA estimated both existing and projected future walking distances to bus stops for each alternative for various segments of the Geary corridor (Market Street to Van Ness Avenue, Van Ness Avenue to Broderick Street, Broderick Street to Palm Avenue, Palm Avenue to Park Presidio Boulevard, Park Presidio Boulevard to 25th Avenue, and 25th Avenue to 34th Avenue). The build alternatives would both increase and decrease estimated average walking distances to bus stops at various locations along the Geary corridor. According to SFCTA's estimates, the maximum projected increase in walking distance would be about 360 feet and would occur between Fillmore and Divisadero streets and between Van Ness Avenue and Laguna Street. These segments of the Geary corridor, like most other portions of the Geary corridor, include Census block groups with EJ populations.

The maximum increases in walking distance would not be substantial and thus no adverse effect would occur, and thus no disproportionate effect on any EJ population would occur. Moreover, the minor increases in walking distance would be offset by several beneficial factors. These factors include but are not limited to faster and more frequent bus service, improved bus stops/waiting areas, and reduced travel times. These beneficial effects would occur in both EJ and non-EJ communities as described above and in Section 3.5.4.

The project would result in improved bicycle safety and accessibility along part of the Geary corridor. The construction of a bicycle connection from Masonic Avenue to Presidio Avenue would connect the currently planned Masonic Avenue bicycle facilities to existing facilities on Presidio Avenue and Post Street. This connection would close a key gap in the City's bicycle network and improve bicycle connectivity. This is considered a beneficial effect.

Project construction would result in temporary detours and access changes for pedestrians and cyclists throughout the corridor where new physical improvements are proposed (Market Street to 34th Avenue). This includes both EJ and non-EJ communities. However, these detours and changes are expected to be minimal and were thus found in Section 3.5 not to result in any adverse effect. Accordingly, there would be no disproportionate effect on EJ populations.

Parking

The project would result in the temporary (construction-period) and permanent (operation-period) loss of public on-street parking. Section 3.6 provided a detailed parking analysis throughout the Geary corridor, noting changes in on-street parking associated with each build alternative and considering whether parking losses generally and parking for people with disabilities could result in any adverse effect. The analysis concluded that the changes in parking would not result in any adverse effect for any of the build alternatives during construction of operation.

When comparing 2012 and 2016 data for EJ populations in the study area, some communities that were identified as EJ are no longer EJ, and some new

communities are identified as EJ adjacent to or within larger EJ communities. The analysis below remains valid in its discussion of relative effects to EJ communities and comparison of those effects to non-EJ community effects. Similarly, the discussion of mitigation measures accurately represents the type, level, and quality of mitigation in EJ and non-EJ communities.

Notwithstanding the conclusion of no adverse effect, this section considers project related parking changes in the context of EJ populations.

SFCTA estimates that there are more than 9,800 existing publicly available parking spaces area-wide along the western portion of the Geary corridor (between 34th Avenue and Gough Street).[7] This includes on-street parking (metered and non-metered) and publicly accessible garages along or within approximately 700 feet (one to two blocks) of the Geary corridor. Of those spaces, approximately 1,680 are located directly on Geary itself. SFCTA tallied on-street parking spaces in both the eastern and western portions of the Geary corridor, but only counted parking spaces in the vicinity of the corridor in the western portion because none of the build alternatives would result in substantial parking loss east of Gough Street.

Construction: During construction, temporary conversion of parking lanes to mixed-flow travel lanes could be implemented, resulting in localized losses in on-street parking. Parking constraints would likely cause temporary inconveniences to local businesses and residents in all locations along the Geary corridor where new physical improvements are proposed (Market Street to 34th Avenue). This includes both EJ and non-EJ communities. Effects would be of a similar nature and magnitude in both EJ and non-EJ communities; for example, temporary mixed-flow lanes would need to be installed in both EJ and non-EJ communities. However, as described above in Section 4.14.4.5, businesses along the corridor are anticipated to benefit from the project.

As described in Section 4.15, the staggered multiple block construction approach would affect approximately five blocks at a time, minimizing impacts on corridor functions generally, such that no adverse construction period parking effect would occur. This strategy would be implemented in both EJ and non-EJ communities.

Operation: Of all the build alternatives, Alternative 2 would result in the removal of the greatest number of on-street parking spaces, followed by Alternative 3, then the Hybrid Alternative, then Alternative 3-Consolidated (see Table 3.6-3). However, as noted previously, these changes in parking were found not to be adverse given the availability of other on- and off-street parking spaces along and/or near the Geary corridor. In terms of these parking changes and EJ populations, well over half of the Census block groups comprising the Geary corridor study area include one or more EJ populations.

The discussions below provide further context on parking changes in two sub areas of the corridor with EJ populations, the Japantown/Fillmore area and Broderick Street to Palm Avenue. The local agencies did not receive any public comments from these communities regarding on-street parking loss, nor was there any adverse effect related to parking in any location along the Geary corridor. These discussions, therefore, are for informational and contextual purposes only.

[7] See Table 3.6-2.

Japantown/Fillmore: Section 3.6 included a particular focus on parking loss in the Japantown/Fillmore area (Gough Street to Steiner Street), as several transportation safety and access improvements would be located there (which would require additional removal of on-street parking) and the area is entirely composed of EJ communities. The Hybrid Alternative (as presented in the Draft EIS/EIR) would require removal of 94 parking spaces between Gough Street and Steiner Street. This was found not to be an adverse effect because the Japantown/Fillmore area has a much higher supply of existing on- and off-corridor parking spaces than other neighborhoods along the Geary corridor. The 94 parking spaces represent approximately three percent of the overall neighborhood supply of publicly available parking spaces in the Japantown/Fillmore area. This is comparable to other portions of the corridor, where parking loss would range from about 0 to 5 percent depending on location.

Current peak public parking occupancy rates in the Japantown/Fillmore study area Gough Street to Steiner Street) are approximately 80 percent of the estimated 2,929 total publicly available parking spaces (see Table 3.6-6), leaving approximately 20 percent of the spaces unused. Therefore, as discussed further in Section 4.2.4.4, the loss of three percent of publicly available parking spaces would not result in adverse effects on the Japantown/Fillmore community because no parking deficit would be created and no decrease of motorist access would occur. The project features requiring parking removal directly correlate to project benefits, such as enhanced transit access and pedestrian amenities, which would be also concentrated in the Japantown/Fillmore community. Additionally, the improved transit service would offset some parking demand, and would result in an overall enhancement of access to the community.

Modifications to the Hybrid Alternative/LPA: Taking into account modifications to the Hybrid Alternative/LPA since the publication of the Draft EIS/EIR would not result in an adverse effect related to parking corridor-wide or in the Japantown/Fillmore area.

The modifications would increase parking removal in the Japantown/Fillmore area (more specifically, the area between Gough Street to the east and Steiner Street to the west) by about 15 more spaces than without the modifications, increasing the total parking spaces removed in the area from 94 spaces to 109 spaces.

Parking removal in other areas (containing a mix of non- EJ communities and EJ communities) would also increase, ranging from 0 to 100 spaces in each community. These changes are associated with the addition of BRT stops at Laguna Street and some of the additional pedestrian improvements, which would concentrate project benefits in the Japantown/Fillmore area. These modifications would increase the percentage of area-wide parking supply lost (from 3 percent without the modifications to 4 percent with). The percentage of area-wide parking spaces removed in the Japantown/Fillmore community would still fall within the range of percentages removed in other portions of the corridor, including areas without EJ communities (0 to 5.5 percent, with the six modifications). The modifications would not substantially change the overall parking loss along the Geary corridor that would occur within EJ communities. This higher amount of parking removal would still be substantially less than the available unused spaces during peak times (approximately 20 percent of the total supply), so no parking deficit or diminishment of access would be created. Therefore, the combined parking loss due to the Hybrid

Alternative/LPA with the six modifications would not cause any adverse effects in the Japantown/Fillmore community, and no disproportionate adverse effect on EJ communities would occur.

In addition, the six minor modifications would increase parking loss in another corridor segment with EJ communities – between Broderick Street on the east and Palm Avenue on the west. Between Broderick Street and Palm Avenue, the modifications (associated with some of the additional pedestrian improvements) would reduce area-wide parking by about 10 spaces compared to what was identified in the Draft EIS/EIR. However, this would not appreciably change the percentage of parking loss in that segment relative to existing areawide parking spaces (a decrease of about 5 percent with or without the modifications).

Combining these geographies (Gough Street to Palm Avenue, 23 blocks, inclusive of four blocks between Steiner Street and Broderick Street), there are more than 5,600 on- and off-street parking spaces in the vicinity (area-wide parking). The total number of lost spaces with the modifications in these two areas would represent 4 percent to 5 percent of the total nearby public parking supply, comparable to the effects prior to the modifications. Similar to non-EJ communities, no parking shortfall is anticipated. Therefore, given the amount of parking availability in these areas, the changes associated with these modifications would not result in any

Loading

Section 3.6 concluded that the build alternatives would result in changes to both passenger and commercial loading spaces along the entirety of the Geary corridor. Tables 3.6-9 and 3.6-10 documented the expected changes in loading spaces by alternative and by various segments of the corridor in which new physical improvements are proposed (Market Street to 34th Avenue). These tables identified that many commercial and passenger loading spaces could be relocated either within the same block or in close proximity. While the number of loading spaces to that would be lost under any build alternative constituted no more than 2 percent of total commercial or passenger loading spaces, it was noted that most of the losses would occur between Market Street and Van Ness Avenue, where there are fewer opportunities to relocate any loading spaces that might be lost as a result of implementation of the build alternatives. The Market Street to Van Ness Avenue portion of the Geary corridor includes EJ populations.

In sum, Section 3.6 found an adverse effect related to the loss of loading spaces. Accordingly, Section 3.6.5 documented an avoidance measure to seek further opportunities during project design and construction to relocate and/or consolidate loading spaces, including coordination with adjoining business owners. This measure would be applied in the same way and quality in both EJ communities and non-EJ communities. Adherence to the avoidance measure would eliminate the adverse effect. To this end, there would be no disproportionate adverse effect.

4.14.4.11 | FINDINGS AND COMPARATIVE EFFECTS OF ALTERNATIVES

As demonstrated in the preceding subsections, the study area has a high concentration of EJ populations and impacts of the project may be considered predominately borne by the EJ community. However, environmental effects generally would occur in similar nature and magnitude in both EJ communities and non-EJ communities. The operation and construction effects would not occur with greater intensity in EJ communities, and therefore would not be disproportionately high and adverse effect to EJ communities. Operational effects would not be adverse, and therefore would not result in a disproportionate adverse effect. With implementation of mitigation, the build alternatives would avoid and minimize adverse effects. The mitigation implemented would be the same in EJ and non- EJ communities.

Only one environmental topic area would result in any adverse effects after application of avoidance, minimization, and/or mitigation measures (automobile traffic, intersection level of service). As shown in the preceding discussion, the No Build Alternative would result in the highest number of intersections that would in 2035 operate at LOS E or LOS F fully or partially within EJ populations. Each of the build alternatives would result in less than half the number of such affected intersections as the No Build Alternative. (See Table 4.14-2, Figure 4.14-4, and Figure 4.14-5). The adverse effects remaining after mitigation would occur in areas with and without EJ populations; the effects would be realized by all drivers (not just those from EJ populations).While these adverse effects cannot be fully avoided, minimized, or mitigated, they would not be disproportionately high or adverse on EJ populations and would also be offset by several beneficial effects of the project, which would accrue in similar nature and magnitude to both EJ and non-EJ communities. These beneficial effects include improved transit service, enhanced neighborhood access and mobility, and better transit reliability and connectivity between residential areas, community facilities, employment centers, and local businesses. For example, as described in Section 3.3.4.5, throughout the corridor all build alternatives would reduce BRT bus travel times by about 15 to 35 percent in 2035 compared with Rapid bus travel time in the No Build Alternative. The Hybrid Alternative/LPA would be slightly faster than Alternative 2, although slightly slower than Alternatives 3 and 3-Consolidated. These transit access and mobility enhancements in EJ communities would outweigh the mobility reduction associated with the traffic congestion effects that would occur. Other benefits include an enhanced visual environment and landscape, improved air quality, lower greenhouse gas emissions, decreased pedestrian crossing distances, pedestrian-scale lighting, median-width changes, improved bus shelters and bulbouts, and other urban design features.

Taking all of these factors into account, none of the build alternatives (including the Hybrid Alternative/LPA) would have disproportionately high and adverse effects on EJ populations.

4.14.5 | Avoidance, Minimization, and/or Mitigation Measures

There would be no disproportionate high and adverse effects on EJ communities within the study area. Construction effects throughout the Geary corridor, including those within EJ communities, would be adequately avoided, minimized, and/or mitigated through the measures identified/summarized in Section 4.15.7 through Section 4.15.16.[8] No other avoidance, minimization, or mitigation measures are required to address EJ effects for the build alternatives.

As described in other sections of this Final EIS, implementation of any of the build alternatives would include benefits to low-income and minority populations, as well as the community at large, including a safer, more reliable and improved transportation system, improved mobility across the Geary corridor, improved accessibility to jobs, and aesthetic improvements. These benefits are expected to be shared throughout the Geary corridor.

[8] All of the measures noted in Section 4.15.7 through Section 4.15.16 also appear in the individual topical sections of Chapter 4. Collectively, the measures would avoid, minimize, or mitigate for effects to both EJ communities and non- EJ communities.

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4.15 Construction Methods and Impacts

For each of the build alternatives, this section provides an overview of anticipated construction activities including construction stages and their estimated duration. This section summarizes construction-related impacts discussed in earlier subsections of Chapters 3 and 4. Please refer to those earlier subsections for reviews of the six minor modifications to the Hybrid Alternative/LPA added since publication of the Draft EIS/EIR in terms of potential additive construction effects. Discussions within those subsection demonstrate that none of the minor modifications to the Hybrid Alternative/LPA would change any of the construction impact determinations within any topical/resource area.

This section is based in part on the draft Project Construction Plan, which is a planning tool that presents and evaluates construction scenarios for the build alternatives. Detailed traffic control and detour plans would be developed after final design plans are prepared for the preferred alternative.

The nature of the construction discussion results in a different organization of this section compared to preceding Chapter 4 sections. This section is organized as follows:

- 4.15.1: Summary of Major Construction Activities for Build Alternatives
- 4.15.2: Construction Schedule and Phasing
- 4.15.3: Construction Approach
- 4.15.4: Construction Staging
- 4.15.5: Transportation Management Plan
- 4.15.6 - 4.15.16: Summary of Construction-Related Effects and Avoidance, Minimization, and Mitigation Measures by Environmental Resource Area

This section does not include any discussion of construction related to any of the improvements comprising the No Build Alternative. Under the No Build Alternative, the only construction that would occur is related to previously approved or planned projects.

The construction durations evaluated in this section assume continuous construction of a full corridor alternative. As discussed later in Section 4.15.3, any of the build alternatives would likely need to be constructed in phases. The assessment of continuous construction activities presents "worst-case" evaluation of potential construction period effects. Under a phased construction approach, any potential environmental consequences would not be more intense compared to a continuous construction technique. Further discussion is provided in Section 4.15.2.1.

Many construction period effects, such as noise and air pollutant emissions, would occur only during active construction efforts. Outside of active construction periods, such effects would not be expected to occur. The analysis herein assumes a concentrated construction period, reflecting the highest potential intensity of day-to-day construction efforts and in turn, the highest potential day-to-day construction-related effects regarding air and noise. Other construction-related effects, such as potential effects to cultural resources and effects related to the potential exposure of hazardous materials, are related only to construction activities themselves, not their duration. Phasing of the project's construction would not increase or decrease effects like these. Therefore, the assessment of continuous construction activities of a full corridor alternative represents a "worst-case" for the analysis of potential construction-period effects.

However, subsections 4.15.6 through 4.15.16 include discussions that specifically assess the potential for additive effects of the construction phasing associated with the Hybrid Alternative/LPA. As demonstrated in the discussions below, the construction phasing would not change any of the construction impact conclusions for the Hybrid Alternative/LPA and would not require any new avoidance, minimization, or mitigation measure.

4.15.1 | Summary of Major Construction Activities for Build Alternatives

This section discusses the 11 major types of activities that would occur under all the build alternatives, though not all activities would occur under each alternative. Overall, construction methods and equipment would be similar across all build alternatives, but the duration of the work would vary by alternative, especially between side-running and center-running locations, and by location.

Table 4.15-1 and the discussions below summarizes which of the 11 major construction activities would be performed for each build alternative within each of the four geographic sub-areas of the Geary corridor (see Figure 4.15-1). To provide greater detail for the Hybrid Alternative/Locally Preferred Alternative (LPA), Table 4-15.1 also notes which major construction activities would occur within Phase I or Phase II of the project. (Please see Section 2.2 for a greater discussion of *all proposed* construction activities for all Build Alternatives. A greater discussion of Phase I and Phase II is provided in Section 4.15.3).

4.15.1.1 | CENTER-RUNNING BUS LANES (ALTERNATIVES 3 AND 3-CONSOLIDATED, AND HYBRID ALTERNATIVE/LPA)

Construction of the center-running bus lanes would require four sub-activity categories including:

- **Site Preparation** which involves the removal of existing infrastructure such as curbs, gutters and pavement; landscaped areas (including top soil); and signposts and street lights (where present).
- **Storm Drainage System** and utility work which involves repair and replacement (depending on conditions) of existing stormwater inlets, drain pipes, manholes, and utilities.

- **Roadway/Reconstruction** including excavation of existing roadway; subgrade compaction/repair/reconstruction of road bed subsurface; and construction of curbs and gutters.

- **Bus Lane Construction,** which involves the use of a slab of color-integrated Portland cement concrete. (Alternative colorization of the lanes may be considered.)

4.15.1.2 | PLATFORMS FOR CENTER-RUNNING BUS LANES (ALTERNATIVES 3 AND 3-CONSOLIDATED, AND HYBRID ALTERNATIVE/LPA)

Platforms that flank the bus lanes would be constructed in spaces currently occupied by existing pavement sections. Prior to building the median platform, the pavement section and underlying soil would be removed to the depth (approximately 3 feet) needed to construct the new platform and the station amenities. After removal operations, platform and foundation elements for the station amenities would be built.

4.15.1.3 | LANDSCAPED MEDIANS FOR CENTER-RUNNING BUS LANES (ALTERNATIVES 3 AND 3-CONSOLIDATED, AND HYBRID ALTERNATIVE/LPA)

Similar to the median platforms, landscaped medians flanking center-running bus lanes would be constructed in spaces currently occupied by existing pavement sections. Initial steps would entail removal of pavement sections; underlying soil would be removed to the depth needed (approximately 3 feet) to construct curbs and gutters and to install ground cover, landscaping, and irrigation equipment. Where new lighting is needed, excavation would need to extend as deep as 16 feet (see Table 4.15-2 below).

4.15.1.4 | SIDE-RUNNING BUS LANES (ALL BUILD ALTERNATIVES)

Side-running bus lanes would be constructed on the existing pavement section adjacent to parking lanes (where present) or adjacent to sidewalks. It is anticipated that the existing pavement would be resurfaced for the width of the bus lanes. Resurfacing involves milling out the existing asphalt and then placing new asphalt or color-integrated concrete in some locations.

In addition to resurfacing it is also anticipated that rehabilitation of concrete pavement may be needed between 28th and 26th avenues and between Masonic and Van Ness avenues. The detailed scope of this rehabilitation effort would be defined in the next phase of design.

4.15.1.5 | BUS BULBS (ALL BUILD ALTERNATIVES)

Bus bulbs would be constructed along existing sidewalks to extend curb lines to the new side-running bus lanes to simplify bus docking and patron boarding and alighting. Prior to construction, removal of items such as existing curbs, gutter, adjacent portions of sidewalk, underlying compacted fill, trees, and parking meters would be required. Bus bulb and reinforced concrete bus pad construction would also include the removal of pavement sections within and adjacent to the bulb footprint. Additionally, modification of the pavement cross-slope adjacent to the bus pad is anticipated. These modifications may include construction of new pavement sections or pavement resurfacing.

Following removal operations, construction would proceed for new curbs and gutters, sidewalk, foundations for station amenities, and tree wells. Bus bulb construction may require utility relocation. The extent of relocation depends on local conditions; utilities needing relocation could include: hydrants and valves, manholes, streetlights and traffic signal poles, storm water inlets, and drain pipes. During construction, adjacent sidewalks would need to be narrowed and/or relocated temporarily.

4.15.1.6 | PEDESTRIAN CROSSING BULBS (ALL BUILD ALTERNATIVES)

Pedestrian crossing bulbs would be constructed at various locations selected to improve transit access and pedestrian safety. Most locations would be at corners, but some would be associated with midblock crossings. Preparatory removal work and construction would be similar to bus bulbs, with the exception that pedestrian crossing bulbs would be smaller in area. The Hybrid Alternative/LPA includes the addition of 26 more pedestrian crossing bulbs than previously proposed in the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR), for a total of 91 bulbs; the number proposed for the other build alternatives has not changed since publication of the Draft EIS/EIR. Like the previously proposed 65 pedestrian bulbs, these would be spread out across the Geary corridor (and, thus, their construction effects would be spread out across the Geary corridor). As a result of the additional bulbs, the number of locations of construction activities would be increased with the Hybrid Alternative/LPA.

Pedestrian crossing bulb construction would involve demolition and removal of the existing curb and a portion of the sidewalk. All construction work would take place in a pre-legislated no-parking zone. Equipment used to construct pedestrian bulbs would include jackhammers, excavators, concrete trucks, compactors, and hand tools. Like other construction activities throughout the Geary corridor, construction of pedestrian crossing bulbs would occur during regular business hours between 7 a.m. and 8 p.m., and construction would not restrict pedestrian or business access, per San Francisco Municipal Transportation Agency's (SFMTA) construction policies. The duration to construct a pair of pedestrian crossing bulbs would be approximately four to six days.

The 26 pedestrian crossing bulbs added to the Hybrid Alternative/LPA after publication of the Draft EIS/EIR would result in additional construction activities dispersed throughout the Geary corridor; however, as described above, construction would be short in duration, would not restrict access, and would involve minimal localized construction-related disruptions typical of a dense, urban environment. Therefore, the additional pedestrian crossing bulbs would not result in new or more severe impacts at any location for any topic area, individually or cumulatively than what was described in the Draft EIS/EIR.

4.15.1.7 | MODIFY SEWER (ALTERNATIVES 3 AND 3-CONSOLIDATED, AND HYBRID ALTERNATIVE/LPA)

Construction of center-running bus lanes and associated medians/platforms is anticipated to impact existing sewer infrastructure. As described in Sections 2.2.5 through 2.2.7, three build alternatives include reconstruction or replacement of an existing, more than 120-year-old brick sewer beneath Geary Boulevard between 14th and 4th avenues. Between 14th and 11th avenues, it is assumed that a 55-year-old reinforced concrete sewer would be relocated from under the planned bus rapid transit (BRT) stop to underneath the leftmost eastbound travel lane.

4.15.1.8 | MODIFY TUNNEL (ALTERNATIVES 3 AND 3-CONSOLIDATED)

Two alternatives would feature a new BRT station at the approaches of the Masonic Avenue tunnel beneath Geary Boulevard. Station construction would require removal of existing pavement and the full length of the center barrier. After these removal operations, center-running bus lanes and platforms at the tunnel approaches would be constructed. The platform work would also include the foundations for installation of an elevator, stairs, and other station amenities. Following the heavy work, noise absorbing tiles and other finishes would be installed.

4.15.1.9 | REMOVE FILLMORE STREET UNDERPASS (ALTERNATIVES 3 AND 3-CONSOLIDATED)

Alternatives 3 and 3-Consolidated include the removal of the Fillmore Street underpass at Geary Boulevard. Work would entail the demolition of the Fillmore Street Bridge, underpass pavement, and upper portion of the underpass, and, if required, removal of an existing below-ground pump station and its fuel tank. The pump station is currently used to prevent inundation of the underpass.

Wall demolition and pump station/fuel tank removal would be facilitated by temporary, shored excavations (alternatively, the pump station could be decommissioned and left in place).

Prior to demolition, local utilities carried on the bridge and connected to the pump station would need to be temporarily relocated. Furthermore, temporary pumping may be required to handle stormwater. Following the removal activities, imported dune sand (similar to other underlying soils) would be deposited and compacted in stages to fill the underpass. New utilities would then be installed, followed by the center-running bus lanes, medians, and platforms as described above.

4.15.1.10 | PEDESTRIAN BRIDGE REMOVAL (ALL BUILD ALTERNATIVES)

The alignments of proposed bus-only lanes within each build alternative would conflict with the piers of the existing pedestrian bridge at Steiner Street which would be removed under all build alternatives. Alternatives 2, 3, and 3-Consolidated would also remove the Webster Street pedestrian bridge. Demolition would include removal of the bridge superstructures, substructures, and below-ground (spread footing) foundations. Prior to removing the bridges a protective soil "blanket" would be spread under the bridges to catch debris. For Alternatives 2, 3, and 3-Consolidated, removal of the Webster Street bridge would require protection measures to avoid damage to an adjacent underground Auxiliary Water Supply System (AWSS) cistern. The Hybrid Alternative/LPA would retain the Webster

Street bridge – one of the six modifications proposed after publication of the Draft EIS/EIR – and would thus not require such measures to protect the AWSS.

4.15.1.11 | MIXED-FLOW LANE PAVEMENT REHABILITATION

It is anticipated that rehabilitation of the asphalt wearing surface may be needed between 28th and 10th avenues and between Masonic and Van Ness avenues. Within these limits the concrete pavement base may also require rehabilitation. The scope of the rehabilitation effort would be defined during the project's design phase.

Table 4.15-1 Major Construction Activities by Alternative

SEGMENT	MEDIAN BUS LANES	SIDE BUS LANES	MEDIAN PLATFORM	NEW MEDIANS	BUS BULB	PED XING BULB	MODIFY SEWER	MODIFY TUNNEL	REMOVE UNDER-PASS	REMOVE PEDESTRIAN BRIDGE(S)[1]	MIXED FLOW PAVEMENT REHABILITATION
ALTERNATIVE 2											
34th to Palm		●			●	●					●
Masonic Area		●			●	●					●
Fillmore Area		●			●	●				●	●
Inner Geary Corridor		●			●	●					
ALTERNATIVES 3 & 3-CONSOLIDATED											
34th to Palm	●	●	●	●	●	●	●				●
Masonic Area		●			●	●		●			●
Fillmore Area		●			●	●			●	●	●
Inner Geary Corridor		●			●	●					
HYBRID ALTERNATIVE/LPA											
34th to Palm	●	●	●	●	●	●	●				●
Masonic Area		●			●	●					●
Fillmore Area		●			●	●				●	●
Inner Geary Corridor		●			●	●					

Source: Draft Project Construction Plan, Jacobs Engineering Group, Inc. October 2013

1 Under the Hybrid Alternative/LPA, only the Steiner Street pedestrian bridge would be removed. The Webster Street bridge would be retained.

4.15.1.12 | ANTICIPATED CONSTRUCTION AREAS AND EXCAVATION DEPTHS

Table 4.15-2 summarizes the approximate construction areas expressed as nominal dimensions and the estimated depth of excavation. The removal area considered is roughly the nominal footprint of the construction item or the item to be removed. The table lists the major construction items discussed above and includes detail on proposed bus stop amenities (i.e., shelters, lighting).

Table 4.15-2 Anticipated Construction Areas and Excavation Depths

CONSTRUCTION ITEM	APPROXIMATE AREA	DEPTH (FEET)
Median Platform	9-ft – 6-in wide by 240-ft long per block	3
BRT Bus Bulb	Typically 8-ft wide by 240-ft long per block	1.5
Local Bus Bulb	Typically 8-ft wide by 195 ft long	1.5
Pedestrian Crossing Bulb	40-ft by 8-ft at corners; 8-ft wide by 60-ft long at midblock	1.5
New Center Median	Typically 10-ft wide by 240-ft long per block	3
Center-Running Bus Lanes (New pavement section for 2 lanes)	26-ft to 240-ft long per block	3
Side-Running Bus Lane Pavement Rehabilitation	13-ft wide by 240-ft long excavations	1
Shelter Canopy Foundation	3-ft by 3-ft excavation per Canopy Post	1
Street Lights, Pedestrian Scale Lights, and Traffic Signal Poles	3-ft by 3-ft excavations per Light Pole	16
Surface Mounted Utility (SMU) Foundation	3-ft by 5-ft excavations per SMU	3
Sewer Replacement	8-ft wide by 240-ft excavations per block	16
Catch Basin with Inlet	6-ft by 6-ft excavation	8
Fillmore Underpass Pump Station - Fuel Tank Removal (Alternatives 3 and 3-Consolidated Only)	12-ft by 12-ft excavation	30
Fillmore Underpass and Pump Station Removal (Upper Portion Only) (Alternatives 3 and 3-Consolidated Only)	8-ft wide by 100-ft (Blue Book limit)	12
Hydrant Relocation	5-ft by 5-ft excavation	8

Source: SFCTA, 2015

4.15.2 | Construction Schedule & Phasing

In the Draft EIS/EIR, San Francisco County Transportation Authority (SFCTA) and SFMTA disclosed that any of the build alternatives would be of such scale that some type of phased implementation would be anticipated. The Draft EIS/EIR identified elements of a potential phased approach, specifically noting that an initial phase of construction could include traffic signal modifications, construction of bus and pedestrian bulbs, implementation of side-running bus lanes, changes to right-turn pockets, and bus stop relocations. At the time of publication of the Draft EIS/EIR, there was uncertainty as to what alternative would be selected as the LPA and thus no detailed construction phasing analysis was completed.

Section 1.2.1 summarizes agency approvals since publication of the Draft EIS/EIR, including selection of the LPA. Since then, SFCTA and SFMTA have developed a more detailed construction phasing plan, outlined in this section. The refined schedule and construction details for the Hybrid Alternative/LPA includes two primary construction phases, described below.

Table 4.15-3 summarizes the estimated duration of construction periods for each build alternative.[1] The construction durations shown in Table 4.15-3 assume continuous construction of a full corridor alternative. These durations represent the anticipated total amount of time for construction of the entire project. Once construction starts, completion of all improvements is expected to take 2 to 4 years, including inactive periods.

Table 4.15-3 Estimated Construction Schedule by Alternative

BUILD ALTERNATIVE	DURATION TO SUBSTANTIAL COMPLETION (WEEKS)
Alternative 2	90
Alternative 3	120[1,2]
Alternative 3-Consolidated	130[1,2]
Hybrid Alternative/LPA	Phase I: 100[1] Phase II: 100[1]

1: Does not include sewer and water modifications that may be sponsored by SF Public Utilities Commission and coordinated with the Geary BRT project. Such modifications are not necessary for implementation of the Geary BRT project. However, does include sewer and water modifications triggered by the project.

2: Does not include the scope of utility modifications at Fillmore, the scope of this work is to be determined.

Source: SFCTA, 2017.

As illustrated in Figure 4.15-1, Phase I would entail all work east of Stanyan Street, with one exception, where BRT would operate in side-running bus-only lanes. Phase II would include all work west of Stanyan Street, where BRT operations would be in predominantly center-running bus-only lanes. Phase II would also construct a new dedicated bike facility within the Phase I geographic limits on Geary Boulevard between Masonic and Presidio avenues. The project would likely be constructed using the Staggered Multiple Block Segment Approach described later in this chapter. This construction approach has the greatest potential to minimize overall construction duration (one to 12 months maximum) at any given location.

While construction of the Hybrid Alternative/LPA would occur in two phases, this Final EIS discusses environmental impacts as a whole. The refined construction phasing for the Hybrid Alternative/LPA would not result in any different construction-period effects, other than clarification as to when and where such effects would occur. While the Draft EIS/EIR acknowledged that the project would be constructed in phases with a multiple-block approach, the plan to implement the Hybrid Alternative/LPA in two phases (generally splitting at Stanyan Street) would simply change *when* localized construction-period effects would occur within the Geary corridor.

[1] At this time the construction-period estimates do not include the impact of major utility work because interagency coordination with the various utilities has not been completed.

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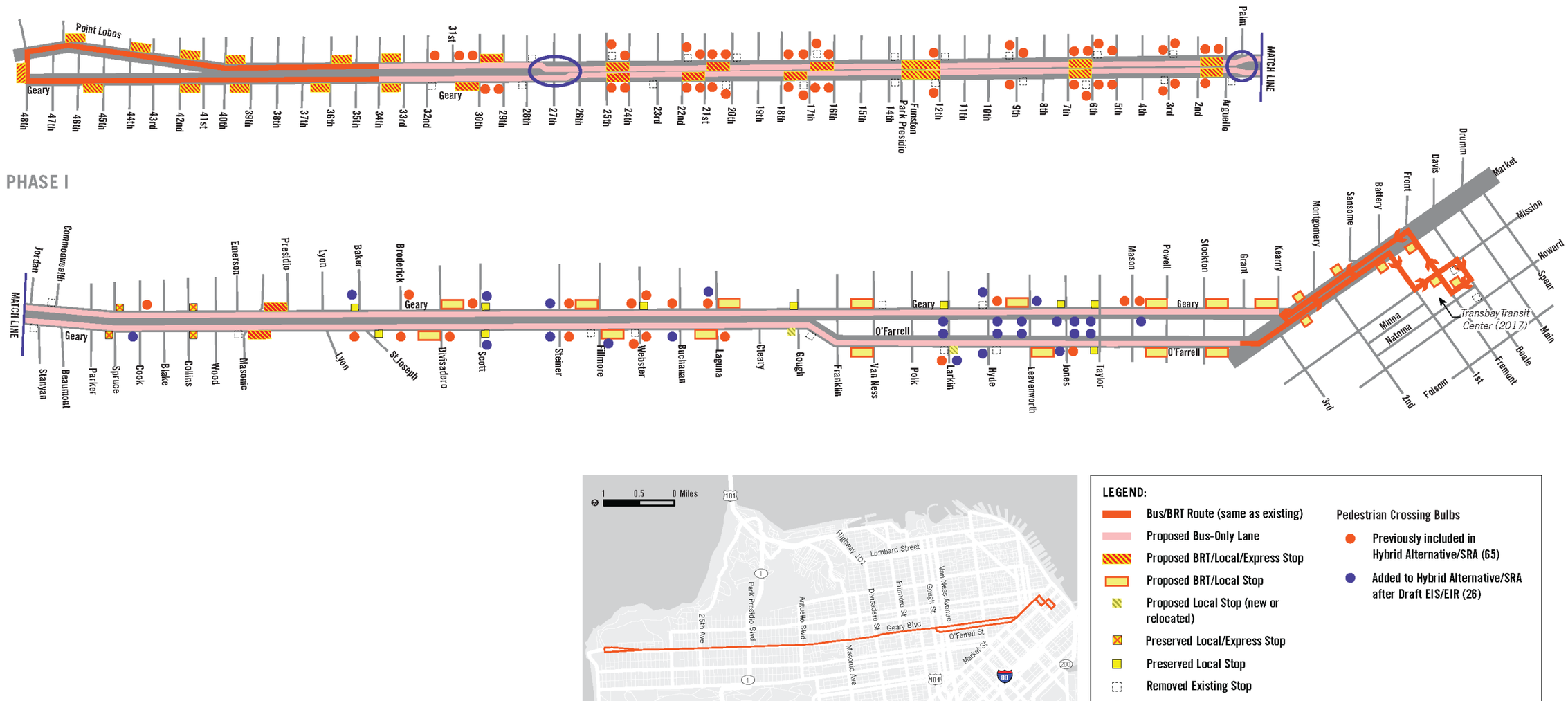
Figure 4.15-1 Construction Phasing for the Hybrid Alternative/LPA



Note: Construction of Class I bicycle lanes between Masonic and Presidio would be part of Phase II **(not to scale)**

Source: SFCTA, 2017

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4.15.2.1 | HYBRID ALTERNATIVE/LPA - PHASE I

Phase I improvements are anticipated to have a duration of 100 weeks and would occur along the Geary corridor between Market and Stanyan streets. The improvements consist of four major categories:

- Side-running bus-only lanes
- Bus and pedestrian bulbs
- Bridge removal at Steiner Street
- Traffic signal work

Phase I would extend the existing side-running bus-only lanes from Market Street west to Stanyan Street. Bus stops on this segment of the Geary corridor would also be relocated to improve operations. Other improvements would entail traffic signal work, pedestrian improvements, and new bus bulbs. Signal work would include installation of new signals, transit queue jumps, new pedestrian countdown signals, and other general modifications. Traffic signal retiming, including optimization of Transit Signal Priority (TSP), would be included. New pedestrian bulbs and/or medians, as well as bus bulbs, would be added at various intersections. The Steiner Street pedestrian bridge would also be removed in Phase I. Fiber optic conduit would be installed between Stanyan and Gough streets to make the existing corridor's TSP more reliable. Utility modifications coordinated with the project could include sewer main replacement between Stanyan Street and Van Ness Avenue as well as water main replacement from Masonic Avenue to Market Street.

Proposed bicycle improvements on Geary between Masonic and Presidio avenues (construction of Class I bicycle lanes in both directions on this block) would be the one exception to the geographic limits separating the Phase I and Phase II limits. These bicycle improvements include reconfiguring the center median island to accommodate a new dedicated bicycle facility. Due to the longer design schedule for these improvements, they would be implemented through the contracting mechanism used to deliver the Phase II improvements west of Stanyan Street. All transit improvements in this area, including bus-only lanes, bus stop consolidation and a transit signal queue jump, would still be part of Phase I.

Construction for the planned Phase I improvements could begin soon after all appropriate project approvals are received. See Section 2.9 and Table 2-11 for a list of required permits and approvals.

4.15.2.2 | HYBRID ALTERNATIVE/LPA - PHASE II

Phase II duration is anticipated to be another 100 weeks following Phase I. Phase II would consist of construction of center-running bus-only lanes from 28th to Palm avenues in the eastbound direction and Palm to 27th avenues in the westbound direction (see Figure 4.15-1). In center-running areas, existing medians and plantings would be removed and replaced with bus-only lanes with new dual medians and new landscaping. Phase II would also include the installation of side-running bus-only lanes from 27th/28th Avenues to 34th Avenue.

Traffic signal modifications, pedestrian improvements, bus stop changes, and construction of transit bulbs, similar to the activities described under Phase I, would occur in Phase II on the segment of the Geary corridor between 34th Avenue and Stanyan Street. Fiber optic conduit would be installed between 25th Avenue and Stanyan Street to accommodate TSP. The existing sewer between 4th and 14th avenues would be replaced and the existing sewer between Funston and 12th avenues would be relocated to the eastbound, leftmost lane of Geary Boulevard, with construction occurring between 11th and 14th streets.

The start of construction of Phase II would follow completion of Phase I.

4.15.3 | Construction Approach

As noted in Chapter 2, Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA could include replacement or relocation of existing sewers in the Park Presidio vicinity, rather than rehabilitation/protection in place. Replacement and relocation would be likely to lengthen the construction period relative to rehabilitation/protection in place.

Construction activities may require a special permit for partial or complete corridor closure if the construction work zone operations cannot safely be executed in the space made available. The longer the duration of construction, the greater the potential would be for interference with traffic. Construction could require the temporary closure of certain segments for short periods of times (several hours) or longer periods such as several days or weeks.

Examples of construction activities that could require temporary closures include: placement and removal of temporary pedestrian safety barriers, utility relocation, construction of pavement, pedestrian bridge demolition, Masonic Avenue tunnel modifications at Geary Boulevard, filling of the Fillmore Street underpass, and removal/reconstruction of the median and resulting lane realignment between Masonic and Presidio avenues to accommodate new dedicated bike lanes.

Considering the goals and constraints, four construction approaches were evaluated:

- Block-by-Block
- Continuous Multiple Block
- Staggered Multiple Block
- Continuous Corridor

The **Staggered Multiple Block Segment Approach** would significantly reduce construction duration by introducing multiple active work zones. In order to maintain manageable impacts on corridor functions, work zones would be separated, and include up to five blocks each. The separation between the work zones would generally be approximately five blocks long.

Considering project goals and local constraints, the **Staggered Multiple Block Segment Construction Approach** is the most likely construction method to be implemented during the construction of all of the build alternatives. Given this, the **Staggered Multiple Block Segment Construction Approach** is evaluated in this Final EIS.

4.15.4 | Construction Staging

Construction would be divided into the following general stages:

- Mobilization of contractor equipment, facilities, materials, and personnel into staging areas
- Installation of construction area signs, circulation of construction announcements
- Establishment of work zone and perimeter buffers
- Installation of temporary street lighting and traffic signals
- Execution of removal work to prepare the work zone for the construction of new infrastructure; this would include clearing of landscaped medians, removal of pavement, streetlights, signals, and interfering underground utilities
- Construction of infrastructure within the work zone (median bus lane pavement, medians, bus and pedestrian crossing bulbs, lights, utilities, etc.)
- Side-running lane resurfacing
- Installation of bus stop amenities and landscaping, lane striping and lane coloring
- Demobilization

4.15.4.1 | CONSTRUCTION STAGING AREAS

Mobilization of personnel and materials would require areas to set up field offices and trailers for personnel, parking for personnel, and space for material delivery, storage and handling. These areas would need to be in proximity of the Geary corridor, ideally no more than 200 feet away.

At this time the only area that has been identified for such use is within the street right-of-way. Candidate locations include parking areas and medians along the Geary corridor, and parking areas located on adjacent side streets. The environmental study limits account for potential construction staging areas (CSAs) on a portion (100 feet, is the extent that is noted on the Environmental Screening Levels map) of the adjacent side streets that intersect the Geary corridor. It is anticipated that the CSAs would move in tandem with the shifting work zone.

4.15.4.2 | STOCKPILING AND MATERIALS HANDLING

Temporary stockpiling of material is anticipated. Potentially stockpiled materials include excavated soil, crushed concrete and reinforcing steel, imported soil, pipe, appurtenances, and other building materials customary of street and utility construction.

The most significant stockpiling would be anticipated for the filling of the Fillmore Street underpass at Geary Boulevard under Alternatives 3 and 3-Consolidated. Approximately 30,000 cubic yards of imported fill material would be needed to fill the area. Because continuously supplying fill would be a significant challenge, stockpiling would be recommended to facilitate work. This work would also entail significant relocation of a range of utilities (gas, electric, sewer, Muni traction power, water, and AWSS). Stockpiling would likely be needed in CSAs along Steiner, Post, Geary, Fillmore, Webster and O'Farrell streets. Delivery and removal of materials and on-site handling would in some cases involve platoons of vehicles.

Removal of demolished infrastructure could introduce material handling challenges. While successful precedent exists that bridges can be removed within one weekend, it is reasonable to expect that removal of the debris would continue over a longer period.

4.15.4.3 | TEMPORARY LIGHTS AND TRAFFIC SIGNALS

Between 34th Avenue and Palm Avenue, planned new infrastructure for Alternatives 3 and 3-Consolidated, and the Hybrid Alternative/LPA would require that existing street lights and traffic signals be removed and then reinstalled or replaced in other locations. As a result, during construction, temporary lighting and signals would be needed. Temporary poles would likely have above-grade foundations, such as large reinforced concrete cylinders. The poles would be located within the street right-of-way, or within CSAs, depending on the available space.

4.15.4.4 | CONSTRUCTION EQUIPMENT

It is anticipated that conventional equipment that can be transported on street-legal rubber-tired vehicles would be used to construct the various components of the build alternatives. Moreover, most of the equipment itself would be rubber-tired. The exceptions would be track-mounted vehicles, including but not limited to excavators, asphalt cold planers, asphalt pavers, dozers, and earth compacting rollers.

4.15.4.5 | DEMOLITION EQUIPMENT

Demolition of the pedestrian bridges at Steiner and Webster Streets, the Fillmore Street underpass, and the Fillmore Street pump station would be achieved by use of conventional construction equipment with specialized attachments, including but not limited to hammers, hydraulic breakers, demolition shears, pulverizers, grapples, and brooms. Smaller-scale pavement demolition would utilize similar specialized attachments on smaller scale equipment.

4.15.5 | Transportation Management Plan

This section describes anticipated construction conditions, associated impacts, and the outline of the Transportation Management Plan (TMP) that would be developed and implemented as a measure to avoid, minimize, and/or mitigate anticipated adverse impacts.

4.15.5.1 | CONSTRUCTION CONDITIONS

The approach to construction of any of the build alternatives would include maintenance of traffic operations and day-to-day activities along the Geary corridor, while providing the construction contractor sufficient timeframes to enable completion of construction work.

In general, construction would also proceed along both sides of the corridor in multiple segments simultaneously and further assumes that work would proceed during normal daytime work hours of 7 a.m. to 8 p.m.

The size and character of the construction zone would be shaped by construction operations and standing safety regulations such as the *California Manual on Uniform Traffic Control Devices* (CA MUTCD) and the *Regulations for Working in San Francisco Streets* ("The Blue Book"). Geary corridor construction zones would vary in size but would always be separated from traffic and pedestrians by a buffer that would include a temporary barrier. Adjacent to the construction zone, traffic speeds would be reduced and parking would be relocated away from the construction zone when active. Depending on local conditions, there may be opportunities to allow parking or loading when the construction zone is inactive. The layout of the transition of traffic and pedestrian flow around the construction zone would be guided by the CA MUTCD and the Blue Book.

Construction activity would be restricted to specified work hours with some exceptions. The draft Project Construction Plan assumes that normal daytime work hours (7 a.m. to 8 p.m.) would be permitted.[2] The typical work week would have 40 work hours. Nighttime work may be possible in areas where land uses are primarily commercial.

In addition to day-to-day restrictions, there may be seasonal restrictions, such as the Holiday Moratorium (Thanksgiving to January 1). The moratorium applies to any City block where at least 50 percent of the frontage is devoted to business, or to businesses located within Geary corridor from Taylor to Market streets (contractors may apply for a waiver to the moratorium). In addition, the Migratory Bird Treaty Act (MBTA) limits tree removal to the period outside of breeding and nesting season, which is February 1 to August 31.

In general, bus access along the Geary corridor and the transit lines that cross the corridor could be maintained during construction. However, some bus stops or routes could be changed during the course of construction. The selected Staggered Multiple Block Construction Approach would make it possible to locate bus stops outside the construction zone and at reasonable spacing. For example, between 33rd

[2] The Project Construction Plan assumes that a waiver to the limitations imposed on corridors classified as Important Streets can be obtained; without the waiver the work hours would be limited to 9 a.m. to 3 p.m.

Avenue and Palm Avenue, a temporary stop spacing of up to 1,800 feet would be implemented, assuming a five-block construction zone is staggered with an approximately five-block-long separation between construction zones. Transit routes that cross the corridor could be relocated in some cases by corner work resulting from bulb and sidewalk construction. Potentially affected transit routes include the 44 O-Shaughnessy, 33 Stanyan, 43 Masonic, 24 Divisadero, 22 Fillmore, 19 Polk, 27 Bryant, the 5 Fulton, and the Powell Cable Car line.

Temporary bus route changes or detours could occur at Masonic and Fillmore areas. At Masonic, a temporary detour of the 43 Masonic (diesel bus) and the 5 Fulton (trolley bus) would be anticipated for all build alternatives. At Fillmore, a temporary detour of the 22 Fillmore trolley bus would be needed for Alternatives 3 and 3-Consolidated. Trolley buses are more complicated to detour due to their reliance on the overhead contact system for power. Fillmore vehicular traffic would need to be detoured around the construction activities associated with the removal of the underpass and the subsequent construction to restore the entire width of Geary to be at-grade. The strongest candidate for such a detour would be Webster Street, since it is the widest nearby street. However, due to lack of an overhead contact system, buses from the diesel or hybrid electric fleet would therefore likely need to be used.

Periodic sidewalk closures may occur during sidewalk rehabilitation work, utility work, demolition of the pedestrian bridge(s), and during removal of the Fillmore underpass (Alternatives 3 and 3-consolidated only). However, detours would be provided and pedestrian access to fronting land uses would be maintained. Sidewalk area improvements would be completed in several stages of construction in order to maintain access, and some intersection crosswalks may need to be closed with pedestrians detoured to the nearest intersection possible.

Parking within the street right-of-way would be subject to temporary restrictions. Parking within any active construction zone would not be permitted at any time. Parking areas within active construction zones would be relocated as close to the construction zone as is practical. Temporary loading zones (within a mixed-flow lane adjacent to an inactive construction zone) may be possible in some circumstances. The TMP would identify any such areas that may be feasible.

Access to parking or loading areas located outside the street right-of-way would be subject to restrictions. When access is located within a proposed bus stop area, the duration of work would be longer than typical street paving projects. This is because work within the bus stop area may involve a bus bulb and sidewalk concrete work, as well as utility relocation work. When feasible, temporary alternative access may be provided at a location outside the construction zone or within an acceptable location within the construction zone. If alternatives are not available, the TMP would include special provisions.

Street paving work would require periodic interruptions to driveway access along the Geary corridor between 34th Avenue and Market Street. Bus bulb construction would result in interruptions of the driveways facing the eastbound service road between Fillmore and Webster streets.

Geary corridor activities to be maintained through construction include:

Traffic and Parking

- Traffic would be maintained to the minimum number of lanes allowed by the City of San Francisco, but may be interrupted periodically.
- Through-travel: East of Gough Street, at least one mixed-flow travel lane in each direction would generally be maintained. Re-grading of the street for construction of physical improvements may require temporary lane closures.
- West of Gough Street, where the right-of-way is wider, two mixed-flow travel lanes in each direction would generally be maintained with further lane reductions possible during certain construction activities (including, but not limited to, utility relocation).
- During off-peak travel periods and/or during heavy construction activities, one mixed flow travel lane in each direction would generally be maintained, with each lane a minimum of 10 feet in width.
- Parking within the right-of-way along the Geary corridor and adjacent side streets would be subject to some restrictions.
- Driveway access to parking or loading zones located outside the street right-of-way would be subject to restrictions and relocations.

Pedestrian and Accessibility Accommodations

- Pedestrian access throughout the corridor would be preserved, but some crosswalks and sidewalks may need to be detoured.
- Sidewalks, with widths temporarily reduced no less than 6 feet clear in commercial areas; where this is not possible, an absolute minimum width of 4 feet; sidewalks would comply with requirements of the Americans with Disabilities Act.

Transportation

- Ongoing operations for Muni bus routes 38 Geary (Local), 38 Rapid, and 38 Express, as well as 1 California, 43 Masonic, 22 Fillmore, electric trolley bus access to the Presidio Division, and Powell Street Cable Cars.
- Ongoing operations for Golden Gate Transit buses.
- Paratransit and Hospital Shuttle boarding and alighting (possible relocations)
- Bus access would be preserved but some stops may be temporarily relocated and the number of stops temporarily reduced
- Bicycle access may be temporarily detoured in some locations

Table 4.15-4 summarizes the construction conditions anticipated for each build alternative. Temporary traffic conditions for each alternative are generally similar, except at the Masonic and Fillmore areas. The detours noted for Alternatives 3 and 3-Consolidated are a result of modifications to the Masonic tunnel and removal of the Fillmore Street underpass.

Table 4.15-4 Construction Conditions

CONSTRUCTION CONDITIONS	ALT 2	ALT 3	ALT 3-CONSOLIDATED	HYBRID/LPA
Maintain 2 mixed-flow travel lanes each direction of Geary corridor during peak hours	●	●	●	●
Maintain mixed-flow travel lane with minimum temporary width of 10-feet	●	●	●	●
Reduce speed within construction zone, <25 mph	●	●	●	●
Periodic nighttime closure of mixed-flow travel lanes	●	●	●	●
Select extended weekend closure of mixed-flow travel lanes	●	●	●	●
Longer-term detour of Masonic tunnel and Fillmore underpass lanes		●	●	
Longer-term detour of Fillmore Street		●	●	
Interruption of traffic at Park Presidio (14th Avenue, Park Presidio, Funston); type of interruption would depend on scope of sewer work		●	●	●

Source: Draft Project Construction Plan, Jacobs Engineering Group, Inc. October 2013.

Pedestrian/sidewalk effects typical of side bus lane construction

4.15.5.2 | CONSTRUCTION SCHEDULE RISK

The estimated duration of construction activities described herein would likely increase if any of the following occurred:

- Major construction activities for utilities are required
- Delays that result in work conflicting with migratory bird season
- Other related projects on the Geary corridor or crossing the corridor conflicting with the Geary construction plan (utilities, street repair, and other major projects)
- Increased duration of agency review and approval cycles for the items of construction
- Alternatives 3 and 3-Consolidated are exposed to the risk of the significant volume of fill material being unavailable
- Buried cultural resources are discovered
- Unforeseen underground utility or sub-sidewalk basement conflicts
- Waiver for extended work hours is not granted

4.15.6 | Construction Period Effects - Traffic and Transportation

Impacts to traffic, transit, parking, pedestrians, and cyclists that could result during project construction are discussed in the following subsections.

Environmental consequences on traffic and transportation during construction may include increased traffic congestion on the Geary corridor as well as on the streets running parallel to the Geary corridor. Increased congestion would be due to slower operating speeds of both traffic and transit resulting from fewer and/or narrower mixed flow travel lanes near active construction zones and safety protocols employed on travel lanes running adjacent to the active construction zones. During certain construction operations, detours could further increase congestion on side streets and parallel streets adjacent to the Geary corridor. Additionally, typical Geary corridor transportation functions are likely to be interrupted, including but not limited to:

- Altered transit and paratransit service
- Altered loading zone location and operations
- Reduced on-street parking
- Relocated accessible parking
- Interruptions in driveway access

Transit operations are expected to be maintained during construction with some schedule modifications and temporary stop relocations. Transit-users would likely experience some delay in transit service during active construction. Accessibility for pedestrians would also be maintained during construction activity; however, sidewalk disruptions and temporary closures could be possible. Typically, sidewalks would remain open to pedestrians but may be condensed during active construction.

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

These potential consequences could be avoided and/or mitigated with an effective TMP to manage traffic congestion and minimize transit service disruptions. Elements of an effective TMP include consideration of:

- Public information programs
- Transit passenger information strategies
- Traveler information strategies
- Incident management and contingency planning
- Construction staging and phasing strategies
- Alternate route strategies

Table 4.15-5 describes each element and its associated objective.

With the refined phasing for the Hybrid Alternative/LPA, construction-period transportation impacts described in the Draft EIS/EIR for the corridor as a whole would occur first just in Phase I. During this time, no construction work would be anticipated west of Stanyan Street. During Phase II, all construction work, with the

exception of bicycle improvements between Masonic and Presidio described above in Subsection 4.15.2, would occur west of Stanyan Street. As described above, the TMP would include consideration of the refined construction phasing for the Hybrid Alternative/LPA.

Regardless of phasing, overall construction impacts of the Hybrid Alternative/LPA would be similar to those described in the Draft EIS/EIR. No new avoidance, minimization, or mitigation measures would be required.

Table 4.15-5 Elements of a Transportation Management Plan

ELEMENT	DESCRIPTION	OBJECTIVE
Public Information Program	Website with regular updates about current and upcoming construction activities, mailers, in person town hall style briefings	To provide advanced information allowing travelers to plan for the construction disruption. An effective program often results in reduced congestion and promotes safety by establishing two-way communications between the public and SFMTA
Transit Passenger Information Strategies	Transit focused website with real-time information about bus schedules, mailers, etc.	To provide advanced information allows travelers to plan for the construction disruption. An effective program often results in an improved passenger experience, reduced congestion, and promotes safety by establishing two-way communications between the public and SFMTA
Traveler Information Strategies	Real time information signs located along the corridor to alert traffic and transit users of delays, closures, and recommended alternative routes	To provide motorists on the road and riders in transit with the latest information to make informed decisions about adjustments to travel plans
Incident Management and Contingency Planning	Management of incidents and unforeseen changes in construction. Implementation of an enforcement program with SFPD and SFMTA, which includes the presence of an enforcement officer on site	To provide a flexible plan, underpinned by on-sight enforcement, to minimize disruption of unanticipated events such as vehicle breakdowns, flat tires, collisions, late lane openings and need of additional short term lane closure
Construction Strategies	Implement staggered multiple block construction approach that maintains 2 lanes of traffic during peak hours and provides a reasonable spacing of curbside transit stops, located in the parking lane, during construction Develop Maintenance of Traffic and Access Plan (MOTA) and implement extended work period closures when the complexity of construction and traffic management is difficult to manage safely. Use quick setting and durable concrete Employ modular construction	To minimize disruption in traffic and transit flow by allowing buses to shunt into the parking lane To increase the level of safety by completing relatively complex removal and construction operations without active travel lanes in proximity To use techniques that reduce construction time and complexity, and hence the exposure of the corridor to disruption
Alternative Route Strategies	Alternative route strategies can be developed to facilitate extended work period closures and managed effectively with information management tools and the enforcement program	To minimize traffic, transit, bicycle and pedestrian exposure to construction and hence exposure to delay and reduce the builders exposure to traffic related safety hazards

Source: SFCTA, 2015

4.15.6.1 | AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

Adherence to a TMP would adequately alleviate environmental effects related to traffic during construction. No further measures are needed.

4.15.7 | Construction Period Effects - Land Use and Community

4.15.7.1 | ENVIRONMENTAL CONSEQUENCES

Some adverse effects to area residents, businesses, and visitors could occur on a temporary basis along the street segments under construction. Construction of each of the build alternatives would result in impacts to traffic, circulation, parking, transit service, and the pedestrian and bicycle environment in the Geary corridor, as described above in Section 4.15.1. These impacts could affect the communities' ability to easily access local businesses and community facilities during active construction. Impact minimization measures described earlier would be implemented to reduce these impacts during project construction.

Temporary conversion of parking lanes to mixed-flow travel lanes would be implemented during project construction, resulting in the removal of on-street parking in areas throughout the Geary corridor while construction is taking place. This would also result in the temporary removal of colored truck and passenger loading zones, which could adversely affect operations of adjacent businesses and residents during construction. Similarly, partial closures of sidewalk areas during construction may result in short-term disruption to loading operations of adjacent land uses, and may negatively impact neighboring businesses. Parking constraints and increased traffic would likely cause temporary inconveniences to local businesses and residents.

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

Land use characteristics differ along the length of the Geary corridor, and include residential, commercial, transportation, public/institutional, recreational, and other mixed-uses. To reduce construction-related impacts to adjacent land uses and to the community (such as access disruptions), the unique characteristics of each area would be taken into consideration in construction planning and scheduling, and access would be maintained to the extent feasible. Construction planning would minimize nighttime construction in residential areas and minimize daytime construction affecting retail and commercial areas. These considerations would be undertaken as part of the public information procedures outlined in the TMP.

Residents, businesses, and visitors along the Geary corridor would also be subject to noise, dust, vibration, and emissions from construction equipment during project construction. These impacts could discourage or restrict pedestrian activity along the blocks under construction and reduce foot traffic, which could impact local businesses. Potential air quality and noise and vibration impacts during construction and associated avoidance and minimization measures are discussed in Section 4.15.10 and 4.15.11 respectively. Light and glare impacts to residential properties that could result from nighttime construction are addressed in Subsection 4.15.8.1.

With the refined phasing for the Hybrid Alternative/LPA, construction-period land use and community impacts described in the Draft EIS/EIR for the corridor as a whole would occur first just in Phase I. These effects include short-term sidewalk closures, detours, conversion of parking lanes to travel lanes, and removal of loading zones, which would temporarily increase traffic and parking difficulties and could disrupt access to public facilities, parks, businesses, and residences within the corridor. During this time, no construction work would be anticipated west of Stanyan Street, where such effects would not be expected.

During Phase II, all construction work, with the exception of bicycle improvements between Masonic and Presidio avenues described above in Subsection 4.15.2.1, would occur west of Stanyan Street. Land use and community effects that would occur during Phase II would be the same as those described for Phase I, but would occur primarily west of Stanyan Street.

Regardless of phasing, overall construction impacts of the Hybrid Alternative/LPA would be similar to those described in the Draft EIS/EIR. No new avoidance, minimization, or mitigation measures would be required.

4.15.7.2 | AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

Avoidance and minimization measures related to air quality and noise and vibration impacts during construction phases are included in this Draft EIS/EIR to ensure that there would be no adverse community effects. The following additional measures would be implemented to reduce construction-related impacts to local businesses and residents:

M-CI-C1. A TMP that includes traffic rerouting, a detour plan, and public information procedures shall be developed during the design phase with participation from local agencies, other major project proponents in the area, local communities, business associations, and affected drivers. Early and well-publicized announcements and other public information measures would be implemented prior to and during construction to minimize confusion, inconvenience, and traffic congestion. The TMP shall include at minimum the following provisions:

- Construction planning shall seek to minimize nighttime construction in residential areas and minimize daytime construction impacts on retail and commercial areas.
- As part of the TMP public information program, San Francisco Municipal Transportation Agency (SFMTA) shall coordinate with adjacent properties along the Geary corridor to determine the need for colored parking spaces (i.e., loading zones) and work to identify locations for replacement spaces or plan construction activities to minimize impacts from the loss of these spaces. SFMTA shall also coordinate with adjacent properties along the Geary corridor to ensure that pedestrian access to these properties is maintained.
- The TMP shall incorporate SFMTA's process for accepting and addressing complaints. This includes provision of contact information for the Project Manager, Resident Engineer, and Contractor on project signage with direction to call if there are any concerns. Complaints would be logged and tracked to ensure they are addressed.
- The TMP shall identify or otherwise designate adequate passenger and truck loading zones to be maintained for adjacent land uses, including maintaining access to driveways and providing adequate loading zones on the same or adjoining street block face.

4.15.8 | Construction Period Effects - Aesthetics/Visual Resources

4.15.8.1 | ENVIRONMENTAL CONSEQUENCES

Construction of any of the build alternatives would occur within and adjacent to the existing street right-of-way. Project construction activities would involve the use of a variety of equipment, stockpiling of materials, and other visual signs of construction. Various TMP elements, such as portable changeable message signs, detours, and other signage would be used during construction. While evidence of construction activity would be noticeable to area residents, and transit riders such visual disruptions would be short-term and are a common feature of the urban environment. Measures described in Subsection 4.15.8.2 would reduce aesthetic impacts from construction activities.

Some construction would be accomplished at night. Project specifications would require the project contractor to direct artificial lighting onto the worksite while working in residential areas at night to minimize "spill-over" light or glare effects. This would be a temporary degradation of the visual environment that would be restored at the completion of construction. Construction best practices described in Subsection 4.15.8.2 would minimize nighttime light and glare impacts.

With the refined phasing for the Hybrid Alternative/LPA, construction-period aesthetic impacts described in the Draft EIS/EIR for the corridor as a whole would occur first just in Phase I. During this time, no construction work would be anticipated west of Stanyan Street. Removal of up to approximately 70 trees between Market and Stanyan Streets would occur in Phase I, resulting in a temporary decline in visual quality (as discussed in the Draft EIS/EIR). In Phase II, all construction work, with the exception of bicycle improvements between Masonic and Presidio described above in Subsection 4.15.2.1, would occur west of Stanyan Street. Approximately 110 trees would be removed in Phase II, and construction activities such as median removal would be more intensive than construction activities in Phase I. Regardless of phasing, overall construction impacts of the Hybrid Alternative/LPA would be similar to those described in the Draft EIS/EIR. No new avoidance, minimization, or mitigation measures would be required.

4.15.8.2 | AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

Implementation of the following measures would reduce the severity of any adverse construction-related impacts to visual quality:

MIN-VQ-C1.

- Project construction shall be phased to reduce the period of disruption at any particular location to the shortest practical length of time
- Construction lighting shall be shielded and directed to limit direct illumination to within the area of work and avoid all light trespass
- Construction staging and storage areas shall be screened by visually opaque screening wherever they would be exposed to public view for extended periods of time

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

4.15.9 | Construction Period Effects - Cultural Resources

4.15.9.1 | ENVIRONMENTAL CONSEQUENCES

Though no prehistoric or historic archaeological sites have been recorded within the project's Area of Potential Effects (APE), construction of any of the build alternatives would involve some ground disturbance with the potential to unearth unrecorded or unknown sites and/or resources. As detailed in Section 4.5, of this Draft EIS/EIR, the Archaeological and Native American Cultural Resources Sensitivity Assessment for the project described a few general locations that may be sensitive for the presence of prehistoric archaeological resources. Two main areas within the archaeological APE are considered to have a high potential for prehistoric archaeological sites. This includes a considerable area near the eastern end of study area (within the Phase I geographic area) and a similar area at the western end of the study area (within the Phase II geographic area).

Two portions of the archaeological APE are considered to have moderate to high probability of yielding historic-era archaeological resources. These include the Yerba Buena Cove area northeast of First Street (within the Phase I geographic area), and the portion of the Geary corridor between Masonic and Gough streets (within the Phase I geographic area, with the portion between Masonic and Presidio avenues within the Phase II area as well). It is considered likely that previous construction of Geary Boulevard itself (particularly the widening, underpass, and tunneling in this area) would have removed or destroyed any intact archaeological resources near Masonic and Gough Streets.

Construction activities would not involve directly physically altering or demolishing any character-defining features of any of the historic buildings, properties, or districts within the architectural APE. However, construction activities could result in the relocation of some number of Golden Triangle street lights (within the Phase I geographic area), Japan Center light standards (within the Phase I geographic area), or components of the AWSS (both Phase I and Phase II area). As set forth in avoidance measure **A-CUL-C5**, proposed improvements would be designed to minimize or avoid the removal, relocation, or damage to these historic structures. In the event that one or more of these streetlights must be relocated, such relocation would conform to appropriate Secretary of the Interior Standards. Furthermore, each of the build alternatives would have some potential indirect effects from the introduction of visual elements and construction vibration that differ based on project components unique to each alternative. However, these effects are negligible and do not diminish the integrity of location, setting, feeling, association, workmanship, design or materials for any historic property, particularly with adherence to avoidance and minimization measures incorporated herein.

With the refined phasing for the Hybrid Alternative/LPA, construction-period impacts to cultural resources described in the Draft EIS/EIR for the corridor as a whole would occur first just in Phase I. During this time, no construction work would be anticipated west of Stanyan Street.

The Phase I geographic area (i.e., east of Stanyan Street) contains one area of high sensitivity for prehistoric-era archaeological resources, one area of high sensitivity for historic-era archaeological resources (i.e., Yerba Buena cove), and one area of moderate sensitivity for historic-era archaeological resources (i.e., Masonic Avenue to Gough Street). The vast majority of historic architectural resources in the study

area are also located within the geographic area of Phase I: 52 properties that are listed or eligible for the National Register of Historic Places (NRHP).[3] As the majority of moderate-high sensitivity areas for archaeological resources and the majority of historic architectural resources are located within the geographic area of Phase I, the majority of potential impacts to cultural resources, as described in the Draft EIS/EIR, would occur during Phase I of construction.

During Phase II, all construction work, with the exception of bicycle improvements between Masonic and Presidio (identified as an area of moderate sensitivity for historic-era archaeological resources) described above in Subsection 4.15.2.1, would occur west of Stanyan Street. The Phase II geographic area contains one area of high sensitivity for prehistoric-era archaeological resources and two NRHP-eligible historical architectural properties.[4]

Based on the foregoing, overall construction impacts of the Hybrid Alternative/LPA would be similar to those described in the Draft EIS/EIR. No new avoidance, minimization, or mitigation measures would be required.

4.15.9.2 | AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

The following measures are proposed to be implemented as part of the construction of any of the build alternatives to avoid or minimize any potential effects upon archaeological, historic architectural or paleontological resources.

MIN-CUL-C1. Limit the use of construction equipment that create high vibration levels, such as vibratory rollers.

MIN-CUL-C2. Develop and implement a Vibration Reduction and Minimization Plan, which would include the identification of vibration-sensitive structures using distance impact thresholds.

MIN-CUL-C3. During advanced conceptual engineering or final design phases, an individual assessment of vibration-sensitive structures' would be conducted where construction activities and equipment would exceed FTA's impact distance guidance for category Category IV structures.

MIN-CUL-C4. Conduct vibration monitoring during construction.

A-CUL-C5. Design proposed stations and stops in the vicinity of the Golden Triangle Streetlights, Japan Center light standards, and components of the AWSS to avoid the removal, relocation, or damage to these historic structures.

OR

MIN-CUL-C6. In the event that avoidance of the Golden Triangle Streetlights, Japan Center light standards, and AWSS are infeasible, all effort will be made first for relocation of such elements within the immediate vicinity of their original location while maintaining placement (distance) within the sidewalk in respect to curb and/or adjacent buildings. For the light standards, additional effort would be made to relocate a light standard within the same block if there is a site where the

[3] One property, the Auxiliary Water Supply System (AWSS), has components across the entire City of San Francisco; elements of the AWSS are thus present in the geographic extents of both construction phases.
[4] See note above.

original light standard has been removed or replaced by modern standards; and last, relocation to an available site within the historic property boundary where an original standard has been removed or replaced by modern standards.

I-CUL-C7. Harmonize the visual qualities of built elements of the build alternatives with adjacent historic properties through careful consideration of design, lighting, materials, and color choices that would complement and be sensitive to nearby historic properties. Where appropriate, ensure adherence to Secretary of the Interior's Standards for the Treatment of Historic Properties.

MIN-CUL-C8. Focused archival research will identify specific areas within the APE that are likely to contain potentially significant remains, and methods and findings will be documented as an addendum to the current report. The Phase I addendum report will be submitted to the City's Environmental Review Officer (ERO) and the State Historic Preservation Officer (SHPO) for concurrence. Research will be initiated once the project's APE map is finalized identifying the major Areas of Direct Impact. The Addendum Survey Report would include:

- A contextual and documentary research section that addresses the development of urban infrastructure that provide a basis for evaluating potential resources as they relate to the history of San Francisco.
- A cut-and-fill reconstruction of the corridor, comparing the modern versus mid-1800s ground surface elevations, to fine-tune the initial prehistoric sensitivity assessment, and refining the location of high-sensitivity locations where prehistoric remains may be preserved.
- Relevant profiles and plan views of specific blocks to illustrate the methods used in analyzing available documentation.
- Summary and conclusions to provide detailed information on locations that have the potential to contain extant historic-era and prehistoric archaeological remains that might be evaluated as significant resources, if any.

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

Two results are possible based on documentary research:

- No or low potential for sensitive locations: major Areas of Direct impact have no potential to retain extant archaeological remains that could be evaluated as significant resources. No further work would be recommended, beyond adherence to the Unanticipated Discovery Plan.
- Potential sensitive locations: if major Areas of Direct Impact contain locations with moderate to high potential to retain extant historic or prehistoric archaeological remains that could be evaluated as significant resources, further work would be carried out, detailed in a Testing and Treatment Plan.

MIN-CUL-C9. Depending on the results of archival research, in concert with the City's ERO, project avoidance areas or, more likely, areas requiring presence/absence investigations for cultural resources will be identified and fieldwork undertaken following exposure of the ground surface, but prior to construction to identify buried cultural resources.

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

MIN-CUL-C10. A Testing and Evaluation/Treatment Plan, if required, will provide archaeological protocols to be employed immediately prior to project construction to test areas identified as potentially significant or having the potential to contain buried cultural resources. In case such areas might be unavoidable, minimization measures will be proposed. The procedures detailed in the Treatment Plan would be finalized in consultation with the City's ERO and the SHPO.

For historic-era resources, work would initially entail detailed, focused documentary research to evaluate the potential significance of any archaeological material identified during initial research that might be preserved. Significance would be based on the data-potential of possible remains applied to accepted research designs. Two results could ensue:

- No potentially significant remains: if no locations demonstrate the potential for significant remains, no further archaeological testing would be recommended.
- Potentially significant remains: if any locations have the potential to contain significant remains, then appropriate field methods will be proposed, including compressed testing and data-recovery efforts. Testing will be initiated immediately prior to construction, when there is access to historic ground levels. Should a site or site feature be found and evaluated as potentially significant, data recovery would take place immediately upon discovery if avoidance of the site is still not possible.

For prehistoric resources, a Treatment Plan will identify relevant research issues for resource evaluation, and pragmatic methods to identify, evaluate, and conduct data recovery if needed. This may include a pre-construction geoarchaeological coring program or a compressed three-phase field effort occurring prior to construction when the ground surface is accessible.

MIN-CUL-C11. Upon completion of all fieldwork, a technical report shall be prepared. This Final Archaeological Resources Report (FARR) shall document all field and laboratory methods, analysis, and findings. The FARR shall be subject to review and approval by the City's ERO and the SHPO. Copies of the approved FARR shall be submitted to the City's ERO, the SHPO, and the Northwest Information Center, together with any associated archaeological site records.

MIN-CUL-C12. If buried cultural resources are encountered during construction activities, construction will be halted and the discovery area isolated and secured until a qualified archaeologist assesses the nature and significance of the find.

MIN-CUL-C13. If human remains are discovered, the County coroner will be notified as soon as is reasonably possible (California Environmental Quality Act Guidelines, Section 15064.5). There will be no further site disturbance where the remains were found. If the remains were determined to be Native American, then the coroner is responsible for contacting the California Native American Heritage Commission within 24 hours, and the Commission, pursuant to Public Resources Code Section 5097.98, will notify those persons it believes to be the most likely descendant. Treatment of the remains will be dependent on the views of the most likely descendant.

MIN-CUL-C14: In the event that paleontological resources are encountered during any phase of project construction, all soil-disturbing activity within 100 feet of the find shall be temporarily halted until a qualified paleontologist can assess the significance of the find and provide proper management recommendations.

4.15.10 | Construction Period Effects - Utilities/Service Systems

4.15.10.1 | ENVIRONMENTAL CONSEQUENCES

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

The build alternatives – including the Hybrid Alternative/LPA could result in adverse impacts to utilities during construction if it would result in the need for expanded or additional facilities by a utility provider. Project demolition and construction waste would be accommodated by existing offsite landfills and recycling centers and it would not affect landfill capacity. Construction activities would be accommodated by existing water and power facilities. Wastewater generation during construction would not exceed wastewater treatment requirements of the San Francisco Regional Water Quality Control Board and would comply with batch discharge permits from the San Francisco Public Utilities Commission (SFPUC), as described in Subsection 4.15.13.2, Hydrology and Water Quality.

The build alternatives would have adverse impacts to utilities during project construction if it would damage facilities, or interfere with utility service to customers and public facilities. As discussed in Section 4.6.4, coordination with all utility providers and proponents of related projects in the project corridor would be initiated during the preliminary engineering phase of the project and carried through final design and construction phases. Coordination and planning efforts would be facilitated through the Committee for Utility Liaison on Construction and Other Projects, Street Construction Coordination Center, and the Department of Transportation (Caltrans), with the focus on identifying potential conflicts and formulating strategies to avoid them, including planning utility relocations/reroutes, and other measures to avoid utility service interruptions.

In general the build alternatives would necessitate some utility relocation in order to maintain utility access and functionality. One example is the construction of bus bulbs and pedestrian crossing bulbs. These features would require relocation of some existing urban infrastructure, including but not limited to stormwater drainage facilities (inlets and laterals), fire hydrants (low pressure and high pressure), valves, manholes, surface-mounted utility boxes, or other appurtenances (see Section 4.6, Utilities). Alternatives 3 and 3-Consolidated propose the potential removal the Fillmore Street underpass and associated pump station. The removals require the relocation of many utilities (such as AWSS, gas, electric, AT&T, SMFTA traction power duct bank, water, sewers, etc.). The largest of these utilities is the combined sewer under Fillmore Street (6-feet-four-inch-by-four-feet elliptical reinforced concrete pipe).

Coordination with SFPW and utility providers would avoid or minimize utility service interruption by staging construction activities and taking appropriate precautions for the protection of any unforeseen utility lines discovered during project construction. This planning and coordination process would avoid and minimize impacts to utilities during construction.

With the refined phasing of the Hybrid Alternative/LPA, construction-period impacts to utilities described in the Draft EIS/EIR for the corridor as a whole would occur first just in Phase I. During this time, no construction work would be anticipated west of Stanyan Street. Both Phases I and II would include replacement and/or relocation of utilities. Phase I utility modifications coordinated with the project could include sewer main replacement between Stanyan Street and Van Ness Avenue as well as water main replacement from Masonic Avenue to Market Street. These utility replacements are not required for the project but, as disclosed in the Draft EIS/EIR, the City of San Francisco coordinates utility replacement work with other street construction projects to minimize disruption to the community (i.e., only dig up the street once).

In Phase II, all construction work, with the exception of bicycle improvements between Masonic and Presidio described above in Subsection 4.15.2.1, would occur west of Stanyan Street. Phase II would include replacement of the existing sewer between 4th and 14th avenues, as well as relocation of the existing sewer from Funston to 12th Avenue to the eastbound, leftmost lane, with construction occurring between 11th and 14th avenues. As disclosed in the Draft EIS/EIR, this relocation is needed as a result of the project so that the sewer lines can be more readily accessed (i.e., not underneath new bus-only lanes) for future maintenance needs.

Based on the foregoing, overall construction impacts of the Hybrid Alternative/LPA would be similar to those described in the Draft EIS/EIR. No new avoidance, minimization, or mitigation measures would be required.

4.15.10.2 | AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

In compliance with City and Caltrans policies, coordination with the utility providers would be initiated during the preliminary engineering phase of the project and would continue through final design and construction.

Where feasible, utility relocations would be undertaken jointly with project construction to minimize potential service disruptions. Design, construction, and inspection of utilities relocated for any of the build alternatives would be done in accordance with City and Caltrans requirements. SFMTA would coordinate with the affected service provider in each instance to ensure that work completed is in accordance with the appropriate requirements and criteria.

MIN-UT-C1. BRT construction would be closely coordinated with concurrent utility projects planned within the Geary corridor.

MIN-UT-C2. An inspection and evaluation of the sewer pipelines within the project limits would be undertaken to assess the condition of the pipeline and need for replacement. Drain inlets on the corridor shall also be inspected to assess condition and confirm functionality. Spot repairs or minor replacement-in-place of sewers may be performed during construction of the project if desired by SFPUC and agreed to by SFMTA.

MIN-UT-C3. During planning and design, consideration would be given to ensure that the Geary corridor station facilities do not prevent access to the underground AWSS lines. Adequate access for specialized trucks to park next to gate valves shall be maintained. Gate valves shall not be located beneath medians, station platforms, or sidewalks.

MIN-UT-C4. In situations where utility facilities are being protected in place, SFMTA would create a plan to accommodate temporary closure of the transitway and/or stations in coordination with utility providers to allow utility providers to perform maintenance, emergency repair, and upgrade/replacement of underground facilities that may be located beneath project features such as the BRT transitway, station platforms, or curb bulbs. Signage for BRT patrons and safety protocols for Muni operators and utility providers shall be integrated into this plan.

4.15.11 | Construction Period Effects - Geology/Soils/Seismicity/ Topography

4.15.11.1 | ENVIRONMENTAL CONSEQUENCES

The Geary corridor may be susceptible to strong ground shaking and liquefaction induced ground settlement and/or differential compaction (settlement due to densification) during a seismic event. Portions of the Geary corridor also could potentially expose people or structures to adverse effects from liquefaction-induced ground failures. Design of project features, and incorporation of minimization measures described in Subsection 4.7.4, would address liquefaction and settlement impacts. In the event of an earthquake during project construction, very strong ground shaking could result in slope instability near excavated areas. As a result, minimization measures for each build alternative to avoid potential slope instability impacts during project construction is discussed below.

In addition, Alternatives 3 (Center-Lane BRT with Dual Medians and Passing Lanes) and 3-Consolidated (Center-Lane BRT with Dual Medians and Consolidated Bus Service) would include the filling of the underpass at Fillmore Street, decommissioning of the existing pump station at Fillmore Street, and either filling (with inert material) or removing the pump station's fuel tank. There are several seismic-related risks associated with construction activities occurring at the Fillmore Street underpass, particularly in removing the pump station and filling the underpass. The measure below would help minimize any such impacts associated with Alternatives 3 and 3-Consolidated.

With the refined phasing for the Hybrid Alternative/LPA, construction-period impacts to geology and soils described in the Draft EIS/EIR for the corridor as a whole would occur first just in Phase I. These impacts could include very strong ground shaking in the event of an earthquake, slope instability effects, and site-specific liquefaction. During Phase I, no construction work would be anticipated west of Stanyan Street. In Phase II, all construction work, with the exception of bicycle improvements between Masonic and Presidio described above in Subsection 4.15.2.1, would occur west of Stanyan Street. Similar to Phase I, potential impacts during Phase II would include very strong ground shaking, slope instability effects, and site-specific liquefaction.

Based on the foregoing, overall construction impacts of the Hybrid Alternative/LPA would be similar to those described in the Draft EIS/EIR. No new avoidance, minimization, or mitigation measures would be required.

4.15.11.2 | AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

MIN-GE-C1. Shoring will be typically required for all cuts deeper than five feet. Shoring design of open excavations must consider the potential surcharge load from neighboring structures. Furthermore, the potential for lateral movement of excavation walls as a result of earthquake-related surcharge load from nearby structures must also be assessed. The following shoring and slope stability best management practices (BMPs) would be implemented during construction:

- Heavy construction equipment, building materials, excavated soil, and vehicle traffic shall be kept away from the edge of excavations, generally a distance equal to or greater than the depth of the excavation.
- In the event of wet weather, storm runoff shall be prevented from entering the excavation. Excavation sidewalls can be covered with plastic sheeting, and berms can be placed around the perimeter of the excavated areas.
- Sidewalks, slabs, pavement, and utilities adjacent to proposed excavations shall be adequately supported during construction.

4.15.12 | Construction Period Effects - Hazardous Materials

4.15.12.1 | ENVIRONMENTAL CONSEQUENCES

There is a potential to encounter pre-existing hazardous materials during project construction proposed under each build alternative. Construction activities that would occur under the No Build Alternative could also encounter pre-existing hazardous materials, as described in Section 4.8.

Known potential contaminants include naturally-occurring asbestos, aerially deposited lead in median soils, and lead-based paint in streetscape structures, and other hazardous materials. There is also the potential to encounter unknown sources of contamination that are sometimes found in areas of undocumented fill, which is a risk common to construction projects.

Work involving filling the existing Fillmore Street underpass associated with Alternative 3 (Center-Lane BRT with Dual Medians and Passing Lanes) and Alternative 3-Consolidated (Center-Lane BRT with Dual Medians and Consolidated Bus Service) would create a new roadbed, remove part of the existing retaining walls, relocate existing utilities, decommission and possible removal of the existing pump station, and import significant dirt and fill materials. All of these construction activities, including filling, have the potential of encountering hazardous materials and would therefore trigger a requirement to comply with Section 2.4.53(d) of the SFPW Code to ensure that fill materials are clean.

Hazardous materials impacts would occur if construction workers or members of the public were exposed to hazardous materials during excavation, grading, and related construction earthwork activities; therefore, minimization measures for each build alternative to be implemented during project construction are described below.

Additionally, prior to excavation and construction, adherence to hazardous material guidelines for collection; disposal, handling, release, and treatment of hazardous material; site remediation; and worker safety and training would be required. In constructing any of the build alternatives, SFMTA, in consultation with SFDPH, would develop, prescribe, and update such hazardous material guidelines. The guidelines shall require any of the alternatives to comply with all federal, state, and local laws regarding hazardous materials, including the Maher Ordinance.

With the refined phasing for the Hybrid Alternative/LPA, construction-period impacts related to hazards and hazardous materials described in the Draft EIS/EIR for the corridor as a whole would occur first just in Phase I.

Ground-disturbing activities during construction would have the potential to result in exposure to hazardous materials. During Phase I, no construction work would be anticipated west of Stanyan Street; therefore, risk of exposure to hazardous materials would not occur west of Stanyan Street.

During Phase II, all construction work, with the exception of bicycle improvements between Masonic and Presidio described above in Subsection 4.15.2.1, would occur west of Stanyan Street. Phase II construction activities would require a relatively greater level of ground disturbance compared to Phase I. Phase II would disturb existing medians between 27th Avenue and Palm Avenue to construct center-running BRT, which would result in a relatively increased risk exposure risk to hazardous materials, aerially deposited lead in the soil, naturally occurring asbestos, lead, and other environmental concerns compared to construction of side-running BRT in Phase I.

In conclusion, overall construction impacts of the Hybrid Alternative/LPA would be similar to those described in the Draft EIS/EIR. No new avoidance, minimization, or mitigation measures would be required.

4.15.12.2 | AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

The following minimization measures are proposed for implementation prior to project construction to reduce or eliminate hazardous material-related effects:

MIN-HZ-C1. Prior to construction, a limited Preliminary Site Investigation shall be performed to investigate hazardous materials concerns related to soil, groundwater, and construction materials on the Geary corridor, as identified in this section.

Areas where soils will be disturbed during construction shall be sampled and tested for contaminants specific to the hazardous materials concerns identified in that location. Soil analytical results shall be screened against the Regional Water Board's Environmental Screening Levels and other applicable risk-based standards to determine appropriate actions to ensure the protection of construction workers, future site users, and the environment and also be screened against state and federal hazardous waste thresholds to determine soil management options. Representative samples of exposed shallow soils shall be collected within 30 feet of the edge of the roadway and analyzed for total lead and soluble lead. For example, aerially-deposited lead is a potential concern throughout the Geary corridor, while naturally-occurring asbestos is potentially present in only a small portion of the Geary corridor. Accordingly, samples in all areas shall be analyzed for total and soluble lead; samples from excavation areas overlying serpentinite bedrock shall also be analyzed for

asbestos. Additional investigation may be required to fully evaluate potential hazardous materials issues if concerns are identified during the Preliminary Site Investigation. All environmental investigations at the project shall be provided to project contractors, so the findings may be incorporated into their Health and Safety and Hazard Communication Programs.

MIN-HZ-C2. Prior to construction, groundwater shall be collected in areas near reported hazardous materials release sites and analyzed for TPH and volatile organic compounds if project excavations were to extend into the groundwater in those areas. Hazardous materials releases sites that have affected groundwater near the Geary corridor are located at 3675 Geary Boulevard, 450 Mission Street, and 2130 O'Farrell Street.

Additional hazardous materials releases may occur or be discovered in the future. Therefore, an updated review of regulatory agency records shall be conducted prior to the groundwater investigation, to ensure that groundwater that will be encountered during construction is properly investigated.

MIN-HZ-C3. A Hazardous Building Materials survey shall be conducted prior to construction. The survey shall minimally sample traffic paint and structures to be demolished or modified.

MIN-HZ-C4. Based on the findings and recommendations of the Preliminary Site Investigation, the project may need to implement special soil, groundwater, and construction materials management and disposal procedures for hazardous materials, as well as construction worker health and safety measures during construction. In addition to the findings and recommendations of the Preliminary Site Investigation, the following measures shall be implemented prior to construction.

- Groundwater from dewatering of excavations, if any, should be stored in Baker tank(s) during construction activities and the water should be characterized prior to disposal or recycling.
- A construction risk management plan should be implemented by contractors with procedures for identifying and mitigating potentially unreported releases of hazardous materials.

4.15.13 | Construction Period Effects - Hydrology and Water Quality

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

4.15.13.1 | ENVIRONMENTAL CONSEQUENCES

In general, construction would include shallow ground disturbance, earthwork grading, and soil excavation within existing roadway median and sidewalk areas. Alternatives 3 and 3-Consolidated would require the most extensive earthmoving activities due to the filling of the Fillmore underpass, and center median reconstruction activities. The total disturbed soil areas for each alternative would be approximately 5.8 acres for Alternative 2 (Side-Lane BRT), 33.9 acres for Alternative 3 and 3-Consolidated, and 18.2 acres for the Hybrid Alternative/LPA. During construction, soils would be exposed and may be entrained in runoff, resulting in erosion within the Geary corridor and potential sediment runoff into the combined sewer system and associated water quality impacts. BMPs required to be implemented during construction under the Construction General Permit would

apply to all build alternatives and would include measures to prevent soil erosion and entrainment of sediment in stormwater runoff.

With a few exceptions relative to Alternatives 3, 3-Consolidated and the Hybrid Alternative/LPA, generally shallow excavations (approximately five to 10 feet deep) would be required for the installation of physical project features of all of the build alternatives. Such features include bus stop amenities, landscaping features, and related equipment. Based on the groundwater depths presented in Subsection 4.9.2.3, excavation to these relatively shallow depths would be highly unlikely to encounter groundwater.

Alternatives 3 and 3-Consolidated would involve filling the underpass at Fillmore Street, and decommissioning and potentially removing the existing pump station north of Geary Boulevard. These actions would allow groundwater in the immediate vicinity of the pump station to return to its natural elevation. This would result in a beneficial impact to groundwater resources, as the amount of groundwater available for beneficial uses in the study area would increase. However, allowing the groundwater elevation in this area to rise from its current level (approximately 30 feet below ground surface (bgs)) to its natural elevation (14 feet bgs), has the potential to adversely affect underground structures located within two blocks of the pump station at depths greater than 14 feet bgs, such as building basements and utility trenches. Avoidance and mitigation measures are identified in Subsection 4.9.4 that would reduce such impacts to nearby underground structures.

In addition, the potential for chemical releases is common at construction sites. Spilled substances such as fuels, oils, paints, and solvents could be picked up by storm runoff and released into groundwater or carried into the combined sewer system. Subsection 4.15.13.2 describes avoidance and minimization measures intended to reduce the release of pollutants and sediment into the combined sewer system and prevent violation of water quality standards and degradation of groundwater resources. These minimization measures would be required under each proposed build alternatives and under the No Build Alternative. The No Build Alternative would involve substantially less earthwork comparatively.

Preparation and implementation of an SWPPP during project construction would minimize or avoid adverse impacts to water quality. Completion of an SWPPP for the National Pollutant Discharge Elimination System (NPDES) General Permit would be required for construction of each build alternative and for earthwork activities under the No Build Alternative, if applicable. The SWPPP would address water quality impacts associated with construction activities, including identification of all drainage facilities onsite, placement of appropriate stormwater and non-stormwater pollution controls and BMPs, erosion and sediment control, spill response and containment plans, inspection scheduling, maintenance, and training of all construction personnel onsite.

The SWPPP would specify how construction-related stormwater effects would be mitigated throughout the project site through:

- The appropriate treatment of overflow stormwater during construction, including inlet protection devices, temporary silt fencing, soil stabilization measures, street sweeping, stabilized construction entrances, and temporary check dams

- Lining storage areas
- Proper and expeditious disposal of items to be removed, such as landscaping, curb bulb waste, existing bus stop shelters, and demolished overhead contact system support poles/streetlights and signal poles

With the refined phasing for the Hybrid Alternative/LPA, construction-period impacts to hydrology and water quality described in the Draft EIS/EIR for the corridor as a whole would occur first just in Phase I. During this time, no construction work would be anticipated west of Stanyan Street. During Phase II, all construction work, with the exception of bicycle improvements between Masonic and Presidio described above in Subsection 4.15.2.1, would occur west of Stanyan Street. Earthmoving activities during both Phases I and II would have the potential to result in sediment in the combined sewer system and erosion, which could impact water quality; impacts would be minimized or avoided with the SWPPP as described above. Excavation depths in both phases would be unlikely to encounter groundwater.

Based on the foregoing, overall construction impacts of the Hybrid Alternative/LPA would be similar to those described in the Draft EIS/EIR. No new avoidance, minimization, or mitigation measures would be required.

4.15.13.2 | AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

MIN-HY-C1. Any construction work that impacts the combined sewer system would require coordination with SFPUC, and construction-related activities shall be consistent with the SFPUC's *Keep it on Site, Pollution Prevention Guide for the Construction Industry*.[5]

MIN-HY-C2. Alternatives 3 or 3-Consolidated would result in a potentially adverse structural effect to nearby buildings from the raising of the groundwater levels in the vicinity of the Fillmore Street pump station during construction. One of two measures would be implemented to address the adverse effect:

A-HY-C2a. To avoid the effect, maintain existing pumping regime by maintaining the existing pump station north of Geary or similar pump to keep groundwater in the vicinity of the Fillmore Street area at current (unchanged) elevations.

-or-

MM-HY-C2b. To mitigate the effect, prior to the cessation of pumping at the existing pump station, a detailed groundwater study shall be performed by a qualified professional to determine the effects of groundwater rise on potentially affected structures and utilities. The study shall take into account the potential implementation of any project-related LID improvements in the vicinity. If the projected rise in groundwater levels may bring these structures or utilities into contact with groundwater, an evaluation of those structures or utilities shall be performed by a licensed structural engineer. Remedial measures determined to be necessary by the structural engineer, which may include waterproofing of foundations and subterranean walls and/or additional enhancements and performance standards such as underslab drainage or other features to resist increased hydrostatic pressure as a result of the elevated groundwater level, shall be

[5] Available at: http://sfwater.org/modules/showdocument.aspx?documentid=4622.

implemented prior to the cessation of pumping to minimize structural affects to surrounding buildings.

Implementation of this mitigation measure may result in the need for supplemental environmental review once the extent of needed improvements is identified.

4.15.14 | Construction Period Effects - Air Quality

4.15.14.1 | ENVIRONMENTAL CONSEQUENCES

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

Construction activity would generate air emissions from various sources, including equipment engines, truck engines, and earthwork activity. All build alternatives would be required to comply with San Francisco Health Code Article 22B and San Francisco Building Code §106A.3.2.6, which collectively constitute the City's Construction Dust Control Ordinance (adopted in July 2008). Recycled water would be required for use for dust control activities under City Ordinance 175-91. The build alternatives would further be required to comply with Section 6.25 of Chapter 6 of the San Francisco Administrative Code (Clean Construction Ordinance), which requires clean construction practices for all City projects that consist of 20 or more cumulative days of construction. Compliance with these regulations would control fugitive dust emissions and substantially reduce exhaust emissions associated with standard construction equipment.

From an air quality perspective (e.g., equipment use), the majority of construction activity would be similar for the various alternatives. However, construction activity associated with bringing Fillmore Street to grade (Alternatives 3 and 3-Consolidated) would generate the maximum daily emissions as a result of additional truck and equipment activity. Regional construction emissions associated with the build alternatives are presented in Table 4.15-6 for Alternatives 3 and 3-Consolidated, and the Hybrid Alternative/LPA. Table 4.15-6 also includes emissions for Alternative 2, which represents a typical segment that includes fewer truck trips and less equipment activity than needed to bring Fillmore Street to grade level. Accordingly, Alternative 2 is projected to result in lower daily levels of emissions. As shown in Table 4.15-6, each of the build alternatives is projected to generate daily emissions of criteria pollutants below applicable thresholds. Therefore, none of the alternatives would result in an adverse effect regarding construction period emissions.

It is anticipated that highest risk to public health would be associated with bringing Fillmore Street to grade under Alternatives 3 and 3-Consolidated. This segment would experience the highest level of construction intensity in terms of equipment use and truck activity. As shown in Table 4.15-7, construction activity would not generate emissions that would exceed the Bay Area Air Quality Management District (BAAQMD) health-risk significance thresholds. Construction activity associated with Alternative 2 or a typical segment for Alternatives 3 and 3-Consolidated or the Hybrid Alternative/LPA would result in lower risks. Therefore, implementation of the build alternatives would not result in adverse effects related to construction health risk.

Table 4.15-6 Estimated Daily Construction Emissions for all Build Alternatives

CRITERIA POLLUTANT OR OZONE PRECURSOR	POUNDS PER DAY			
	ROG	NOX	PM_{10}	$PM_{2.5}$
Alternative 2				
General Construction Emissions	5	21	1	1
Roadway Striping	3	--	--	--
Regional Significance Threshold	54	54	82	54
Exceed Threshold?	No	No	No	No
Alternative 3				
General Construction Emissions	6	41	1	1
Roadway Striping	3	--	--	--
Regional Significance Threshold	54	54	82	54
Exceed Threshold?	No	No	No	No
Alternative 3-Consolidated				
General Construction Emissions	6	41	1	1
Roadway Striping	3	--	--	--
Regional Significance Threshold	54	54	82	54
Exceed Threshold?	No	No	No	No
Hybrid Alternative/LPA				
General Construction Emissions	6	37	1	1
Roadway Striping	3	--	--	--
Regional Significance Threshold	54	54	82	54
Exceed Threshold?	No	No	No	No

Source: OFFROAD, 2011 and TAHA, 2014

Table 4.15-7 Construction Health Risk Assessment

HEALTH RISK TYPE	UNIT OF MEASUREMENT	FILLMORE STREET	THRESHOLD
Excess Cancer Risk (per million)	Probability per one million population	0.83	10
Chronic Health Risk	Health Index	0.05	1
Acute Health Risk	Health Index	0.40	1
Increase in PM Concentration	Annual Average ($\mu g/m^3$)	0.25	0.3

Source: TAHA, 2014

Asbestos has not been identified in the existing roadway surface that would be removed during the construction process. The use of asbestos in asphalt was discontinued in May 1979; streets comprising the Geary corridor have been demolished and repaved since that date.

As a part of an ongoing study, the U.S. Geological Survey (USGS) identifies and maps reported occurrences of asbestos in the United States.[6] It is not anticipated that construction activity would encounter naturally occurring asbestos. Moreover, the City's Construction Dust Control Ordinance would effectively control

[6] USGS. 2011. Van Gosen, B.S., and Clinkenbeard, J.P. California Geological Survey Map Sheet 59. Reported Historic Asbestos Mines, Historic Asbestos Prospects, and Other Natural Occurrences of Asbestos in California. Open - File Report 2011 - 1188 Website: http://pubs.usgs.gov/of/2011/1188/. Last Accessed 10/15/2014.

unanticipated naturally occurring asbestos exposure through a variety of required control measures including watering.[7]

Therefore, the only components of the build alternatives to potentially involve exposure of asbestos would be the demolition of the pedestrian bridges at Webster Street (Alternatives 2, 3, and 3-Consolidated only) and Steiner Street (all build alternatives); in addition, Alternatives 3 and 3-Consolidated would decommission an existing below-grade pump station, including removal of a portion of its structure which could contain asbestos.

Accordingly, construction contractors shall comply with BAAQMD Regulation 11 (Hazardous Pollutants) Rule 2 (Asbestos Demolition, Renovation, and Manufacturing). The requirements for demolition activities include removal standards, reporting requirements, and mandatory monitoring and record keeping.

Equipment exhaust and paving activities would result in odor emissions for each of the build alternatives. Odors would be localized and generally confined to the construction area. Each build alternative would utilize typical construction techniques, and the odors would be typical of most construction sites and temporary in nature. Construction activity would not cause an odor nuisance, and construction odors would not result in any adverse impacts for any of the build alternatives.

With the refined phasing for the Hybrid Alternative/LPA, construction-period impacts to air quality described in the Draft EIS/EIR for the corridor as a whole would occur first just in Phase I). During this time, no construction work would be anticipated west of Stanyan Street. Construction activities during Phase I would generate greenhouse gas and fugitive dust emissions from various sources, including equipment engines, truck engines, and earthwork activity.

During Phase II, all construction work, with the exception of bicycle improvements between Masonic and Presidio described above in Subsection 4.15.2.1, would occur west of Stanyan Street. Accordingly, localized air quality impacts would occur primarily east of Stanyan Street in Phase I and west of Stanyan in Phase II. These impacts would generally be the same as those described for Phase I, though could occur to a greater degree in Phase II due to more intensive construction activities associated with median removal.

Based on the foregoing, overall construction impacts of the Hybrid Alternative/LPA would be similar to those described in the Draft EIS/EIR. No new avoidance, minimization, or mitigation measures would be required.

4.15.14.2 | AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

With adherence to City ordinances and regulations regarding construction, such as the Construction Dust Control Ordinance, none of the alternatives would result in any adverse effects during construction related to emissions of air pollutants and

[7] According to the USGS Survey Map for Asbestos in California, the following areas in the County of San Francisco have been identified with asbestos occurrence:
1) U.S. Mint area, located 1 mile to the south of the Geary corridor; 2) Potrero Hill area, located 2 miles to the south of the Geary corridor; 3) Fort Point-Presidio area, located 2 mile to the northwest of the Geary corridor; and 4) Hunter Points Area, located approximately 5 miles to the southwest of the Geary corridor.

greenhouse gases. Therefore, no additional construction-period avoidance, minimization, or mitigation measures would be necessary.

4.15.15 | Construction Period Effects - Noise and Vibration

4.15.15.1 | ENVIRONMENTAL CONSEQUENCES

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

Noise: As shown in Table 4.15-8, construction equipment noise (from jackhammers and dump truck activity) would exceed 80 dBA at 100 feet. With adherence to the San Francisco Noise Ordinance, which includes limiting the noise levels from individual pieces of construction equipment to 80 dBA at a distance of 100 feet, equipping impact tools with both intake and exhaust mufflers, and obtaining a noise permit for night work from San Francisco Public Works (SFPW), temporary construction noise effects would not be adverse. Additionally, some construction-related activities have potential to result in disturbance and annoyance effects on nearby sensitive receptors. To this end, minimization measures are incorporated herein to provide for noise monitoring throughout construction as well as the implementation of additional sound-attenuating measures (including but not limited to sound walls, management of truck routes, etc.) that are necessary to address potential adverse effects.

Each of the build alternatives includes demolition and removal of one or both of the pedestrian bridges at Webster and Steiner Streets, including all above- and below-ground bridge components. The bridge at Webster Street (proposed for removal under Alternatives 2, 3, and 3-Consolidated) is located as close as 15 feet to residential uses; the bridge at Steiner Street is proposed for removal under all of the build alternatives and is located approximately 60 feet from residences.

Table 4.15-8 Typical Noise Levels From Construction Equipment

	NOISE LEVEL (DBA)	
NOISE SOURCE	50 FEET	100 FEET
Air Compressor	81	75
Back Hoe	80	74
Compactor	82	76
Concrete Mixer	85	79
Concrete Pump	82	76
Crane Mobile	83	77
Concrete Vibrator	76	70
Drill Rig Truck	79	76
Dump Truck	88	82
Generator	81	75
Jackhammer	88	82
Loader	85	79
Paver	77	71
Pneumatic Tool	85	79
Roller	74	68
Saw	76	70

Source: Federal Transit Administration, 2006

Bridge demolition and removal would expose these residential uses to temporary noise increases during active demolition. The primary source of noise associated with bridge removal would be from jackhammers and similar impact equipment. Jackhammers generate a noise level of approximately 88 dBA at 50 feet, or 82 dBA at 100 feet. Section 2907(b) of the San Francisco Police Code states that it shall be unlawful for any person to operate any powered construction equipment if the operation of such equipment emits noise level above 80 dBA when measured at a distance of 100 feet from such equipment. However, this provision is not applicable to impact tools and equipment fitted with intake and exhaust mufflers recommended by the manufacturers and approved by the Director of Public Works or the Director of Building Inspection as best accomplishing maximum noise attenuation. In addition, pavement breakers and jackhammers are required to be equipped with acoustically attenuating shields or shrouds recommended by the manufacturers and approved by the Director of Public Works or the Director of Building Inspection as best accomplishing maximum noise attenuation. With adherence to the San Francisco Noise Control Ordinance the temporary construction noise generated would not result in any adverse effects.

With the construction of Alternatives 3 and 3-Consolidated, the focus of construction activity would occur in the center of the right-of-way, where the new bus-only lanes would be located. This activity would be further from sensitive receptors compared to Alternative 2, which would construct bus-only lanes closer to the edge of the street. The Hybrid Alternative/LPA consists of different components from Alternatives 2, 3, and 3-Consolidated, thus the focus of construction activity would not be concentrated in one particular section of the street right-of-way. Therefore, the Hybrid Alternative/LPA would be represented by the range of construction activity covered between the other three build alternatives.

All build alternatives may result in noise levels in excess of 80 dBA at 100 feet due to removal of pedestrian bridges at Webster and/or Steiner Streets. Given that the Hybrid Alternative/LPA only proposes to remove the pedestrian bridge at Steiner Street, construction-period noise impacts would be slightly reduced, especially in the vicinity of the Webster Street bridge, relative to the other build alternatives. However, with adherence to the aforementioned provisions of the San Francisco Noise Ordinance, these temporary construction noise effects would not be adverse.

Vibration: Vibration effects from equipment used during installation of right-of-way improvements as well as associated utility relocation/demolition activities could potentially cause physical damage or alteration to historic properties, affect existing underground infrastructure, or cause annoyance among nearby sensitive receptors.

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

Historic properties are typically considered more sensitive to vibration owing to their construction methods, ornamentation, age, fragility, or other factors. Table 4.15-9 shows the distances at which vibration impacts would be projected to occur by vibration level and historic building type.

As shown in Table 4.15-9, the most sensitive buildings are potentially susceptible to vibration-related effects at peak-particle velocities (PPV) of 0.12 inches per second. Vibratory rollers, commonly used in road building, have a PPV of 0.21 inches per second. Per Table 4.15-9, vibratory rollers could have adverse effects on "Class III" historic properties when used at a distance of 25 feet; "Class IV" properties, generally the most susceptible to vibration, could be adversely affected by vibratory

roller use at a distance of 36 feet. In comparison, other typical vibration-causing equipment, like a jackhammer, would have somewhat lower potential to affect historic properties. As shown in Table 4.15-9, jackhammers would have adverse effects if used within 11 feet of a Class IV property or 7 feet of a Class III property.

Table 4.15-9 Vibration Velocities for Construction Equipment

EQUIPMENT	PPV AT 25 FEET (INCHES/SECOND)	IMPACT DISTANCE FOR BUILDING CATEGORY, (FT)			
		I	II	III	IV
Vibratory Roller	0.210	14	19	25	36
Hoe Ram	0.089	7	11	14	20
Large Bulldozer	0.089	7	11	14	20
Jackhammer	0.035	4	5	7	11
Loaded Trucks	0.076	7	10	13	18
Small Bulldozer	0.003	1	1	2	2

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, May 2006

There are approximately 53 historical properties along the Geary corridor in proximity of which construction work and thus potential attendant vibration would occur. Since Alternative 2 construction would be focused on side-running lanes, which would be less than 36 feet from most buildings fronting on the Geary corridor, there is potential for an adverse effect to the historic properties along the Geary corridor. However, adherence to minimization measures incorporated herein would avoid or lessen any such effects such that no adverse effect would be expected to occur. Minimization includes employing site-specific, low-vibration construction methods near sensitive resources.

In addition, construction vibration could potentially affect existing SFPUC infrastructure within the project's area of influence, including subsurface brick sewers that are concentrated in the northern and eastern parts of the City.[8] However, prior to construction within the public right-of-way, SFMTA is required to obtain permits from SFPW in accordance with Article 2.4 of the Public Works Code. As part of the plan check process, SFPUC, the agency responsible for maintaining the City's sewer system, reviews the plans. If SFPUC determines that the proposed construction work may damage the older brick sewers, SFPW may impose specific conditions as part of the permit process to eliminate the potential for damage. Adherence to such conditions imposed pursuant to Article 2.4 would avoid or minimize any such potential adverse effects to brick sewers.

Potential annoyance related to vibration would be addressed through a minimization measure incorporated herein. Specifically, the project construction plan would include a program for accepting and addressing noise and construction-related complaints. Contact information for the Project Manager, Resident Engineer, and Contractor would be posted on site, with direction to call if there are any concerns. Complaints would be logged and tracked to ensure they are addressed.

With the refined phasing for the Hybrid Alternative/LPA, construction-period noise and vibration impacts described in the Draft EIS/EIR for the corridor as a whole would occur first just in Phase I. Localized noise and vibration impacts would occur east of Stanyan Street in Phase I. These would include temporary, intermittent

[8]City and County of San Francisco. (2010). 2030 Sewer System Master Plan Task 500 Technical Memorandum NO. 506 Collection System Rehabilitation Program.

increases in ambient noise and vibration levels. Demolition and removal of the Steiner Street bridge during Phase I would expose sensitive receptors to temporary noise and vibration increases during active demolition, primarily from jackhammers and similar impact equipment. During Phase I, no construction work would be anticipated west of Stanyan Street; therefore, construction-related noise impacts would not occur west of Stanyan Street during Phase I.

During Phase II, all construction work, with the exception of bicycle improvements between Masonic and Presidio described above in Subsection 4.15.2.1, would occur west of Stanyan Street. Accordingly, localized noise and vibration impacts would occur primarily west of Stanyan Street in Phase II. Because Phase II would entail construction of bus-only lanes and medians in the center of Geary, rather than on the sides as in Phase I, construction noise sources would be at a slightly greater distance from sensitive receptors along the corridor.

Based on the foregoing, overall construction impacts of the Hybrid Alternative/LPA would be similar to those described in the Draft EIS/EIR. No new avoidance, minimization, or mitigation measures would be required.

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

4.15.15.2 | AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

MIN-NOISE-CI. A Vibration Reduction and Minimization Plan shall be developed to avoid construction vibration damage using all reasonable and feasible means available. The Plan shall provide a procedure for establishing thresholds and limiting vibration values for structures with a potential to be adversely affected. The following steps shall be taken in development of the location-specific vibration reduction plan:

- Potential vibration-sensitive structures shall be identified using the distance impact thresholds in the final engineering drawings.
- Vibration-sensitive structures shall be individually assessed to identify each structure's ability to withstand the loads and displacements due to construction vibrations.
- Construction related vibration in proximity to identified vibration-sensitive historic structures shall not be allowed to exceed the recommended levels set forth in pertinent FTA guidance.
- Peak particle velocities shall be monitored and recorded near sensitive receptors identified where the highest vibration producing activities would occur.
- Rubber-tired instead of tracked vehicles shall be used near vibration sensitive areas.
- Pavement breaking shall be prohibited during nighttime hours.
- Residents within 300 feet of areas where construction activities and pavement breaking would take place shall be notified at least two weeks in advance of the proposed activity through the media and mail. A program shall be implemented to receive and respond to public complaints regarding vibration during construction.

MIN-NOISE-C2. Project construction shall implement best practices in equipment noise control, including the following:

- Use newer equipment with improved noise muffling and ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational. Newer equipment would generally be quieter in operation than older equipment. All construction equipment should be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding).
- Perform all construction in a manner that minimizes noise. Utilize construction methods or equipment that would provide the lowest level of noise impact.
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes.
- Impact tools and equipment, such as jackhammers, shall have intake exhaust mufflers and acoustically attenuating shields or shrouds recommended by the manufacturers and approved by the Director of Public Works or the Director of Building Inspection.

MIN-NOISE-C3. Project construction would conduct truck loading, unloading, and hauling operations so that noise and vibration are kept to a minimum by carefully selecting routes to avoid passing through residential neighborhoods to the greatest possible extent.

MIN-NOISE-C4. Perform independent noise monitoring in sensitive areas, as needed, to demonstrate compliance with applicable noise limits. Require contractors to modify and/or reschedule their construction activities if monitoring determines that maximum limits are exceeded at residential land uses per the City Noise Ordinance.

MIN-NOISE-C5. Temporary sound walls, curtains, or other noise canceling technologies may be used in locations where sensitive receptors could experience construction-related noise exceedances.

4.15.16 | Construction Period Effects - Biological Resources

4.15.16.1 | ENVIRONMENTAL CONSEQUENCES

Given that the Geary corridor is located entirely within an urban (developed) environment with little or no indigenous vegetation, it is unlikely that any sensitive or special-status species would be impacted by any of the build alternatives, as well as by the No Build Alternative. Furthermore, no species of concern or special-status plant species are known to occur within the Geary corridor. However, the study area does include trees that could host birds, nests, and eggs which are protected by the MBTA.

Construction period effects and avoidance, minimization, and mitigation measures discussed throughout this section are identical to those discussed throughout sections 4.1 through 4.14

Potential adverse effects to biological resources associated with project construction are expected to be limited to:

- Trees protected under the Urban Forestry Ordinance
- Birds, their nests, and eggs as protected under the MBTA
- Potential for introduction or increases in noxious weeds associated with ground disturbance activities, as considered under Executive Order 13112

Mature trees shall be preserved and incorporated into the project landscape plan where space permits. Nonetheless, all of the build alternatives would require removal of mature trees and potential work within tree drip lines.

With the refined phasing for the Hybrid Alternative/LPA, construction-period impacts to biological resources described in the Draft EIS/EIR for the corridor as a whole would occur first just in Phase I). During this time, no construction work would be anticipated west of Stanyan Street. During Phase II, all construction work, with the exception of bicycle improvements between Masonic and Presidio described above in Subsection 4.15.2.1, would occur west of Stanyan Street. Up to approximately 70 trees would be removed in Phase I and approximately 110 trees would be removed in Phase II. Phase II also includes median removal from Palm Avenue to 27th/28th and new planting and thus the potential introduction of noxious weeds/invasive species as disclosed in the Draft EIS/EIR.

Based on the foregoing, overall construction impacts of the Hybrid Alternative/LPA would be similar to those described in the Draft EIS/EIR. No new avoidance, minimization, or mitigation measures would be required.

4.15.16.2 | AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

The following minimization measures are proposed to offset potential biological resource impacts during construction resulting from the build alternatives:

MIN-BO-C1. Mature trees shall be preserved and incorporated into the project landscape plan as feasible, as well as the planting of replacement trees and landscaping. For each tree removed, a replacement tree is required.

MIN-BO-C2. To preclude potential effects under the MBTA, tree removal shall occur outside nesting bird season (February 1 through August 31). Regardless of time of year, preconstruction surveys shall be performed prior to tree removal to determine occurrence of nesting birds. If active protected bird nests are encountered during preconstruction surveys, no-disturbance buffers would be created around active protected bird and/or raptor nests during the breeding season, or until it is determined that all young have fledged. Typical buffers include 500 feet for raptors and 50 feet for passerine nesting birds. The size of the buffer zones and types of construction activities restricted in these areas may be further modified during consultation with CDFW, and shall be based on existing noise and human disturbance levels at the project site. Nests initiated during are presumed to be unaffected, and no buffer will be necessary. The "take" of any individual protected birds shall be prohibited. Monitoring of active nests when construction activities encroach upon established buffers may be required by CDFW.

MIN-BO-C3. Seed palettes used for revegetation of disturbed areas shall be reviewed to prevent introduction of invasive species to the site. Follow-up site maintenance shall include a protocol for landscaping staff to recognize weeds and perform maintenance in a manner that prevents weed establishment.

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4.16 Irreversible and Irretrievable Commitment of Resources

Uses of nonrenewable resources (including but not limited to fossil fuels, human labor, and construction materials) in the construction and/or operational phases of a project could be considered *irreversible*. This is because once such resources are committed to a project, removal or reuse of the resource is unlikely.

Implementation of the any of the build alternatives would involve the use of some nonrenewable resources. Construction and operation of any of the build alternatives would require consumption of fossil fuels, labor, and construction materials. These expenditures would be, for the most part, irrecoverable. However, such resources are not considered to be in short supply, and their use would not have an adverse effect upon continued availability of these resources to other projects. Moreover, the project would accommodate a greater number of transit trips into the future and would thus provide more efficient use of fossil fuels than if these trips were to be taken in private automobiles. Additionally, all project alternatives would upgrade the existing bus fleet from a mix of diesel motor coaches to diesel hybrid motor coaches, which are more fuel efficient. (The build alternatives would add a larger complement of such new vehicles to better serve anticipated ridership increases associated with the build alternatives).

Any construction would also require a substantial one-time expenditure of federal and local funds. These funds have been planned or programmed, as explained in Chapter 9 (Financial Analysis). The capital cost of BRT elements and related improvements of the project are estimated to cost between $170 and $435 million. The capital cost of the Hybrid Alternative/LPA is $300 million. Total capital costs are in year of expenditure (YOE). SFCTA has identified a portion of the capital funding that is anticipated to be needed to construct core components of the alternatives.

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4.17 Relationship between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Each of the build alternatives and the No Build Alternative involves construction of public infrastructure improvements. Construction of these improvements would involve short-term uses of the environment via the use of fuels and construction materials as well as through temporary increases in noise levels and air pollutants. For the build alternatives, these short-term effects and uses of resources would result in demonstrable long-term benefits, such as improved transit travel times and increases in transit ridership. These projected travel time savings would allow the San Francisco Municipal Transportation Agency (SFMTA) to use fewer buses while providing similar or greater service frequencies, ultimately leading to potential savings in operating costs.

Other long-term benefits to air quality, noise, and energy demand would result from an anticipated reduction in auto use in favor of bus use. Each of the build alternatives is expected to reduce emissions of several air pollutants, including nitrogen oxides, particulate matter, carbon dioxide, and greenhouse gases. These improvements would contribute to the long-term livability and, therefore, productivity of the Geary corridor.

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CHAPTER 5.0 CUMULATIVE IMPACTS

5.1 Regulatory Setting

5.1.1 | Federal Regulations

The Council on Environmental Quality (CEQ)'s National Environmental Policy Act (NEPA) NEPA implementing regulations define cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts may result from individually minor but collectively significant actions taking place over a period of time.

A cumulative impact includes the total effect on a natural resource, ecosystem, or human community that is attributable to past, present, or reasonably foreseeable future activities/actions of federal, nonfederal, public, or private entities. Reasonably foreseeable actions are those that are likely to occur or probable, rather than those that are merely possible (40 CFR 1508.7). Cumulative impacts may also include the effects of natural processes and events, depending on the specific resource in question.

Cumulative impacts include the total of all impacts on a particular resource that have occurred, are occurring, and will likely occur as a result of any action or influence, including the direct and indirect effects of a federal activity. Accordingly, there may be different levels of cumulative impacts on different environmental resources.

5.1.2 | State Regulations

The California Environmental Quality Act (CEQA) defines cumulative impacts as "two or more individual effects which, when considered together are considerable," and suggests that cumulative impacts may "result from individually minor but collectively significant projects taking place over a period of time" (CEQA Guidelines Section 15355(b)). A project can have environmental effects that are individually limited but cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probably future projects (CEQA Guidelines Section 15065 (a)(3)). CEQA regulations were considered in the Draft EIS/EIR and the Final EIR but are not applicable to this Final EIS.

5.2 Methodology

The cumulative methodology for this Final Environmental Impact Statement (EIS) was based on a review of guidance from the Council on Environmental Quality[1] and the U.S. Environmental Protection Agency[2]. This methodology is based on the following procedural steps.

- Identify resources to be analyzed
- Define the geographic study area for each resource
- Describe existing conditions and historical context for each resource
- Identify direct and indirect impacts of the proposed project
- Identify other reasonably foreseeable actions that affect each resource
- Assess potential cumulative impacts
- Report results and assess the need for mitigation

DEFINITIONS

Direct Effect: a direct effect is caused by the action and occurs at the same time and place (40 CFR § 1508.8)

Indirect Effect: an indirect effect is caused by the action and occurs later in time or farther removed in proximity, but is still reasonably foreseeable (40 CFR § 1508.8)

Cumulative Impact: is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (40 CFR § 1508.7)

Note that this chapter considers the potential cumulative effects of all of the build alternatives. In addition, each topic area includes new analysis of the potential for the six minor modifications to the Hybrid Alternative/Locally Preferred Alternative (LPA), which are described in Section 2.2.7.5, to result in any change to the cumulative impacts presented in the Draft EIS/Environmental Impact Report (EIR).

5.3 Historical Context and Past Projects

The Historic Resources Inventory and Evaluation Report prepared for the project summarizes the historical development of Geary Boulevard. The Geary corridor has seen substantial urban development along its entire length since becoming a major arterial roadway in 1861. Today, the Geary corridor is fully urbanized with no areas of critical biological habitat, wetlands, or other natural features.

Over the past several decades, the Geary corridor has experienced a steady series of alterations to the road's streetscape elements, including ongoing alterations to the sidewalks, streetlights, fire hydrants, and underlying water, sewer, electrical, and other infrastructure. These types of past streetscape improvement projects continue to be planned and implemented along the corridor, as further described in Section 5.4.

A significant past project that occurred along the Geary corridor was the widening of Geary in 1960 through the Fillmore District as part of a larger program of redevelopment efforts. The widening of Geary to an eight-lane expressway through this area followed the acquisition and demolition of numerous Fillmore District

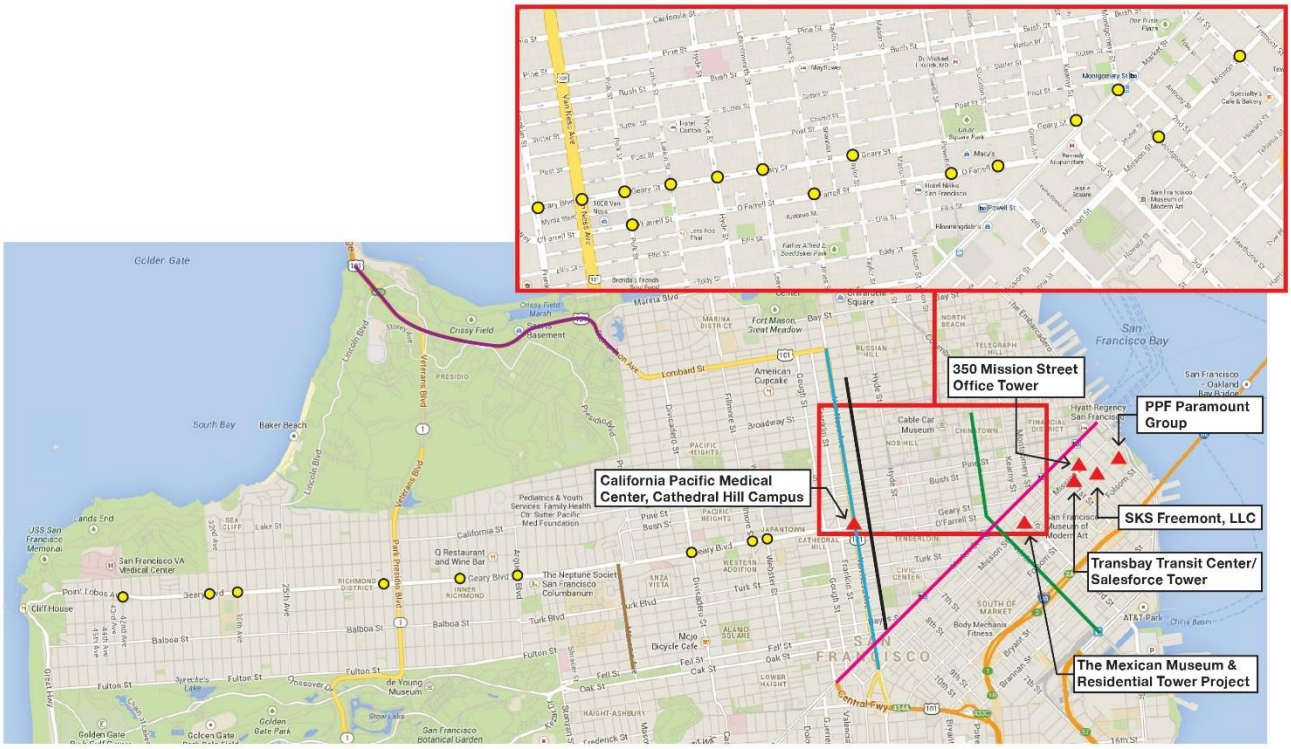
[1] Council on Environmental Quality. 1997. *Considering Cumulative Impacts Under the National Environmental Policy Act*.
[2] U.S. Environmental Protection Agency - Pacific Southwest Region 9 - *National Environmental Policy Act*.

homes and businesses, many of which were owned and/or occupied by African-Americans.[3,4]

5.4 Reasonably Foreseeable Projects

The build alternatives encompass a large section of a major San Francisco thoroughfare that crosses the City. The City anticipates a number of transportation improvement and development projects to be implemented within the vicinity of the Geary corridor. Although not exhaustive, the list of projects in Table 4.3-3 is representative of the foreseeable transportation, development, and infrastructure improvement projects within the general vicinity of the Geary corridor and thus considered in this cumulative analysis. Figure 5-1 shows the locations of several of these projects that would be constructed in the immediate vicinity of the Geary corridor. In addition to the above projects that would offer new or improved infrastructure, infrastructure maintenance activities were also taken into consideration. As described in Section 2.8.1.2, these include but are not limited to such periodic efforts typical of a complex urban environment like San Francisco, such as roadway resurfacing, and replacement/repair of water, combined sewer/storm drain, and similar infrastructure.

Figure 5-1 Locations of Reasonably Foreseeable Projects within General Vicinity of the Geary Corridor



5.5 Environmental Areas with Beneficial or No Adverse Cumulative Effects

The following environmental areas would not be subject to adverse cumulative effects, based on consideration of the nature of the No Build and build alternatives, the project setting, the impact analysis findings, and the characteristics of other reasonably foreseeable projects within the project vicinity.

5.5.1 | Transit

The transit conditions cumulative case analysis includes transit operations on the Geary corridor and immediately adjacent roadways. The San Francisco Municipal Transportation Agency (SFMTA) operates four Muni bus routes on the Geary corridor that provide connections to both local and regional transit services. Additionally, Golden Gate Transit serves the Geary corridor with passenger services to Marin, Sonoma, and Contra Costa counties. Several private shuttles, mostly institutionally based, operate private shuttle services within the Geary corridor as well.

As discussed in Section 3.3 (Transit Conditions), implementation of the build alternatives would improve bus speeds, passenger access, and overall system reliability while reducing travel times relative to what would occur with the No Build Alternative.

By 2035, population and employment trends are anticipated to increase by 20 percent and 40 percent, respectively. As a result, transit passenger demand citywide will likely increase due to densification of land uses.

Other planned projects within the vicinity of the Geary corridor were assessed in modeling scenarios. Such projects include four new traffic signals, Van Ness bus rapid transit (BRT), Central Subway, and the Presidio Parkway project, among others. The eventual operation of several of these other planned and programmed projects would also either directly expand public transportation opportunities or otherwise improve transit movement, resulting in improved access and mobility for transit riders.

Construction of the other transportation, development, and infrastructure projects could overlap with construction of any of the build alternatives. Some potential construction related effects include potential interruptions in traffic lane usage for buses, temporary bus station relocation, and crosswalk detours. However, given that other planned projects' limits generally do not overlap geographically with the build alternatives, except at spot locations, transit service would not be substantially interrupted such that construction of the various projects together would combine into a cumulative effect on transit conditions during construction.

As any of the build alternatives would result in improved transit access and mobility, no cumulative operational impacts would be anticipated.

5.5.1.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: Of the six modifications, only two could increase construction-related transit disruptions. The addition of BRT stops at Laguna Street would increase construction-related transit disruptions, such as temporary detours and bus stop relocations, for two to three weeks in and around the Geary Boulevard/Laguna Street vicinity. Similarly, the addition of 26 new pedestrian crossing bulbs would extend construction by four to six days at the intersections where they would be installed. The other modifications would not increase the level of construction activities needed to implement the Hybrid Alternative/LPA. Given the relatively brief duration of these incremental additions to overall construction activities, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative transit effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects on transit conditions during construction.

Operation: Taken together, retention of existing local and Express stops between Spruce and Cook streets in lieu of adding BRT stops, the addition of BRT stops at Laguna Street, and the retention of existing bus stops at Collins Street, and retention of the Webster Street bridge would diminish the transit travel time savings (i.e. lessen the benefit) of the Hybrid Alternative/LPA by less than one minute in each direction, as described in Section 3.3.4.1. Specifically, the 38 Geary local service travel time savings would be reduced by 16 seconds in the eastbound direction and 36 seconds in the westbound direction. BRT service travel time savings would be reduced by 12 seconds in the eastbound direction and 9 seconds in the westbound direction. Overall, the Hybrid Alternative/LPA would still reduce transit travel times and improve transit access and mobility compared with the No Build Alternative. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative transit effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects on transit during operation.

5.5.2 | Pedestrian and Bicycle Transportation

The cumulative analysis area for pedestrian and bicycle conditions encompasses the entire Geary Transportation Study Area as shown in Figure 3.2-1.

Several portions of the Geary corridor see relatively high volumes of pedestrian activity, particularly in proximity to commercial areas and other activity centers. Many intersections within the Geary corridor have relatively long pedestrian crossing distances or include signals that do not have pedestrian countdown signals. Two existing pedestrian bridges (over Geary Boulevard at Webster and Steiner streets) do not comply with the Americans with Disabilities Act and are otherwise considered substandard. The Geary corridor does not have separated bicycle lanes; bicyclists must share mixed-use lanes with general traffic or use bike facilities on streets parallel to Geary.

During construction, any of the build alternatives would be implemented through a project construction plan (PCP) and would also be subject to minimization measures (including MIN-UT-1 and MIN-UT-4) and City coordination requirements that together would minimize overlapping construction schedules between the project

and other foreseeable planned projects within the Geary corridor. Because of the required implementation of the PCP, any adverse impacts associated with pedestrian and bicycle traffic would not be elevated to a cumulatively considerable level during construction.

Each of the build alternatives would improve multimodal travel by providing pedestrians with enhanced facilities, such as new crossings/new pedestrian crossing bulbs, new countdown signals, and a Class II bikeway connection across one block of Geary Boulevard (between Masonic and Presidio avenues). While Alternatives 2, 3, and 3-Consolidated would remove both the Webster and Steiner street pedestrian bridges, both locations would see substantially enhanced ground-level crossings, providing accessible crossings for people with disabilities that the pedestrian bridges do not afford.

Collectively, these build alternative improvements would enhance pedestrian conditions along the Geary corridor, as well as bicycle conditions between Masonic and Presidio Avenues and are thus projected to increase pedestrian use and modestly increase bicycle use relative to levels without the proposed improvements.

The pedestrian and bicycle improvements associated with the build alternatives would help offset projected increases in average walking distances to bus stops associated with the consolidation of bus service contemplated by the build alternatives.

Overall, since implementation of the build alternatives would result in benefits to bicycle and pedestrian travel, the project would not contribute to any cumulative effect related to pedestrian and bicycle transportation.

5.5.2.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: Of the six modifications, the addition of BRT stops at Laguna Street would increase construction-related disruptions to pedestrians and bicyclists, such as temporary sidewalk and bicycle lane closures and detours, for a period of two to three weeks in and around the Geary Boulevard/Laguna Street vicinity. The addition of 26 new pedestrian crossing bulbs would extend construction by four to six days at the intersections where they would be installed. The other modifications would not increase the level of construction activities needed to implement the Hybrid Alternative/LPA. Given the relatively brief duration of these incremental additions to overall construction activities, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative pedestrian and bicycle effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects on pedestrian or bicycle access during construction.

Operation: As demonstrated in Section 3.6.4.1, each of the six modifications would result in either beneficial changes or no substantive changes to the Hybrid Alternative/LPA's operational-period effects on pedestrian and bicycle circulation. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative pedestrian and bicycle circulation effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects on pedestrian or bicycle circulation during operation.

5.5.3 | Parking and Loading

The parking and loading cumulative effects analysis area includes parking facilities within the Geary corridor and immediately adjacent roadways. The Geary corridor provides a diverse supply of on-street parking, including metered and unmetered general parking spaces, residential parking permit zones, commercial and passenger loading zones, and parking spaces for persons with disabilities. Corridorwide analysis is an appropriate geography for considering potential cumulative effects to parking and loading so as to best capture potential effects of other transportation and development projects.

While each build alternative would require the removal of some on-street parking spaces, Section 3.6.4 further notes that none of the build alternatives would result in any adverse effects related to changes in parking or loading with adherence to several improvement and avoidance measures. These measures would be applied throughout project final design to minimize the removal of parking spaces and therefore, any secondary effects that could result from parking space removal.

Neither NEPA nor the guidance of the Environmental Planning Division of the San Francisco Planning Department identifies the loss of parking spaces, in and of itself, as a significant effect on the environment. However, if a single project or group of projects were to singly or collectively result in such a decrease in parking availability that secondary effects like worsened traffic or worsened air quality emissions could occur, then loss of parking could indirectly result in a physical environmental effect and/or contribute considerably to a cumulative physical environmental effect.

Parking and Loading Demand: None of the build alternatives are expected to increase parking or loading demand, given the transit-related nature and existing urbanized context of the build alternatives. Any of the build alternatives would help complete the planned Citywide BRT[5] and SFMTA Rapid Network. Each would provide improved pedestrian amenities along the Geary corridor. Accordingly, these improvements would reduce parking demand along the corridor by encouraging use of other travel modes, offsetting changes in supply.

While other land development projects could increase parking demand, these developments are largely proposed in neighborhoods east of Gough Street, which are transit-rich areas that also features extensive off-street parking garages and facilities. Moreover, other transit development projects, like the Central Subway and Van Ness BRT would reduce vehicle miles traveled (VMT) and thus reduce demand for parking by providing higher quality transit service. No major development projects are anticipated for the Geary corridor west of Gough Street that would result in substantial losses of parking or increases in parking demand.

Parking and Loading Supply: As described in Section 3.6.4 of this document, implementation of any of the build alternatives would be expected to result in reductions of areawide parking supply, ranging from 2 percent to 4 percent of available on- and off-street spaces in the Geary corridor, including side streets to the north and south (see Figure 3.6-1 for the area-wide parking study area). Loading spaces would be reduced by less than 1 percent.

[5] See Section 1.4, Planning Context

Temporary conversion of parking lanes to mixed-flow travel lanes during construction would result in temporary removal of on-street parking in those areas. Parking areas within active construction zones would be relocated as close to the construction zone as is practical. While this may cause temporary inconveniences, temporary parking restrictions during construction would be short in duration and are a common aspect of the urban environment, thus would not contribute to cumulative parking impacts.

In terms of removing publicly available parking spaces, the build alternatives' anticipated reduction in parking spaces combined with other known projects, would not create a substantial parking deficit. On-corridor parking space loss would range from 13 percent under Alternative 3-Consolidated and 27 percent under Alternative 2; however, as Section 3.6 demonstrates, parking loss under any of the build alternatives would be a small percentage of the nearby supply, ranging from a decrease in areawide public parking supply of 2 percent to 4 percent. In the neighborhoods where on-street parking losses would be greatest (near Masonic Avenue and Fillmore Street), enough capacity exists in the surrounding areas to accommodate parking demand at peak times. The build alternatives would also have minimal change to loading supply, largely relocating/consolidating loading spaces to minimize any project-related changes.

The Masonic Avenue Streetscape Improvement Project removed 13 parking spaces along Masonic Avenue between Geary Boulevard and Anza Street. Removal of these 13 spaces is in addition to those anticipated to be removed as a result of any of the build alternatives (as discussed in Section 3.6). This removal would occur in an area with substantial off-street public parking serving the commercial uses at the corner of Masonic Avenue and Geary Boulevard.

Implementation of several other foreseeable projects, including the California Pacific Medical Center (CPMC), Van Ness Avenue BRT, the Polk Street Improvement Project, WalkFirst, etc., would potentially result in additional loss of parking within the study area. However, once all of the foreseeable projects within the general vicinity of the Geary corridor are completed, area residents and the public at large would have improved pedestrian networks and transit systems for daily commuting and commerce compared to existing conditions.

This document includes several measures that would either avoid any adverse parking/loading effects or would require that various improvement/best practice measures be followed to limit the potential for loss of parking spaces. Cumulative effects related to traffic are described below in this chapter; no adverse cumulative effects to air quality are anticipated based on modeling of future cumulative case traffic.

Conclusion: Because the project is a transit project that would increase transit ridership and divert some auto trips to transit and pedestrian trips, thereby decreasing parking demand, none of the build alternatives would contribute to an increase in parking demand, though they would contribute to a small reduction in on-street parking supply. Other planned projects may increase parking demand east of Gough Street, and may decrease parking supply throughout the corridor. However, because the reduction in on-street spaces is small in context of the corridor supply and the amount of parking removal planned for other projects, the

build alternatives would not result in any adverse cumulative effects to parking or loading supply.

5.5.3.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: Of the six modifications, the addition of BRT stops at Laguna Street would increase construction-related temporary parking and loading zone removals for a period of two to three weeks. The addition of 26 new pedestrian crossing bulbs would extend construction by four to six days at the intersections where they would be installed. The other modifications would not increase the level of construction activities needed to implement the Hybrid Alternative/LPA. Given the relatively brief duration of these incremental additions to overall construction activities, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative parking and loading effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects on parking and loading supply during construction.

Operation: Taken together, the modifications to the Hybrid Alternative/LPA would result in a net decrease of 35 on-street parking spaces relative to what was described in the Draft EIS/EIR, bringing the total parking loss to 410 spaces. These changes in parking spaces are small in the context of total supply and would not cause parking space reductions associated with the Hybrid Alternative/LPA to fall outside of the range previously described in the Draft EIS/EIR (2 to 4 percent). Even with the six modifications incorporated, the Hybrid Alternative/LPA still would have the second-lowest parking loss of any of the build alternatives (Alternative 2 would have the highest amount of parking loss at 460 on-street parking spaces lost). Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative parking and loading effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects regarding parking and loading supply.

5.5.4 | Land Use

The area examined for cumulative analysis related to land use is the Geary corridor, including public right-of-way areas, adjacent lands fronting the Geary corridor, and along streets perpendicular to the Geary corridor.

Construction of the build alternatives would occur entirely within existing right-of-way areas (street, sidewalks, median). Portions of the roadway would be formally set aside for exclusive use by buses and transit patrons. These activities would not result in direct foreseeable changes to land uses adjacent to the Geary corridor beyond what has been planned in other City documents or permitted for construction.

For all build alternatives, construction equipment and materials would be temporarily staged within public right-of-way areas and/or adjacent properties when permitted by the City. Section 4.15 describes likely staging locations. The use of these areas for construction staging would be temporary and would not result in any change to existing or planned land uses. The majority of anticipated construction projects are development projects south of Market or otherwise outside the immediate Geary corridor. The proposed CPMC project is immediately along Geary Street; construction of the new medical facilities is underway as of 2018. However,

infrastructure projects/infrastructure maintenance activities would occur citywide, but largely within public right-of-way areas.

Existing and proposed land uses as well as land use plans along and near the Geary corridor support transit use and its expansion. Any of the build alternatives would substantially enhance access to major activity centers along the Geary corridor, such as major employment centers (downtown and Civic Center), health care facilities (Kaiser Permanente campuses; the future CPMC medical facilities), cultural destinations (Japantown), and entertainment and shopping districts (Union Square, Fillmore Street, Clement Street, and others).

None of the build alternatives would result in any direct construction outside public right-of-way areas. However, Alternatives 3 and 3-Consolidated would remove the Fillmore Street underpass and raise Geary Boulevard to street level. This aspect of those alternatives has the potential for long-term beneficial land use effects through the removal of a perceived barrier.

In all, the build alternatives, along with other past, current, and reasonably foreseeable projects would result in cumulative land use changes along the Geary corridor, but these changes would be consistent with adopted plans for growth in key areas such as the downtown and Transbay areas and would thus be considered beneficial. No adverse cumulative impact would be anticipated.

5.5.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: Like other project components, all modifications would be constructed entirely within the existing transportation right-of-way, limiting their potential to substantially affect land uses. Short-term land-use effects during construction would be similar in nature to other short-term construction effects described in this section (potentially increased by four to six days at intersections where additional pedestrian crossing bulbs would be added, and two to three weeks at Geary Boulevard and Laguna Street) and similarly typical of an urban environment. Thus, the modifications would not result in long-term adverse changes to or conflicts with land use plans, or any new physical division within a community. Thus, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative land use effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not substantially interrupt land uses such that construction of the various projects together would combine into a cumulative effect on land uses during construction.

Operation: During operation, as described in Section 4.1.4.1, the six modifications would help enhance access to various land uses along the Geary corridor, reduce physical divisions in the community, and would remain consistent with existing and proposed land use plans. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative land use effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative land use effects.

5.5.5 | Community Impacts

The area for analysis of cumulative effects related to community impacts encompasses a half-mile radius along the Geary corridor. The study area is

comprised of a number of "traffic analysis zones" (TAZs) and 2010 US Census data Block Groups, as discussed in Section 4.2 (Community Impacts). Potential cumulative community effects could occur primarily as a result of traffic congestion and loss of parking within the general vicinity of the Geary corridor.

This document sets forth numerous avoidance and minimization measures that would render project-related effects to land use, growth, visual resources, air quality, and noise/vibration to a level that would not be considered adverse.

During construction, businesses and community facilities alike may experience adverse effects resulting from periodic sidewalk closures, detours, conversion of parking lanes to travel lanes, and removal of loading zones. Parking constraints, increased traffic, and a construction-dominated pedestrian environment may cause temporary inconveniences to local businesses and residents. The extent of construction would vary by alternative. Alternatives 3 and 3-Consolidated would entail extensive roadway modifications and diversions in the Fillmore and Masonic areas. However, the effects would be temporary, and measures would be implemented to minimize such construction-related effects (refer to Section 4.2, Community Impacts). Further, adherence to city policies requiring coordination of infrastructure repair/maintenance so as to minimize street disruptions would also minimize construction related effects to communities.

Based on the location, schedule, and scope of the other foreseeable projects listed in Table 4.3-3, the roadway segments that would likely experience cumulative effects from construction activities are those in the vicinity of the Geary corridor that would occur concurrently with the construction of any of the build alternatives. These effects could be minimized through close coordination between projects occurring simultaneously to develop construction schedules and phasing that avoid activities that could elevate construction-related adverse community effects (e.g., detouring and parking and access restrictions) to area residents, visitors, and travelers. For example, public roadway-related work under the CPMC Cathedral Hill Campus (at Geary Street and Van Ness Avenue) should be completed before or shortly after commencement of Geary corridor construction activity within the same vicinity.

Implementation of any of the build alternatives would result in the loss of on-street parking, which could result in adverse effects to nearby commercial and residential properties. The parking supply analysis within Chapter 3 concluded that the loss of parking spaces along the Geary corridor would not create a substantial parking deficit that could not be accommodated by remaining capacity in the surrounding area. As noted above in Section 5.5.3, implementation of several other foreseeable projects, including the CPMC, Van Ness Avenue BRT, the Polk Street Improvement Project, WalkFirst, etc., would potentially result in additional loss of parking within the study area. However, once all of the foreseeable projects within the general vicinity of the Geary corridor are completed, area residents and the public at large would have improved pedestrian networks and transit systems for daily commuting and commerce compared to existing conditions. Any of the build alternatives would help complete the planned Citywide BRT and SFMTA Rapid Network. Each would provide improved pedestrian amenities along the Geary corridor. These improvements would reduce parking demand along the corridor, offsetting changes in supply.

With the development and implementation of a project construction plan that minimizes overlapping construction schedules between the project and other foreseeable planned projects within the Geary corridor, adverse impacts associated with circulation, parking, air quality, noise, and visual resources would not be elevated to a cumulatively adverse level from the standpoint of a community impact assessment. Furthermore, construction-related effects of any of the build alternatives would be avoided, minimized, and/or mitigated by adherence to a transportation management plan (TMP), as required by the Federal Highway Administration Work Zone Safety and Mobility Rule (23 CFR 630.1012), that includes traffic rerouting, a detour plan, and public outreach. The TMP would be developed during the design phase, with participation from local agencies, business associations, residents, and other stakeholders in the area. Early and well-publicized announcements and outreach will help to minimize confusion, inconvenience, and traffic congestion during construction phases. Therefore, with the implementation of minimization measures, none of the build alternatives would have adverse cumulatively considerable impacts to the community.

5.5.5.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: Of the six modifications, the addition of BRT stops at Laguna Street would increase construction-related temporary parking and loading zone removals for a period of two to three weeks. The addition of 26 new pedestrian crossing bulbs would extend construction by four to six days at the intersections where they would be installed. The other modifications would not increase the level of construction activities needed to implement the Hybrid Alternative/LPA. The Hybrid Alternative/LPA would still be subject to the measures described in Section 4.2.5 to minimize community effects during construction. None of the modifications would require any temporary or permanent displacement of residences, community facilities, parks, or businesses. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative community effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative community effects during construction.

Operation: As demonstrated in Section 4.2.4.1, during operation, the six modifications would help enhance multimodal accessibility along the Geary corridor and community access to transit, generating beneficial community effects. As described in Section 3.5.4.1, the modifications to the Hybrid Alternative/LPA would not contribute to cumulative traffic congestion effects. The modifications would require the removal of an additional 35 on-street parking spaces. However, even with the loss of these additional spaces, the total number of on-street spaces lost would constitute a small portion of the corridor's total parking supply (about 2 percent of the corridor's total of 1,680 on-street parking spaces) and, as noted previously, the change in the amount of available parking (both on-street and off-street) would not result in any cumulatively considerable effect. Moreover, even with the six modifications, the Hybrid Alternative/LPA would remain the build alternative with the second-lowest proposed parking loss. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative community effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative community effects during operation.

5.5.6 | Growth

The area examined for cumulative growth effects is the entire City. As set forth in Section 4.1 and 4.2 of this document, the City has adopted a number of land use plans that call for increased residential density in selected areas, including Civic Center, Downtown, and the Transbay area. As development consistent with these previously adopted plans is actually built over time, population and employment growth are anticipated. Growth-related effects of those plans and projects have been examined in other project-specific environmental analyses.

The build alternatives were introduced in recognition of this anticipated growth in the eastern part of San Francisco, as such, growth is projected to further increase already high demands on public transportation in the Geary corridor. In other words, any of the build alternatives would serve a growing population and employment base in and around the Geary corridor.

Transportation projects can indirectly affect growth by reducing travel time and enhancing the attractiveness of surrounding land for development through changes in accessibility.[6] None of the build alternatives would substantially change existing development patterns, population, housing, or employment densities beyond what is projected for the study area, the City and County, and the greater Bay Area region. As such, outside of areas where planned development is anticipated, the potential for the build alternatives to induce population growth would not present an adverse cumulative effect on growth. The Geary corridor is already served by several transit lines and is in proximity to several others. While the enhanced transit service afforded by any of the build alternatives would offer improvements in transit speed and quality over existing and future No Build conditions, the potential for these enhancements to induce substantial population growth in and of themselves is considered negligible given the already fully urbanized nature of the Geary corridor.

Moreover, construction of any of the build alternatives, in combination with other planned infrastructure and development projects, would be unlikely to result in any substantial population growth. The Geary corridor is within a major metropolitan area that is well-served by regional transportation. A substantial sector of the employment base of the Bay Area is in the construction trades and therefore, construction of any of the build alternatives and related projects would be unlikely to result in any short-term population growth.

In all, the build alternatives, along with other past, current, and reasonably foreseeable projects would result in indirect and cumulative growth-related effects along and around the Geary corridor. However, such growth would be consistent with adopted plans and would thus be considered beneficial. Therefore, implementation of the any of the build alternatives would not be anticipated to directly or indirectly induce population growth at a level in excess of what is projected for the Bay Area and San Francisco. Accordingly, none of the build alternatives would contribute to any cumulative impacts with regard to population growth.

[6] American Association of State Highway and Transportation Officials. 2013. Center for Environmental Excellence: Indirect Effects/Cumulative Impacts Analysis.

5.5.6.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: The modifications would extend construction by four to six days at locations where new pedestrian crossing bulbs would be installed, and by two to three weeks at Geary Boulevard and Laguna Street. This incremental increase in construction activities would not substantially influence population or job growth. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative growth effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative growth effects during construction.

Operation: As demonstrated in Section 4.3.4.1, during operation, the six modifications would be consistent with planned development and planned land uses and would not change existing development patterns, population, housing, or employment densities. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative growth effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative growth effects during operation.

5.5.7 | Visual/Aesthetics

The area examined for cumulative effects analysis related to visual resources and aesthetics is the immediate Geary corridor.

Reasonably foreseeable transportation projects near the Geary corridor will continue the trend of emphasizing the multi-modal nature of the City's transportation system among various users (drivers, transit riders, bicyclists, and pedestrians). Collectively, these projects will result in cumulative changes in the street aesthetics in which human scale elements (pedestrian crossing bulbs, bicycle lanes, etc.) are emphasized. On the other hand, reasonably foreseeable development projects will continue the trend of higher density/higher intensity development in the eastern portion of the corridor, particularly in the vicinity of Civic Center, Downtown, and the new Transbay Transit Center. Infrastructure projects would have only very temporary construction period visual effects as most infrastructure is located below ground level.

Construction of the build alternatives would occur entirely within existing right-of-way areas (streets, sidewalks, and medians). Construction activities for any of the build alternatives, along with other anticipated development projects, would involve the use of a variety of equipment, stockpiling of materials, and other visual signs of construction. While evidence of construction activity may be noticeable to area residents, transit riders, and other viewer groups, such visual disruptions would be short term and would be considered a common feature of any dynamic urban environment.

Some construction may occur at night, requiring the use of artificial lighting at the worksite. Any temporary degradation of the visual environment would end with the completion of construction. Construction best practices would be implemented to minimize any effects.

Construction of other planned projects, such as the CPMC Cathedral Hill campus and elements of the Muni Forward program, will occur in areas along the Geary corridor, as described in Table 4.3-3. The construction activities for such projects could potentially disrupt the visual environment temporarily; however, it is highly unlikely that these and other planned projects would occur simultaneously and in the same location as construction activity associated with any of the build alternatives. As such, visual disruptions and degradation associated with construction activities of any of the build alternatives would not be a cumulatively considerable effect.

Visual changes resulting from implementation of any of the build alternatives would contribute to and be part of the trend of cumulative aesthetic changes that are occurring with the transportation system of the City. All build alternatives incorporate new landscaping and tree planting, along with a visually consistent street design that comports with the *Better Streets Plan*. Given the long-term positive effect the project would have related to visual resources, the contribution to cumulative visual and aesthetic changes would be considered beneficial.

5.5.7.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: The six modifications to the Hybrid Alternative/LPA would extend construction by four to six days at locations where new pedestrian crossing bulbs would be installed, and by two to three weeks at Geary Boulevard and Laguna Street. This brief extension of construction activities would not substantially increase the severity of temporary visual effects. As such, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative visual effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative visual disruptions and degradation during construction.

Operation: As documented in Section 4.4.4.1, during operation, the six modifications to the Hybrid Alternative/LPA would generally add to human-scale visual features and further enhance streetscape visual quality, along with the cumulative projects. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative visual effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative visual effects during operation.

5.5.8 | Cultural Resources

The area for analysis of cumulative effects to cultural resources includes the Geary corridor and immediately adjacent land uses.

As noted in Section 4.5, none of the build alternatives would result in any adverse effect to any known archaeological resource or to any of the eligible historic architectural resources along or within the Geary corridor.

The build alternatives, along with selected other anticipated infrastructure and development projects, would require excavation at various points of the Geary corridor. Some of these areas could include locations where there is increased potential of encountering unknown archaeological resources during excavation. As these projects are unlikely to occur in exactly the same place at the same time, there would be negligible potential for cumulative effects upon unknown/unrecorded archaeological resources.

In terms of historic resources, any of the proposed build alternatives, along with selected development and infrastructure projects, would result in continued change to the Geary corridor to reflect a more contemporary appearance. The preponderance of historic architectural resources in the Geary corridor is located east of Van Ness Avenue, where each of the build alternatives has relatively minimal construction (side-running bus lanes, many previously existing) and thus lesser potential to result in any substantial change to the overall historic character of the area. In contrast, anticipated development projects in the Downtown and Transbay Transit Center areas will continue to alter historic character, particularly in the south of Market area. The extent to which these other projects adversely affect historic character of any particular historic resource are documented in other environmental documents. To the extent there is any adverse cumulative effect on historic resources in the Downtown area, any contribution from the build alternatives would be less than considerable, insofar that the build alternatives' effects on overall historic character would be at minimal levels in the vicinity of the known historic resources along the Geary corridor.

5.5.8.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: Of the six modifications, the Webster Street bridge, pedestrian crossing and safety improvements, and Laguna Street BRT stops are located near historic architectural resources (components of the Auxiliary Water Supply System [AWSS], St. Francis Square Cooperative, and Japan Center), while the other modifications are not. Of the modifications located near resources, retention of the Webster Street bridge would eliminate demolition in proximity to historic structures such as the AWSS components and Japan Center. Construction of pedestrian enhancements and Laguna Street BRT stops would occur entirely within the existing transportation right-of-way, outside of historic property boundaries. Analysis of the proposed additional construction at Laguna Street has confirmed that no direct or indirect impacts would occur to either of the two historic properties in the vicinity, St. Francis Square Cooperative and AWSS components, as discussed further in Section 4.5.4.1.

As described in Section 4.5, an addendum Archaeological Sensitivity Assessment completed in June 2017 determined that all of the modifications to the Hybrid Alternative/LPA would be located in areas with low sensitivity for unrecorded archaeological resources because they either have a vertical impact less than 3 feet or are determined to be in locations previously disturbed by post-1960s utilities and other urban infrastructure. Moreover, excavation for other cumulative projects is unlikely to coincide both spatially and temporally with excavation for the Hybrid Alternative/LPA, and any coincidence would be coordinated through the TMP. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative cultural effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects to cultural resources during construction.

Operation: As described in Section 4.5.4.1, as project operation would not entail ground-disturbing activities, no adverse effects to archaeological and paleontological resources would occur and thus no contribution to any cumulative effect to these resources could occur. None of the six modifications that are located near historic architectural resources (i.e., Webster Street bridge, pedestrian improvements, and

Laguna Street BRT stops) would change the character or setting of any historic property or its relationship to the existing transportation corridor. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative cultural effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects on cultural resources during operation.

5.5.9 | Utilities

The utilities cumulative effects area for analysis includes the Geary corridor and immediately adjacent roadways, including public right-of-way areas.

Given that the cumulative effects study area is predominantly urbanized with little impervious surface area, the build alternatives combined with reasonably foreseeable projects would have little effect on stormwater flows and infrastructure. Implementation of any of the build alternatives would relocate several catch basins, but additional catch basins would be constructed and connected to the existing system as part of each build alternative. Construction would be phased to minimize utility disruption and maintain infrastructure capacity. Overall, impervious surfaces within the Geary corridor would decrease as a result of the new dual medians (associated with all alternatives except Alternative 2) owing to landscaping and infiltration design, which would be considered beneficial in terms of cumulative effects to stormwater runoff.

The build alternatives would have little to no effect on electricity, potable water, or wastewater usage or demand. As such, none of the build alternatives would contribute to cumulative effects on these resources and facilities.

5.5.9.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: As shown in Section 4.6.4.1, none of the six modifications would require any additional utility relocations or substantively change the methods in which utility work would be performed. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative utilities effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects to utilities during construction.

Operation: As shown in Section 4.6.4.1, the six modifications would not substantively change utility demand or operations. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative utilities effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects to utilities during operation. See Section 5.5.15 for a discussion of potential cumulative effects related to energy consumption.

5.5.10 | Geology/Soils/Seismic/Topography

The area for analysis of cumulative effects related to geology and soils includes the Geary corridor and immediately adjacent land uses. Cumulative geology and soils effects could occur if a significant number of people and/or a significant amount of

property would be exposed to any one or more geologic/soils hazards – including landslides, seismic shaking, ground failure, and many others.

It is unlikely that any of the build alternatives in combination with projected land development, transportation, and infrastructure projects would result in a cumulatively significant effect related to geology/soils hazards or mineral resources. This is due to the enactment of a number of federal, state, and local regulations, as well as several adopted goals, policies, and standard mitigations associated with local general plans that individually and collectively aim to reduce geology and soils related effects on all land development and transportation projects. As such, the design of individual project features (both the build alternatives and other anticipated development projects) would meet seismic standards, and thus would not substantially increase the risk of geologic hazards. Additionally, all of the build alternatives' structures are limited to streetscape features that would bear relatively light loads; soils in the Geary corridor appear to be suitable for proposed improvements identified in each of the alternatives. Overall, therefore, the risk of geologic hazards is low and would not be cumulatively considerable.

Future transportation projects are generally planned in already-existing transportation corridors and land use projects in already-urbanized areas; as such, neither type of project would be likely to result in limitation of access to important mineral resources. Additionally, all of the build alternatives would be implemented along the existing urbanized Geary corridor, where no mineral resource sites are located. Therefore, there would be no cumulatively significant effect relative to soils or mineral resources associated with any of the build alternatives.

5.5.10.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: Site-specific conditions are the primary driver of impacts with regard to geology and soils. As shown in Section 4.7.4.1, the six modifications would occur under the same geologic conditions as described in the Draft EIS/EIR, and would not substantially change the nature of the anticipated construction activities. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative geology and soil effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects related to geology and soils during construction.

Operation: Retention of the Webster Street bridge and existing bus stops between Spruce and Cook streets and at Collins Street would not result in any increased geologic or seismic risk compared to existing conditions. The Webster Street bridge was seismically retrofitted in 1996 and its retention would not introduce a new or more severe risk. All other modifications would be limited to streetscape features such as sidewalks and curbs; therefore, the risk of geologic hazards is low and similar to existing conditions. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative geology and soil effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects related to geology and soils during operation.

5.5.11 | Hazards and Hazardous Materials

The hazards and hazardous materials cumulative analysis area includes the Geary corridor and immediately adjacent roadways. As set forth in Section 4.8 (Hazards and Hazardous Materials), the Initial Site Assessment assessed hazardous release sites within a one-eighth-mile radius.

Potential risks associated with hazardous materials mostly relate to ground-disturbing activities from construction. Due to the long history of heavy vehicular activity along Geary corridor, the soil in the medians and adjacent areas may likely be contaminated with aerially deposited lead from the exhaust of cars burning leaded gasoline. Additionally, due to the age of existing structures nearby, lead-based paint may have been used on streetscape features. Three recognized environmental conditions sites were identified within the Geary corridor that may have resulted in contaminated soil and/or groundwater in these relative areas.

Implementation of any of the build alternatives would include construction activities that would potentially risk exposure to aerially deposited lead in the soil, naturally-occurring asbestos, and other environmental concerns. Such activities include pavement resurfacing, median removal, construction of pedestrian crossing bulbs, and curb ramp construction. These and related activities would require some degree of excavation (see Table 4.15-2 of this Final EIS).

The risk of encountering a recorded hazardous waste site during construction of any of the build alternatives would be location-specific. The proposed project and all cumulative projects would be required to comply with Article 22A of the San Francisco Health Code (Maher Ordinance), which would avoid impacts associated with excavation in areas with soil and groundwater contamination. Minimization measures are in place to minimize potential construction effects and to comply with federal, state, and local policies, as discussed in Section 4.15.12. As such, no adverse cumulative effects related to hazards and hazardous materials would occur during construction.

During operation, additional bus service would operate along the corridor, but would not pose a risk of encountering substantial levels of contaminants, as discussed in Section 4.8.4.3.2. Other cumulative projects in the area are not expected to generate long-term additional heavy vehicle traffic, which regardless would not result in contamination of aerially deposited lead as vehicles no longer burn leaded gasoline. Therefore, no adverse cumulative effects related to hazards and hazardous materials would occur during operations.

5.5.11.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: As described in Section 4.8.4.1, additional pedestrian crossing bulbs would each require excavation to about 1.5 feet below ground surface, a depth too shallow to substantially increase the risk of encountering contaminated soils or groundwater. Moreover, these additional excavations would be spread across the entire Geary corridor and thus would not result in any particular location seeing excessive excavation activity. Construction activities and excavation required for the Laguna Street BRT stops and relocation of the westbound bus lane transition would be similar to the ground disturbance which would occur throughout the corridor and would be subject to the same minimization measures identified in Section 4.8.5

to reduce potential for adverse effects related to hazardous materials. The other modifications would not require increased excavation. The incremental increase in construction activities and excavation associated with the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative hazard effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects related to hazards and hazardous materials during construction.

Operation: As discussed in Section 4.8.4.1, since risks of exposure to hazards and hazardous materials are primarily related to construction and other ground-disturbing activities, none of the six modifications would increase such a risk during operation. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative hazard effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still contribute to any adverse cumulative effects related to hazards and hazardous materials during operation.

5.5.12 | Hydrology and Water Quality

The area for analysis of cumulative effects to hydrology and water quality includes the Geary corridor and other immediately adjacent roadways.

The Geary corridor is a highly developed, urbanized setting largely covered with impervious surfaces. As noted in Section 4.9, construction of any of the project alternatives could result in water quality degradation when soils are exposed; however, compliance with applicable City standards and permit conditions would minimize such effects.

Implementation of any of the build alternatives would decrease the amount of impervious surface through the incorporation of pervious paving and infiltration planters at new stations along the Geary corridor, thus reducing potential water quality effects associated with polluted stormwater runoff – the quality of which would be further improved with the incorporation of rain gardens and biotreatment swales in new landscaped medians along new center-running bus lanes (for Alternatives 3 and 3-Consolidated, and the Hybrid Alternative/LPA only). Other planned infrastructure and development projects have the potential to pollute stormwater runoff; however, all other projects nearby are subject to same Storm Water Pollution Prevention Program (SWPPP) permit requirements, requirements of the San Francisco Public Utilities Commission, and best management practices to mitigate stormwater effects during construction, which would minimize adverse effects to hydrology and water quality in the Geary corridor and would not likely have the potential to change groundwater levels substantially.

Alternatives 3 and 3-Consolidated would result in the decommissioning of the existing pump station beneath the Fillmore Street underpass. This would allow the groundwater elevation in this area to rise. Underground structures located within two blocks of the pump station at depths greater than 14 feet below ground surface, such as building basements and utility trenches could be adversely affected. This document identified a measure to avoid the adverse effect (continuing operation of the pump station to maintain existing groundwater levels). An alternative minimization measure could be implemented in lieu of continuing operation of the pump station. Through avoidance or minimization, there would be no adverse

cumulative effect as no other anticipated projects in this area would have the potential to change groundwater levels substantially.

Overall, none of the build alternatives would contribute to any cumulative effect related to hydrology and water quality.

5.5.12.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: Modifications to add BRT stops at Laguna Street would result in incremental additional construction activities which would have the potential to affect water quality when soils are exposed. Construction of additional pedestrian improvements would involve localized excavations of about 1.5 feet in depth – too shallow to affect groundwater. Adherence to the SWPPP, best management practices, and minimization measures identified in Section 4.9.5 would limit the potential for substantial additional quantities of construction-period runoff at Laguna Street or locations of new pedestrian crossing bulbs. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative hydrology and water quality effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects related to hydrology and water quality during construction.

Operation: As demonstrated in Section 4.9.4.1, none of the six modifications to the Hybrid Alternative/LPA would increase the proposed amount of impervious surfaces in the Geary corridor, as they would all occur on existing paved areas. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative hydrology and water quality effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects to hydrology and water quality during operation.

5.5.13 | Air Quality/Greenhouse Gas Emissions

The area examined for cumulative air quality and greenhouse gas (GHG) effects is the entire San Francisco Bay Area Air Basin (Air Basin).

Regarding GHG emissions, the State Office of Planning and Research issued guidance that the effects of GHG emissions are cumulative and should be analyzed accordingly. Therefore, the analysis of the impact of the build alternatives on climate change focuses on the project alternatives' contribution to cumulatively significant GHG emissions. However, the GHG analysis included in this document concluded that build alternatives would result in a long-term benefit associated with reducing GHG emissions (relative to the No Build Alternative). Therefore, the build alternatives not result in any adverse cumulative effect.

Criteria Pollutants

Regional air pollution is by its very nature largely a cumulative impact. Emissions from past, present and future projects contribute to the region's adverse air quality on a cumulative basis. No single project by itself would be sufficient in size to result in nonattainment of regional ambient air quality standards. Instead, a project's individual emissions contribute to existing cumulative adverse air quality impacts. In accordance with Bay Area Air Quality Management District (BAAQMD) guidance, the project-level thresholds for criteria pollutants and ozone precursors are based on

levels by which new sources are not anticipated to contribute to an air quality violation or result in a cumulatively considerable net increase in criteria air pollutants.

As discussed in Section 4.10 (Air Quality and Greenhouse Gases), the build alternatives would result in a long-term benefit associated with reducing operational emissions. In addition, none of the build alternatives would exceed the project-level thresholds for construction emissions, would not contribute to the generation of a localized carbon monoxide or particulate matter hot-spot, and would not generate adverse odors. Based on BAAQMD guidance, none of the build alternatives would contribute to a cumulatively considerable impact related to criteria pollutants and odors.

Health Risk

To evaluate cumulative health risk potential, the Citywide air pollution model within San Francisco's Community Risk Reduction Plan was queried to determine existing health risks and particulate matter (PM) mass concentration at construction locations. The model takes into account emissions from various sources including on-road mobile sources, permitted stationary sources, diesel locomotives, ships and harbor crafts, major construction projects in 2010 and 2015, and transit vehicles. BAAQMD defines air pollution hotspots as areas with a cancer risk burden that is greater than 100 per one million population exposed, areas where non-cancer risk is above 10 Hazard Index, or areas where annual $PM_{2.5}$ from all local sources exceeds 0.8 $\mu g/m^3$. The zone of influence is defined as a 1,000-foot radius from fence line of Geary corridor.

According to the Citywide air pollution model, a carcinogenic hotspot cover approximately 5.7 percent of the 1,000-foot buffer along the alignment, mostly near downtown San Francisco. Annual $PM_{2.5}$ hotspots cover 0.23 percent of the total area within 1,000 feet of the alignment. The maximum existing excess cancer risk, acute and chronic health indices, and annual $PM_{2.5}$ concentrations for locations within 1,000 feet of the alignment are provided in Table 5-1.

Table 5-1 Existing Maximum Health Risks

HEALTH RISK TYPE	LOCATION	EXCESS CANCER RISK (PER MILLION)	AVERAGE ANNUAL PM2.5 CONCENTRATION (MG/M³)
Cancer Risk	Main St. and Harrison St.	559	10.079
Annual $PM_{2.5}$ Concentration	Buchanan St. and Geary Blvd.	136	10.688

Source: City of San Francisco, Air Pollution Model, 2014

Regarding cumulative health risks related to construction activity, BAAQMD guidance states that construction activities do not require analysis of long-term health risks because of their temporary and variable nature. Due to the variable nature of construction activity, the generation of TAC emissions in most cases would be temporary, especially considering the short amount of time construction activity would be near sensitive receptors. Furthermore, models and methodologies for conducting health risk assessments are usually associated with longer-term exposure periods of nine, 40, and 70 years. The build alternatives would be constructed over approximately two to three years.

However, dispersion modeling was completed to assess construction-related health risks. Alternatives 3 and 3-Consolidated would generate the greatest localized risk (bringing Fillmore Street to grade) by contributing 0.25 μg/m³ to annual average $PM_{2.5}$ concentrations and result in an excess cancer risk of 0.83 per one million population (during construction). The cumulative risk at this location is approximately 10.42 μg/m³ and 124.68 cancer risk in 1 million people exposed, based on the Citywide air pollution model.

The acceptable level of project-level excess cancer risk is less than 10 per one million persons exposed, and an annual average $PM_{2.5}$ concentration of less than 0.3 μg/m³. Therefore, the maximum construction-related health risk would not exceed the project-level thresholds. Based on the project-level thresholds and the low percentage of total health risk, construction activities of the build alternatives would not contribute considerably to existing health risks.

Regarding cumulative health risks related to operational activity, the risk was assessed in the portion of the Geary corridor where the build alternatives would generate the highest increase in bus emissions (Geary Boulevard between Masonic Avenue and Collins Street). A series of transit vehicles were modeled using line-volume sources to determine the health impact relative to the roadway. The analysis indicated that Alternative 2 would result in a higher risk than the other build alternatives. As shown in Table 4.10-7 of the Air Quality section, Alternative 2 would result in an excess cancer risk of two per 1 million populations and contribute 0.005 μg/m³ to annual average $PM_{2.5}$ concentrations. However, these risks would be less than the project-level significance thresholds.

Under the maximum operational scenario, the build alternatives would contribute at maximum 1.7 percent to the cumulative cancer risk and less than 0.1 percent to the cumulative annual $PM_{2.5}$ concentrations. Based on the project-level thresholds and the low percentage of total health risk, operational activities would not contribute considerably to existing health risks.

5.5.13.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: Modifications to add BRT stops at Laguna Street and construct additional pedestrian improvements would result in incremental increases in localized criteria pollutant emissions at these locations, similar in nature and duration to emissions anticipated to occur with construction of the other 51 BRT stops and 65 pedestrian crossing bulbs. The other modifications would not increase the level of construction activities needed to implement the Hybrid Alternative/LPA and would, therefore, reduce or not change localized construction-period emissions of criteria pollutants. The net effect of the modifications would not substantially change construction-period emissions. As such, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative air quality effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative air quality effects during construction.

Operation: As demonstrated in Section 4.10.4.1, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding the Hybrid Alternative/LPA's air quality benefits and GHG emissions reductions; the Hybrid Alternative/LPA would therefore still not contribute to any adverse cumulative air quality effects during operation.

5.5.14 | Noise and Vibration

The area for analysis of cumulative effects related to noise and vibration includes the Geary corridor and other immediately adjacent roadways.

The build alternatives, along with selected other anticipated transportation, infrastructure, and development projects, would result in temporary increases in ambient noise levels. Noise levels would fluctuate depending on the construction phase, equipment type and duration of use, distance between the noise source and receptor, and presence or absence of noise attenuation barriers. The increase in noise resulting from the build alternatives would occur during construction, the duration of which depends on alternative, but would not exceed one year in any given multi-block construction area (see Section 4.15 for more detail on construction duration and phasing). As the effects of noise and vibration are highly location specific, cumulatively considerable effects would occur only if such noise and vibrations were being produced from the same localized area.

Construction of other anticipated projects would occur along and near the Geary corridor. However, it is unlikely that substantial noise and vibration would occur at the same place and at the same time as construction activity resulting from the implementation of any of the build alternatives. As such, there would be no adverse cumulative noise and vibration effects during construction.

Operational noise levels are not anticipated to differ significantly from existing conditions. As shown in Table 4.11-7, activity associated with any of the build alternatives would increase existing noise levels by less than 1 dBA at each of the analyzed receptors. Increased traffic volumes in 2020 and 2035, resulting from ambient growth and related projects, would increase background noise levels, and lessen the build alternative's contribution to ambient noise levels. The build alternatives' contribution to a cumulative noise increase would be 1 dBA or less at each of the analyzed receptors. Studies have shown that the smallest perceptible change in sound level for a person with normal hearing sensitivity is approximately 3 dBA. The contribution to ambient noise levels would not be audible, and the build alternatives would not contribute to a cumulatively considerable noise impact.

5.5.14.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: Modifications to add BRT stops at Laguna Street and construct additional pedestrian improvements would result in temporary, intermittent increases in localized construction noise at these locations, similar to that which would occur for construction of other BRT stops and pedestrian crossing bulbs. Because the location of these modifications would be within the public right of way, their potential to increase the severity of any previously identified construction-period noise effects would be limited. The other modifications would not increase the level of construction activities needed to implement the Hybrid Alternative/LPA and would not increase the level of localized construction-period noise. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative noise and vibration effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative noise effects during construction.

Operation: Retention of the existing local and Express stops between Spruce and Cook streets would mean that BRT buses would pass by this location at higher speeds rather than make a stop, which may marginally increase operational noise at this location relative to what was described in the Draft EIS/EIR, but such increases would be below the level of human perception. Moreover, operational noise from buses would be generally similar to both existing conditions as well as to other locations along the corridor where existing local and express stops would be retained. Retention of the existing local and express stops at Collins Street would mean that, instead of all buses passing by Collins Street at higher speeds, local and express buses would stop, resulting in marginally reduced operational noise at this location. Similarly, the addition of BRT stops at Laguna Street would mean BRT buses would now stop at this location rather than pass by at higher speeds, somewhat reducing noise levels. Moreover, the bus stops at Laguna Street would be located on transit islands further away from sensitive receptors. As shown in Section 4.11.4.1, the other modifications would not substantially affect bus operations or noise. The six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative noise and vibration effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative noise effects during operation.

5.5.15 | Energy

The energy cumulative analysis considers energy consumption within San Francisco as a whole.

Implementation of the build alternatives would involve consumption of some nonrenewable resources. Construction of the any of the build alternatives would require use of fossil fuels, labor, and construction materials, with Alternatives 3 and 3-Consolidated requiring more (owing to more intensive construction programs, particularly in the Fillmore area). These expenditures would be mostly irrecoverable; however, they are not in short supply and their use would not have an adverse effect upon continued availability of these resources.

Operational energy consumption involves energy use by vehicles within the Geary corridor – both automobiles and the BRT bus fleet. While each of the build alternatives would reduce automobile VMT, generally, the build alternatives would have little to no effect on automobile energy supply and consumption. Alternative 2 is projected to result in a minimal increase in energy use in 2020 and a small decrease by 2035. Alternative 2's projected increase in energy use (year 2020) would not be an adverse effect because fuels are not in short supply and the relatively small percentage of increased energy use would not substantially affect total supply. Transportation energy use of Alternatives 3 and 3-Consolidated, and the Hybrid Alternative/LPA is projected to drop slightly relative to the No Build Alternative both in 2020 and 2035. The reductions in energy use would be considered small but beneficial effects. These reductions are attributable to the projected increases in bus VMT associated with these build alternatives, which in turn take into account network operating characteristics of the alternatives.

Other planned transportation and infrastructure projects within the vicinity of the Geary corridor would require energy consumption for construction and operational activities. Construction-period expenditures of fossil fuels, labor, and construction materials for reasonably foreseeable projects, in combination with any of the build alternatives, would not combine to create new demands for these resources that would limit their continued availability. As demonstrated in Section 4.12.4.2, these other planned and programmed projects would ultimately result in long-term reductions in energy consumption, particularly resulting from conversion to a more fuel-efficient bus fleet by 2035. Accordingly, the build alternatives would not result in any cumulative energy effect.

5.5.15.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: As described in Section 4.12.4.1, the addition of more pedestrian crossing and safety improvements and Laguna Street BRT stops would marginally increase construction-period energy consumption. The other modifications would not increase the level of construction activities. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative energy effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative energy effects during construction. Moreover, the associated construction materials are not in short supply and their use, in combination with planned and reasonably foreseeable projects, would not have an adverse effect on continued availability of these resources.

Operation: As shown in Section 4.12.4.1, during operation, none of the modifications would substantially affect bus operations or VMT and, thus, operational energy use, relative to what was described in the Draft EIS/EIR. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative energy effects of the Hybrid Alternative/LPA; the Hybrid Alternative/LPA would still not contribute to any adverse cumulative energy effects during operation.

5.5.16 | Biological Resources

The area for analysis of cumulative effects to biological resources includes the Geary corridor and lands within a quarter mile.

The full length of the Geary corridor and surrounding lands are fully urbanized, with relatively limited capacity to host sensitive plant or animal species. Trees, such as those in the Geary corridor median, the Park Presidio greenways, and those lining adjacent streets are the primary biological resources of the Geary corridor. Some build alternatives would remove median trees, but would also incorporate new landscaping and tree replacement, offsetting any potential long-term effects (project-level as well as cumulative) regarding trees or the migratory bird species that can nest in trees. Other reasonably foreseeable projects that are resulting in tree removal would similarly replace trees that need to be removed for construction. Therefore, the build alternatives would not result in any cumulative effect upon biological resources.

5.5.16.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction: The modifications would result in the preservation of thirteen trees that had been previously proposed for removal in the Draft EIS/EIR, reducing the total number of trees that would be removed for the Hybrid Alternative/LPA from 195 to 182. Given that the modifications to the Hybrid Alternative/LPA would reduce the overall number of trees removed, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative biological effects of the Hybrid Alternative/LPA; The Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects to biological resources. No other biological resources exist in the Geary corridor.

Operation: As shown in Section 4.13.4.1, during operation, none of the proposed modifications would have additional effects to biological resources. Moreover, none of the modifications would introduce any new biological resources beyond the replacement trees previously noted in the Draft EIS/EIR. Therefore, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative biological effects of the Hybrid Alternative/LPA; The Hybrid Alternative/LPA would still not contribute to any adverse cumulative effects to biological resources during operation.

5.5.17 | Environmental Justice

The area for analysis of cumulative effects related to environmental justice encompasses a half-mile radius along the Geary corridor.

No adverse or disproportionate effects have been identified in several environmental topic areas. As such, there would be no potential for any cumulatively considerable disproportionate adverse effect to minority or low-income populations associated with land use, growth, cultural resources, utilities, geology and soils, and energy.

The remaining environmental topic areas identified as having potential environmental justice effects (almost entirely within the construction period) include community impacts, visual resources, hazards and hazardous materials, hydrology and water quality, air quality and GHGs, noise and vibration, and transportation and transit. During construction, there would be temporary access disruptions, risks due to usage, transport, release, or exposure of hazardous materials, air pollutant emissions, visual effects and noise and vibration effects due to construction equipment. However, all of these adverse effects would be temporary and would be dispersed throughout all portions of the Geary corridor.

The prospect for cumulative effects would be Geary project construction occurring at the same time as construction of other projects' improvements. The implementation of construction period traffic management plans (such as would be required for the build alternatives per Section 4.15.5.), as well as adherence to existing San Francisco regulations for working in right-of-way areas would help minimize the potential for multiple construction projects to result in cumulative effects anywhere along the Geary corridor, including within environmental justice communities.

Once operational, the project would benefit the Geary corridor, including residents, business owners, and transit-users, by providing the BRT systems and associated amenities. Therefore, no adverse cumulative environmental justice effects are anticipated during construction or operation of the project.

5.5.17.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

Construction and Operation: As described in Sections 5.5.1 through 5.5.16 above, no adverse cumulative effects would occur for most environmental topic areas during construction or operation. As described in Section 5.6.1 below, the only environmental topic area subject to adverse cumulative effects is automobile traffic. For the Hybrid Alternative/LPA, inclusive of its six modifications, 25 percent of level-of-service (LOS)-affected intersections in both 2020 and 2035 (the cumulative forecast year) would be located in environmental justice communities, while 75 percent of LOS-affected intersections would be located in non-environmental justice communities. Environmental justice communities are located throughout the entire length of the Geary corridor. Therefore, the modifications to the Hybrid Alternative/LPA would still not contribute to any cumulative effects to environmental justice communities during construction or operation.

5.6 Environmental Area Subject to Cumulative Effects

The analysis herein is based on consideration of the nature of the build alternatives, the project setting, the impact analysis findings presented in Chapters 3 and 4, and the characteristics of other reasonably foreseeable projects within the project vicinity. The incremental impact of the build alternatives, when added to other past, present, and reasonably foreseeable future actions, have the potential to result in cumulative effects for automobile traffic.

5.6.1 | Automobile Traffic

The study area for cumulative analysis covers the entirety of the Geary Transportation Study Area (study area), as shown in Figure 3-2.1. The study area includes the entirety of Geary Street/Boulevard, plus certain parallel and/or nearby routes. The study area includes 78 intersections on and off the Geary corridor.

5.6.1.1 | PROJECT OPERATIONAL EFFECTS ON AUTOMOBILE TRAFFIC

The cumulative analysis was based on a review of impacts at study area intersections for model year 2035. This horizon year assumes full operation of any of the build alternatives, but also includes the increment of traffic associated with projected future development and population growth in and around the study area, as well as foreseeable changes to the transportation network, such as those associated with planned transportation improvements. In other words, the project-level analysis presented in Section 3.4 of this Final EIS for year 2035 is equivalent to a cumulative case analysis.

Implementation of the project alternatives, when added to other past, present, and reasonably foreseeable actions, would result in an adverse cumulative effect if they would result in a substantial degradation of intersection level of service (LOS) relative to No Build horizon year conditions. It should be noted that the analysis of the No Build Alternative indicates that adverse traffic effects would result at 21 corridor/study area intersections. In contrast, the build alternatives would each result in substantially fewer adversely affected intersections.

Table 5-2 below summarizes where such effects would occur for the build alternatives and the feasibility of mitigation.

Table 5-2 Summary of Study Intersection Impacts and Mitigation Measures, 2035 Cumulative Horizon Year

INTERSECTION	IMPACT, BY BUILD ALTERNATIVE				AVOIDANCE, MINIMIZATION OR MITIGATION MEASURES
	ALT 2 (LOS/DELAY)	ALT 3 (LOS/DELAY)	ALT 3-CONSOLIDATED (LOS/DELAY)	HYBRID ALT (LOS/DELAY)	
Parker Street & Geary Boulevard	No D/46	No D/38	No D/53	**Yes[1] E/63**	None feasible
Baker Street & Geary Boulevard	No D/47	No D/47	**Yes[1] E/61**	No D/55	None feasible
Divisadero Street & Geary Boulevard	**Yes[1] F/>80**	No E/67	No D/53	No E/69	None feasible
Fillmore Street & Geary Boulevard	No D/40	**Yes[1] E/78**	No D/45	No D/54	None feasible
Laguna Street & Geary Boulevard	**Yes F/>80**	**Yes[1] F/>80**	No D/37	**Yes[1] E/76**	None feasible
Gough Street & Geary Boulevard	**Yes F/>80**	**Yes[1] F/>80**	**Yes[1] F/>80**	**Yes F/>80**	None feasible
Franklin Street & O'Farrell Street	No D/43	**Yes[1] F/>80**	**Yes[1] F/>80**	No D/44	None feasible
Van Ness Avenue & Geary Boulevard	**Yes[1] E/71**	No E/79	No E/77	**Yes[1]** E/67	None feasible
Clement Street & Park Presidio Boulevard	No C/35	No D/51	**Yes[1] E/57**	No D/54	Remove 3 parking spaces from *either* south or north side of Clement St. or both (6 spaces) Provide short (75') right-turn pockets
California & Arguello Boulevard	No D/46	**Yes[1] E/61**	No D/48	**Yes[1] E/66**	Restricting EB and WB left-turns could alleviate effects but would cause substantial diversions; therefore considered infeasible
Turk Street & Parker Avenue	No D/37	**Yes[1] E/61**	**Yes[1] E/73**	No D/37	Restrict EB or EB and WB left-turns
California Street & Presidio Avenue	No D/39	**Yes[1] E/68**	**Yes[1] E/64**	**Yes[1] E/68**	Increasing cycle length and optimizing signal cycle length could reduce traffic effects but would substantially worsen conditions for pedestrians; therefore considered infeasible
Fulton Street & Stanyan Street	**Yes[1] F/>80**	**Yes[1] F/>80**	**Yes[1] F/>80**	**Yes[1] F/>80**	None feasible
Fulton Street & Park Presidio Boulevard	No F/>80	**Yes[1] F/>80**	No F/>80	No F/>80	None feasible
Anza Street & Park Presidio Boulevard	No E/56	No D/48	**Yes[1] E/57**	**Yes[1] E/67**	Reconfiguring westbound approach to add additional through travel lane could reduce effects but would remove parking and worsen pedestrian conditions – therefore considered infeasible
Geary Street & Polk Street	No E/70	No E/72	**Yes[1] E/73**	No E/59	None feasible

1. Intersections were also determined to be adverse effects of build alternatives in Near Term (2020) scenario.
2. The No Build Alternative would result in adverse effects at 21 intersections in all; see Final EIS Section 3.4.5.

Source: Fehr & Peers, 2014

The No Build Alternative would result in a total of 21 study intersections with adverse effects in 2035. It would be infeasible to mitigate effects at all of these 21 intersections through the addition of travel lanes, new turning lanes, or similar street-widening means because there would be insufficient street right-of-way width to accommodate new lanes without removing pedestrian facilities and/or parking or otherwise incorporating additional right-of-way. Narrowing sidewalks or large-scale reductions in on-street parking lanes that serve as a barrier between pedestrians and moving traffic to make room for new lanes would be contrary to the purpose and need goals of improving pedestrian access while maintaining general vehicular access and circulation.

Implementation of Alternative 2 would contribute to cumulative effects at five study intersections. No feasible avoidance, minimization or mitigation measures could avoid or lessen cumulative effects at these intersections.

Alternative 3 would contribute to cumulative effects at nine study intersections. Potentially feasible avoidance or minimization measures could avoid or lessen these cumulative effects at one of the affected intersections (Turk Street and Parker Avenue); however, this mitigation would entail restricting left turns in one or both directions of Turk Street. Of the nine affected intersections, one would result in unique cumulative effects under Alternative 3: Fulton Street/Park Presidio Boulevard; no other build alternative would result in cumulative effects at this intersection.

Alternative 3-Consolidated would contribute to cumulative effects at 9 study area intersections. Of these nine, potentially feasible avoidance or minimization measures have been identified for two intersections. No feasible measures exist for the remaining seven intersections and thus the adverse effects would remain.

The Hybrid Alternative/LPA would contribute to cumulative effects at eight study area intersections. Because mitigation options considered for these eight intersections would require additional travel lanes, worsening of pedestrian conditions, and/or removal of parking and thereby eliminating the buffer between pedestrians and moving traffic that on-street parking provides, mitigation was deemed infeasible at all intersections and thus the adverse effects would remain.

5.6.1.2 | PROJECT CONSTRUCTION EFFECTS ON AUTOMOBILE TRAFFIC

Several of the projects listed in Table 4.3-3 as well as described in Section 2.8.1.2 may be constructed at the same time as improvements associated with any of the build alternatives. Traffic congestion, travel delays, and access restrictions attributable to construction activities of projects in and/or near the Geary corridor could be expected during the construction of any of the build alternatives. A PCP would be established that would provide detailed information on construction activities, including potential detours and closures in specific locations at various times. Any of the build alternatives would generally maintain two mixed-flow travel lanes west of Van Ness Avenue throughout the construction period. The PCP would also take into account potential effects of any other transportation and/or development projects that may be in active construction. Construction of multiple projects within close proximity to each other would escalate short-term traffic effects. The severity of such effects could be lessened through adherence to the PCP; other projects implementing similar control plans, and timely public announcements of construction activities. These and related other measures

included in Section 4.15 would lessen construction-related effects on automobile traffic such that the build alternatives' contribution to any such effect would not be cumulatively considerable.

5.6.1.3 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL CONTRIBUTIONS TO CUMULATIVE EFFECTS

As discussed in the Sections 5.6.1.1 and 5.6.1.2, the Hybrid Alternative/LPA would contribute considerably to adverse cumulative traffic effects during operations, but not during construction. Therefore, for construction, the analysis below assesses whether the modifications to the Hybrid Alternative/LPA would cause new project contributions to adverse cumulative effects. For operations, the analysis below assesses whether the modifications would cause new contributions to adverse cumulative effects, and whether the modifications would cause the contributions to adverse cumulative effects identified in the Draft EIS/EIR to become more severe.

Construction: As discussed in Section 5.6.1.2, none of the build alternatives would result in considerable contributions to adverse cumulative construction effects. Of the six modifications, the addition of BRT stops at Laguna Street would increase construction-related traffic disruptions for two to three weeks. The addition of 26 new pedestrian bulbs would extend construction by four to six days at the intersections where they would be installed. The other modifications would not increase the level of construction activities needed to implement the Hybrid Alternative/LPA. Given the relatively brief duration of these incremental additions to overall construction activities, the six modifications would not alter the conclusions in the Draft EIS/EIR regarding cumulative construction period traffic effects of the Hybrid Alternative/LPA. The Hybrid Alternative/LPA still would not substantially contribute to any adverse cumulative effects on automobile traffic circulation during construction beyond what was identified in the Draft EIS/EIR.

Operation: As discussed in Section 5.6.1.1, the Hybrid Alternative/LPA would contribute to adverse cumulative effects at eight study area intersections during operations, and no feasible mitigation measures are available. The modifications would not substantially change the magnitude of the Hybrid Alternative/LPA's contributions to these adverse cumulative effects. The retained pedestrian bridge and staggered crosswalk at Webster Street would require a minor signal timing adjustment; however, this adjustment would not result in a change in LOS at any nearby intersections compared to what was described in the Draft EIS/EIR. None of the other six modifications would alter signal timing in a manner that would increase the severity of traffic delay, nor would they reduce travel lane capacities. Thus, taken together, none of the modifications would change any of the LOS conclusions for 2035 described in the Draft EIS/EIR. The Hybrid Alternative/LPA would still contribute to adverse cumulative effects at the eight intersections identified in Section 5.6.1.1, but the modifications would not make those contributions more severe, nor would they cause any new contributions to adverse cumulative effects at other intersections.

CHAPTER 6.0 SECTION 4(F) AND 6(F) EVALUATION

6.1 Introduction

6.1.1 | Section 4(f)

Section 4(f) of the Department of Transportation Act of 1966 (49 U.S.C. 303) is intended to avoid or minimize impacts to public park and recreational areas, wildlife and waterfowl refuges, and certain historic properties.

The legislation limits the ability of the U.S. Department of Transportation (USDOT) to approve any transportation program or project requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance (as determined by the federal, state, or local officials having jurisdiction over the park, area, refuge, or site) unless:

1. There is no prudent or feasible avoidance alternative to the use of the land from the Section 4(f) property; and,
2. The program or project includes all possible planning to minimize harm to the Section 4(f) property resulting from the use.

Section 4(f) of the DOT Act of 1966 applies to all operating administrations of the USDOT. The Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) implement Section 4(f) requirements through regulations established at 23 CFR 774. These regulations define an avoidance alternative as "not feasible" if such an alternative cannot be built as a matter of sound engineering judgment. Similarly, the regulations state that an avoidance alternative is "not prudent" if it compromises the project to a such an extent that the stated purpose and need can no longer be met, if a project would result in unacceptable safety or operations problems, or if it were to result in severe impacts to people, the environment, or other resources (23 CFR 774.117).

RESOURCE

For more information about Section 4(f), go to: http://environment.fhwa.dot.gov/4f/index.asp

DEFINITION

De Minimis Impact: A *de minimis* impact involves the use of Section 4(f) property that is generally minor in nature. A *de minimis* impact is one that, after taking into account avoidance, minimization, mitigation and enhancement measures, results in no adverse effect to the qualifying attributes of a Section 4(f) resource

For more information on Section 6(f), go to: http://www.fhwa.dot.gov/wadiv/envir/section6f.cfm

6.1.2 | Section 6(f)

Established by Congress in 1965, the Land and Water Conservation Fund is a federal grant program intended to help finance the acquisition or improvement of federal, state, or local park and recreation areas. Section 6(f) of the enabling legislation restricts the conversion of land acquired or developed under these grants to a non-recreational purpose without explicit approval from the U.S. Department of the Interior (DOI). Under Section 6(f), replacement lands of equal value (monetary), location, and usefulness must be provided to obtain DOI approval of a conversion of Section 6(f) lands for transportation projects.

6.1.3 | Project Summary

The build alternatives involve implementing bus rapid transit (BRT) service along San Francisco's Geary corridor, between 48th Avenue to the west and the Transbay Transit Center to the east.

The San Francisco County Transportation Authority (SFCTA), in coordination with the San Francisco Municipal Transportation Agency (SFMTA), developed and analyzed several alternatives toward achieving the project's purpose and need. The alternatives considered herein are summarized in the following section. For complete descriptions of the No Build and build alternatives and associated project components, please see Section 2.2.

- **No Build Alternative**
    - No BRT service. Only previously planned/programmed transit and infrastructure improvements would occur on the Geary corridor.
- **Alternative 2:** Side-Lane BRT
    - BRT service would replace 38 Geary Rapid service and would operate in dedicated bus-only lanes on the outside edges of the Geary corridor from the Transbay Transit Center to 34th Avenue. Existing 38 Geary local and express services would continue to operate and would use bus-only lanes where constructed, elsewhere, mixed-flow travel lanes.
- **Alternative 3:** Center-Lane BRT with Dual Medians and Passing Lanes
    - West of Laguna Street, BRT service would operate in dedicated bus-only lanes in the center of the Geary corridor. East of Laguna Street, BRT service would operate in dedicated bus-only lanes on the outside edges of the Geary corridor (similar to Alternative 2). Existing 38 Geary local and express services would continue to operate and would use bus-only lanes where provided; elsewhere, mixed-flow travel lanes.
- **Alternative 3-Consolidated**: Center-Lane BRT with Dual Medians and Consolidated Bus Service
    - Same as Alternative 3; however, BRT service would replace both 38 Geary Rapid and 38 Geary local service in a new consolidated configuration along the entire Geary corridor. Express services would continue to operate and would use bus-only lanes where provide; elsewhere, mixed-flow travel lanes.
- **Hybrid Alternative/Locally Preferred Alternative (LPA)**
    - BRT service would operate along the entire corridor, dedicated bus-only lanes would be provided from the Transbay Transit Center to 34th Avenue. Bus-only lanes would be in the center of Geary Boulevard between 27th Avenue (eastbound)/28th Avenue

(westbound) and Palm Avenue. Side-running bus-only lanes would be located between the Transbay Transit Center and Palm Avenue as well as between 27th/28th avenues and 34th Avenue. The Hybrid Alternative/LPA would consolidate 38 Geary Rapid and 38 Geary local services. Express services would continue to operate and would use bus-only lanes where provided; elsewhere, mixed-flow travel lanes.

6.2 Section 4(f) Resources

6.2.1 | Parks and Recreation Properties

As listed in Table 6-1 and shown in Figure 6-1, there are 38 park and recreational properties in or in close proximity (0.5-mile radius) to the Geary corridor. The ID numbers in the table correspond to those shown in the figure.

Five of these properties are located directly adjacent to the Geary corridor:

- Hamilton Recreation Center and Playground (ID #6)
- Raymond Kimbell Playground (ID #9)
- Japantown Peace Plaza and Pagoda (ID #17)
- Sergeant John Macaulay Park (ID #23)
- Union Square (ID #19)

One resource is perpendicular to Geary Boulevard: the discontinuous path within the greenway lining both sides of Park Presidio Boulevard. In general, the resources are under local jurisdiction and comprise a mix of urban parks, playground, and recreation centers. Two resources are under federal jurisdiction (National Park Service); these two resources have public recreation aspects and attributes.

Table 6-1 Park and Recreational Facilities within 1/2 Mile of Geary Corridor

ID	NAME	LOCATION	OFFICIAL WITH JURISDICTION	KEY SECTION 4(F) ATTRIBUTES
1	Angelo J. Rossi Playground	2 Willard North St.	San Francisco Recreation and Park (SFRP)	Public recreation area
2	Argonne Playground	18th Ave. & Geary Blvd.	SFRP	Public recreation area
3	Cabrillo Playground	858 38th Ave.	SFRP	Public recreation area
4	Dupont Tennis Courts	336 31st Ave.	SFRP	Public recreation area
5	Fulton Playground	855 27th Ave.	SFRP	Public recreation area
6	Hamilton Playground and Recreation Center	1900 Geary Blvd.	SFRP	Public recreation area
7	Laurel Hill Playground	251 Euclid Ave.	SFRP	Public recreation area
8	Margaret S Hayward Playground	1016 Laguna St.	SFRP	Public recreation area

ID	NAME	LOCATION	OFFICIAL WITH JURISDICTION	KEY SECTION 4(F) ATTRIBUTES
9	Raymond Kimbell Playground	Geary Blvd. & Steiner St.	SFRP	Public recreation area
10	Justin Herman Plaza	Steuart St. & Market St.	SFRP	Public recreation area
11	Richmond Recreation Center	251 18th Ave.	SFRP	Public recreation area
12	Rochambeau Playground	238 25th Ave.	SFRP	Public recreation area
13	Rossi Swimming Pool	600 Arguello Blvd.	SFRP	Public recreation area
14	Sue Bierman Park	Washington St. & Drumm St.	SFRP	Public park and recreation area
15	Tenderloin Recreation Center	570 Ellis St.	SFRP	Public recreation area
16	Buchanan Street Mall	Buchanan b/t Eddy & Grove St.	SFRP	Public recreation area
17	Japantown Peace Plaza And Pagoda	Post St. & Buchanan St.	SFRP	Public recreation area
18	Balboa Natural Area	Balboa St. at Great Highway	SFRP	Public recreation area
19	Union Square	Post St. & Stockton St.	SFRP	Public recreation area
20	Cottage Row Mini Park	Sutter St. & Fillmore St.	SFRP	Public park
21	Father Alfred E. Boeddeker Park	295 Eddy St.	SFRP	Public park
22	Jefferson Square	Eddy St. & Gough St.	SFRP	Public park
23	Sergeant John Macaulay Park	Larkin St. & O'Farrell St.	SFRP	Public park
24	Lincoln Park	34th Ave. & Clement St.	SFRP	Public park
25	Mini Park at 10th & Clement	351 9th Ave.	SFRP	Public park
26	Mini Park at Fillmore & Turk Sts.	Fillmore St. & Turk St.	SFRP	Public park
27	Mini Park at Bush & Baker Sts.	Bush St. & Baker St.	SFRP	Public park
28	Mini Park at O'Farrell & Beideman Sts.	O'Farrell St. & Beideman St.	SFRP	Public park
29	Mini Park at Steiner & Golden Gate Sts.	Steiner St. & Golden Gate Ave.	SFRP	Public park
30	Mountain Lake Park	One 11th Ave.	SFRP	Public park
31	Muriel Leff ("Arguello") Mini Park	419-435 7th Ave.	SFRP	Public park
32	Path/Greenway along Park Presidio Blvd.	Park Presidio Blvd.	SFRP	Public recreation area/trail
33	Lands End	680 Point Lobos Avenue	National Park Service	Public recreation area
34	Seal Rocks	Offshore	National Park Service	Public recreation area
35	Richmond Playground	149 18th Ave	SFRP	Public recreation area
36	Yerba Buena Gardens	Mission Street and 3rd Street	City and County of San Francisco	Public park and recreation area
37	St. Mary's Square	Pine Street and Quincy Street	SFRP	Public park and recreation area
38	Willie "Woo Woo" Wong Playground	853 Sacramento Street	SFRP	Public park and recreation area

The ID numbers in the table correspond to those shown in figure 6-1.

Source: Review of San Francisco Recreation and Parks data, aerial maps

6.2.2 | Wildlife and Waterfowl Refuges

There are no wildlife or waterfowl refuges within the Geary corridor. The closest federal wildlife refuge is the Marin Islands National Wildlife Refuge, located on two islands in San Francisco Bay east of the City of San Rafael approximately 16 miles north of the Geary corridor.

There are no wildlife or waterfowl refuges within 16 miles of the Geary corridor

The closest state wildlife area is the San Pablo Bay Wildlife Area in the mudflats and waters of San Pablo Bay near the mouth of the Petaluma River in Marin and Sonoma Counties. This area is approximately 30 miles northeast of the Geary corridor.

Given the distance between the above refuges and the Geary corridor, no use of any wildlife or waterfowl would foreseeably result from project implementation. Accordingly, such resources are not discussed further in this chapter.

6.2.3 | Historic Sites

Properties that are on or eligible for the National Register of Historic Places (NRHP), including historic districts, buildings, structures, objects, and certain archaeological sites qualify for Section 4(f) protection.

6.2.3.1 | HISTORIC ARCHITECTURAL RESOURCES

Prior to conducting the Section 4(f) analysis, the process to identify and evaluate historic properties as required under Section 106 of the National Historic Preservation Act was completed for the proposed project and documented in a Historic Resources Inventory and Evaluation Report (HRIER) (JRP Historical Consulting, 2017).

There are 53 historic architectural properties within the proposed project's APE considered eligible for the NRHP, all of which are considered Section 4(f) resources

Table 4.5-1 (in the Section 4.5, Cultural Resources) lists 53 eligible historic architectural properties noted in the HRIER as being within the proposed project's historic Area of Potential Effect (APE). Figures 4.5-2 through 4.5-5 illustrate the locations of most of these properties. All 53 of these properties are considered Section 4(f) resources.

Figure 6-1 Park and Recreational Facilities within 1/2-mile of Geary Corridor

Source: Jacobs, 2014 and Circlepoint, 2015

6.2.3.2 | ARCHAEOLOGICAL RESOURCES

The Archaeological and Native American Cultural Resources Sensitivity Assessment (ASA) investigated the Geary corridor APE for the potential presence of prehistoric and historic archaeological resources.

As the Geary corridor has been fully urbanized for nearly a century or longer, there are no above-ground archaeological resources existing in the Geary corridor archaeological APE. The ASA identified eight previously recorded historic-era and nine previously recorded prehistoric-era archaeological sites adjacent to, or in proximity to but outside of, the Geary corridor APE. These previously recorded sites yielded resources during prior excavation or other ground-disturbing activities.

In addition to these previously recorded sites, the ASA assessed the sensitivity of the entire Geary corridor for both historic- and prehistoric-era unrecorded resources. In terms of unknown prehistoric archaeological resources, the ASA noted that the eastern and western ends of the Geary corridor have relatively high potential to yield such resources. These are areas where blowing sand and sand dunes could have covered such resources. The ASA notes that if any such sites happen to be discovered in the course of construction, they would likely be eligible for the NRHP, given the relative lack of documented prehistoric sites on the northern San Francisco peninsula.

In contrast, the ASA finds that most of the central part of the Geary corridor, as well as any areas underlain by bedrock, have no or very low potential to yield prehistoric archaeological resources.

As for historic-period archaeological resources, the ASA notes heightened sensitivity in the areas northeast of First Street and the portion of the Geary corridor between Masonic and Gough.

If excavation associated with the build alternatives were to uncover buried, unrecorded resources, it is possible that they would qualify as Section 4(f) properties. Such resources would be considered Section 4(f) properties only if they are found eligible for the NRHP under a criterion other than Criterion "D." However, an exception at 23 CFR 774.13(b)(1) applies if archaeological site(s) are important chiefly because of what can be learned by data recovery and have minimal value for preservation in place. This exception to the requirement for 4f approval would apply both to situations where data recovery is undertaken and where the lead agency decides, with agreement of the official(s) with jurisdiction, not to recover the resource. This type of NRHP eligibility means that a given resource has historical value that is closely connected to the physical location of the resource. (23 CFR 774.13 (b)(1)). Examples of archaeological resources that would potentially be considered Section 4(f) resources include pre-historic habitation sites or villages, rock art sites, and other similar resources whose specific location is an intrinsic part of the resource's value.

Examples of archaeological resources that would potentially be considered Section 4(f) resources include pre-historic habitation sites or villages, rock art sites, and other similar resources whose specific location is an intrinsic part of the resource's value

In contrast, resources that have value only in terms of data that can be recovered from them are typically not considered Section 4(f) properties. These can include trash or debris scatters or other artifacts whose location of discovery does not add substantial cultural value to the resource in question.

6.3 Section 6(f) Resources

According to data compiled by the National Park Service, several parks in the City and County of San Francisco received grants from the Land and Water Conservation Fund (LWCF) dating as far back as 1967.[1] The vast majority of LWCF grant funds were targeted at John McLaren Park and the Candlestick Point State Recreational Area (well outside the Geary corridor).

The City and County received LWCF grants for "mini-park acquisition and development and park lighting" between 1968 and 1971. Table 6-1 above indicates the presence of several mini-parks within 0.5 mile of the Geary corridor. The mini park at Bush & Baker (#27) and the Willie "Woo Woo" Wong playground (#38) received LWCF funds, and thus are considered 6(f) resources. No other parks in the Geary corridor have been identified as receiving LWCF funding at any time.

6.4 Evaluation of Potential Impacts to Section 4(f) Properties

The Section 4(f) "use" of a resource is defined and addressed at 23 CFR 774.17. A "use" is classified in one of three ways: (1) as permanent incorporation, (2) temporary occupancy, or (3) as a constructive use. Section 4(f) uses are described in more detail below. In addition to these types of Section 4(f) use, the regulations also define a "de minimis" impact.

Direct Use. A direct use occurs when lands containing Section 4(f) resources will be permanently incorporated into a transportation facility.

Temporary Occupancy. A temporary occupancy occurs when the occupancy of the Section 4(f) resource is adverse in terms of the statute's preservation purpose as determined by 23 CFR 774.13(d), (e.g., no interference with the attributes of the resource that qualify it for Section 4(f) consideration). After the occupancy, the resource must be restored at least as good as the condition in which it was prior to construction.

A temporary occupancy (e.g., right-of-entry, construction, and other temporary easements) will not constitute a use of a Section 4(f) resource when all of the following conditions are met:

- Duration of the occupancy must be temporary (i.e., less than the time needed for construction of the project, and there should be no change in land ownership);

[1] Investigate West: Land and W: http://www.invw.org/data/lwcf/grants-ca.htmlater Conservation Fund Grants: California. Accessed on March 28, 2014.

- Scope of the work must be minor (i.e., both the nature and magnitude of the changes to the Section 4(f) resource are minimal);
- There are no anticipated permanent adverse physical impacts nor will there be interferences with the protected activities, features, or attributes of the property, on either a temporary or permanent basis;
- The land being used must be fully restored (i.e., the property must be returned to a condition that is at least as good as what existed prior to the project); and
- There must be documented agreement by the official(s) with jurisdiction over the resource regarding the previously described conditions.

In situations where the above criteria cannot be met, the temporary occupancy constitutes a use of Section 4(f) property.

Constructive Use. A constructive use of a Section 4(f) resource occurs when a transportation project does not permanently incorporate land from the resource, but the proximity of the project results in adverse impacts (e.g., noise, visual, access, and/or vibration impacts) so severe that the activities, features, or attributes that qualify the resource for protection under Section 4(f) are substantially impaired. Substantial impairment occurs only if the protected activities, features, or attributes of the resource are substantially diminished, meaning that the value of the resource in terms of its 4(f) significance will be reduced or lost. This determination is made through the following process:

- Identification of the current activities, features, or attributes of the resource that may be sensitive to proximity impacts.
- Analysis of the potential proximity impacts on the resource.
- Consultation with the appropriate officials having jurisdiction over the resource.

Constructive use may include these examples:

- The projected noise level increase attributable to a proposed project substantially interferes with the use and enjoyment of a noise-sensitive resource protected by Section 4(f).
- The proximity of a proposed project substantially impairs aesthetic features or attributes of a resource protected by Section 4(f), where such aesthetic features or attributes are considered important contributing elements to the value of the resource.
- A proposed project results in a restriction of access to the Section 4(f) resource, which substantially diminishes or eliminates the utility of a significant publicly owned resource.
- The vibration impact of a proposed project would substantially impair the use of a Section 4(f) resource.

De Minimis Impact. Federal regulations define a *de minimis* impact to a public park, recreation area, or wildlife/waterfowl refuge as one that would not adversely affect the activities, features, or attributes of the property qualifying the property for 4(f) protection. For historic properties, 23 CFR 774.5(b) states that a de minimis impact is one that would result in a Section 106 determination of "no adverse effect" or "no historic properties affected" in accordance with 36 CFR 800 and 23 CFR 774.5(b).

Guidance on the implementation of Section 4(f) states that a *de minimis* impact may be made for a permanent incorporation or a temporary occupancy of a Section 4(f) resource. Further, the guidance states that a *de minimis* impact determination can be approved without the need to develop and evaluate avoidance alternatives.[2]

A *de minimis* impact determination requires agency coordination with the officials having jurisdiction over the Section 4(f) property and opportunities for public involvement pursuant to 23 CFR 774.5(b), as well as concurrence from the official with jurisdiction, which is the SHPO if the Section 4(f) property is a historic property eligible for the NRHP.

6.4.1 | Evaluation of Impacts to Park and Recreational Facilities

6.4.1.1 | POTENTIAL FOR DIRECT USE OF PARK AND RECREATIONAL FACILITIES

The build alternatives, including the changes associated with the Hybrid Alternative/LPA, would not result in the permanent incorporation of any park or recreational Section 4(f) resources. The project would not use any park or recreational facility since the project would be located entirely within the existing Geary corridor or immediately adjacent sidewalk areas where no public parks or recreational facilities exist.

This takes into account the Park Presidio path, which exists within the existing discontinuous greenway on the east side of Park Presidio Boulevard between Fulton Street to the south and Lake Street on the north. The greenway is fully owned by the City and County of San Francisco and is maintained by San Francisco Recreation and Parks. The adjacent Park Presidio Boulevard roadway is part of State Route 1 and owned by Caltrans. The east side of the greenway includes a maintained dirt recreational path. An informal, unmaintained dirt trail runs also within portions of the western side of the greenway.

The greenway and path comprise a Section 4(f) resource because it is a public, recreational amenity that links Golden Gate Park with the Presidio and Mountain Lake Park. As noted above, the greenway and the path are discontinuous, interrupted by several perpendicular streets (California Street, Clement Street, Geary Boulevard, Anza Street, Balboa Street, and

[2] FHWA, July 2012, *Section 4(f) Policy Paper*; FTA, November 2012, Memorandum of Associate Administrator Lucy Garliauskas; *FTA Use of the FHWA Section 4(f) Policy Paper*.

Cabrillo Street), all of which are owned by the City and County of San Francisco and maintained by San Francisco Public Works.

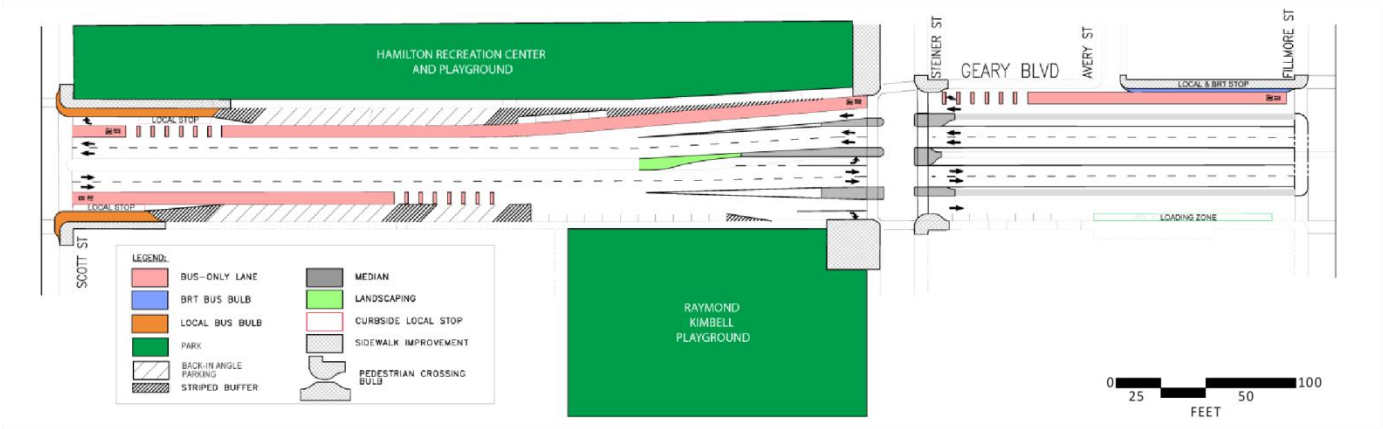
The build alternatives would make alterations to the existing Geary Boulevard roadway that currently interrupts the Park Presidio path. However, none of the build alternatives would widen Geary's existing right-of-way here or in any other location along the corridor. Therefore, none of the build alternatives would permanently incorporate any land from the Park Presidio greenway or path. With any of the build alternatives, as well as at present, recreational users of the path would be guided to cross Geary Boulevard at the existing crosswalk, some 50 feet to the west of the path.

The modifications to the Hybrid Alternative/LPA since the publication of the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) include 26 additional pedestrian crossing bulbs. Of these 26, three would be located within intersections near three different Section 4(f) recreational resources: Hamilton Recreation Center and Playground (ID #6 on Figure 6-1); Raymond Kimbell Playground (ID #9); and Sergeant John Macaulay Park (ID #23).

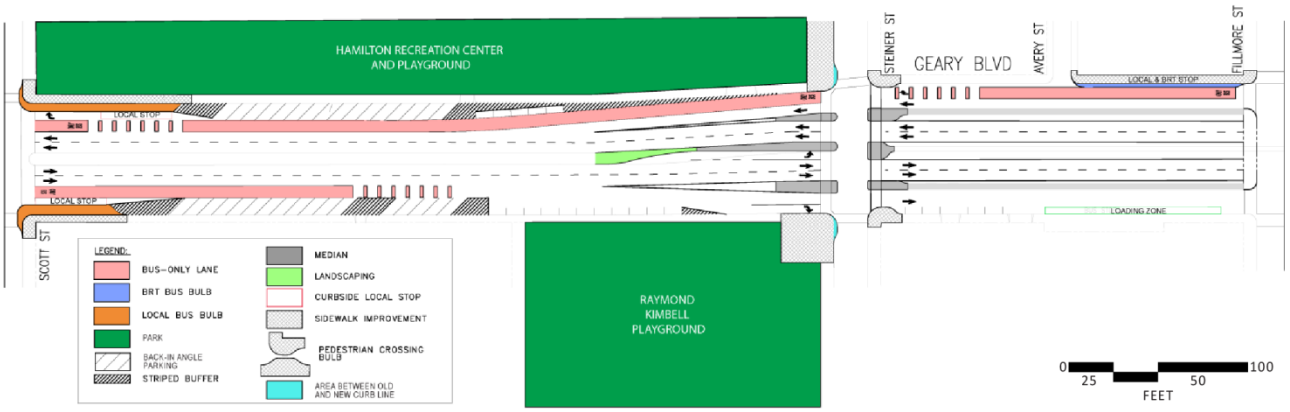
As demonstrated in Figures 6-2 and 6-3, each of the additional pedestrian crossing bulbs would be built out from the existing curb face toward the street (highlighted in light blue), within the existing paved areas of the Geary corridor. Figure 6-4 shows a photograph of a finished pedestrian crossing bulb. Bulb construction would typically include reconstruction of the adjacent existing sidewalk. None of the project infrastructure would be located within the park or recreational facility properties. The additional pedestrian improvements near these resources would act to improve pedestrian access to them, enhancing their recreational use.

Therefore, none of the build alternatives, including the Hybrid Alternative/LPA as modified after publication of the Draft EIS/EIR, would have any potential for direct use of any park or recreation facility.

Figure 6-2 Geary Boulevard/Steiner Street Intersection (Hamilton Recreation Center and Raymond Kimbell Playground)



a) Geary Boulevard/Steiner Street Intersection Assuming Removal of Steiner Bridge without Additional Pedestrian Crossing Bulbs (All build alternatives as described in Draft EIS/EIR)

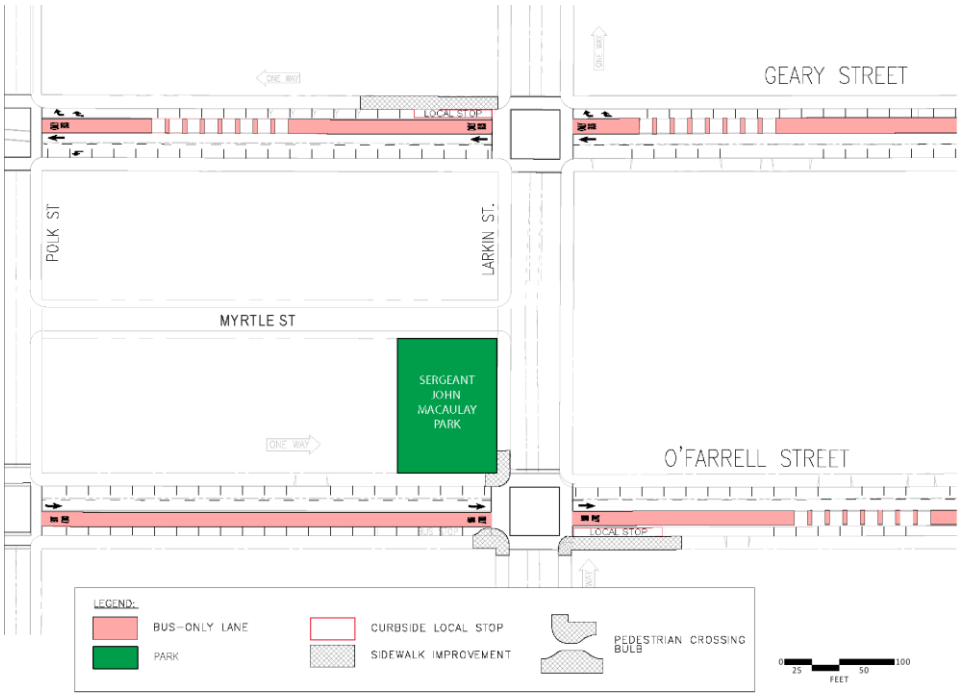


b) Geary Boulevard/Steiner Street Intersection Assuming Removal of Steiner Bridge with Additional Pedestrian Crossing Bulbs (Hybrid Alternative/LPA as modified in this Final EIS)

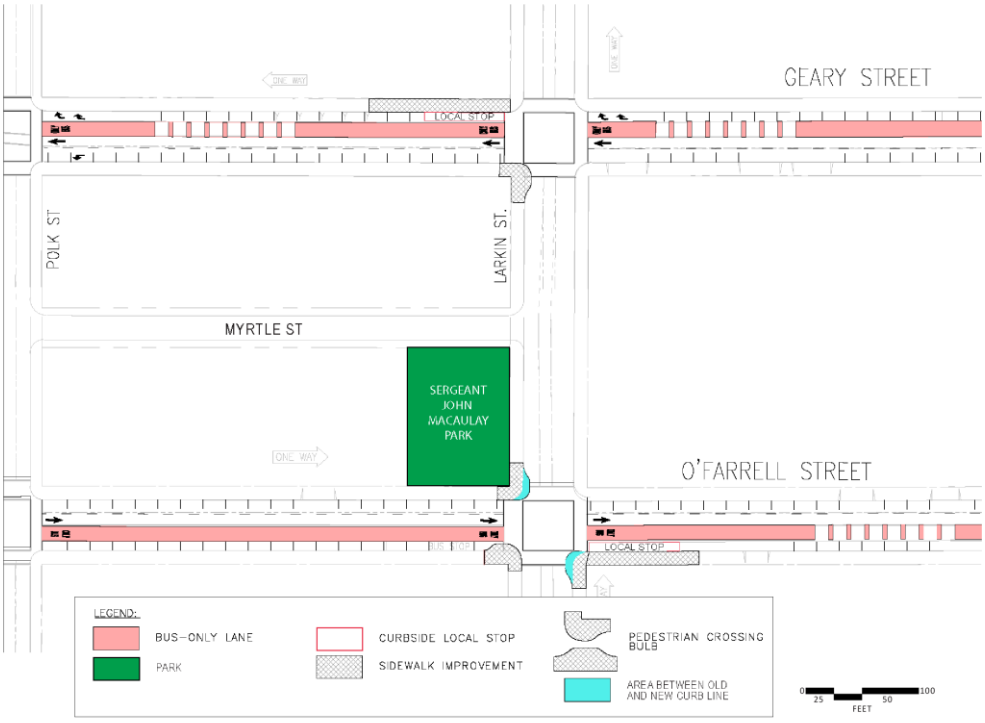
Note: Not to scale

Source: San Francisco Planning Department, 2017

Figure 6-3 O'Farrell Street/Larkin Street Intersection (Sergeant John Macaulay Park)



a) O'Farrell Street/Larkin Street Intersection without Additional Pedestrian Crossing Bulbs



b) O'Farrell Street/Larkin Street Intersection with Additional Pedestrian Crossing Bulbs

Note: Not to scale

Source: San Francisco Planning Department, 2017

Figure 6-4 Typical Pedestrian Crossing Bulb Build Out into Street

6.4.1.2 | POTENTIAL FOR TEMPORARY OCCUPANCY OF PARK AND RECREATIONAL FACILITIES

The build alternatives, including the changes associated with the Hybrid Alternative/LPA, would not result in temporary occupancy of any park or recreational Section 4(f) properties. While some temporary construction staging areas will be needed to implement the build alternatives, none would use any park or recreational spaces or access thereto. Construction activities that may occur adjacent to park and recreation locations are expected to be of short duration and would be conducted in accordance with permit conditions to protect the physical urban environment, thus limiting potential impacts during construction. This includes the construction of the additional pedestrian improvements, including the three discussed in Section 6.4.1.1, which are proposed for areas near public parks/recreation areas. Construction of these pedestrian improvements at any one location would be short in duration (4-6 days) with minimal excavation needed at each site (1.5 feet in depth). There would be no loss of access to any recreational facilities. For these reasons, temporary construction activities do not meet the criteria for a Section 4(f) temporary occupancy and are not expected to require the temporary utilization of, or have adverse effects on, any Section 4(f)-protected properties.

6.4.1.3 | POTENTIAL FOR CONSTRUCTIVE USE OF PARK AND RECREATIONAL FACILITIES

The project would not cause noise or vibration related proximity impacts to park or recreational properties. Therefore, constructive use of Section 4(f) parks and recreational properties would not occur

The build alternatives, including the changes associated with the Hybrid Alternative/LPA, would not result in a constructive use of any park or recreational properties. The Japantown Peace Plaza and Pagoda (ID # 17 on Figure 6-1); Union Square (ID # 19 on Figure 6-1); the Hamilton Recreation Center and Playground (ID #6 on Figure 6-1); Raymond Kimbell Playground (ID #9); and Sergeant John Macaulay Park (ID #23) could experience construction-related noise that would have the potential to exceed FTA construction thresholds. As noted in Section 6.4.1.2, construction of the pedestrian bulbs would be short in duration (4-6 days), so any construction-related increases in noise or vibration would be brief. Section 4.11.5.1 details minimization and mitigation measures that would

be applied during construction that would reduce noise and vibration levels below FTA thresholds and avoid adverse effects. The Japantown Peace Plaza and Pagoda, Union Square, Hamilton Recreation Center and Playground, Raymond Kimbell Playground, and Sergeant John Macaulay Park properties include parks, a pool, or playground areas that do not require quiet as an essential feature of the resource. Therefore, pursuant to 23 CFR 774.15(f)(5), the build alternatives including the changes associated with the Hybrid Alternative/LPA would not result in a substantial impairment to the activities, features, or attributes that qualify these properties for protection under Section 4(f).

Operational period noise along the Geary corridor would be below the FTA noise thresholds applicable to the subject parks and recreational facilities (see Section 4.11). As the existing project area's noise levels are typical for a dense urban environment, noise associated with the BRT system would not be different from or out of character with the existing urban setting.

It is expected that the project would cause no operational noise or vibration related proximity impacts to parks or recreational properties. Therefore, no substantial impairment of the activities, features, or attributes that qualify properties for 4(f) protection would occur from operation of any of the build alternatives, including the changes associated with the Hybrid Alternative/LPA.

6.4.2 | Evaluation of Impacts to Cultural Resources

6.4.2.1 HISTORIC ARCHITECTURAL RESOURCES

There would be no permanent incorporation, temporary occupancy, or constructive use of any of the 53 historic architectural properties within the proposed project's APE with the implementation of mitigation measures

Within the Geary corridor right-of-way, which includes sidewalk areas, three potentially eligible historic architectural resources have been identified and are considered Section 4(f) resources. The SHPO is the official with jurisdiction over the identified eligible architectural resources. Additional detail on the historic resources may be found in Section 4.5.

The "Golden Triangle" light standards are eligible for the NRHP and thus treated here as a Section 4(f) property. There are approximately 189 of these Beaux-Arts style streetlights in the Union Square area; 21 are within the architectural APE. Of these 21, 14 are adjacent to improvements associated with the build alternatives.

Second are lighting standards associated with the Japan Center. These Japan Center lighting standards are located on the sidewalk on the north side of Geary Boulevard between Fillmore and Laguna Streets. The Japan Center building and grounds are a historic architectural resource. The Japan Center lighting standards in adjacent public right-of-way areas are contributing elements to the Japan Center. Both the Golden Triangle streetlights and Japan Center lighting standards are part of the urban fabric and share sidewalk space with functional elements of the streetscape, such as trash receptacles, newspaper boxes, and the like.

The Auxiliary Water Supply System (AWSS) is a historic resource, which consists of cisterns, pipes, valves, hydrants, and pump stations across San

Francisco. As noted in Section 4.5, the Geary corridor APE includes a small percentage of all City-wide AWSS cisterns, pipes, valves, and hydrants. Cisterns, pipes, and valves are located below the ground surface. No AWSS pump stations are located within the Geary corridor APE.

The St. Francis Square Cooperative is a low-income housing development constructed in 1963 as part of the City's redevelopment effort of the Western Addition. The complex is significant as the first racially integrated cooperative housing in San Francisco and it is a historic property eligible for listing on the NRHP. No permanent incorporation of land from the St. Francis Square Cooperative would be expected, therefore no direct use of this Section 4(f) property would occur.

The build alternatives, including the changes associated with the Hybrid Alternative/LPA, would make streetscape improvements in the vicinity of the Golden Triangle streetlights and Japan Center lighting standards, as well as components of the AWSS, potentially requiring the removal and relocation of one or more streetlights/lighting standards and/or AWSS cisterns valves or hydrants. The streetscape may permanently incorporate the land on which these resources were located, which would be considered a use under Section 4(f). The relocation of the Golden Triangle streetlights or Japan Center lighting standards would be considered a direct use of these historic properties; however, these historic properties would retain overall integrity of setting, feeling, and association. Measures to minimize harm to the Golden Triangle streetlights, Japan Center streetlights, and AWSS components, such as avoidance, minimization, mitigation, and enhancement measures, were developed in coordination with the SHPO for these properties. As further described below, build alternatives, including the changes associated with the Hybrid Alternative/LPA, would result in *de minimis* impacts to these historic resources.

Section 4.5 of this document sets forth an avoidance measure (A-CUL-5) requiring that the design of any streetscape improvements in the vicinity of the Japan Center lighting standards, Golden Triangle streetlights, or AWSS components seeks first to avoid any relocation of these resources. A related minimization measure (MIN-CUL-6) states that if relocation is ultimately deemed necessary, such work must adhere to appropriate Secretary of the Interior's *Standards for the Treatment of Historic Properties* (SOI Standards) so as to maintain the historic integrity if moved to a different location.

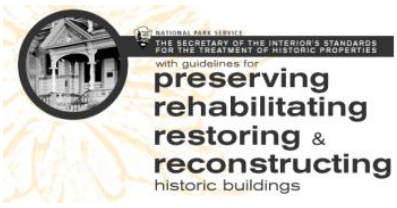
With the application of these minimization and avoidance measures, relocation of the historic the Japan Center lighting standards, Golden Triangle streetlights, or AWSS components under the build alternatives including the changes associated with the Hybrid Alternative/LPA would result in a *de minimis* impact under Section 4(f) as their relocation would not adversely affect the features, attributes or activities that make the Section 4(f) property significant. On October 17, 2017, the SHPO, as the official with jurisdiction, concurred with FTA's "no adverse effect" determination for the Golden Triangle streetlights, Japan Center streetlights, and AWSS components. Therefore, no analysis of avoidance

alternatives is required. (See Appendix E) A temporary occupancy of these historic resources may occur if the build alternatives require temporary removal and re-installation of these resources in their same location to accommodate construction. The temporary occupancy of historic resources would be minimal so as to not constitute a use and would be expected to meet the exception criteria at 23 CFR 774.13(d) as any land being used would be fully restored and there would be no permanent adverse physical impacts. Overall, there would be no change in the integrity of location, design, setting, materials, workmanship, feeling, and association for these historic resources, if they were to be temporarily relocated. In addition, the SHPO concurred with the lead agency's Section 106 finding that the project would have "no adverse effect" to historic properties.

Regarding the potential for constructive use of historic resources, proximity effects from construction and operation of the project, including changes associated with Hybrid Alternative/LPA, would be expected to occur. The noise analysis conducted for this document (Section 4.11) showed that construction noise would have the potential to exceed FTA thresholds from certain construction equipment within 100 feet; however, adherence to mitigation measures would avoid or lessen construction period noise impacts below FTA thresholds. None of these historic resources require quiet as an essential feature and they would retain their setting, feeling, and association as the existing project area is a dense urban environment. Therefore, none of the expected proximity noise effects would be expected to result in a substantial impairment of the St. Francis Square Cooperative, the Golden Triangle streetlights, Japan Center streetlights, and AWSS components. Pursuant to 23 CFR 774.15(f)(1), a constructive use does not occur when 36 CFR 800.5 results in an agreement of "no adverse effect." On October 17, 2017, SHPO concurred that the Project would result in a "no adverse effect" to historic properties under Section 106.

Construction activities that may occur adjacent to historic resources with the potential for vibratory effects are expected to be short in duration and would be conducted in accordance with permit conditions to protect the physical environment. Construction of these improvements at any one location would last 4-6 days with minimal excavation needed at each site (largely 1 to 3 feet in depth, with limited exceptions extending to 8 and 16 feet in depth). Section 4.11 of this document describes potential vibration effects that could result from the use of construction equipment in proximity to historic resources. The implementation of measure MIN-NOISE-C1 would avoid construction vibration impacts as outlined in the Vibration Reduction and Minimization Plan. Minimization measures associated with MIN-CUL-C1 and C4 would ensure that any potential vibratory effects would be avoided or not adverse. Therefore, no substantial impairment of the activities, features, or attributes that qualify historic properties for 4(f) protection would occur.

Operational period noise along the Geary corridor would be below the FTA noise thresholds. Accordingly, no adverse effect would occur and no



mitigation measures would be required. As the existing project area's noise levels are typical for a dense urban environment, noise associated with the project would not be substantially different from or out of character with the existing urban setting. The build alternatives would cause no noise or vibration related proximity impacts to historic resources, and no substantial impairment of the activities, features, or attributes that qualify historic properties for 4(f) protection would occur. Likewise, no adverse indirect visual effects on historic resources would be expected from either construction or operation of the project. Concurrence from SHPO on the "no adverse effect" finding was received on October 17, 2017 (See Appendix E). Therefore, the build alternatives, including the changes associated with the Hybrid Alternative/LPA, would not result in a constructive use of Section 4(f) historic properties.

6.4.2.2 | | ARCHAEOLOGICAL RESOURCES

As noted in Section 4.5 of this document, there are no archaeological resources above ground in the Geary corridor. A total of 26 formally recorded archaeological sites were documented in the vicinity of or adjacent to the Geary corridor, but none are documented as extending into the Geary corridor. Accordingly, none of the project alternatives would result in any disturbance to previously recorded (i.e., known) archaeological sites. An addendum to the ASA was prepared in June 2017 to analyze project elements in any portion of the Geary corridor understood to have a moderate overall sensitivity for historic-era archaeological resources. The archaeological APE includes a depth of 1 to 3 feet below surface, with limited exceptions of 8 to 16 feet of APE depth needed (for street lights, signal poles, sewer replacement between 12th and 16th avenues on Geary, and catch basin inlet and hydrant relocations).

The addendum ASA determined that sensitivity for historic-era archaeological resources is low in the areas where the project would require excavation. Although the Market Street portion of the project area has a high potential for sites submerged below the Bay Mud, archaeological sites have only been found at depths greater than 20 feet. Since project excavations would occur at depths of no more than 16 feet, project excavations would not be sufficiently deep to encounter buried prehistoric resources. For the project portions between Masonic Avenue and Gough Street, sensitivity for encountering resources was determined to be low because the project was either within areas distributed during the original construction of Geary Street or areas previously distributed by other urban infrastructure.

As set forth in Section 4.5, in the event that any previously unknown intact archaeological resources are inadvertently discovered during construction, a determination as to NRHP eligibility will be made. If any archaeological resources are subsequently determined to be eligible for the NRHP under Criterion D (in other words, to warrant preservation in place), SFCTA, in concert with FTA, will prepare separate Section 4(f) evaluations for such resources. Such evaluations would include determinations of permanent incorporation, temporary occupancy, and/or constructive use, and, if warranted, avoidance alternatives and measures to reduce harm to any

qualifying Section 4(f) resources. Only archaeological resources that are eligible for the NRHP and warrant preservation in place will be considered under Section 4(f).

6.5 Measures to Minimize Harm

The project alternatives would not result in a use, temporary occupancy or constructive use of any parks or recreational facilities, wildlife or waterfowl refuge.

The Project would result in use with *de minimis* impacts of historic properties if Golden Triangle streetlights, Japan Center streetlights, and AWSS components were relocated. As previously discussed in Section 6.4.2.1 and Section 4.5, measures to avoid and minimize harm were included. An avoidance measure (A-CUL-5) requiring that the design of any streetscape improvements in the vicinity of the Japan Center lighting standards, Golden Triangle streetlights, or AWSS components seeks first to avoid any relocation of these resources. A related minimization measure (MIN-CUL-6) states that if relocation is ultimately deemed necessary, such work must adhere to appropriate Secretary of the Interior's *Standards for the Treatment of Historic Properties* (SOI Standards) so as to maintain the historic integrity if moved to a different location. As set forth in Section 4.5 of this document, the project incorporates avoidance and minimization measures that resulted in SHPO's finding of no adverse effect to historic architectural resources.

All of the project alternatives incorporate, to some extent, various amenities and landscape features to enhance the experience of residents, motorists, transit riders, cyclists, and pedestrians in the Geary corridor and visually blend the transportation improvements into the existing urban neighborhood setting in a manner that is compatible with its context and setting. These amenities are substantially greater for the build alternatives.

Opportunities for harmonizing the visual effects of project elements with adjacent historic properties will continue to be developed as the design consultation process goes forward. Design elements, appropriate lighting, compatible materials, and color choices that complement and do not visually compete or clash with the nearby historic properties and are sensitive to their surroundings will be identified. Design will be guided by the SOI Standards to the extent applicable. For all design elements along the Geary corridor, a consulting historic architect working on behalf of SFMTA will review project plans to assure design elements are compatible with the character-defining features of the historic district in terms of massing, size, scale, and architectural features.

The SOI Standards (36 CFR, Part 68) are, according to the agency's website, "common sense principles in non-technical language [that] were developed to help protect our nation's irreplaceable cultural resources by promoting consistent preservation practices."[3] The Standards provide guidance for maintaining, repairing, and replacing historic materials, as well

[3] http://www.nps.gov/tps/standards.htm.

as about designing new additions or making alterations to historic resources, including related landscape features and the building's site and environment, including adjacent or related new construction. The following principles are most relevant to the proposed project:

- The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
- New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
- New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

Where project features will be located in proximity to historic structures, the SOI Standards will serve as a guide to assure that new structures are compatible with and do not radically change, obscure, damage, or destroy character-defining materials or features associated with historic properties.

Finally, as outlined and discussed in Section 4.4, Visual Resources, though some project build alternatives would create slight visual changes in the vicinity of certain park and recreational properties, the incorporation of compatibility features in the project design would minimize any visual effects on Section 4(f) properties.

6.6 Evaluation of Potential Impacts to Section 6(f) Properties

The Bush and Baker mini-park and Willie "Woo Woo" Wong playground received LWCF funds and are located within 0.5-mile of the Geary corridor. However, none of the project alternatives could foreseeably result in any adverse permanent or temporary effect to either of these Section 6(f) resources as they are both located over three blocks north of the Geary corridor. Therefore, there would be no acquisition or conversion of any Section 6(f) properties.

6.7 Coordination

For historic properties, the project's evaluation of cultural resources began with the delineation of the architectural and archaeological APEs. The SHPO reviewed and commented on the adequacy of the architectural and archaeological APEs delineated for the project alternatives in May 2015. In addition, consulting parties and Native American groups were consulted with in accordance with Section 106 (see Section 4.5 of the FEIS). On September 20, 2013 Section 106 consulting parties including area planning agencies, local governments, historical societies, museums and other parties

interested in historic preservation issues were invited to participate in the Section 106 process. No responses were received.

Per 23 CFR Section 774.5(b), in their letter dated September 14, 2017, FTA notified SHPO of the intent to make a de minimis impact determination under Section 4(f) for historic resources (namely, the Auxiliary Water Supply System, the Golden Triangle Light Standards, and light standards associated with Japan Center) based on their concurrence with the Section 106 finding of no adverse effect to historic properties. On October 17, 2017, SHPO concurred with the lead agency's Section 106 finding that the project would have "no adverse effect" to historic properties. See Appendix E for pertinent correspondence and see Section 4.5 for additional details on Section 106 consultation. As part of local agency coordination, draft cultural reports (the HRIER, Finding of Effect, and ASA) were provided to the City of San Francisco Planning Department (Historic Preservation Commission staff) for review and comment in fall 2014). As described in Section 4.5, addenda and or/updates were prepared to finalize the ASA (June 2017), HRIER (April 2017), and Finding of Effect (July 2017). (See Appendix E for a copy of this consultation correspondence).

Staff from multiple agencies of the City and County of San Francisco were consulted in fall 2014 to help identify and confirm significant public parks and recreational resources which may be Section 4(f) resources. Agencies were provided copies of and the opportunity to comment on the Draft EIS and the Section 4(f) analysis. No agencies provided comments regarding any of the parks/recreational resources identified as Section 4(f) resources.

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CHAPTER 7.0 CALIFORNIA ENVIRONMENTAL QUALITY ACT EVALUATION

The Final Environmental Impact Report (EIR) was published on December 9, 2016, pursuant to the California Environmental Quality Act (CEQA), via notifications in multiple formats and languages including a radius mailing along the corridor.

As the CEQA lead agency, San Francisco County Transportation Authority (SFCTA) certified the Final EIR and unanimously approved the project on January 5, 2017, and issued a Notice of Determination under CEQA. SFCTA analyzed the 27th Avenue transition change in a CEQA addendum and approved this change on June 27, 2017. On July 18, 2017, the SFMTA Board separately approved the Geary Corridor Bus Rapid Transit Project, concurred with the SFCTA's determination that the Hybrid Alternative is the Locally Preferred Alternative, and adopted the CEQA Findings and Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Program for the project. SFMTA also filed its own Notice of Determination under CEQA. Local thresholds previously referenced throughout Chapter 7 are reflected in the Methodology and Environmental Consequences discussions of each of the Chapter 3 and Chapter 4 sections. Therefore, Chapter 7 is no longer necessary as part of this Final Environmental Impact Statement. The Final EIR is available at:

http://www.sfcta.org/geary-corridor-bus-rapid-transit-final-eir

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CHAPTER 8.0 PUBLIC PARTICIPATION

8.1 Overview

The Geary corridor's 6.5 miles feature a very diverse mix of communities from Ocean Beach in the west to the Financial District and South of Market neighborhood in the east. In between, the Geary corridor passes through neighborhoods historically associated with Russian, Japanese, Chinese, Vietnamese, and African-American communities. The Geary corridor also passes through some of the City's major civic spaces, cultural districts, and business centers.

With such length and diversity, the proposed project is responsible to a large and complex constituency. For over a decade, the San Francisco County Transportation Authority (SFCTA) and San Francisco Municipal Transportation Agency (SFMTA) have conducted a multi-faceted community engagement process regarding the project alternatives. This chapter summarizes the agencies' efforts to engage the public as well as stakeholder agencies in the development of alternatives, the screening of alternatives, and the environmental review process. This chapter also includes descriptions of public participation during and after the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) public review period, as well as an explanation of planned outreach to follow release of this Final EIS/Record of Decision (ROD).

8.2 Interagency Consultation

Given the complex nature of the proposed project and the need for informed technical input during all phases of project development, as well as to comply with the requirements of both federal and California environmental law, SFCTA conducted early engagement of responsible public agencies on the scope of the environmental review as well as on the feasibility of various alternatives. These efforts are summarized below.

8.2.1 | SFCTA and SFMTA Coordination

This section describes SFCTA and SFMTA intra- and inter-agency management and coordination approach and activities for the Geary Bus Rapid Transit (BRT) project, including the roles of the various respective functional divisions and the coordination of their support for the project. The project created multiple channels for communication in order to develop a close partnership between SFCTA and SFMTA toward facilitating the project development and environmental documentation work.

Many community meetings were held to engage the residents and community of the Geary corridor

Staff project managers from the SFCTA's Planning Division and SFMTA's Sustainable Streets Division-Planning Subdivision (formerly the Strategic Planning and Policy Subdivision) met weekly as a project team to coordinate on project development issues. The weekly meetings, held with the technical consultant team, were opportunities to coordinate project activities such as outreach, analysis, and conceptual design. The meetings were also opportunities to identify issues and

decisions requiring input and approval by other SFMTA Divisions or by SFMTA and SFCTA executive management.

The project team coordinated with staff from other SFCTA Divisions that provided project support, including the SFCTA's Technology Services, Capital Projects, and Policy and Programming Division, by inviting their participation at the weekly meetings on an as-needed basis.

The project team coordinated with SFMTA staff from other Divisions that are providing project support by arranging meetings with the relevant Division staff contacts on an as-needed basis. At these meetings, the project team raised issues and decisions requiring input and approval by the respective Division, including Transit (Operations Support), Sustainable Streets (Transportation Engineering, Planning, Livable Streets), Capital Programs and Construction (Project Management, Engineering), and Funding and Information Technology (Capital Financial Planning and Analysis). The decision processes involved written confirmation with the Division manager. Key decisions involving other SFMTA Divisions were also coordinated via SFCTA/SFMTA deputy-level management meetings.

The project team organized periodic deputy-management-level meetings between SFCTA and SFMTA to provide progress updates and build consensus on key decisions. Relevant deputies from SFMTA's Capital Programs and Construction, Transit, and Sustainable Streets Divisions participated. From the SFCTA side, deputies from the Planning and Capital Projects Divisions participated. The meetings were opportunities to build consensus on project design details and needed project development activities.

8.2.2 | External Local Agency

The project team coordinated with other local agencies both on an individual basis, through an inter-agency Technical Advisory Committee, and at the City's regular Directors Working Group meetings, comprised of directors from various City departments. Other departments with which the project team coordinated most closely includes:

- San Francisco Public Works, including the Infrastructure Design and Construction Division, the Bureau of Urban Forestry, and the Bureau of Street and Sewer Repair
- San Francisco Planning Department, including the Citywide Policy Planning Division and Environmental Planning Division
- San Francisco Public Utilities Commission, including the Water Enterprise and the Wastewater Enterprise
- Golden Gate Bridge, Highway, and Transportation District

The participating agencies provided valuable input on the project, drawing on their respective areas of expertise. The project team also coordinated with respective agencies on potential Geary project interactions with the water system, the sewer system, street paving, and trees and landscaping.

8.2.3 | Federal Transit Administration Coordination

The project team provided updates to the lead agency at periodic progress review meetings and conference calls.

8.3 Community Involvement

Community involvement in development of the Geary BRT Project has a long history, beginning with outreach around the 2003 Proposition K Expenditure Plan reauthorization and adoption of the 2004 Countywide Transportation Plan. SFCTA conducted extensive outreach during its preparation of the Geary BRT Feasibility Study, adopted by the SFCTA Board in 2007. The details of prior outreach are described in the Geary BRT Feasibility Study final report, available at:

http://www.sfcta.org/sites/default/files/content/Planning/GearyCorridorBusRapidTransit/Geary_FS_low-res.pdf

This section describes community involvement activities accompanying the environmental review phase, which began in 2008. Reaching and meaningfully engaging the diverse groups along the Geary corridor in the development of alternatives and environmental review of the project requires a multi-faceted outreach effort utilizing different communication tools and in several different languages, including Chinese, Japanese, Korean, Russian, Spanish, Filipino, and Vietnamese. The project has conducted multiple rounds of outreach as the project design underwent refinement and considered previous community input. Community outreach efforts will continue throughout the environmental review process. Detailed project information, including fact sheets, progress reports, project schedule, etc. will remain available on SFCTA's website at:

http://www.sfcta.org/geary

SCOPING MEETINGS

The mailing list for the proposed project includes more than 23,000 addresses along the Geary corridor

The scoping process included two meetings open to the general public that were widely noticed. Those meetings were held on the following dates:

December 4, 2008
Jackie Chan Activity Center, 408 22nd Ave
6:00 - 8:00 p.m.

December 6, 2008
Tenderloin Community School, 627 Turk St
10:00 am - 12:00 p.m.

8.3.1 | Public Information Meetings

8.3.1.1 | SCOPING PHASE

The scoping process included a comprehensive round of outreach that sought to raise awareness of the project and gather input on actions, alternatives, environmental effects, and mitigation measures to be analyzed in the environmental review process. The Notice of Preparation (NOP) was sent to the State Clearinghouse and to local, regional, and State agencies on November 20, 2008. The lead agency published a Notice of Intent (NOI) in the Federal Register on November 24, 2008. Appendix B includes the NOP and NOI.

The public notice effort included advertisements in local newspapers; a mailing to more than 23,000 residential and commercial occupants of buildings along the Geary corridor, as well as to the outreach database of interested parties developed during the Feasibility Study; online announcements on SFCTA and SFMTA websites; and an announcement poster at bus stops along the Geary corridor.

Scoping meetings were held in December 2008 in the Outer Richmond at the Jackie Chan Activity Center, and in the Tenderloin at the Tenderloin Community School. In July 2009, the project team hosted another community meeting in the Richmond District as part of the scoping process.

SFCTA and SFMTA also used their respective social media platforms to announce these and subsequent meetings. SFCTA also issued press releases as a means of partnering with the local media to raise awareness of the project and to communicate opportunities to provide input.

The results of the scoping process and lists of comments received are summarized in the *Draft Scoping Summary Report*, which is available on SFCTA's website at:

http://www.sfcta.org/sites/default/files/content/Planning/gearybtenvironmental/documents/GBRT_DraftScopingReport_20090223.pdf

8.3.1.2 | CITIZENS ADVISORY COMMITTEE

To provide a sustained forum for public input with the ability to focus on key aspects of the project in more detail, SFCTA formed a project-specific Citizens Advisory Committee (CAC) of 13 members living or working on or near the Geary corridor. The CAC held noticed and open-to-the-public meetings at least on a quarterly basis, and as frequently as bi-monthly throughout the environmental analysis. The CAC was actively involved in project development and design discussions and in previewing and providing recommendations about materials in advance of their provision to the general public. The CAC also assisted with publicizing community meetings, including participating in the distribution of flyers along the Geary corridor in key neighborhoods in which the build alternatives would reduce on-street parking , such as Masonic, the Fillmore, and Japantown. In addition to its ongoing input on project development, at its final meeting on January 4, 2017, the CAC made a recommendation to the SFCTA Board to certify the Final EIR and select the Hybrid Alternative as presented in the Final EIR with the addition of a BRT stop at Laguna Street as the Locally Preferred Alternative (LPA). January 4, 2017 was the final meeting of the CAC – previous meeting agendas, minutes, and other information about the CAC can be found at:

http://www.sfcta.org/geary-corridor-bus-rapid-transit-citizens-advisory-committee

Russian-language poster on Geary Blvd bus shelters announcing a community meeting on the project.

SFMTA has now formed a CAC that will advise SFMTA during the design and implementation phases of the project. More information can be found at:

https://www.sfmta.com/committees/geary-community-advisory-committee

8.3.1.3 | COMMUNITY MEETINGS ON PROJECT ALTERNATIVES

After the scoping process concluded, SFCTA convened multiple rounds of general community meetings in part to obtain community input on development of project alternatives. SFCTA noticed these meetings on multiple platforms to encourage broad community participation. These notifications included announcements on the project website, emails to project contacts, displays inside SFMTA buses, bus shelter ads, flyers distributed to local gathering places, and newspaper advertisements in *The Examiner* and *Sing Tao Daily*. Briefings with and announcements to key stakeholder

groups were also used to inform the attendees of upcoming community meetings. In communities with high numbers of non-English speakers, information was provided in multiple languages, including Chinese, Japanese, Korean, Russian, Spanish, Tagalog, and Vietnamese on the bus cards, shelter ads, and emails.

A round of outreach on project development was held in 2012. Meetings focused on several key aspects of the project, including overall project purpose, progress to date, proposed alternatives, and complex areas such as the Masonic tunnel and the Fillmore underpass/Japan Center area. Public comments elicited at these meetings helped SFCTA better understand the advantages and costs of different options in these areas. Meetings were held at the following times and places:

- June 25, 2012
  Richmond Recreation Center, 251 18th Avenue
  6:30 - 8:30 p.m.
- June 26, 2012
  Japanese Cultural and Community Center, 1840 Sutter Street
  6:30 - 8:30 p.m.
- June 27, 2012
  The Event Center at Saint Mary's Cathedral, 1111 Gough Street
  6:30 - 8:30 p.m.

In late 2013 and early 2014, SFCTA convened an additional round of community meetings conducted in an open house format. These meetings focused on proposed alternatives including such detail as stop spacing, and potential parking/traffic changes associated with the various alternatives. In these meetings, SFCTA introduced its reasoning and rationale for the Hybrid Alternative that is analyzed in this document (prior to its 2017 adoption as the LPA). SFCTA described the potential benefits and concerns of the various alternatives and sought further community feedback in order to identify any other issues of concern.

- December 9, 2013
  Richmond Recreation Center, 251 18th Avenue
  6:00 - 8:00 p.m.
- December 17, 2013
  SF Main Library, Koret Auditorium, 100 Larkin Street
  6:00 - 8:00 p.m.
- January 30, 2014
  Japanese Cultural and Community Center, 1840 Sutter Street
  6:00 - 8:00 p.m.

The presentation materials from the meetings held in June 2012 and each open house held in late 2013/early 2014 are available at:

http://www.sfcta.org/geary-corridor-bus-rapid-transit-draft-eis-eir

8.3.1.4 | MEETINGS WITH LOCAL GROUPS AND ORGANIZATIONS

PUBLIC MEETINGS

SFCTA has met with 65 local community and business groups along the Geary Corridor

The project team convened meetings and/or briefings with over 65 local community, neighborhood, business, advocacy, and interest groups over the course of project development process. SFCTA and SFMTA's involvement with many of these groups is ongoing and is expected to continue through the final phases of the

environmental review process. The meetings to date have varied in character, including both small-group discussions and large-group presentations.

- Alamo Square Neighborhood Association
- Alliance for a Better District 6
- Chinatown Community Development Center (including Japantown, Richmond, and Tenderloin facilities)
- Central City SRO (Single Room Occupancy) Collaborative
- Clement Street Merchants
- Coalition for San Francisco Neighborhoods
- Franklin Delano Roosevelt Democratic Club
- Fillmore/Lower Fillmore Neighborhood Association
- First Unitarian Universalist Society of San Francisco
- Friends of the Urban Forest
- George Washington High School Parent Teacher Student Association
- Greater Geary Merchants and Property Owners Association
- Holy Virgin Cathedral
- Institute on Aging
- Interfaith Council
- Japantown Organizing Committee
- Japantown Taskforce
- Kaiser Permanente
- Kimochi
- La Voz Latina
- LightHouse for the Blind
- Lower Fillmore Merchants Association
- Lower Polk Neighborhood Association
- Mayor's Disability Council
- Mo' Magic
- Nihonmachi Little Friends
- SFMTA Multimodal Accessibility Advisory Committee
- Pacific Heights Residents Association
- Pedestrian Safety Advisory Committee
- Planning Association for the Richmond (PAR)
- Richmond District Democratic Club
- Richmond District Neighborhood Center
- Richmond District Senior Center
- Richmond Village Beacon
- Roosevelt Middle School
- Rosa Parks Elementary School
- Russian American Community Services
- Saint Francis Square Cooperative

- Saint Mary's Cathedral (Cathedral of St. Mary of the Assumption)
- San Francisco Council of District Merchants
- San Francisco Planning and Urban Research (SPUR)
- San Francisco Unified School District
- San Francisco Youth Commission
- Save Muni
- Senior and Disability Action Network
- Sequoias San Francisco
- Sierra Club of San Francisco
- SF Bicycle Coalition
- SFMTA Citizen Advisory Committee
- SF Small Business Commission
- SF Transit Riders Union
- Spruce-Cook Block Merchants
- Tenderloin Community Benefit District
- Tenderloin Futures Collaborative
- TransForm
- Union Square Business Improvement District
- University of San Francisco Student Senate
- University of San Francisco Residence Hall Association
- Urban Forestry Council
- Walk San Francisco
- Yerba Buena Alliance

8.3.1.5 | CORRIDOR SURVEYS AND VISUALIZATION KIOSKS

In addition to the meetings with neighborhood groups, the project team conducted several surveys on the Geary corridor. A 2013 visitor intercept survey reached nearly 600 travelers in the corridor and obtained information on their travel behavior, perspectives on Geary transportation needs and the BRT project. Also in 2013, a door-to-door survey of over 500 of the local merchants along the Geary corridor obtained responses from over 200 businesses, capturing their perspectives on transportation needs along Geary and the BRT project. From October to December 2015, the project team placed two visualization kiosks on Geary Boulevard, one at Webster Street and one at 17th Avenue, allowing passers-by to view simulated images of the proposed improvements at those locations and complete a short survey to share their opinions on the project. Over 6,400 people used the devices; of these, about 1,800 completed the survey.

8.3.1.6 | INFORMATIONAL MATERIALS

To facilitate the earliest phases of public outreach, SFCTA developed an array of informational materials to foster greater public understanding of the project purpose and potential project alternatives.

In 2008, SFCTA first developed and distributed a four-page fact sheet to provide a project overview and detailed information on specific issues that concerned the community and for which input was sought by SFCTA to shape the project

alternatives. SFCTA updated and distributed the fact sheet regularly through the course of project development, most recently in April 2017. Iterations of the fact sheet were translated from English into several languages including Chinese, Japanese, Korean, Russian, Spanish, Filipino, and Vietnamese. The current project fact sheet is available for download at:

http://www.sfcta.org/delivering-transportation-projects/geary-corridor-bus-rapid-transit-home

In 2017, SFMTA transitioned into the lead role for most future project communications with stakeholders and the public. A project website has been set up, including a fact sheet:

https://www.sfmta.com/geary

8.3.1.7 | CULTURAL RESOURCES COMMUNITY CONSULTATION

As part of the Historic Resources Inventory and Evaluation Report and the Archaeological Survey Report, local historic preservation groups, as well as Native American tribes, groups, and individuals, were contacted and given the opportunity to review these reports and provide input. Please see Section 4.5 for additional information on this outreach.

8.3.2 | Outreach during the Draft EIS/EIR Circulation and Public Comment Period

SFCTA distributed the Draft EIS/EIR on October 2, 2015, in accordance with both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act, to applicable federal, state, and local agencies, elected officials, neighborhood groups, and other interested parties who had expressed interest in the proposed project and those who requested a copy of the Draft EIS/EIR. It was made available for a 59-day public review period to solicit public comment from agencies, organizations, and individuals. An electronic version of the Draft EIS/EIR was posted to the project website at www.gearybrt.org; paper copies were made available at SFCTA (1455 Market St.), SFMTA (1 South Van Ness Ave.), the San Francisco Planning Information Center (1660 Mission St.), the Main Library (100 Larkin St.), the Anza Branch Library (550 37th Ave.), the Richmond/Senator Milton Marks Branch Library (351 9th Ave.), and the Western Addition Branch Library (1550 Scott St.) throughout the duration of the public comment period. CD copies of the Draft EIS/EIR were made available upon request through the SFCTA at no cost to the public and paper copies could be purchased at the cost of printing.

SFCTA invited comments to be submitted in writing via mail or email throughout the public comment period, or provided at the public comment meeting orally or in writing. A total of 299 comment communications (e.g., letters, emails, oral comment transcripts) were submitted. These included six communications from agencies, 13 communications from organizations, and 280 separate communications from 244 individuals. All comments received during the public comment period, as well as those received before December 10, 2015, are included in Appendix L of this Final EIS along with written responses to each of these comments. The topics most commonly raised in the comments received are reflected in the list of Master Responses provided in Appendix L, Table L.2-1.

8.3.2.1 | DOCUMENT RELEASE NOTIFICATION

Notification of the availability of the Draft EIS/EIR and the associated public comment meeting was provided in a variety of mediums, formats, and languages, including the following:

1. A multi-lingual (English, Spanish, Filipino and Chinese) mailer was mailed to over 20,000 residents and owners along the length of the corridor, stakeholder groups and past meeting attendees.
2. The project website was updated the week prior to release of the Draft EIS/EIR announcing the upcoming public comment period. Information was provided in English, Spanish, Chinese, Filipino, Russian, Japanese, Vietnamese and Korean.
3. Multi-lingual bus shelter ads were posted along the Geary corridor in English, Spanish, Chinese, and Filipino, announcing the availability of the Draft EIS/EIR for public review and comment. The same ad was also posted inside buses in the space behind the driver's seat.
4. A multi-lingual email was sent on October 5, 2015, in English, Spanish, Chinese, and Filipino to over 1,000 people by SFCTA and SFMTA. Additional communications were sent on the following dates: October 30, 2015 and November 12, 2015 via SFCTA's and SMFTA's Twitter and Facebook pages announcing the public comment meeting and the extension of the public comment period.
5. The Notice of Availability/Notice of Completion of the Draft EIS/EIR was published in the following publications: *San Francisco Examiner*, *Richmond Review*, *The New Fillmore*, *Western Edition*, *Central City Extra*, *Kstati*, *Nichi Bei Weekly*.
6. Facebook ads were posted to announce the public comment meeting targeting people using the application near the Geary corridor.
7. A project fact sheet was housed on the project website (gearybrt.org) available for the public to download. It was also provided at all community meetings and briefings, and available at the public comment meeting held on November 5, 2015. Fact sheet inserts describing the public comment period and meeting were available in Spanish, Chinese, Filipino, Russian, Japanese, Vietnamese, and Korean.
8. SFMTA published a blog post on October 20, 2015, that described the environmental process, including the purpose of the public comment period and public comment meeting.
9. SFCTA and SFMTA contacted over 80 local stakeholder organizations and met with those groups that requested a meeting with the project team prior to or during the public comment period for the Draft EIS/EIR. These meetings occurred in October and November 2015 and provided project updates, including information about the Draft EIS/EIR and the public comment meeting.
10. Information about the release of the Draft EIS/EIR and public comment meeting were provided to the CAC at its October 7, 2015, meeting.
11. A press release announcing the availability of the Draft EIS/EIR was distributed to local media outlets on Thursday October 1, 2015.

8.3.2.2 | PUBLIC COMMENT MEETING

SFCTA held a public comment meeting in an open house format on November 5, 2015 at Saint Mary's Cathedral, 1111 Gough St. The purpose of the meeting was to encourage the public to provide oral comments at the meeting and submit written comments. The public had an opportunity to discuss issues and questions with subject experts including engineers and planners on the project team. There was a

30-minute formal presentation given during the meeting, and over two hours were devoted to an open house question-and-answer session with the project team to provide open dialogue between the public and staff. Comment cards were available for participants to submit written comments at the meeting, and court reporters were present to record and transcribe all oral comments on the Draft EIS/EIR. Approximately 160 people attended the meeting.

During the formal presentation at the meeting, some previously submitted written comments and sign-in sheets were stolen from the sign-in table. As soon as staff were made aware, a staff member publicly announced the incident to all community members in attendance and encouraged those who had previously submitted comments to resubmit and sign in again. As a result of the incident and subsequent public comments requesting an extension of the public comment period, SFCTA extended the public comment period an additional 14 days, from its originally scheduled November 16, 2015, end date to November 30, 2015. SFCTA notified the public of the incident and extended comment period with an email to the 750 subscribers to the project email list; newspaper advertisements in the San Francisco *Examiner, Western Edition, Kstati,* and *Nichi Bei Weekly*; an SFMTA blog post; and social media posts on Facebook, Twitter, and Nextdoor. Several comments that were stolen from the meeting, possibly representing all of the stolen comments, as well as stolen meeting sign-in sheets were later returned anonymously to SFCTA by mail. The recovered comments are included in Final EIS Appendix L together with all other comments received.

8.3.3 | Outreach following the Draft EIS/EIR Circulation Period

Following the end of the public comment period on November 30, 2015, the project team continued ongoing outreach to neighborhood groups, advocacy organizations, residences, and merchants who submitted comments in order to better understand their concerns, develop responses to comments addressing those concerns, and refine design to better fit the key needs of communities along the corridor. The project team also received additional meeting requests from stakeholder groups who did not submit comments during the public comment period.

Since the release of the Draft EIS/EIR, the project team convened a total of more than 60 meetings with over 30 stakeholder groups. At several of the meetings, additional concerns outside of those articulated during the comment period were voiced and documented. In addition, meeting attendees made recommendations of additional community groups, advocacy organizations, and institutions the project team should engage with to collect additional public input on project proposals.

All of the stakeholder groups the project team met with since the release of the Draft EIR/EIS are discussed in Section 8.3.4 below. In some cases, the project team met with groups multiple times.

In addition to stakeholder meetings, the project team attended community events such as farmer's markets and other gatherings with a project representative to convey information and answer questions about the project. The project team also updated the project CAC four times after the release of the Draft EIS/EIR on outreach efforts, community concerns, and design refinements.

8.3.4 | Community Input Received after the Draft EIS/EIR Circulation Period

Since the close of the public comment period of the Draft EIS/EIR on November 30, 2015, the project team has continued to receive public input. In some cases, members of the public have provided input as part of the ongoing outreach processes described in Section 8.3.3, while in other cases the project team has received written communications including letters and emails. Letters received after the close of the comment period did not present new information or circumstances that would require supplemental documentation.

While communications received after December 10, 2015 are not considered formal comments on the Draft EIS/EIR, these comments are also addressed in Appendix L (see Table L.1-4) of this Final EIS and were considered by the lead agency in its ROD.

The project team has continued an open dialogue with members of the public and worked to respond to these additional communications, including answering questions and addressing concerns where possible, outside the formal environmental document public review process.

Agency staff responded to some of these communications in writing, particularly if a member of the public had a specific question or concern about the project. In other instances, staff met with the member(s) of the public who submitted a communication in order to provide additional project information, answer questions, and discuss specific issues.

None of the communications received after the close of the comment period contain new information revealing new or more severe environmental impacts that would result from the project, identify feasible project alternatives or mitigation measures substantially different from those identified in the Draft EIS/EIR, or point to substantial flaws in the Draft EIS/EIR.

8.4 Final EIR, Current, and Future Outreach Efforts

In advance of the Final EIR release in December 2016, the project team launched a multi-channel, multi-lingual education campaign beginning in October 2016 outlining recent design refinements and details related to the environmental review process. The campaign includes website updates, social media, corridor-wide mailings, canvassing at bus stops, and Textizen updates. Textizen is a service that allows subscribers to opt in to receive project information via text.

In addition, the project team provided notice of the Final EIR release and related hearing dates in multiple languages and explained how to provide public feedback to the project decision-makers, the SFCTA Board and SFMTA Board. Advertisements included newspaper ads, postcards at bus stops, information cards in bus shelters and on buses, and ads in local newspapers in accordance with Federal, state and local law.

The certified Final EIR is available online at **www.gearybrt.org**. The website provides information on how to view or obtain a hard copy of the Final EIR and will also feature the Final EIS and ROD.

As mentioned in Section 8.3.1.2, the SFCTA Board certified the Final EIR, approved the project, and identified the Hybrid Alternative with five minor modifications as the LPA on January 5, 2017. SFCTA issued a Notice of Determination (NOD) on January 6, 2017. A sixth minor modification was subsequently added and analyzed in a CEQA addendum, which the SFCTA Board approved on June 27, 2017.

On July 18, 2017, the SFMTA Board unanimously approved the project and concurred with the LPA, including six minor modifications. SFMTA issued a NOD on July 25, 2017.

After completion of environmental review, the lead role for the project will transition from SFCTA to SFMTA. SFMTA will manage the project's design, implementation, and ongoing outreach efforts; including distributing information about the project via multiple channels such as direct mailings, electronic newsletters and outreach events. SFMTA will also convene two committees that would play an advisory role during design and construction: a CAC and a Business Advisory Committee.

The main project website is **www.sfmta.com/gearybrt**. The previous site (**www.gearybrt.org**) will remain live, and SFCTA staff will update it periodically.

CHAPTER 9.0 FINANCIAL ANALYSIS

This chapter describes the estimated costs of construction, annual operations, and maintenance of the improvements associated with the various project alternatives, including the Hybrid Alternative, which the San Francisco County Transportation Authority (SFCTA) Board adopted as the Locally Preferred Alternative (LPA) with five minor modifications on January 5, 2017. SFCTA issued a Notice of Determination (NOD) on January 6, 2017. A sixth minor modification was subsequently added and analyzed in a California Environmental Quality Act (CEQA) addendum, which the SFCTA Board approved on June 27, 2017. The San Francisco Municipal Transportation Agency (SFMTA) Board of Directors separately approved the project and concurred with the LPA, including six minor modifications, on July 18, 2017. SFMTA issued a NOD on July 25, 2017.[1]

The chapter also summarizes committed, planned, and potential additional sources of project funding. Since publication of the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR), there have been no changes to the overall cost estimate for the LPA or to the project elements proposed for funding from the Federal Transit Administration's (FTA) Capital Investment Grant Program (Small Starts) program.

9.1 Capital Costs

SFCTA and SFMTA have collectively developed cost estimates for the engineering, design, and construction of the proposed improvements. As a first step in estimating costs, SFCTA prepared preliminary-level engineering design drawings for each alternative over the entire Geary corridor. Design and construction costs are comprised of:

- Hard costs based on itemized quantities of project components using the preliminary engineering drawings, including anticipated contractor mark-ups
- Allowances for scope items identified as necessary but not yet defined at an engineering level
- Soft costs for needed professional services
- Contingencies to account for uncertainties inherent at this preliminary level of engineering design

These costs include all of the scope elements described in this chapter and analyzed in this document. Some of these scope elements are not strictly needed in order to provide and operate a bus rapid transit (BRT) facility, but they otherwise benefit the community in other ways or are needed to facilitate the continued management and stewardship of the City's street, streetscape, and utility systems as changes are made to the Geary corridor to accommodate BRT. These related improvements are therefore important to

[1] See Section 2.2.7.2 for a complete description of the Hybrid Alternative/LPA, including each of the aforementioned minor modifications.

coordinate closely with the BRT components for construction. Examples of each type of scope element are as follows:

- **BRT elements**: Includes new road surface and base for bus lanes where no surface currently exists (such as for center-running alternatives); new road surface for bus lanes where pavement condition is poor; new landscaped medians to accommodate bus lanes for center-running alternatives and segments; new bus bulbs; station platforms where none currently exist (such as for center-running bus lanes); station and stop passenger amenities; bus vehicles for increased service; right-turn pockets to improve bus flows; traffic signal modifications to improve bus flows and accommodate center-running bus lanes; and removal of pedestrian bridges at Steiner Street (all build alternatives) and Webster Street (Alternatives 2, 3, and 3-Consolidated only) to provide bus lanes and accommodate improved street-level crossings and smoother traffic flows. In addition, elements such as underground sewer and water line relocations and replacements in some locations are needed to accommodate bus lanes, stations, and bus bulbs.
- **Related improvements:** Includes new street lights; roadway base and surface repair for mixed-flow travel lanes; traffic signal modifications for pedestrian crossing enhancements; traffic signal underground communications; pedestrian crossing bulbs; new landscaping on existing medians; sidewalk and streetscape improvements; a street re-design between Masonic and Presidio Avenues to accommodate bike lanes; and a street re-design between Gough and Scott streets to accommodate a road diet to remove mixed-flow travel lanes.

Table 9-1 presents capital costs for the four build alternatives in Year of Expenditure (YOE) dollars. The table shows costs of BRT elements and related improvements, all of which are described in detail in Chapter 2 (Descriptions of Project Alternatives). The total capital cost for all build alternatives ranges from $170 million to $435 million. The Hybrid Alternative/LPA is estimated to cost $300 million. Although six minor modifications were incorporated in this alternative between the Draft EIS/EIR and Final EIS (see Final EIS Chapter 2, Section 2.2.7.2), the overall cost estimate has not changed. Of the project modifications, the retention of the pedestrian overcrossing at Webster Street and the elimination of BRT stops at Spruce Street would together reduce the cost of the Hybrid Alternative/LPA by approximately $4 million. However, the retention of the Laguna Street BRT stop together with additional pedestrian crossing bulbs and other safety improvements added to the Hybrid Alternative/LPA would add a roughly equivalent cost. Therefore, on balance the changes to the Hybrid Alternative/LPA do not affect the total cost estimate of $300 million.

Table 9-1 Capital Cost Estimates for Build Alternatives

BUILD ALTERNATIVE	DESCRIPTION	CAPITAL COST OF BRT ELEMENTS AND RELATED IMPROVEMENTS (YOE IN MILLION $)
Alternative 2	Side-Lane BRT	$170
Alternative 3	Center-Lane BRT with Dual Medians and Passing Lanes	$430
Alternative 3-Consolidated	Center-Lane BRT with Dual Medians and Consolidated Bus Service	$435
Hybrid Alternative/ (LPA)	34th Avenue to Palm Avenue – Center-Lane BRT with Consolidated Service East of Palm Avenue – Side-Lane BRT	$300

Source: SFCTA & SFMTA, 2015

9.1.1 | FTA Small-Starts-Funded Project Elements

For federal funding purposes, the project cost estimate has been developed with separate costs for each scope element and corridor segment. As noted in Section 9.1.4 and 9.1.5 below, the project would draw upon multiple sources to fund its capital cost, a plan requiring it to be separated into packages of scope elements as appropriate to maximize eligibility and competitiveness for each funding source.

For Alternative 2 and the Hybrid Alternative/LPA, the cost of the BRT scope elements is less than $300 million, making those alternatives eligible to compete for funds within the FTA Small Starts competitive transit project funding program. The estimated cost of the Hybrid Alternative/LPA is $300 million (of which $100 million will be sought from the FTA Small Starts program).

Other federal sources and local sources have been budgeted or planned as noted in Section 9.1.4 below. Local source funding includes anticipation of cost-sharing with other City efforts, such as for re-surfacing and utility replacements, which SFMTA will pursue.

As described in Chapter 2, the Hybrid Alternative/LPA was divided into two primary construction phases. Phase I would entail work east of Stanyan Street where BRT would operate in side-running bus-only lanes. Phase II would include work west of Stanyan Street, where BRT operations would be in predominantly center-running bus-only lanes.[2] Section 4.15 contains a detailed description of project phasing. Table 9-2 below describes the further separation of the Hybrid Alternative/LPA into three funding packages.

[2]Proposed bicycle improvements on Geary between Masonic and Presidio Avenues (construction of Class I bicycle lanes in both directions on this block) would be the one exception to the geographic limits separating the Phase I and Phase II limits. These would be implemented together with the Phase II improvements west of Stanyan Street.

- Package A would consist of Phase I near-term improvements, similar to those initially outlined in Draft EIS/EIR Section 2.3. Packages B and C would comprise Phase II.
- Package B would serve as the project definition for application to the FTA Small Starts program.
- Package C would represent other concurrent improvements to be implemented in the corridor that would use other funding, including local sources and potentially other federal sources aside from the FTA Small Starts program.

The packages are delineated for the sole purpose of providing further detail on specific construction activities, however, it is anticipated that the sum of both packages would entail the total capital costs for the Small Starts application.

Table 9-2 Proposed Geary Corridor Funding Packages – Hybrid Alternative/LPA

PROJECT FUNDING PACKAGE	IMPROVEMENTS INCLUDED	COST ESTIMATE (YEAR OF EXPENDITURE $) AND POTENTIAL FUNDING SOURCES
Phase I		
A. Near-term improvements (initiate construction in 2018)	• Red bus-only lane, Gough to Stanyan, where feasible[1] • Bus stop changes • Bus and pedestrian bulb-outs • Traffic signal upgrades • Right-turn pockets • Fillmore-area road diet (lane reduction), pedestrian bridge removal, median improvements, and signals • Upgraded station amenities and real-time passenger information • Mixed-flow lane re-surfacing, Market to Stanyan, as needed • Utility relocation related to BRT • Utility upgrades coordinated with BRT (separate environmental clearance)[2]	$65M Local, State, and non-Small Start federal funds, including: Transportation Performance Initiative General Obligation and Revenue Bonds Prop AA Vehicle Registration Fee One Bay Area Grant Prop K Sales Tax General Fund SF PUC Contribution
Phase II		
B. Geary Bus Rapid Transit project (initiate construction as early as 2018)	• Center-running, red bus-only lane, Stanyan to 27th Ave with high-amenity stations • Bus and pedestrian bulbs, stops, and signals (additional locations) • Vehicles for increased service • Utility relocation related to BRT[2]	$200M FTA Small Starts ($100M) with matching local and non-Small-Starts federal funds

PROJECT FUNDING PACKAGE	IMPROVEMENTS INCLUDED	COST ESTIMATE (YEAR OF EXPENDITURE $) AND POTENTIAL FUNDING SOURCES
C. Other Concurrent Improvements (initiate construction as early as 2018)	• Red bus-only lane and stop modifications, 27th to 48th Ave • Masonic-area bike lane and median modifications • Mixed-flow lane re-surfacing, remainder of corridor, as needed • Pedestrian bulbs (additional safety-related locations) west of Stanyan	$35M Local and non-Small-Starts federal funds

Notes:

1. Some blocks around Fillmore and Masonic may have insufficient width to designate a transit-only lane unless additional street infrastructure changes were to be made.
2. Additional utility work not related to the Geary Corridor project may be coordinated with the project to minimize public disruption and maximize efficiency.

9.1.2 | Projects to be Coordinated with the Proposed Project

As noted in Section 2.2.2, the No Build Alternative identifies several proposed improvements to the Geary corridor. These related projects would be constructed in coordination with the Hybrid Alternative/LPA. These related projects may share some of the costs identified in the proposed project's cost estimate but will have funding plans of their own, and include the following:

Transit Signal Priority (TSP). As assumed as part of the No Build Alternative (see Section 2.2.2.1), SFMTA installed wireless next-generation TSP at signalized intersections along the Geary corridor. TSP technology allows buses to spend less time stopped at red lights. Buses are equipped with TSP transponders, which send signals to traffic lights to either extend the green light to allow approaching buses to pass through or trigger a change from red to green when it would not unduly affect crossing traffic.

In comparison, all build alternatives include the installation of fiber-based TSP on all signalized intersections between 25th Avenue and Gough Street. This type of TSP technology differs from the existing wireless TSP in that it requires placement of cables in underground trenches along the corridor. Wireless and fiber-based TSP have similar operational benefits; fiber-based TSP is considered more durable and to have a longer useful life.

New, low-floor buses. SFMTA is in the process of replacing its entire fleet of 124 60-foot, articulated, diesel motorcoach buses with low-floor, diesel hybrid buses with three doors on the right-hand side of the vehicles, including all vehicles currently operating in the Geary corridor. These buses do not have steps as older traditional buses do. Low-floor buses thus improve accessibility for all riders and also reduce time boarding and alighting. SFMTA has planned to increase the number of vehicles serving Geary in the future. The replacement of the existing bus fleet is funded by sources including federal FTA Section 5307/09 formula funds and local

Proposition K funds. The Geary BRT project's build alternatives all propose increases in service beyond the levels that SFMTA has planned for without the Geary BRT project. The build alternatives, therefore, would supply an additional increment of vehicles above and beyond that required for the No Build Alternative as each build alternative would result in improved transit infrastructure on the Geary corridor that would make the use of more buses effective in improving transit service. See Section 2.7.1 for more information on this issue.

Enhanced station communications. The proposed project includes a baseline level of passenger communications to be installed at the project's bus stops, such as real-time arrival displays, as described in Chapter 2. Additional communications infrastructure above and beyond that baseline level may be installed in conjunction with the proposed project if SFMTA determines appropriate. This enhanced communications infrastructure would be funded separately from the proposed project.

Sewer replacement/rehabilitation. The sewer infrastructure underneath the Geary corridor, particularly in the western portion, is aging and due for replacement or rehabilitation in future years. Although the San Francisco Public Utilities Commission (SFPUC), which owns and operates the sewer system, has not formally planned to replace the aging sewers, the agency may move forward with sewer replacements or rehabilitation in conjunction with the proposed project.

This work would be distinct from sewer rehabilitation/replacement work directly triggered by specific physical improvements of the proposed project. Such work would represent a potential cost-sharing opportunity. In addition, if a sewer project outside the area affected by proposed project moves forward, it is anticipated to be funded by local sources.

Water supply line replacement. The water supply infrastructure underneath the Geary corridor is due for replacement in future years. SFPUC, which owns and operates the water supply system, is planning to replace water lines. See Section 4.6 for a more detailed description of this project.

California Pacific Medical Center. As of 2017, construction of this new facility at Geary Street and Van Ness Avenue is underway. Plans call for the relocation of an existing (westbound) bus bulb at Polk Street and Geary Street to the west side of Geary Street, to be immediately alongside the new medical facility.

Central Subway. The Central Subway Project, led by SFMTA, is the second phase of San Francisco's Third Street Light Rail Project. The project consists of a 1-mile extension of the Muni Metro T-Third line from the Caltrain Station to Chinatown. The portion of the alignment between Bryant Street and Chinatown would be in a new subway. Project construction began in 2010 and is expected to be completed in 2018; the Central Subway is scheduled to open to customers in 2019. This project will provide pedestrian bulbs on Geary Street at Stockton Street.

Transit Center District Plan. The San Francisco Planning Department developed this plan in 2012 with the Transbay Joint Powers Authority and the former SF Redevelopment Agency to develop San Francisco's downtown neighborhood with residential, office, and retail uses. The plan includes mechanisms to direct any increased development value to help pay for the construction of the Transbay Transit Center and other public improvements (e.g., affordable housing, public facilities, and circulation improvements). The plan builds on San Francisco's 1985 *Downtown Plan* that envisioned the area around the Transbay Transit Center as the heart of the new, more intensively developed downtown. This project will provide bus-only lanes and bus stop improvements on First Street, Mission Street, Fremont Street, and Beale Street to serve the eastern terminal for Geary BRT service, connecting to prospective Geary BRT project improvements that would begin at Market Street and continue west.

Pavement maintenance, rehabilitation, and/or resurfacing projects (selected locations). Previously planned/programmed repair, replacement, maintenance, or other modifications to the road surface, curbs, or utilities along the Geary corridor. SFPW will give priority to locations where pavement condition is below the agency threshold.

City-wide curb ramp retrofit program. These pavement depressions facilitate access by people who use wheelchairs while also facilitating movement for people toting strollers, carts, luggage, and the like. By 2020, SFPW will install curb ramps at some intersections along the Geary corridor that do not meet current City standards and/or requirements of the federal Americans with Disabilities Act. SFPW will give priority to locations with high populations of mobility-challenged pedestrians.

Better Market Street. This project proposes to build improvements on Market Street to improve mobility in the study area through reliable and efficient transit service and improved conditions for pedestrians and bicyclists. The project is currently undergoing environmental review, which is anticipated to be completed in 2019, with the design phase and the announcement of contract bids to follow. Construction is anticipated to begin in 2020.

9.1.3 | Funding – Phase I

Budgeted/planned funding sources for Phase I are described below and summarized in Table 9-3, along with other potential funding sources. Funding sources for Phase II are described in Section 9.1.5.

9.1.3.1 BUDGETED/PLANNED FUNDING: FEDERAL/STATE

- **Transit Performance Initiative (TPI) Investment Program ($9.6 million).** In May 2012, the Metropolitan Transportation Commission (MTC) adopted the TPI Investment Program, which functions as a competitive capital program focused on incremental investments to improve performance on major transit corridors. Projects funded via this program are expected to be implemented or under construction within 18 months of funding approval. In

January 2017, MTC approved $5.6 in Round 3 funding (federal Surface Transportation Program (STP)/Congestion Mitigation and Air Quality Improvement (CMAQ) Program funding), as well as $4 million transfer from Round 2 funding, to Geary BRT Phase I.

- **One Bay Area Grant (OBAG) Program - Federal STP/CMAQ Funds ($6.9 million).** Projects funded through this program are selected by SFCTA for federal funding (STP/CMAQ) passed through MTC, and are meant to support focused and advance the region's greenhouse gas emissions reductions goals. $6.9 million of OBAG Cycle 2 funds have been programmed to Geary BRT Phase I.

9.1.3.2 BUDGETED/PLANNED FUNDING: LOCAL

- **Proposition K Sales Tax ($3.4 million).** In November 2003, San Francisco voters approved Proposition K (Prop K), extending the existing half-cent local sales tax for transportation and approving a new 30-year Expenditure Plan identifying projects and programs to be funded by the sales tax, including BRT on Geary. The Prop K Strategic Plan (2014) prioritized funding for BRT on Geary within the BRT/Transit Preferential Streets/MUNI Metro Network and Transit Enhancements categories. To date, the SFCTA Board has allocated almost $2 million in Prop K funds for the detailed design phase of Geary BRT Phase I. Going forward, an additional $1.4 million of Prop K funding for Phase I is anticipated.
- **Local General Obligation Bonds and SFMTA Revenue Bonds ($14 million).** San Francisco voters approved a General Obligation bond measure for transportation in November 2014, with a program emphasis on improving transit and safe streets. In addition, SFMTA Revenue Bonds can fill in funding gaps where other funding sources have traditionally not been available and provides funding for state of good repair projects and capital improvement programs such as Muni Transit Safety and Spot Improvements, Transit Fixed Guideway Improvements, Pedestrian Safety and Traffic Signal Improvements and Muni Light Rail Vehicle Procurement. San Francisco voters had earlier authorized SFMTA to issue revenue bonds with the 2007 passage of Proposition A. The first such revenue bonds for new projects and financing existing debt were issued in 2012. SFMTA has allocated $1.6 million and programmed approximately $12.5 million of these local sources for Geary BRT Phase I in its Capital Improvement Program.
- **Proposition AA Vehicle Registration Fee ($2.4 million).** In November 2010, San Francisco voters approved a $10 increase in vehicle registration fees, with revenues dedicated to transportation improvements identified in the 30-year Expenditure Plan. Under this source, elements of the project would be eligible for funds under all three Expenditure Plan categories: (1) street repair and reconstruction; (2) pedestrian safety; and (3) transit reliability and mobility improvements. Proposition AA (Prop AA) generates approximately $5 million annually and is administered by SFCTA.

Funds are programmed for projects through the Prop AA Strategic Plan and 5-Year Prioritization Programs. $2.4 million in Prop AA funds will be available in the Street Repair and Reconstruction category in Fiscal Year 2017/18.

- **General Fund ($2.3 million).** San Francisco has budgeted $2.3 million in General Funds for the paving and related improvements of the Geary BRT Phase I.
- **SFPUC ($26 million).** SFPUC is planning on contributing $26 million for the sewer and water infrastructure as described in Section 9.1.3. This work is not related to BRT improvements, but is to be coordinated with BRT to minimize construction disruption.

Table 9-3 Budgeted/Planned Funding Sources for Geary BRT Phase I

PROPOSED FUNDING SOURCE	PROPOSED (UP TO) AMOUNT ($M)	PROPOSED YEAR AVAILABLE
FEDERAL/STATE FUNDS		
Transit Performance Initiative-Investment	$9.6	FY 2017-2020
One Bay Area Grant	$6.9	FY 2017-2020
LOCAL FUNDS		
Prop K Transportation Sales Tax	$3.4	FY 2011-2020
Local General Obligation Bond & SFMTA Revenue Bond	$14	FY 2015-2020
Prop AA Vehicle Registration Fee	$2.4	FY 2017-2020
General Fund	$2.3	FY 2017-2020
SF PUC Contribution	$26.0	FY 2015-2020
TOTAL	**$65 M** [1]	

[1] Amount is rounded.

9.1.4 | Funding – Phase II

As the project advances through the next steps of development and approvals, SFCTA and SFMTA staff will continue to identify possible sources of funding. In addition to the budgeted/planned funding as described in Sections 9.1.4.1 and 9.1.4.2, the agencies will explore tapping multiple fund sources, as shown in Sections 9.1.4.3 through 9.1.4.5 and Table 9-4 below.

9.1.4.1 BUDGETED/PLANNED FUNDING: FEDERAL

FTA Small Starts ($100 million). This program provides competitive grants for new transit projects with capital costs that do not exceed $300 million. Since the Draft EIS/EIR, the lead agency has increased the maximum grant amount from $75 to $100 million, and the maximum project capital cost from $250 to $300 million. SFCTA and SFMTA intend to apply for the maximum grant amount, $100 million, with plans to enter the program in Fiscal Year 2018/19. The funding

would be applied to the BRT component of Phase II (shown as Packages B and C in Table 9-2).

9.1.4.2 BUDGETED/PLANNED FUNDING: LOCAL

- **Proposition K Sales Tax ($47.5 million).** In addition to $3.4 million assigned to Geary BRT Phase I, the SFCTA Board has allocated $15.8 million in Prop K funds for various phases of Phase II. Going forward, an additional $31.7 million is programmed for Phase II, summing up to a total of $47.5 million in Prop K funding for Phase II.
- **Proposition AA Vehicle Registration Fee ($2.1 million).** In addition to $2.4 million assigned to Geary BRT Phase 1, the SFCTA Board has programmed an additional $2.1 million in Prop AA funds for Phase II.

9.1.4.3 POTENTIAL FUNDING: FEDERAL

TPI Investment Program ($5 million). As noted in Section 9.1.4.1, MTC's TPI Investment Program functions as a competitive capital program focused on incremental investments to improve performance on major transit corridors. The project would be competitive for funding under this program, as demonstrated by the $9.6 million award for Phase I. Based on the funding availability and previously awarded projects, Geary BRT Phase II could receive $5 million.

- **OBAG Program - Federal STP/CMAQ Funds ($3.1 million).** In addition to $6.9 million programmed to Phase I, elements of the proposed project, including the Small Starts BRT package (see Table 9-4) would seek to secure up to $3.1 million in OBAG funds.
- **Lifeline Transportation Program (LTP) ($5 million).** Similar to OBAG, LTP is comprised of state and federal funds programmed by MTC cop, but San Francisco projects are selected by SFCTA and SFMTA. The LTP supports projects that improve transportation choices for low-income or otherwise disadvantaged communities or closes barriers to mobility. As the Geary corridor traverses identified Communities of Concern (Tenderloin/Civic Center, Western Addition, and Inner Richmond; see Figures 4.14-1 and 4.14-2), components of the proposed project could potentially compete well in future LTP cycles. While the amount of LTP funding varies from cycle to cycle, with each cycle lasting approximately 3 years, in 2013 SFCTA programmed a little over $5 million and SFMTA programmed over $17 million to eligible projects. Based on previous cycles, the project could compete for $5 million in the 2017 call.

9.1.4.4 STATE

- **Transit and Intercity Rail Capital Program (TIRCP) ($20 million).** The state's cap-and-trade program includes 10 percent of continuously appropriated funds for the TIRCP. SFMTA received $86 million in the first two rounds of programming. In August 2016, the Legislature approved Assembly Bill 1613, which, among other

things, appropriated $135 million from prior auction process to TIRCP. TIRCP will fund direct investments in transit programs that reduce greenhouse gas emissions and benefit disadvantaged communities. The proposed project would be eligible to seek funds from this program. MTC has adopted a regional framework for the TIRCP, and includes funds for SFMTA core capacity and BRT projects generally, potentially also including the Geary BRT Project.

9.1.4.4.1 LOCAL

- **New Local and Regional Revenue Measures ($30 million).** The City and County of San Francisco and MTC are committed to identifying new revenues to fund transportation, including a new local revenue measure (Regional Measure 3) and an additional bridge toll on state-owned bridges in the Bay Area. If one or more measures pass in 2018, it could raise funds in the order of $100-plus million annually for transportation, which could be distributed among various projects, potentially up to $30 million for Geary BRT Phase II.
- **Cost-Sharing Opportunities ($11 million).** As described in Section 9.1.2, a number of concurrent improvements are planned to be coordinated with the BRT components to minimize public disruption and maximize efficiency and benefits, e.g., utility improvements and street resurfacing. SFCTA and SFMTA will continue to pursue cost-sharing opportunities with lead agencies for those improvements, e.g., SFPUC and San Francisco Public Works.
- **Other Developer Contributions ($10 million).** The SFMTA works with real estate developers to fund transportation improvements that mitigate the impacts caused by new development through development agreements or other arrangements, which are separate and on top of Transportation Sustainability Fee (TSF) funds. It is possible that the project could receive up to $10 million in funds from developer contributions.
- **TSF ($5 million)**. In 2015, San Francisco approved the TSF as part of a program that aims to take a comprehensive approach to new development's role in supporting the transportation system. The TSF replaces the Transit Impact Development Fee and helps to offset the impacts of new development on the transportation system. The TSF is anticipated to fund a $1.2 billion expenditure program over 30 years. The amount and timing of these funds are dependent on the pace of development in San Francisco, but revenues are anticipated to be collected beginning in Fiscal Year 2016/17 with approximately $5 million that could be used for the project.

SFCTA and SFMTA staff will continue to advocate for future regional, state, and federal revenue sources for the project, including new state and regional revenues such as from an additional Bay Area bridge toll, which is contemplated in the 2017 Regional Transportation Plan, *Plan Bay Area 2040*, adopted by MTC in July 2017.

Table 9-4 Planned and Potential Geary Funding Sources for BRT Phase II

PROPOSED FUNDING SOURCE	PROPOSED (UP TO) AMOUNT ($M)	PROPOSED YEAR AVAILABLE
FEDERAL FUNDS		
FTA Small Starts	$100	FY 2018
TPI – Investment	$5	FY 2018-2027
OBAG Program (Federal STP/CMAQ Program funds)	$3.1	FY 2018-2027
Lifeline Transportation Program	$5	FY 2019
STATE FUNDS		
Cap and Trade	$20	FY 2017-2020
LOCAL FUNDS		
Prop K Sales Tax	$47.5	FY 2011-2020
Prop AA	$2.1	FY 2017-2020
New Local Revenue Measure	$30	FY 2018-2020
Cost sharing opportunities (e.g., Public Utilities Commission, San Francisco Public Works, others for utilities, paving, etc.)	$11	FY 2018-2020
Other Developer Contributions	$10	FY 2018-2020
TSF	$5	FY 2015-2020
TOTAL	**$239M [1]**	

[1] The potential funding amounts add up to more than the Phase 2 project cost ($235 million).

9.2 Operations and Maintenance Costs

This section summarizes the expected operations and maintenance costs associated with each of the build alternatives. Funding for operations and maintenance of the proposed project would come from existing revenue sources for SFMTA, which include fare and parking revenues, operating grants (e.g., State Transit Assistance), traffic fees, and fines. Changes that have been incorporated into the Hybrid Alternative since the Draft EIS/EIR would not increase the proposed amount of transit service or materials that require maintenance, such as landscaping or other infrastructure, so the operations and maintenance costs have not changed.

9.2.1 | Operating Costs

Table 9-5 illustrates the annual costs for SFMTA to run vehicles and provide revenue service for the No Build and the build alternatives. These estimates include the annualized vehicle operating costs and roadway maintenance costs. The operational cost of Alternative 2 and the Hybrid Alternative/LPA are the highest; approximately 33 percent higher than the No Build Alternative. Alternatives 3 and 3-Consolidated are approximately 26 percent and 20 percent higher than the No Build Alternative, respectively.

Each build alternative would provide increased transit service (relative to No Build Alternative) in anticipation of higher demand resulting from improved transit performance.

It should be noted that these service plans and resulting operating costs are intended for analysis and comparison purposes only. Ultimately, SFMTA will make service decisions based on the analysis of empirical ridership data and other available resources. Therefore, actual service plans may vary.

Table 9-5 Annual Operating and Maintenance Costs for Proposed Service

COST TYPE	NO BUILD ALTERNATIVE	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3-CONSOLIDATED	HYBRID ALTERNATIVE/ LPA
Annualized Revenue Hour Vehicle Operating Cost*	$36,471,000	$48,409,000	$45,586,000	$43,322,000	$48,340,000
% Change From No Build Alternative	--	+33%	+25%	+19%	+33%
Other Incremental Annualized Operating and Maintenance Costs**	$251,000	$1,091,000	$596,000	$596,000	$858,000
% Change From No Build Alternative	--	+335%	+137%	+137%	+242%
Total Cost	$36,722,000	$49,500,000	$46,182,000	$43,918,000	$49,198,000
Total % Change From No Build Alternative	--	+35%	+26%	+20%	+34%

Note: Operating and vehicle maintenance costs based on National Transit Database (NTD); other roadway maintenance accounts for paving, pothole, red lane, and landscape costs.

* Vehicle cost type includes costs for operating the service and maintaining the vehicles.

** Other cost type includes busway surface maintenance and landscaping maintenance.

Source: SFMTA, 2015

9.2.2 | Maintenance Costs

Table 9-5 also shows the maintenance cost of the street infrastructure improvements. Each of the build alternatives would result in greater maintenance costs than the No Build Alternative. Increased maintenance costs include any needed repairs to potholes and patches to any center-running bus-only lanes, maintenance of thermoplastic material in side-running bus-only lanes, and additional landscaping and tree maintenance costs for new medians. Alternative 2 and the Hybrid Alternative/LPA would have higher maintenance costs than Alternatives 3 and 3-Consolidated due to the additional costs associated with maintaining the red lanes in the side-running segments.

In summary, the total estimated annual operations and maintenance cost for the No Build Alternative would be approximately $36.7 million. As shown in Table 9-5, annualized operations and maintenance cost estimates range from $43.9 million for Alternative 3-Consolidated (20 percent higher than the No Build Alternative), to $49.5 million for Alternative 2 (35 percent higher than the No Build Alternative). For the Hybrid Alternative/LPA,

annualized operations and maintenance would cost $49.2 million, approximately 34 percent higher than the No Build Alternative.

9.3 Coordination with Metropolitan Transportation Commission and *Plan Bay Area* Consistency

MTC serves as the transportation planning, coordinating, and financing agency for the nine-county San Francisco Bay Area. MTC functions as both a regional transportation planning agency for California, and for federal purposes, as the region's metropolitan planning organization. As such, it is responsible for regularly updating the Regional Transportation Plan (RTP)/Sustainable Communities Strategy (SCS), which adopts a land use vision and a transportation investment and growth strategy for the Bay Area. The most recent RTP/SCS, *Plan Bay Area 2040*, was adopted in 2017 and specifies how $303 billion in anticipated federal, state, and local transportation funds will be spent in the Bay Area over the next 24 years. Improvements to local and express bus services are included as a major project in *Plan Bay Area 2040*, including BRT service on the Geary corridor. The *Plan Bay Area 2040* Investment Strategy Report includes the Geary Corridor BRT Project at $300 million as a high-performing project in the financially constrained plan.

MTC approved in September 2016 the 2017 TIP, the comprehensive four-year regional spending plan, and updated it to conform to *Plan Bay Area 2040* in July 2017; the Federal Highway Administration (FHWA) and FTA determined the TIP to conform to the SIP on August 23, 2017.

9.4 Risk Analysis

A risk analysis accounts for potential issues that could increase the total project costs and delivery schedule. Risks affecting costs include those that may result from unforeseen necessary changes to the project scope, as well as those that may result from schedule delays. For the delivery schedule, risks could impact the remainder of the project development process and also the construction process. The types of risks identified for the proposed project are as follows:

- **Project cost risks.** While the project's level of design detail and uncertainty is appropriate for a project at this stage of development, project changes may occur during the detailed engineering design phase that may increase the project's capital cost, including:
    - Selection of transit lane paving materials.
    - Extent of necessary underground utility modifications for the project's median bus lane, bus bulb, and pedestrian bulb features.

  - Extent of necessary street and sidewalk repair.
  - Bus and pedestrian bulb design assumptions relating to SFPW standards and policies, including those related to paving materials and necessary underground utility relocations.
  - Extent of necessary work between Presidio Avenue and Masonic Avenue above the Masonic tunnel, including remedial median and pavement work, potential changes to bus stop design relating to the Masonic plaza, and relocation of overhead contact system wires for the 43 Masonic bus line.
  - Availability of power connections for side-running bus stops.
  - Cooperation from property owners on driveway locations in the Divisadero area.
  - Types and extent of required temporary facilities and services during construction.

- **Project development schedule risks.** These risks may affect the schedule for completing the detailed engineering design phase of the project, including:
  - Regulatory process and requirements relating to the potential need to relocate historic Golden Triangle or Japantown street lights.
  - Potential discovery of contaminated soils or groundwater.
  - Coordination with related underground utility and street repair work in the Geary corridor.
- **Construction schedule risk.** The project's construction plan bases construction duration on assumptions reasonable for this stage of project development, but issues still pose the potential to add delays, including those discussed above as cost risks, and the following:
  - Attainment of remaining agency approvals for certain construction items.
  - Necessary major construction activities for utilities
  - Community acceptance of disruption to parking, streets, and transit service, especially during certain night-time hours and holidays.
  - Discovery of buried cultural resources.
  - Avoidance of construction activities during migratory bird season.

- Changes to construction methods necessary to avoid properties identified as sensitive to strong vibrations.
- For Alternatives 3 and 3-Consolidated, Fillmore underpass fill material availability when needed.

9.5 Financial Analysis Conclusions

In conclusion, the funding plan for the project remains a work in progress, as is normal for a project of this type in the environmental phase, with over $115 million of the needed capital funding already committed and up to $196 million in planned and potential funding sources identified. As the project enters the detailed engineering design phase, SFCTA and SFMTA will seek additional grants from various sources to complete the funding plan. Funding for operations and maintenance of the project would come from existing revenue sources for SFMTA, which include fare and parking revenues, operating grants (e.g., State Transit Assistance), traffic fees, and fines.

CHAPTER 10.0 INITIAL DEVELOPMENT AND SCREENING OF ALTERNATIVES

10.1 Introduction

This chapter describes the process to generate, develop, refine, and evaluate the project alternatives selected for further evaluation in the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) (and the elimination of other options, configurations, and alternatives). This chapter also recounts the identification of the Staff-Recommended Alternative (SRA). Chapter 2 describes in detail the alternatives evaluated in the Draft EIS/EIR and this Final EIS.

The multi-year, multi-faceted process involved multiple rounds of design and analysis to identify the design configurations and service options that best respond to the project's purpose and need and to eliminate the lowest-performing concepts from further consideration.

The chapter is divided into two parts: the first describes the options considered previously that were not advanced as complete alternatives for consideration within the Draft EIS/EIR and this Final EIS; the second describes the process and analysis used to identify the SRA from among the alternatives evaluated within this document.

The Geary corridor is characterized by a variety of roadway configurations, traffic and ridership conditions, neighborhoods, and land uses along its length. The optimal physical street configurations and bus rapid transit (BRT) service options vary according to these characteristics and constraints. Accordingly, this analysis considers the optimal physical and service configuration by segment.

10.2 Configuration and Service Options Previously Considered and Rejected

10.2.1 | Previous Analysis Rounds

Previous rounds of planning design and analysis include the following:

- *The Geary Bus Rapid Transit Feasibility Study*, May 2007, focusing separately on configurations east and west of Gough Street.
- *The Geary Bus Rapid Transit Alternatives Screening Report*, May 2009, also focusing on configurations east and west of Gough Street.
- *The Geary Bus Rapid Transit Design Options Screening Report*, January 2014, focusing on configurations for east of Gough Street, the Masonic area, and the Fillmore area.

Each round produced multiple design options for various segments and locations along the corridor, ultimately recommending some for elimination and others to advance for further consideration. This section describes the configurations/service

options that were considered and eliminated from further analysis. The previous analysis rounds used the following criteria to evaluate potential options:

- Traffic conditions, including congestion, diversions, circulation, access, and parking, and loading conditions
- Transit travel time, reliability, and passenger experience and access
- Pedestrian access, safety, and streetscape design
- Bicycle safety and connectivity
- Rail readiness
- Capital and operating costs
- Impacts to Muni operations
- Construction impacts

10.2.2 | Corridorwide Configurations/Service Options

The BRT configurations that were considered would apply to particular segments of the Geary corridor, and are discussed geographically below. In addition, a rail option was considered for the entire corridor but, as described below, was withdrawn from further analysis.

Surface Rail, Underground Rail, and Combination. Under these suggested service options, a new light rail line would be constructed along the Geary corridor. The surface rail option would convert the leftmost travel lane in both directions to a dedicated transit lane operating adjacent to the existing, single, center median that would serve as a platform at the stations. The tunnel option would entail operating light rail vehicles in a tunnel underneath the Geary corridor. A combination of surface and underground rail that was explored would provide a transition point in the vicinity of Laguna Street.

These rail-based alternatives were considered in the 2009 Screening Report but did not advance for further analysis because of the high capital cost and commensurate difficulty in obtaining funds. Surface light rail capital costs are in excess of $100 million per mile, and a subway project would cost over $500 million per mile. Order-of-magnitude cost estimates place a surface rail project at $2.5 billion and a surface-to-subway project at $5 billion.

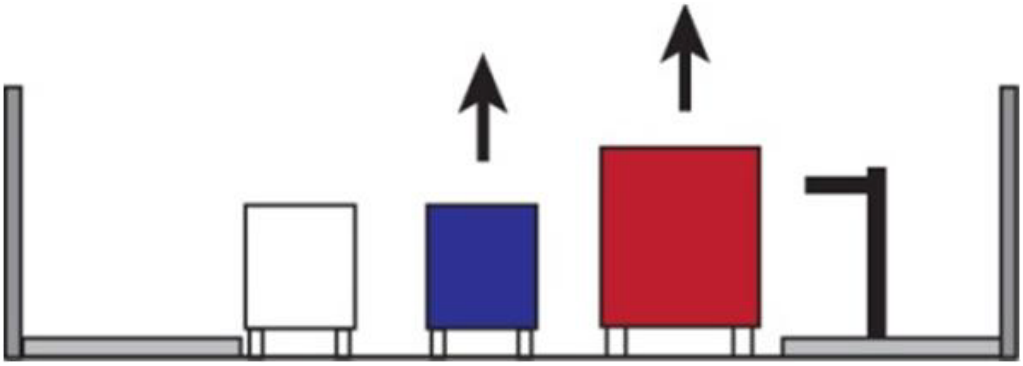
Although rail options are not currently feasible, rail construction could be pursued in the future if funding becomes available. The proposed BRT alternatives would not preclude future conversion of the corridor to rail, and the relative ease of doing so is included as a performance metric in the initial development and screening of alternatives.

10.2.3 | Inner Geary Configurations/Service Options

The Inner Geary area consists of Geary Street and O'Farrell Street, which form a one-way couplet from Market Street to Gough Street. The current configuration in this one-mile segment consists of an existing bus-only lane in each direction alongside one to three lanes of mixed-flow travel (see Figure 10-1). Loading opportunities and parallel parking are available on both of the streets. The street widths are considerably narrower than west of Gough Street.

During the alternatives screening process, the project team considered several possible configurations for BRT service through Inner Geary, eliminating the following options from further consideration:

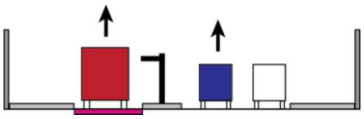
Figure 10-1 Inner Geary existing configuration (buses shown in red, mixed traffic in blue)



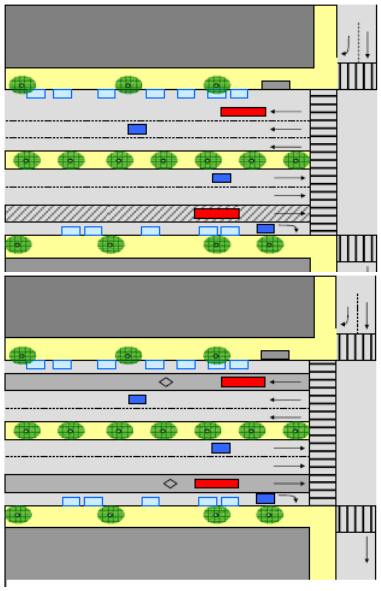
Two-Way Geary Bus-Only Transit Mall. This configuration would convert Geary to two-way operations, with Post Street reversed to become a one-way westbound street to serve through-traffic in tandem with the existing one-way O'Farrell Street. Transit services would be consolidated onto a two-way Geary Street reserved for transit only. The 2009 Screening Report dropped this configuration from further consideration because it would not provide significant transit performance benefits; it would have significant impacts to parking and loading; and it would require a major reorganization and redesign of transit and traffic circulation in the greater downtown, both north and south of Market Street. In addition to the substantial capital cost associated with these changes, this redesign of area-wide traffic patterns would require significant additional time and resources in order to undertake the necessary planning and design activities.

Two-Way Geary Bus-Only Lanes and Traffic Lanes. This configuration would require all of the changes to traffic circulation and street directionality included in *Two-Way Geary Bus-Only Transit Mall*. However, under this alternative, mixed-flow travel would be permitted on Geary Street. Buses would travel in designated transit lanes in each direction on Geary Street. A single travel lane would also be provided in each direction on Geary Street. Although auto access would be maintained, on-street parking would be generally eliminated in order to accommodate all four travel lanes. The 2009 Screening Report eliminated this configuration from further consideration because it would not provide significant transit performance benefits; it would have significant impacts to parking and loading; and it would require a major reorganization and redesign of transit and traffic circulation in the greater downtown, both north and south of Market Street. In addition to the substantial capital cost associated with these changes, this redesign of area-wide traffic patterns would require significant additional time and resources in order to undertake the necessary planning and design activities.

Two-Way Geary Partial Transit Mall. This configuration would also require all of the changes to traffic circulation and street directionality included in *Two-Way Geary Bus-Only Transit Mall*. However, under this alternative, auto access would be permitted for a certain segment or segments of Geary Street. The 2009 Screening Report eliminated this configuration from further consideration because it would not provide significant transit performance benefits; it would have significant impacts to parking and loading; and it would require a major reorganization and redesign of transit and traffic circulation in the greater downtown, both north and south of Market Street. In addition to the substantial capital cost associated with these changes, this redesign of area-wide traffic patterns would require significant additional time and resources in order to undertake the necessary planning and design activities.



Left-Side-Running Bus-Only Lanes with One-Sided Parking and Loading. This configuration would replace all parking and loading spaces along the left side of Geary Street and O'Farrell Street with a bus-only lane in each direction. This option would also prohibit left turns along this portion of the corridor, resulting in the elimination of bus conflicts with loading, parking, and turning vehicles. New island station platforms would be constructed to the right of the bus-only lane. This design option was dropped from consideration due to its significant parking and loading impacts on businesses along this portion of the corridor, which include major hotels, regional retail, and performing arts venues. Most on-street spaces in this corridor segment are designated for commercial and passenger loading, and there is no feasible way to replace all of the lost loading areas.



10.2.4 | West of Gough Configurations/Service Options

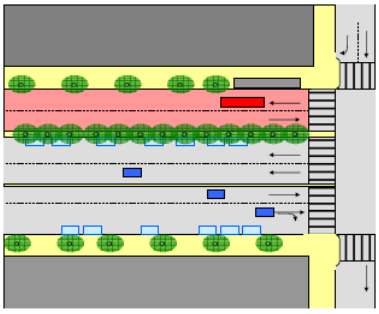
The following are configuration options applicable to segments West of Gough Street, all of which were considered but withdrawn from further analysis.

Peak-Period/Direction Bus-Only Lanes. This alternative would provide a designated lane in the rightmost travel lane that would be reserved for buses only during the peak period in the peak direction. As documented in the 2009 Screening Report, this alternative did not advance for further analysis because Geary transit experiences delays and reliability problems throughout the day and in both directions, and transit ridership on Geary is robust throughout the day, not just during peak periods.

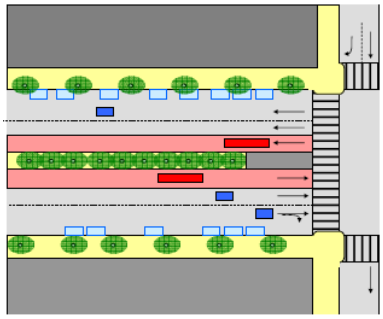
Striping-Only Bus Lanes. This alternative would extend the existing bus-only lanes on Geary and O'Farrell Streets to Geary Boulevard, converting the right-most lane to exclusive all-day bus use. No bus bulbs would be included. As documented in the 2009 Screening Report, this alternative did not advance for further analysis because without a more prominent treatment for the bus-only lane, the design would not be effective in preventing auto vehicles from using the lane.

One-Sided Bus-Only Lanes. Buses would run in adjacent dedicated transit lanes on one side of the street. Other vehicles would operate in both directions on the other side of the street with two mixed-flow travel lanes in each direction. As documented in the 2009 Screening Report, this alternative did not advance for further analysis because it would require a highly complex street configuration, with

degraded pedestrian safety. Pedestrians crossing Geary would have to cross a wide street in which traffic directionality switches more than once, creating confusion as buses and mixed traffic approach from unfamiliar and alternating directions. Motorists utilizing the on-street parking adjacent to the busway would likely jaywalk across the transit lanes to reach the sidewalk. The alternative would eliminate loading on one entire side of the street and cause greater traffic and circulation impacts because of the need to provide protected signal phases for both left and right turn movements.



Center-Running Bus-Only Lanes with Center Platforms (Left-Side Loading). Under this alternative, the leftmost travel lane in each direction would be converted into a dedicated BRT lane. Buses would operate adjacent to the existing single center median, which would serve as a platform at the stations, and waiting passengers would be buffered from auto traffic by BRT lanes. This alternative would be operated using five-door buses with doors on both sides of the bus, because the median platform would be located on the left side of the bus.



Although the 2009 Screening Report indicated several potential performance benefits of this configuration, this alternative ultimately did not advance for further analysis because of its special vehicle requirement. The San Francisco Municipal Transportation Authority (SFMTA) maintains a large and complex vehicle fleet at nine facilities distributed across San Francisco, all of which are capacity-constrained. In part because of these capacity constraints, SFMTA does not operate sub-fleets – all 60-foot motor coaches must be interchangeable such that they can be used on any bus line that operates 60-foot motor coaches. Flexibility in spare vehicles is needed such that they can be used on all lines that operate 60-foot motor coaches.

Because this configuration would require left-side loading of buses, the only buses that would be able to operate on the Geary corridor would be five-door buses (i.e. buses with doors on both sides), effectively creating a 60-foot-motor-coach sub-fleet for the first time. This constraint would drastically reduce the flexibility for SFMTA to substitute buses on the other 60-foot motor coach bus lines, and conversely, Geary would require a much higher spare vehicle ratio because only the five-door buses would be able to operate on Geary. Further, SFMTA would potentially need to modify its maintenance facilities to accommodate five-door buses, which would pose a logistical challenge considering the already-existing constraints.

There is also a durability concern. Five-door buses are relatively new in the industry in the United States. There are few five-door bus fleets in operation in the United States including in Eugene, Oregon, and Cleveland, Ohio, both of which experience less adverse conditions, including flat terrain and at least 70 percent fewer boardings.

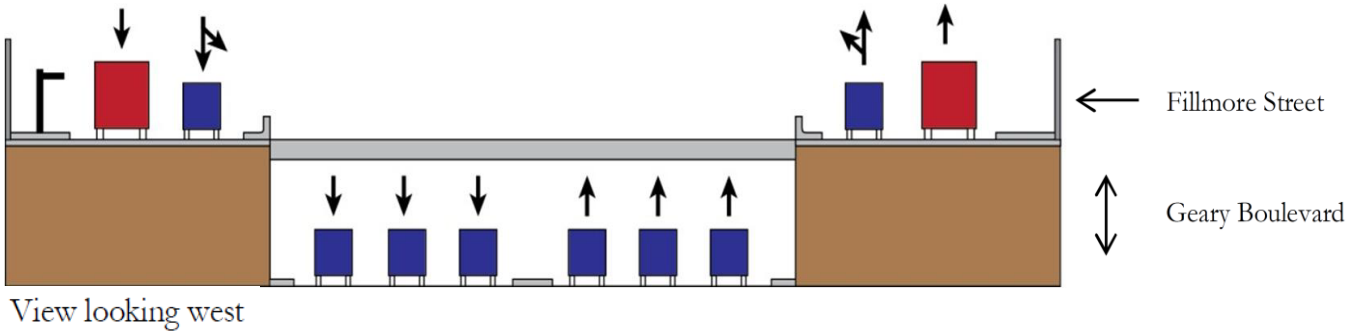
Given the logistical challenge of accommodating a new type of bus in its maintenance facilities, the implications of operating a sub-fleet including loss of flexibility and increased risk relating to availability of spare vehicles, SFMTA's Operations Support group has determined that five-door vehicles are not a viable option for the agency at this time.

10.2.5 | Fillmore Underpass Area Configurations

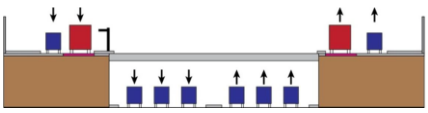
The Fillmore Street underpass at Geary Boulevard represents a major engineering constraint for implementing BRT service. As shown in Figure 10-2, the existing

facility includes six travel lanes located in a trench, over which crosses a bridge carrying Fillmore Street. A side service road in each direction diverges from the main Geary travelway, connecting to Fillmore Street at street grade before descending to meet the main Geary travelway again. This configuration poses a challenge for providing a bus-only lane as well as a station stop at Fillmore that sees high transfer activity between the 38 Local service and the 22 Fillmore line. In particular, the potential designs are constrained by the narrow width of the service roads and underpass grades that are not level enough to accommodate center platforms with the existing configuration.

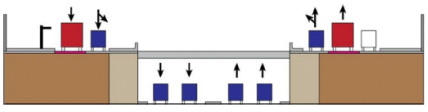
Figure 10-2 Fillmore underpass existing configuration (buses shown in red, mixed traffic in blue)



During the alternatives screening process (and as documented in the 2014 Screening Report), the project team considered nine possible configurations for BRT service through the Fillmore underpass area, eliminating each of the following options from further consideration for the reasons stated below:



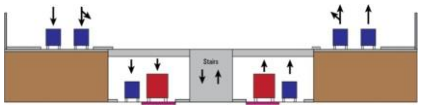
Bus-Only Lane with Cantilevered Stations. This design option would cantilever the station platforms over the underpass to provide additional platform space. The cantilever would be modest, lining up with the curb in the underpass to minimize impact on vertical clearance for vehicles in the underpass. The service road would be widened to accommodate this arrangement. In terms of traffic operations, the BRT buses would travel on the inside lane of the frontage roads, thereby traffic in each direction would be retained in the underpass. This design option was dropped from consideration due to its significant cost, anticipated low benefits, structural infeasibility, and financial burden to San Francisco Public Works (SFPW).



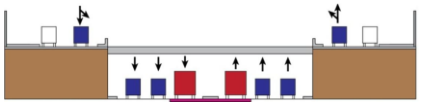
Bus-Only Lane in Widened Service Road. The service roads in this design option would be widened by approximately 10 feet, which would allow some space for a modest plaza on the north side and parking on the south side of the intersection. The service roads would have one lane for bus-only operations and another mixed-flow lane in both directions. The expansion of the service road would result in a commensurate decrease in the underpass's width, which would subsequently only have enough right-of-way for two lanes of mixed-flow traffic in each direction. From Webster to Steiner Streets, some parking spaces would be removed and sidewalks would be widened. This design option was dropped from consideration due to its significant cost, anticipated low life-cycle benefits relative to costs, structural

burden to the Fillmore bridge, impact to the existing drainage system, and financial burden to SFPW.

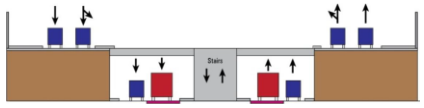
Bus-Only Lane and Station in Underpass. This design option would involve moving all Geary bus operations to the underpass. A bus station would be underground and passengers would change levels to transfer between the Geary and Fillmore buses. To implement this design option, the underpass would need to be modified to accommodate the new underground station platforms. One mixed-flow lane in each direction would operate in the underpass adjacent to the bus-only lane. The service roads on both sides of Geary Boulevard would each have one mixed-flow lane and a parking lane. This design option was dropped from consideration due to its design infeasibility. The 8 percent grade in the underpass would not provide a sufficient level boarding area for a 180-foot BRT station and platform. This grade of steepness would also not allow for construction of accessible platforms for a potential rail project in the future, and improvements proposed for the project must not preclude the possibility of future rail construction, as mandated by Proposition K.



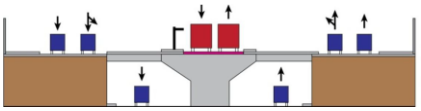
Bus-Only Lane in Underpass with Stations at Webster. Given the physical constraints of the service roads and the high volume of activity and congestion at the Fillmore intersection, this design option would shift the existing Geary bus stops from Fillmore to Webster Street. This modification would provide more physical space for the bus stops. The Geary buses would operate through the underpass in bus-only lanes and bypass the Fillmore intersection altogether to pick up or drop off passengers at Webster Street. Two mixed-flow lanes in each direction would be retained in the underpass, and the service roads would each have one mixed-flow lane and a parking lane. This design option was dropped from consideration since it would disrupt a key transfer location for bus riders using the Geary lines and the 22 Fillmore line. SFMTA has also stated its preference not to make major changes for the 22 Fillmore route at this location.

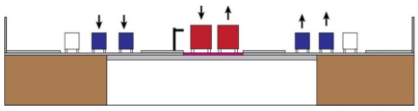


Bus-Only Lane and Stations in Extended Underpass. This design option would extend the Fillmore underpass past Webster and Steiner Streets. As a result, the stretch between these two streets would be at-grade. Fillmore, Steiner, and Webster Streets would subsequently be reconnected, with only the service roads separating the Japantown and Western Addition neighborhoods. The new street-level space could accommodate open space uses (e.g., pocket parks, bicycle paths) or air rights development. This design option was dropped from consideration due to its long construction timeframe and very high estimated costs that are not commensurate with the anticipated benefits.

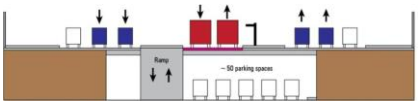


Bus-Only Lane on Viaduct. This design option would construct a bus-only lane at the surface level of the Fillmore intersection for buses to operate in the center of the road. This would be achieved by raising the grade of the center lanes of the underpass (likely using a combination of fill and structure) to create a relatively flat grade for transit operations. The Geary bus stations would be located on street-level plazas. Two mixed-flow travel lanes would be retained in the underpass in each direction, as well as one service road in each direction. This design option was dropped from





consideration due to the restricted vertical clearance over traffic created by the construction of the viaduct, high cost, adverse impacts to emergency access, and impacts to the existing drainage system. In addition, the re-location of the existing 22 Fillmore bus stops is operationally not acceptable to SFMTA.

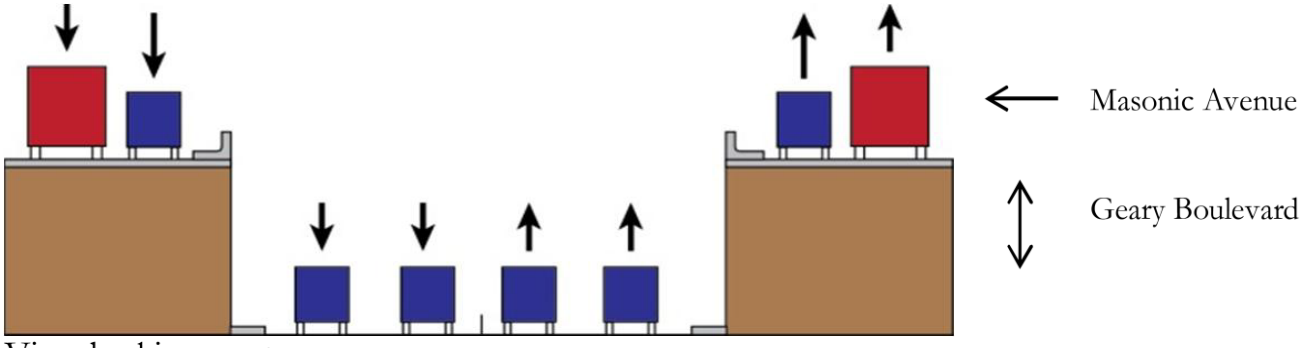


Bus-Only Lane on Deck (option: underground parking). This design option would deck the existing underpass, and all traffic would operate on the street level. Two mixed-flow travel lanes and a parking lane in each direction would be created by the removal of the existing service road. In an optional variant, the space under the deck would be converted to parking. This design option was dropped from consideration due to its significant cost and operations risks. In particular, the design would create an undesirable under-bridge environment that would need to be ventilated, kept dry, and lit for regular maintenance and inspection. This design would likely result in significant operations and maintenance costs as well as significant risk of BRT service disruption when the deck reaches the end of its useful life. In addition, surface access to the garage was not considered feasible and the construction costs per parking space would be very high.

10.2.6 | Masonic Area Underpass Configurations

The Masonic Avenue underpass (or tunnel) below Geary Boulevard and Presidio Avenue represents a second major physical constraint on potential configurations for BRT service in the corridor. As shown in Figure 10-3, two mixed-flow travel lanes through the tunnel in each direction. As at Fillmore, a side service road in each direction diverges from the main Geary travelway, connecting to the intersections with Masonic Avenue and Presidio Avenue at street grade before descending to meet the main Geary travelway again. Buses on Geary operate on the side service roads, which also accommodate car traffic and parking.

Figure 10-3 Masonic underpass existing configuration (buses shown in red, mixed traffic in blue)

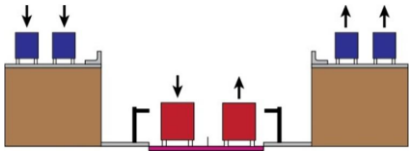


View looking west

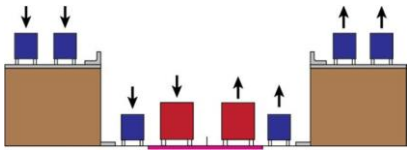
During the alternatives screening process (and as documented in the 2014 Screening Report), the project team considered eight possible configurations for BRT service through the Masonic underpass. Major alterations to the tunnel structure were not considered because, compared to the Fillmore underpass, the Masonic tunnel is longer and the underpass travelway is narrower. Therefore, there is less flexibility to reconfigure the facility and major alterations would generally be even more costly

than at Fillmore. During the screening process, the following configuration options were eliminated from further consideration:

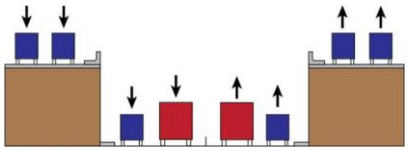
Center-Running Bus-Only Lane in Tunnel with Mixed Traffic at Surface. This design option would shift all bus operations to bus-only lanes in the tunnel and re-locate the bus stops to the trench on either side of the tunnel. All other vehicles would be moved to the surface service roads with two mixed-flow lanes in each direction. Parking would be removed on the service roads to accommodate mixed-flow traffic. This design option was dropped from consideration due to the undesirability of the below-grade bus stop location as well as the significant reduction in auto capacity. As the number of mixed-flow lanes would be reduced, traffic congestion and queuing would likely increase and private automobiles would likely divert to alternative routes.



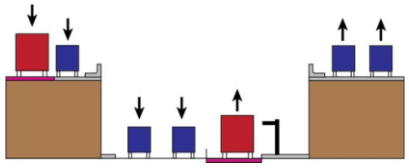
Center-Running Bus-Only Lane and Mixed Traffic in Tunnel, No Stops. Bus-only lanes would be located in the tunnel in this design option. Buses would not stop in the tunnel or approaches, and the existing surface Geary bus stops would either be eliminated or relocated to the west and/or east of the tunnel approaches. For general traffic, one mixed-flow lane in each direction would remain for through auto travel in the tunnel, and local traffic would use two mixed-flow lanes in each direction on the surface streets. Parking would be removed on the service roads to accommodate eastbound and westbound mixed-flow traffic. This design option was dropped from consideration due to the proposed removal or re-location of existing bus stops, which would make the heavily-used transfer to the 43-Masonic route much more difficult.



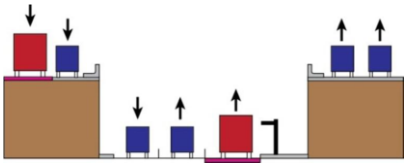
Center-Running Mixed-Flow Lanes in Tunnel, No Stops. In this design option, two mixed-flow lanes would be located in each direction in the tunnel and two mixed-flow lanes would be located in each direction on the service roads. The Geary buses would operate in the centermost mixed-flow tunnel lanes in both directions instead of having their own dedicated right-of-way (i.e., a bus-only lane). Buses would not stop in the tunnel or approaches, and the existing surface Geary bus stops would either be eliminated or relocated to the west and/or east of the tunnel approaches. Some parking on the service roads would be maintained, as most traffic demand would be accommodated in the tunnel's mixed-flow lanes. This design option was dropped from consideration due to flaws related to the proposed removal or re-location of existing bus stops, which would make the heavily-used transfer to the 43-Masonic route much more difficult.



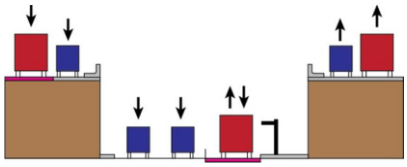
Westbound Bus-Only Lane in Tunnel with One-Way Traffic. In this design option, the eastbound Geary buses would travel in a bus-only lane on the surface service road, while westbound Geary buses would operate in a bus-only lane in the tunnel. Stops would continue to be located at Masonic Avenue, with the westbound bus stop located in the trench adjacent to the tunnel. Eastbound traffic would use two mixed-flow lanes in the tunnel in the eastbound direction and one mixed-flow lane on the service road. Westbound traffic would travel on the surface in two mixed-flow lanes on the service road. Parking would be removed on the service roads to accommodate the eastbound bus-only lane and westbound mixed-flow



traffic. This design option was dropped from consideration due to the undesirability of the below-grade bus stop location as well as the significant reduction in westbound auto capacity. As the number of mixed-flow lanes would be reduced, traffic congestion and queuing would likely increase and private automobiles would likely divert to alternative routes.



Westbound Bus-Only Lane in Tunnel with Two-Way Traffic. In this design option, eastbound Geary buses would travel in one bus-only lane on the service road, while westbound Geary buses would operate in one bus-only lane in the tunnel. Stops would continue to be located at Masonic Avenue, with the westbound bus stop located in the trench adjacent to the tunnel. For general traffic, there would be one mixed-flow lane in each direction for through traffic in the tunnel; one mixed-flow lane on the service road for eastbound travel; and two mixed-flow lanes on the service road for westbound travel. Parking would be removed on the service roads to accommodate the eastbound bus-only lane and westbound mixed-flow traffic. This design option was dropped from consideration due to the undesirability of the below-grade bus stop location as well as the reduction in auto capacity.



Reversible Bus-Only Lane in Tunnel with One-Way Traffic. In this design option, one bus-only lane would be available for eastbound buses on the surface road, and a reversible bus-only lane would be placed in the tunnel. The operating direction for the reversible lane would likely be eastbound during the morning peak hours and westbound in the evening peak hours, which would require using buses with doors on the left-hand side. While westbound BRT buses would also travel on a curbside, mixed-flow lane on the surface, there would not be a bus-only lane in the westbound direction on the surface side street. Stops would continue to be located at Masonic Avenue, with the reversible lane's bus stop located in the trench adjacent to the tunnel. For general traffic, only eastbound through traffic could travel in the tunnel; eastbound local traffic would use the mixed-flow lane on the service road; and westbound traffic would travel on the surface in two mixed-flow lanes on the service roads. Parking would be removed on the service roads to accommodate the eastbound bus-only lane and westbound mixed-flow traffic. This design option was dropped from consideration due to the undesirability of the below-grade bus stop location as well as the significant reduction in auto capacity.

10.3 Analysis of Configurations and Combinations, Identification of Staff-Recommended Alternative

This analysis compares the performance of the potential project configurations on key performance criteria. As part of the process to identify a staff recommendation for a Locally Preferred Alternative (LPA) (i.e., the SRA), both the alternatives analyzed in the Draft EIS/EIR as well as a number of additional potential hybrid configurations were considered and are discussed in this analysis. The process described here focused on refining the set of build alternatives for analysis in the Draft EIS/EIR, including eliminating some from consideration, before comparing the alternatives' performance with the No Build Alternative.

10.3.1 | Alternatives and Combinations Considered

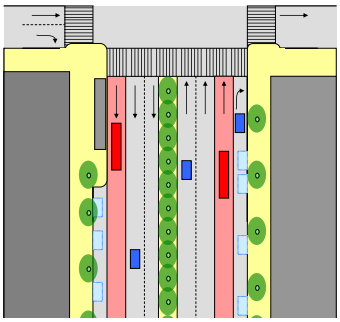
Three corridor-length build alternatives that could potentially meet the project purpose were initially developed for environmental analysis based on all of the previous development and screening efforts: Alternative 2, Alternative 3, and Alternative 3-Consolidated, described briefly here and in more detail in Chapter 2. These are known as the "pure" alternatives, because they feature a single bus-only lane configuration for most of the project alignment along Geary Boulevard.

All of these build alternatives would share similar configurations east of Gough Street and west of 27th Avenue. Under all alternatives, buses would continue to travel east along Market Street and connect to the Transbay Transit Center. The Better Market Street project is evaluating configuration options for that street, and no physical changes are proposed to this portion of the corridor as part of the BRT project.

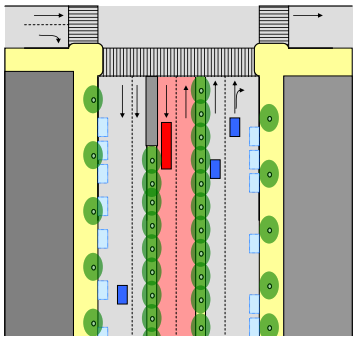
East of Gough Street, all of the evaluated build alternatives would retain the existing right-side-running bus-only lanes on Geary Street and O'Farrell Street and extend them to Market Street. The alternatives also include "spot improvements" in this corridor segment, including lane reconfigurations and queue jump signals, to reduce bus conflicts with turning traffic at key locations. This was the only option retained during the screening process, which eliminated options with reduced transit benefits or greater potential impacts.

West of 34th Avenue, both bus ridership and traffic congestion are significantly less than in the rest of the corridor, rendering bus-only lanes less beneficial. In this segment, BRT vehicles would continue to travel in the existing mixed-flow lanes, and no changes would be made to existing stops. Between 34th Avenue and 27th Avenue, BRT improvements including bus-only lanes would be beneficial. However, more costly center bus-only lanes are not warranted, so all of the build alternatives would install a bus-only lane along the side of the street in this section of the corridor.

The build alternatives would differ between 27th Avenue and Gough Street as follows:



Alternative 2: Side-Lane BRT. In this alternative, BRT service would replace the existing 38 Geary Rapid service and operate in dedicated side-running bus-only lanes. Alternative 2 would retain both BRT/local and local-only stops, similar to the existing configuration. At the Masonic and Fillmore underpasses, this alternative would convert the parking lanes along the service roads to bus lanes, where feasible, to continue the side-running configuration through these constrained areas. The previous screening analyses identified side-running lanes as generally feasible throughout all segments of the corridor and likely to provide more moderate transit performance benefits at reduced cost compared to center-running options.



Alternative 3: Center-Lane BRT with Dual Medians and Passing Lanes. This alternative would convert the existing median and two centermost mixed-flow lanes into adjacent bus-only lanes separated from traffic by two side medians. Station platforms would be located in the two medians, and buses would load from the right side. Alternative 3 would retain both BRT/local and local-only stops, similar to the existing configuration.

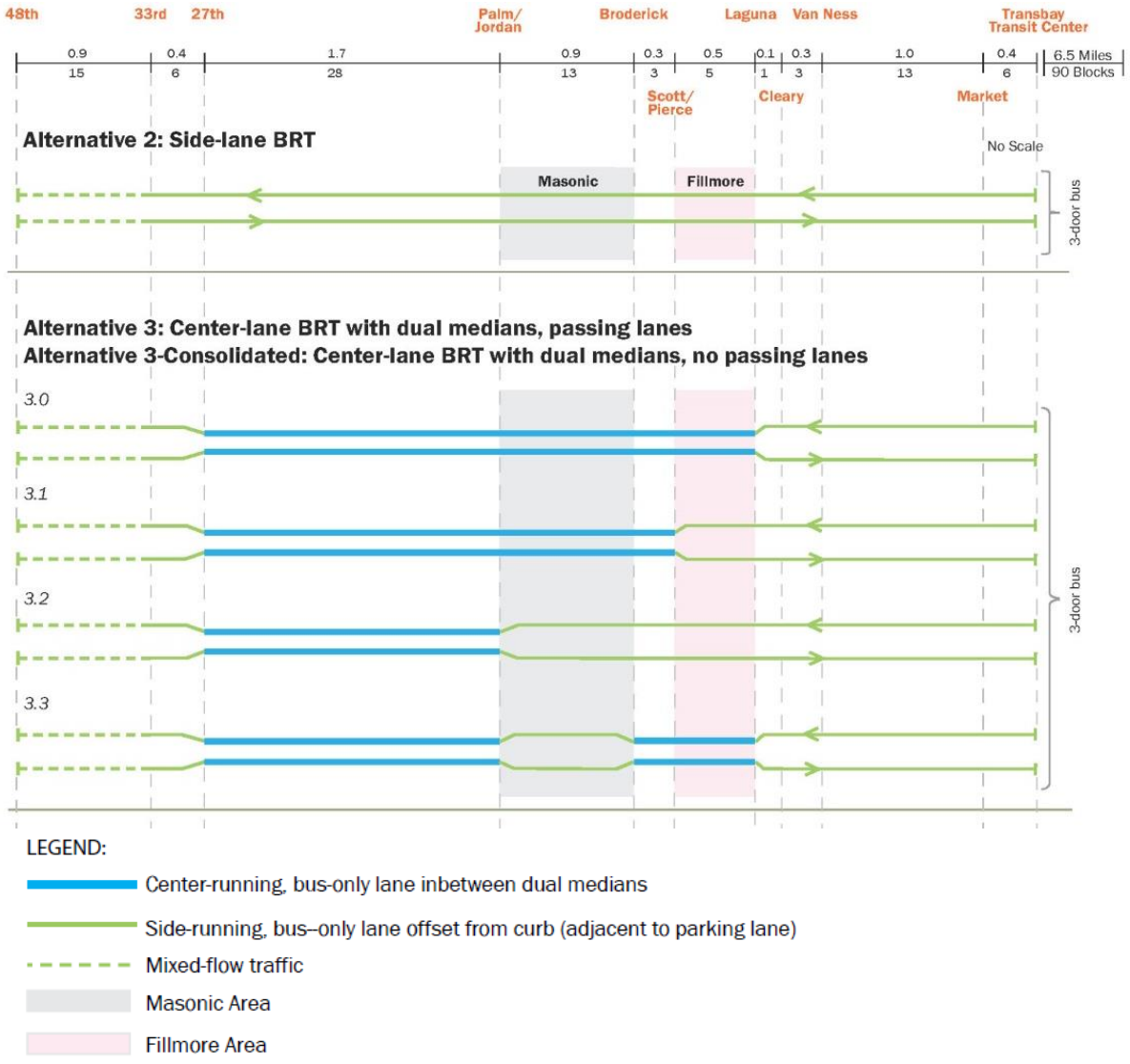
This alternative would include center-running bus lanes through the Masonic underpass with the eastbound stop at Masonic Avenue and the westbound stop at Presidio Avenue. One westbound travel lane would remain in the tunnel. Additional westbound and all eastbound traffic would utilize the surface service roads, with elimination of parking lanes and two surface travel lanes in each direction through this portion of the corridor. This Masonic underpass configuration was retained through the screening analysis due to the transit travel time advantage of utilizing the tunnel. At Fillmore Street, the screening process determined that to maintain a direct connection to the 22 Fillmore, center-running bus-only lanes are only feasible if the existing underpass is filled in. Thus, Alternative 3 would include filling the Fillmore underpass.

Alternative 3-Consolidated: Center-Lane BRT with Consolidated Bus Stops, Dual Medians, and No Passing Lanes. In addition to the BRT alternatives identified during the scoping and screening process, the project team developed one additional variant in response to public input. Alternative 3-Consolidated would have a similar configuration to Alternative 3, with center-running bus-only and dual medians, but would consolidate local and rapid stops throughout the corridor. All buses would serve all stops. As with Alternative 3, center-running bus-only lanes would utilize the Masonic underpass but would necessitate filling the Fillmore underpass. The consolidated-stop variant was developed because it would require significantly less parking loss to implement center-running BRT than would Alternative 3, and would thereby help address merchant concerns about the project.

As these "pure" alternatives were developed, the agencies determined that a single "pure" configuration for the entire corridor need not be selected as the LPA; different configurations could be selected for different portions of the corridor, resulting in a significantly larger set of potential combinations. The range of feasible design combinations, including both "pure" and "hybrid" configurations, is shown in Figure 10-4. It includes three configurations that combine segments of center-running and side-running bus-only lanes, designated combinations 3.1, 3.2, and 3.3, which also have consolidated-stop variants, designated 3.1C, 3.2C, and 3.3C.

This initial development and screening of alternatives considered these options based on a set of evaluation criteria, and uses the results of the "pure" alternatives analysis to estimate the performance of potential hybrid options. It eliminated some options based on fatal flaws or low performance, and identified an SRA based on the performance of the remaining options.

Figure 10-4 Geary BRT Project Alternatives and Combinations Under Consideration



Based on the initial estimates indicating its strong performance, the SRA was ultimately included as an alternative in the full environmental analysis. The following describes the staff-recommended configuration:

> **Hybrid Alternative/(Alternative 3.2C).** This alternative represents a combination of the Alternative 2 and Alternative 3-Consolidated configurations. For most of the corridor, it would utilize the Alternative 2 design, with new side-running bus-only lanes from 34th Avenue to 27th Avenue and from Palm Avenue (just east of Arguello Boulevard) to Gough Street. Between 27th Avenue and Palm Avenue, the Hybrid Alternative would utilize the Alternative 2.3-Consolidated configuration, with center-running bus-only lanes and consolidated local and BRT stops. Local and BRT stops would also be consolidated in the segments of the corridor between 34th Avenue and 27th Avenue and between Palm Avenue and Masonic Boulevard. Both local and BRT services would exist with this alternative, but both would make all stops in the consolidated-stop portion of the corridor. In the following evaluation, which includes multiple hybrid configurations, this alternative is referred to as Alternative 3.2C. In all other chapters, it is referred to as the Hybrid Alternative/LPA (and includes a subsequent modification to extend the westbound bus-only lane to 28th Avenue, rather than 27th Avenue).

10.3.2 | Evaluation Criteria

This section and Table 10-1 present the key performance indicators used to inform the selection of the staff-recommended alternative. These metrics were selected because they: 1) Are related to the project purpose and need or to key issues identified by the public and other stakeholders, and 2) Were expected to show varying levels of performance between the build alternatives and so facilitate selection of a single alternative as the preferred build option.

Table 10-1 Key Performance Indicators

PERFORMANCE INDICATOR	DEFINITION
TRANSIT PERFORMANCE	
Vehicle travel time	Bus PM peak travel time, local and BRT*
Reliability	Difference between average and 95th percentile bus travel time*
Ridership	Daily boardings for all Geary lines*
SYSTEM PERFORMANCE	
Person-delay (auto and transit)	PM peak delay per person per intersection along the Geary corridor*
Diversions	Increase in PM peak hour traffic on nearby parallel streets
ENVIRONMENTAL EFFECTS	
Parking opportunities	Change in number of curb spaces (all types)
Trees and landscaping provided	Percent of existing trees retained Median area available for landscaping opportunities
PEDESTRIAN ACCESS AND SAFETY	
Ease of access to stops	Average maximum walk to closest local stop

PERFORMANCE INDICATOR	DEFINITION
	Average maximum walk to closest BRT stop
Pedestrian safety improvements	Opportunity for pedestrian curb bulbs in optimal locations Elimination of permissive-phase left turn signals or conversion to protected-phase signals
RAIL-READINESS	
Ease of conversion to rail	Extent of future construction to accommodate rail service
COST	
Construction cost	Total construction cost
Operations and maintenance costs	Annual operating cost Annual maintenance cost
CONSTRUCTION IMPACTS	
Access to businesses during construction	Length of construction duration

* Transportation performance measures are provided for the year 2020.

Source: SFCTA, 2015

10.3.3 | Elimination of Options by Location: Fillmore

The variation between the combinations under consideration primarily occurs in the portion of the corridor between 27th Avenue and Gough Street, where a large set of potential options was analyzed. As the most constrained locations in the corridor, the lane configurations selected for the underpass complexes at Fillmore Street and Masonic Avenue largely determine the alternatives that are possible for adjacent segments of the corridor. Therefore, many configurations were first considered and screened for these constrained locations. This subsection discusses the screening process for options at the Fillmore underpass; the following two subsections discuss the Masonic underpass and the segment between the two underpass areas, respectively.

For reasons of cost, engineering feasibility, and transfer accessibility to the 22 Fillmore line, the project team previously eliminated all options that would operate buses in the Fillmore underpass, rendering center-running BRT lanes infeasible for this section of the corridor without filling in the underpass. However, there has long been community interest in filling the underpass at Fillmore and restoring a surface street. Such a fill project would require a community process to obtain consensus on a final new street design, then additional time for engineering design and construction. A time estimate for these steps places construction completion well beyond 2020. This would result in delays to the Geary BRT project, which is currently scheduled for opening of BRT service by 2020. This represents a fatal flaw for the center-running BRT alternatives in the near term; however, Alternatives 3 and 3-Consolidated both include such a configuration through the Fillmore area.

Timing was a relevant factor in considering identification of the SRA. Given the timing issue, the only project design for the Fillmore area that would be compatible with a pre-fill scenario is an Alternative 2 configuration with side-running BRT lanes.

Benefits of center-running bus-only lanes at Fillmore. Although the center-running BRT alignment through the Fillmore area is not feasible in the near term due to timing constraints, it would have some benefits, including better transit performance and preservation of on-street parking. Transit travel times for center-running bus-only lanes with the fill would be up to 30 seconds shorter than side-running BRT using the service roads. The center-running configuration would require the removal of 49 parking spaces between Gough and Steiner Streets, while side-running would eliminate about 94 spaces.[10]

Summary of SRA considerations. In a pre-Fillmore fill scenario, side-running bus-only lanes are the recommended design for the segment between Palm Avenue and Laguna Street. This design does not preclude a future fill project and the work completed thus far by the Geary BRT project provides strong technical background to inform future discussions about the fill.

10.3.4 | Elimination of Options by Location: Masonic

Further study of the possible BRT configurations in the segment of the corridor with the Masonic tunnel identified significant passenger experience and traffic system performance issues with center-running BRT lanes in this area. Given these issues, configurations with center-running bus-only lanes in this segment of the corridor were eliminated from consideration. These performance issues are expanded upon below.

Passenger waiting experience. Center BRT lanes at Masonic would result in a poor passenger waiting experience in several ways, largely as a result of the location of the BRT platforms. While the station platforms would not be in the tunnel itself, they would be located below grade in the existing trench adjacent to the tunnel and not directly visible from street level. The project team has heard concerns from the public and the project Citizens Advisory Committee members about personal security and safety for passengers waiting on the platforms with minimal visibility. Poor visibility from the stations to the surroundings and their locations in the concrete trench would also result in a less aesthetically pleasing location for passengers to wait. The remaining through-lane of traffic would be located directly next to the westbound BRT platform, and could result in a noisy environment. Lastly, the tunnel and trenches channel wind through the area, which would add an element of physical discomfort to the station locations.

Wayfinding. Wayfinding would be more challenging with the center-running stop configuration, because the eastbound BRT station would be located just west of Masonic Avenue, while the westbound station would be just east of Presidio Avenue, a block away, and both would be below grade. The center-running configuration would also complicate transfers to and from the 43 Masonic.

Vertical circulation. The center station configurations would rely largely on vertical circulation to allow passengers to reach the platforms from Masonic and Presidio Avenues, although there would also be at-grade access to the opposite end of each platform. Due to the width of the platforms, only a single elevator and a relatively narrow set of stairs could be accommodated to serve passenger access needs at the end of each platform adjacent to the underpass. Ridership projections indicate that

this capacity would be sufficient to accommodate expected passenger flows in the opening and horizon years of the project, but if ridership at the station were higher than expected or continued to grow beyond 2035, modifications to increase capacity could be needed. Due to the limited width of the underpass, constructing additional access infrastructure would likely necessitate removing the remaining westbound mixed-flow travel lane through the underpass, resulting in additional traffic on the surface.

Circulation system performance. Reducing traffic capacity on Geary Boulevard is expected to cause some drivers to take alternate routes, and the project team has heard concerns from members of the public about possible traffic volume increases on parallel streets. Due to the loss of capacity resulting from the removal of all eastbound traffic and some westbound traffic from the underpass, center-running alternatives are expected to divert more traffic than side-running alternatives to parallel routes. This is particularly true with the higher overall traffic volumes projected in 2035. In that year, it is expected that Alternative 2 would divert fewer than 400 eastbound vehicles to major parallel streets during the PM peak hour, representing an 11 percent increase in traffic on those streets, while Alternative 3 would divert more than 900 eastbound vehicles, representing a 28 percent increase in parallel route volumes. Although model results are only available for the PM peak, the AM peak eastbound diversions for the center-running BRT alternatives would be expected to be even greater.

In terms of vehicle level of service (LOS) at the intersection of Masonic and Geary, which is based on the amount of delay experienced by vehicles moving through the intersection, Alternative 2 would create less vehicle delay, achieving an LOS of C in 2020, while Alternative 3 would produce an LOS of D. Average queue lengths for eastbound vehicles waiting for the light at Masonic would be about 19 vehicles for Alternative 3. Alternative 2, with side-running BRT, produces shorter queue lengths of approximately 10 vehicles.

Pedestrian and bicycle conditions. The surface-level service roads west of Masonic Avenue and east of Presidio Avenue are narrow, approximately 20 feet wide. Rerouting all eastbound and a portion of the westbound through traffic on Geary to the service roads with the center-running BRT alternatives would result in large traffic volumes operating in a narrow travelway directly adjacent to the sidewalk. Pedestrians would not be protected by a parking lane or other physical buffer from heavy vehicle traffic, resulting in poor sidewalk conditions. In addition, all project build alternatives would include a bicycle lane between Masonic Avenue and Presidio Avenue to connect east-west bicycle routes to the north and south of Geary Boulevard, and additional traffic at the surface level would worsen conditions for bicyclists using this connection. Installing a bus-only lane at the surface and retaining the existing through-travel lanes in the Masonic underpass would result in better pedestrian and bicycle conditions at the surface due to lower vehicle volumes in close proximity to sidewalks and bike lanes.

Benefits of center-running bus-only lanes at Masonic. Although the center-running BRT alignment through the Masonic tunnel (as incorporated into Alternatives 3 and 3-Consolidated) has significant performance issues, it would have some benefits, including better transit performance and preservation of on-street parking. Center-running bus-only lanes through the Masonic underpass would improve transit travel time over side-running bus-only lanes in this segment of the

corridor; the expected travel time for Alternative 3 would be approximately 80 seconds faster than for Alternative 2 between Broderick and Stanyan Streets. While all build alternatives would remove some parking spaces from Geary Boulevard in the Masonic segment of the corridor, center-running Alternative 3 would remove approximately 120 existing parking spaces between Broderick and Palm while Alternative 2 with side-running bus-only lanes would result in less parking loss with about 90 spaces removed. Although these benefits are considerable, in considering a SRA, they must be weighed against the other criteria, including the overall passenger experience.

Summary of SRA considerations. Center BRT lanes through the Masonic area are eliminated from consideration as the SRA due to low performance, particularly concerning the passenger experience and system performance. Thus, Alternative 2 is the only "pure" build alternative that remains under consideration for implementation corridorwide. Although the center-lane option is not recommended in the Masonic segment it was retained for the purposes of environmental analysis due to the transit performance benefits of bypassing the surface intersections with Masonic and Presidio Avenues.

10.3.5 | Elimination of Options by Location: Between Fillmore Street and Masonic Avenue

As the most constrained locations in the corridor, the design options selected for the underpass complexes at Fillmore Street and Masonic Avenue limit the options that are possible for the intervening segment of the corridor. The BRT lanes would need to be on the side at Scott/Pierce Streets to move through the Fillmore complex, and on the side again at Broderick Street in order to move through the Masonic complex. The distance between these intersections is 0.3 miles, too short to justify transitioning the bus from side to center and back again. Therefore, center-running BRT lanes were eliminated from consideration for the short portion of the corridor between Masonic Avenue and Fillmore Street.

10.3.6 | Comparison of Remaining Combinations

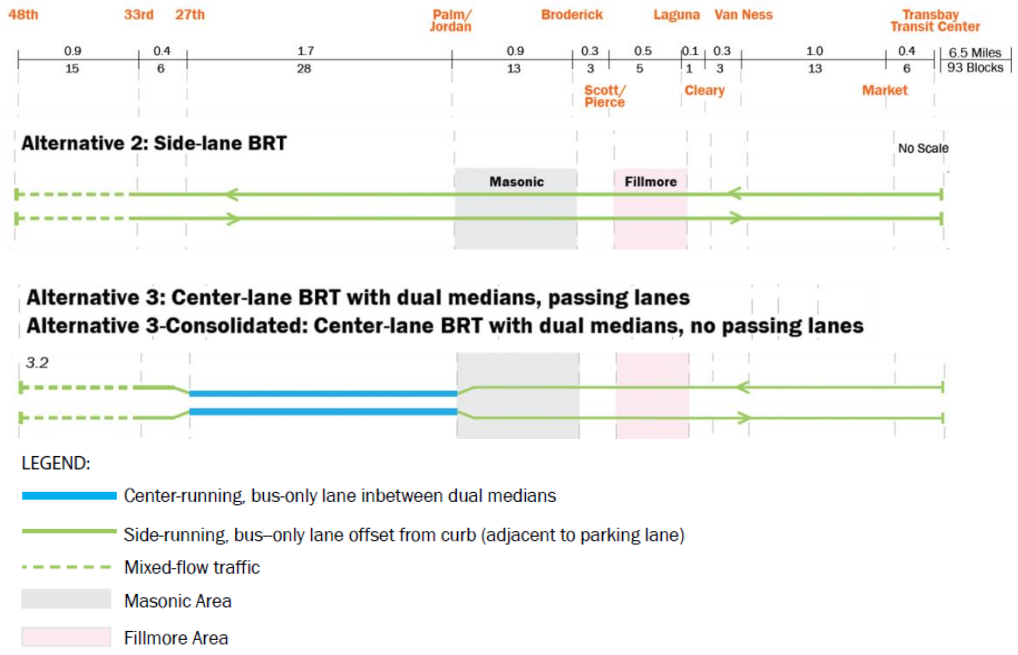
After screening fatally flawed and low-performing alternatives/configurations from consideration for the SRA, the following alternatives and combinations remained for evaluation (shown in Figure 10-5):

- Alternative 1: No Build Alternative
- Alternative 2: Side-lane BRT between Market Street and 34th Avenue with dual service (separate local and BRT services)
- Alternative 3.2:
    - Side-lane BRT between Market Street and Palm Avenue with dual service
    - Center-lane BRT with right-side platforms between Palm and 27th Avenues with dual service
    - Side-lane BRT between 27th and 34th Avenues with dual service
- Alternative 3.2C (Hybrid Alternative, the eventual LPA):

- Side-lane BRT between Market Street and Palm Avenue with dual service
- Center-lane BRT with right-side platforms between Palm and 27th Avenues with consolidated service
- Side-lane BRT between 27th and 34th Avenues with consolidated service

Consolidated service was considered only with Alternative 3.2 primarily because it was intended to reduce the significant parking losses caused by passing lanes in a center-running BRT configuration with dual service. In addition, the transit travel time benefits of center-running bus-only lanes would be more than able to compensate for the additional dwell time for BRT buses with consolidated stops.

Figure 10-5 Remaining Alternatives and Combinations Under Consideration



Source: SFCTA, 2014

To help identify a SRA, this section considers the performance of Alternatives 2, 3.2, and 3.2C compared to the No Build on each key performance indicator for the entire corridor from 48th Avenue to the Transbay Transit Center. Table 10-2 summarizes the results of this evaluation. Alternative 3.2 was not modeled as part of the analysis, but for many metrics, results could be estimated by combining results from the side- and center-running segments of other alternatives. However, doing so is not possible for some metrics, such as transit ridership, so a range is provided. Also, for some indicators, data is only available for the portion of the corridor where the BRT physical improvements would be implemented.

Table 10-2 Alternatives and Combinations Performance Summary

PERFORMANCE INDICATOR	NO BUILD	ALT. 2 (SIDE-LANE BRT)	ALT 3.2 (CENTER/ SIDE, NOT CONSOLIDATED)	ALT 3.2C (HYBRID; CENTER/ SIDE, PARTIALLY CONSOLIDATED)
TRANSIT PERFORMANCE				
Vehicle travel time [min]				
Rapid/BRT service	53:50	45:00	42:45	44:45
Local service	1:02:30	54:00	51:55	51:55
Reliability, BRT [travel time diff. bet. average and 95th % trip, min]				
Rapid/BRT service	4:45	3:15	2:55-3:15	3:35
Local service	5:40	4:05	4:05-4:20	4:10
Ridership [total daily boardings]	64,000	75,700	75,700-77,600	77,600
CIRCULATION SYSTEM PERFORMANCE				
Person-delay [auto+transit, total delay hours during peak hour]	4,890	4,130 (-16%)	4,130-4,310 (-12-16%)	4,310 (-12%)
Diversions [increase in peak hour traffic on nearby parallel streets at Masonic]	0	4%	7%	7%
ENVIRONMENTAL EFFECTS				
Parking opportunities [existing corridor on-street parking removed]	0	460	500	410
Existing trees removed	0	156	195	182
Median landscaping area [acres]	3.1	3.1	3.6	3.5
PEDESTRIAN ACCESS AND SAFETY				
Average stop spacing [feet]				
Rapid/BRT stops	1540	2180	2160	1740
Local stops	720	840	920	1090
Pedestrian safety improvements	-	+	+	++
RAIL-READINESS				
Ease of future conversion to rail	•	•	+	++
COST				
Construction cost [2013$]	$0	$170M	$300M	$300M
Operations and maintenance costs [2013$/year and $/weekday passenger]	$36.7m	$49.5m	$49.2-49.5m	$49.2m
CONSTRUCTION IMPACTS				
Total duration of construction [weeks]	0	90	100	100 weeks per Phase* (Market-Stanyan Phase I; Stanyan - 34th Phase II)

All performance results are for the year 2020.

Symbol key:

+ or ++ indicates performance advantage or strong advantage relative to No Build condition.

- or -- indicates performance disadvantage or strong disadvantage relative to No Build condition.

• indicates minimal or no performance change relative to No Build condition.

Source: SFCA, 2014

Transit performance

Transit travel time. Throughout the corridor, all of the build alternatives would provide 16 percent to 21 percent reductions in travel times compared to the No Build scenario. Alternative 2 BRT travel time would be approximately 45 minutes for this section. Alternative 3.2 would be faster than Alternative 2 by more than two minutes; Alternative 3.2C would be slightly faster than Alternative 2. Travel times would vary between 34th Avenue and Stanyan, but would otherwise be the same across all of the build scenarios.

Transit reliability. Transit reliability is measured using the difference between the average bus travel time in each alternative and the 95th percentile travel time, which for a weekday round-trip commuter would approximately correspond to the worst travel time experienced on any one commute journey over a two-week period. For a trip along the entire corridor, 19 out of every 20 trips are expected to take no longer than the average transit travel time plus the additional 95th percentile travel time reported in Table 10-2. A high number indicates greater travel time variability, while a lower number indicates more consistent travel times. The tools used to estimate transit performance show that the build scenarios would reduce 95th percentile additional travel time for rapid/BRT service by about 1.5 minutes relative to the No Build alternative. Differences between build alternatives would be relatively small.

Not all of the causes of travel time variability can be analyzed with available traffic simulation models. Some sources of travel time variability, particularly the cascading effects that occur when a bus starts to run late, are not captured by these tools. The estimated values likely understate travel time variability for scenarios and segments that do not feature dedicated center-running bus lanes.

Ridership. All of the build alternatives are expected to increase Geary transit ridership compared to the No Build alternative. In 2020 Alternative 2 is projected to increase ridership in the corridor by approximately 18 percent relative to the No Build Alternative. Alternative 3.2 and 3.2C are expected to have higher ridership than Alternative 2.

System performance

Person-delay. Person-delay, or the total hours that all auto and transit users spend in delay during the peak period, provides a measure of overall transportation system efficiency and performance in the corridor. The measure includes all intersections along the corridor between Van Ness Avenue and 25th Avenue. All of the build alternatives would reduce person-delay relative to the No Build Alternative. Alternative 2 would reduce delay by 16 percent, while the Alternative 3.2C would reduce delay by 12 percent. Alternative 3.2 would likely perform within the range of the other two build alternatives.

Diversions. With fewer mixed-flow travel lanes on Geary Boulevard with the proposed BRT project, some drivers are expected to use other parallel routes to reach their destinations. These diversions are projected to be greatest in the section of the corridor near Masonic Avenue. In this area, traffic on nearby parallel streets (between Fulton Street and the Presidio) with Alternative 2 would increase by an estimated average of 4 percent in the PM peak hour in 2020 relative to projected volumes in the No Build scenario. Diversion rates with Alternative 3.2 and Alternative 3.2C are expected to be somewhat higher.

Community effects

Parking preservation. All three build alternatives would result in elimination of on-street parking spaces in at least some portions of the corridor. Corridorwide, Alternatives 2 and 3.2 would have similar parking impacts, resulting in removal of approximately 27 percent and 29 percent of spaces, respectively. Alternative 3.2C would remove less parking, a total of 22 percent of spaces. These differences are due to the different configurations west of Palm Avenue; parking impacts east of Palm would be identical.

Existing trees retained. All of the alternatives under consideration would retain most of the existing trees corridorwide, but some would need to be removed to accommodate street reconfigurations. Alternative 2 would result in the fewest tree removals, 156, because most of the corridor improvements would be made along the sides of the street and not require reconstruction of the median. Alternatives 3.2 and 3.2C would remove approximately 40 more trees than Alternative 2. All trees removed as part of the project would be replaced with new healthy, drought-resistant trees.

Median landscaping area. The area available for median landscaping would differ between alternatives only where center BRT lanes are under consideration and for the length of the associated transitions at either end of the center-lane portion. As a result, most of the difference in median area available would occur in the Palm Avenue to 27th Avenue portion of the corridor. Corridorwide, Alternative 3.2 would provide the most median area, followed by Alternative 3.2C. Alternative 2 would provide approximately the same amount of median area as the No Build alternative.

Pedestrian access and safety

Average stop spacing. All of the build alternatives include fewer bus stops than current exist and would continue to exist with the No Build Alternative. West of 33rd Avenue and east of Masonic Avenue, most stop locations would be the same across the build alternatives. Alternative 3.2C would consolidate local and BRT stops between Arguello Boulevard and 34th Avenue. As a result, corridorwide it would significantly increase the average spacing between local stops but result in minimal change in average spacing between BRT service stops. Alternatives 2 and 3.2 would result in higher average spacing between BRT stops, but less change in the average distance to local stops.

Pedestrian safety improvements. All of the build alternatives would include pedestrian safety improvements along the Geary corridor, including installation of new corner bulbs to reduce crossing distances, new pedestrian crossing signals, and traffic signal upgrades. These elements would improve pedestrian safety corridorwide relative to the No Build Alternative. Alternatives 3.2 and 3.2C would provide additional benefits in the Palm to 27th Avenue section of the corridor due to proposed signal upgrades. The Alternative 2 and Alternative 3.2 street configurations would not allow bulbs to be placed at many corners with local bus stops. Alternative 3.2C would allow bulbs to be placed at more corners with transit stops, better meeting the project's transit access and pedestrian safety objectives. Under Alternative 3-Consolidated, pedestrian bulbs could be placed in more optimal locations for transit access and safety objectives than with the other build alternatives.

Rail-readiness

Alternative 3.2C would best facilitate future conversion to rail service in the Palm to 27th Avenue portion of the corridor due to its center-running alignment and consolidated stops. Alternative 3.2 would partially facilitate conversion in the center-running portion. Outside that segment, the build alternatives would not differ; all would require substantial construction to construct rail, but none would preclude the possibility of doing so.

Costs

Capital costs. In terms of capital construction costs, Alternative 2 would be less expensive than Alternatives 3.2 and 3.2C because it would utilize much of the existing pavement and reuse most of the existing median. The center lane alternatives would include a new median busway with new pavement, new medians with landscaping and bus platforms, and new street lighting. These additional improvements would be primarily between Palm and 27th Avenues. The construction cost maximum for projects receiving FTA Small Starts funding, which this project is seeking, is $300 million. Alternative 2 costs would be well below the cap; but costs for Alternatives 3.2 and 3.2C would approach the maximum.

Operating costs. The annual cost to operate bus service on the Geary corridor is expected to increase over time in due to increasing traffic congestion and the need to accommodate higher ridership. By 2020, the service is estimated to cost $36.7 million annually to operate with the No Build scenario. Further increases in service frequency would be required with the build alternatives in order to serve the additional riders that would be attracted to the corridor with improvements to bus travel time and reliability. With Alternative 2, the annual operating cost is expected to increase to $49.5 million, while Alternative 3.2C would cost $49.2 million to operate and costs for Alternative 3.2 would be between $49.2 million and $49.5 million.

Construction Impacts

Total construction duration. The recommended construction approach would involve construction on multiple work zones of several blocks each in order to minimize the length of disruption on any one block. Thus, construction in any individual work zone would generally be shorter than the length of time required to construct the entire project. Construction durations for the overall project would vary from 21 months for Alternative 2 to 23 months for either Alternative 3.2 or 3.2C.

10.3.7 | Summary Conclusion: Alternative 3.2C (Hybrid Alternative) as Staff Recommendation

San Francisco County Transportation Authority (SFCTA) staff engaged in a collaborative process with SFMTA staff to consider the performance of the alternatives and configurations under consideration against the evaluation criteria in Section 10.3.2 above and identify the alternative that meets the project purpose and need. This process included an extensive public outreach process, with three public open houses and meetings with more than 25 community stakeholder groups, to collect input on the alternatives (with further meetings regarding the underlying design options and configurations that comprise the full corridor alternatives). Based on the analysis of performance and public input received, SFCTA and SFMTA staffs

identified Alternative 3.2C, the Hybrid Alternative, as the SRA – in other words, the alternative recommended for the adoption as LPA. See Chapter 2 for detailed descriptions of the alternatives evaluated in the Draft EIS/EIR and this Final EIS and Section 2.3.8 regarding further comparison of alternatives and the selection of the Hybrid Alternative/LPA as the environmentally preferable alternative and the preferred alternative.

As set forth in Chapter 1 of this Final EIS, the purpose established for the project under NEPA was to:

- Improve transit performance on the corridor as a key link in the City's rapid transit network to improve the passenger experience and promote high transit use.
- Improve pedestrian conditions and pedestrian access to transit.
- Enhance transit access and the overall passenger experience, while maintaining general vehicular access circulation.

The need for the project was defined as encompassing the following facts:

- Existing transit service in the Geary corridor is unreliable, slow, and crowded, and is in need of improvement in order to promote high ridership and competitiveness with other travel modes.
- Geary Boulevard's wide travelway and high vehicle travel speeds create unfavorable pedestrian conditions - especially west of Gough Street and throughout the Richmond District.
- The Geary corridor's existing street and streetscape environment do not provide a high-quality transit passenger experience, despite the corridor's high transit ridership.

As discussed in this chapter, many alternatives were considered and rejected prior to the Draft EIS/EIR due to failure to meet the project purpose and need or other fatal flaws. As demonstrated in earlier sections of this chapter, the Hybrid Alternative is feasible to construct and operate within the time and funding limitations of the project, as well as within the physical and operating constraints of the Geary corridor. As noted previously, Alternatives 3 and 3-Consolidated would require intensive, expensive, and lengthy construction particularly within the Fillmore and Masonic areas. Due to these and other issues with center-running bus lanes at these locations, agency staff rejected Alternatives 3 and 3-Consolidated from further consideration as the SRA.

Of the alternatives and combinations that remained under consideration, the Hybrid Alternative and Alternative 3.2 would provide the most significant improvements to transit. While all of the build alternatives would improve transit speed, reliability, and the passenger experience compared to the No Build Alternative, the two alternatives that include center-running bus-only lanes in the Richmond would most improve bus performance in the corridor and would attract more riders than either Alternative 2 or the No Build Alternative.

A significant advantage of the Hybrid Alternative is its benefits to pedestrian safety, a key element of the project purpose. All of the build alternatives would out-perform the No Build Alternative, but the Hybrid Alternative would offer more

opportunities for pedestrian safety features, such as protected left turn signals and curb bulbs at key crosswalks, than Alternatives 2 and 3.2.

In addition to providing the best overall transportation system performance, the Hybrid Alternative would have similar or reduced impacts compared to the other build alternatives in key areas that are of concern to communities along the corridor. In particular, it would have a much more limited effect on the corridor parking supply than would the other build alternatives that remained under consideration. Differences between the build alternatives are generally smaller for other areas of concern: the Hybrid Alternative (and Alternative 3.2) would result in more tree removal but also more landscaping opportunities than Alternative 2. Construction duration for the two alternatives with a center-running segment would also be somewhat longer. However, compared with these other impacts, input from communities along the corridor has consistently indicated the most concern with parking loss. The No Build Alternative would involve minimal changes to parking, entail no tree removal, and result in more limited construction disruption but would have fewer landscaping opportunities compared to the build alternatives.

Among build alternatives, between the Hybrid Alternative and Alternatives 2, 3 and 3-Consolidated, the Hybrid Alternative would meet the purpose and need of the project by improving transportation conditions in the corridor and its similar or lesser impacts in key areas of community concern compared to other alternatives. SFCTA and SFMTA staffs therefore recommended selection of the Hybrid Alternative as the LPA for BRT in the Geary corridor.

10.4 Selection of Locally Preferred Alternative

The Draft EIS/EIR was published on October 2, 2015, and was made publicly available for a 59-day review period, wherein all interested parties were encouraged to review and provide comments on its contents. A public comment meeting was held on November 5, 2015, at St. Francis Hall, St. Mary's Cathedral (1111 Gough Street, San Francisco, CA) from 6:30pm to 8:30pm; see Section 8.3.2.2 for further details. A total of 299 comment communications (e.g., letters, emails, oral comment transcripts) were submitted. These included six communications from agencies, 13 communications from organizations, and 280 separate communications from 244 individuals. All comments received during the public comment period, as well as those received before December 10, 2015, are included in Appendix L of this Final EIS along with written responses to each of these comments.

SFCTA released the Final EIR for the Geary BRT project on December 9, 2016. As the California Environmental Quality Act (CEQA) lead agency, SFCTA certified the Final EIR, approved the project, and identified the Hybrid Alternative with five minor modifications as the LPA on January 5, 2017. All of these actions were on unanimous votes of the SFCTA Board. SFCTA issued a Notice of Determination (NOD) on January 6, 2017. The sixth minor modification was subsequently added and analyzed in a CEQA addendum; the SFCTA Board took an approval action on June 27, 2017, as further discussed in Section 2.2.7.6.6.

On July 18, 2017, the SFMTA Board unanimously approved the project and concurred with the LPA, including all six minor modifications noted above. SFMTA issued a NOD on July 25, 2017.

As demonstrated throughout this Final EIS, none of these modifications would result in new or more severe impacts to any resource area and thus had no bearing on the selection of the Hybrid Alternative as the LPA – the modifications simply address local concerns while still meeting the purpose and need established for the project.[11] The six minor modifications to the Hybrid Alternative/LPA are:

1) Retention of the Webster Street pedestrian bridge;
2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
3) Addition of more pedestrian crossing and safety improvements;
4) Addition of BRT stops at Laguna Street;
5) Retention of existing local and express stops at Collins Street; and
6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.[12]

These modifications to the Hybrid Alternative/LPA are consistent with the project purpose and need to enhance the performance, viability, and comfort level of transit and pedestrian travel along the Geary corridor. Modifications to retain the Webster Street bridge and provide additional pedestrian crossing and safety improvements further the purpose of improving pedestrian conditions in the corridor. Modifications to bus stop configurations, i.e., at Spruce/Cook, Laguna, and Collins Streets, further the purpose of enhancing access to transit – either BRT or local/Express services. Moreover, all modifications were developed in response to input from the public to enhance the overall experience for passengers and pedestrians along the corridor. See Section 2.1.1 for further discussion of selection of the LPA.

[11] As noted in Section 2.3.8, the modifications were also not relevant to the selection of the environmentally preferable alternative and the preferred alternative.
[12] This change to the Hybrid Alternative was not included in the LPA that was approved in January 2017 but rather was added and approved in June 2017. SFCTA prepared an addendum to the Final EIR associated with this change.

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