central subway

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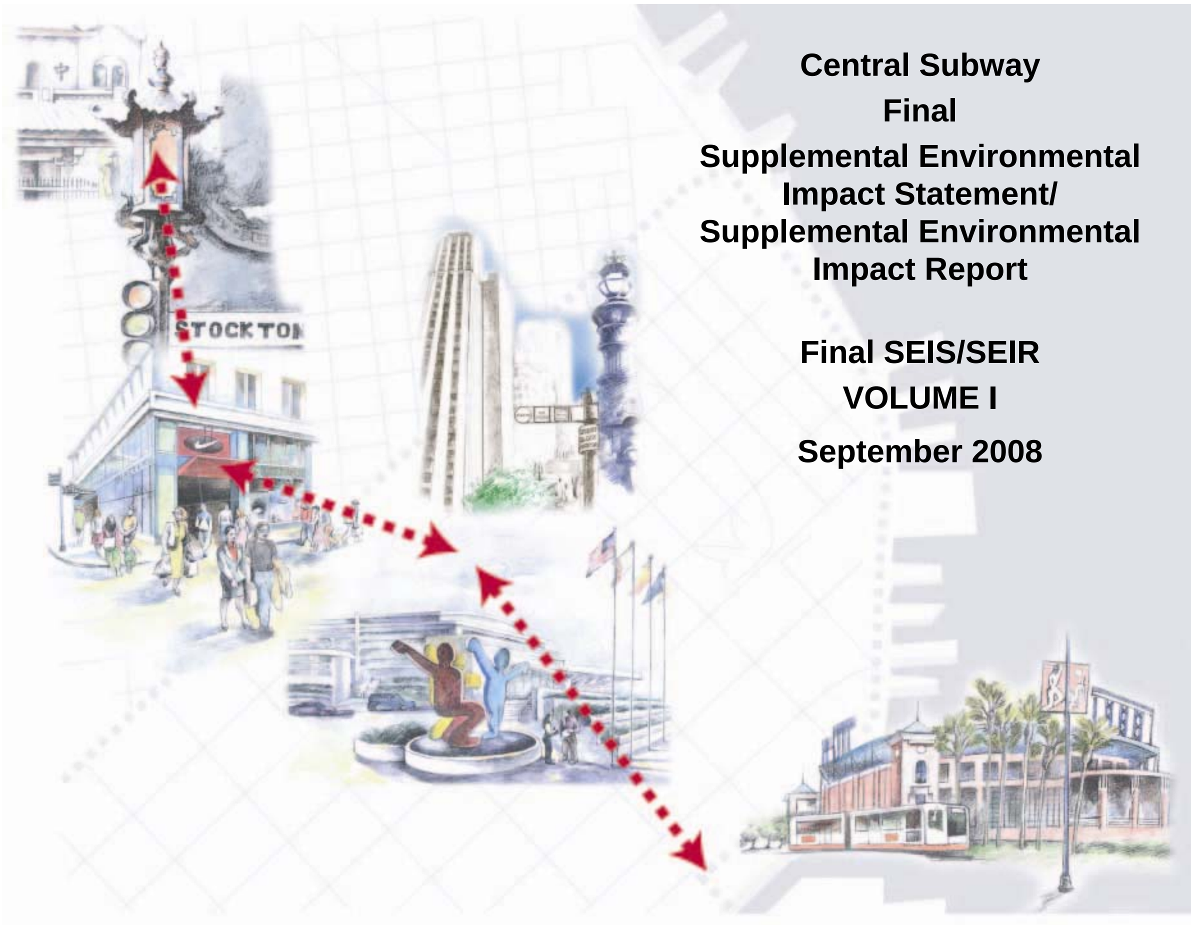

Central Subway
Final
Supplemental Environmental Impact Statement/ Supplemental Environmental Impact Report

Final SEIS/SEIR

VOLUME I

September 2008

FEDERAL TRANSIT ADMINISTRATION
U.S. DEPARTMENT OF TRANSPORTATION

CITY AND COUNTY OF SAN FRANCISCO
PLANNING DEPARTMENT

Case No. 96.281E
State Clearinghouse No. #96102097

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT/ FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT

for the

CENTRAL SUBWAY/THIRD STREET LIGHT RAIL PHASE 2 IN THE CITY AND COUNTY OF SAN FRANCISCO

prepared by the

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL TRANSIT ADMINISTRATION

and the

CITY AND COUNTY OF SAN FRANCISCO PLANNING DEPARTMENT

Pursuant to

National Environmental Policy Act (42 USC §4332) 49 USC Chapter 53, 49 USC §303, 16 USC §470, 23 CFR Part 771, 23 CFR Part 450, Executive Order 12898 Section 6002 SAFETEA-LU, 40 CFR parts 1500-1508, and California Environmental Quality Act, PRC 21000 *et seq.*; and the State of California CEQA Guidelines, California Administrative Code, 15000 *et seq*

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ABSTRACT: This Supplemental EIS/EIR describes and summarizes the environmental and transportation impacts, along with measures to improve, avoid, minimize or mitigate impacts for the Central Subway Project Alternatives, that would be Phase 2 of the Third Street Light Rail (T-Third Line) connecting Visitation Valley, Bayview/Hunters Point and Mission Bay with the downtown retail district and Chinatown in San Francisco, California. The term 'supplemental' is used for this environmental document because it tiers off of a previous EIS/EIR for the two-phase Third Street Light Rail Project that was evaluated under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) (Case No. 96.281E) in 1998. The Phase 1 Initial Operating Segment (IOS), now the T-Third Line, opened for operation in April of 2007. The San Francisco Municipal Transportation agency (MTA) is the Project Sponsor.

This document for the Phase 2 Central Subway updates information in the 1998 EIS/EIR for the Study Area and focuses on changes to the Project that have occurred since the certification of the Final EIS/EIR. These changes include: a new double-track segment along Fourth and Stockton Streets between Brannan and Market Streets as an alternative to use of Third, Harrison, Kearny, and Geary Streets; extension of the planning horizon year from 2015 to 2030; the addition of above ground ventilation shafts for tunnel segments and stations; the use of off-street access to stations; a deep tunnel under Market Street; and the potential extension of a construction tunnel to the north end of the Project near Washington Square under Columbus Avenue for removing the tunnel boring machine. Three alternatives are evaluated in this SEIS/SEIR for the Central Subway Project:

- Alternative 1 - No Project/Transportation Systems Management, developed in conformance with NEPA and CEQA guidelines to represent a baseline for comparison with build alternatives. This alternative includes the T-Third Line and associated bus changes for the Phase 1 Third Street Light Rail Project.
- Alternative 2 - Enhanced EIS/EIR Alignment, as analyzed in the 1998 FEIS/FEIR, that would use King, Third, Harrison, Kearny, and Geary Streets as well as Fourth and Stockton Streets, with a shallow tunnel crossing of Market Street and four subway stations at Moscone, Market Street, Union Square and Chinatown, and a surface platform at Third and King Streets. The enhancements to this original alternative include: above-ground ventilation shafts to meet fire code, off-sidewalk station entries to minimize pedestrian congestion on busy downtown sidewalks, and the provision of a closed-barrier fare system.
- Alternative 3 – The Fourth/Stockton Alignment was developed during preliminary engineering and community outreach to avoid or minimize potential impacts identified in the 1998 FEIS/FEIR for the Central Subway phase of the Third Street Light Rail Project. This alternative would operate exclusively on Fourth and Stockton Streets, avoiding impacts along Third, Harrison, Kearny, and Geary Streets, and would include a deep (rather than shallow) tunnel under Market Street to minimize conflicts with a major sewer line. Two design options are included in this alternative; Option A with a double-track portal on Fourth Street between Townsend and Brannan Streets and three subway stations at Moscone, Union Square/Market Street, and Chinatown (the entrance between Sacramento and Clay Streets on the east side of Stockton Street, adjacent to Hang Ah Alley and Willie "Woo Woo" Wong park/playground), and Option B with a double-track portal on Fourth Street between Bryant and Harrison Streets to reduce the length of the tunnel, and a surface platform on Fourth Street at Brannan Street to serve local residents, and subway stations at Moscone, Union Square/Market Street and Chinatown. The primary entrance to the Union Square station for Option B would be on the Geary Street side of the plaza rather than the Stockton Street side; and vent shafts~~, but~~ would be in the Ellis/O'Farrell garage rather than the plaza, minimizing impacts to the plaza ~~park~~. The Chinatown Station entrance for Option B would be located on the west side of Stockton Street ~~between~~ at the corner of Clay and Washington Streets, and would not affect Willie "Woo Woo" Wong Playground. Alternative 3 also includes a construction tunnel extension to Columbus Avenue near Washington Square Park for purposes of extraction of the tunnel boring machine.

Impacts discussed in this SEIS/SEIR include: displacement of businesses and residences; removal of on-street parking at stations and along the surface portion of the alignments; removal of parking in three garages for vent shafts; use of a small portion of Union Square plaza for a station entry; degraded traffic service levels at intersections along Third and Fourth Streets where the surface alignments would be located; potential affects to historic architectural properties and historic districts adjacent to the tunnel portals and station entries; impacts to archaeological resources; and construction related impacts (localized noise, vibration, traffic, visual affects) for an estimated five to six year construction period. As required for CEQA, mitigation measures are described for all impacts determined to be significant to reduce them to less-than-significant. Unavoidable impacts are described for: traffic at Third and King, Fourth and King, Fourth and Harrison, and Sixth and Brannan Streets; displacement of affordable housing units; and for prehistoric archaeological resources during construction and potential impacts to potentially eligible historic architectural buildings and ~~Districts in~~ the Chinatown ~~and Union Square station areas~~ Historic District. Impacts to Section 4(f) properties meet the criteria for a "de minimis" finding.

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PREFACE

This Final Supplemental Environmental Impact Statement/Supplemental Environmental Impact Report (SEIS/SEIR) is presented in two volumes: Volume I is the SEIS/SEIR with text changes resulting from responses to comments on the Draft SEIS/SEIR, and from the Public Hearing, and also includes Staff Initiated Changes between the Draft and Final SEIS/SEIR. Volume II includes copies of all comment letters on the Draft SEIS/SEIR, copies of comment forms from the Public Hearings, and the transcript from the Public Hearing. Each comment letter and form is followed by responses to comments. The staff-initiated text changes follow by Chapter of the SEIS/SEIR. Text additions are noted by an underline and text deletions are noted by a ~~strikethrough~~. The two volumes constitute the Final SEIS/SEIR.

The SEIS/SEIR is prepared pursuant to the requirements of both the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). There are a number of differences between the guidelines for CEQA and NEPA that affect reporting in this document. CEQA provides an Initial Study Checklist (Appendix G of the State CEQA guidelines) that describes thresholds for determining significance for environmental topics. These thresholds along with other City requirements were used throughout the analysis and the levels are shown in Chapter 7.0, Table 7-1, CEQA Significance Criteria. CEQA requires identification of and mitigation for significant adverse impacts in an EIR, while under NEPA, measures to avoid, minimize or mitigate affects are considered for all of the adverse impacts of a project, regardless of significance. The affected environment or existing conditions are described in Chapter 4.0, while in Chapter 5.0 of this combined NEPA/CEQA document, operational and cumulative impacts are described for each of the alternatives regardless of whether they would be considered significant under CEQA and mitigation measures are described wherever practicable to reduce identified adverse impacts. Construction methods and construction-related impacts and mitigation measures are described in Chapter 6.0. Specific discussion of the level of impact significance before and after mitigation and or improvement measures, as well as a summary of unavoidable significant impacts, growth-inducing impacts, and cumulative impacts in accordance with CEQA is provided in Chapter 7.0.

Another important difference between CEQA and NEPA is that CEQA only considers impacts to the physical environment, while NEPA includes impacts to the human environment, such as socioeconomic impacts and environmental justice. These NEPA topics are included in Chapters 4.0, 5.0 and 6.0, while the topics that relate only to CEQA are addressed in Chapter 7.0.

For Department of Transportation projects, as is the case for the Central Subway because it would need the approval of the Federal Transit Administration (FTA) to qualify for federal New Starts funding, the SEIS must also address the financial feasibility of the project, including a revenue analysis, a cost analysis, and a cash flow analysis. This information is included in a separate Chapter 8.0 of this SEIS/SEIR. Environmental documents for New Starts transportation projects must also evaluate, or compare, all alternatives for mobility, environmental benefits, operating efficiencies, cost effectiveness, transit supportive land use, and local financial commitment (Chapter 9.0).

Federal regulations require that transportation projects must address potential impacts to public parks and recreation areas and significant historic resources or wildlife/waterfowl refuges as part of a Section 4(f) analysis in the EIS. Because of potential impacts to Union Square, Willie "Woo Woo" Wong playground, Washington Square park and historic resources in Chinatown, a Section 4(f) Report is included as Chapter 10.0. <u>Concurrence with a "de minimis" finding for impacts to Union Square Park by the Recreation and Parks Commission is attached as Appendix J. This satisfies the Section 4(f) requirement for the Project.</u>

Technical studies, which were prepared as part of the environmental analysis for the Central Subway Project, are available for review by appointment at the San Francisco Planning Department, 1650 Mission Street, Suite 400, San Francisco, California.

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT/ SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT (SEIS/SEIR)

VOLUME I

(See page xv for Table of Contents, Volume II)

S.0 EXECUTIVE SUMMARY S-1

1.0 PURPOSE AND NEED 1-1
1.1 CORRIDOR LOCATION 1-2
1.2 PURPOSE OF PROPOSED ACTION 1-3
1.3 NEED FOR TRANSPORTATION IMPROVEMENTS IN THE CORRIDOR 1-4
1.3.1 MUNI SERVICE RELIABILITY PROBLEMS IN THE CENTRAL SUBWAY CORRIDOR 1-5
1.3.2 INADEQUATE CONNECTIVITY BETWEEN CORRIDOR TRANSIT LINES AND OTHER TRANSIT SERVICES 1-5
1.3.3 PROJECTED INCREASES IN 2030 TRANSIT AND AUTO TRAVEL DEMAND IN THE CORRIDOR 1-6
1.3.4 PROJECTED INCREASES IN 2030 TRAFFIC CONGESTION IN THE CORRIDOR 1-9
1.3.5 INTEGRATION OF TRANSPORTATION IMPROVEMENTS WITH COMMUNITY REVITALIZATION ALONG THE CENTRAL SUBWAY CORRIDOR 1-9
1.3.6 AIR QUALITY ISSUES 1-11
1.4 PROJECT GOALS AND OBJECTIVES 1-11

2.0 ALTERNATIVES 2-1
2.1 ALTERNATIVES TO BE ANALYZED IN THE SEIS/SEIR 2-1
2.1.1 ALTERNATIVE 1 - NO PROJECT/TSM 2-3
2.1.2 ALTERNATIVE 2 - ENHANCED EIS/EIR ALIGNMENT 2-9
2.1.3 ALTERNATIVE 3 - FOURTH/STOCKTON ALIGNMENT 2-24
2.2 CAPITAL COSTS 2-49
2.2.1 CAPITAL COST SUMMARY 2-49
2.3 OPERATING AND MAINTENANCE (O&M) COSTS 2-51
2.3.1 O&M COST ESTIMATION METHODOLOGY 2-51
2.3.2 O&M COST SUMMARY 2-51
2.4 PROJECT DEVELOPMENT HISTORY 2-52
2.4.1 PHASE 2 CENTRAL SUBWAY CONCEPTUAL DESIGN 2-55
2.4.2 INITIATION OF SUPPLEMENTAL EIS/EIR 2-56
2.4.3 MODIFICATIONS TO THE ALTERNATIVES 2-57
2.4.4 SCREENING OF DESIGN OPTIONS/ALTERNATIVES NOT CARRIED FORWARD 2-58
2.5 ROLE OF THE SEIS/SEIR 2-62
2.5.1 APPROVAL PROCESS 2-62
2.5.2 REQUIRED PERMITS AND APPROVALS 2-63

3.0 ~~TRANSPORTAION~~ TRANSPORTATION ANALYSIS 3-1
3.1 AFFECTED ENVIRONMENT 3-1
3.1.1 TRANSIT 3-1
3.1.2 TRAFFIC 3-15
3.1.3 FREIGHT AND LOADING 3-23
3.1.4 PARKING 3-24
3.1.5 PEDESTRIANS 3-26
3.1.6 BICYCLES 3-28
3.1.7 EMERGENCY VEHICLE ACCESS 3-32
3.2 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES 3-33
3.2.1 TRANSIT 3-33
3.2.2 TRAFFIC 3-45
3.2.3 FREIGHT AND LOADING 3-56

3.2.4 PARKING 3-58
3.2.5 PEDESTRIANS 3-64
3.2.6 BICYCLES 3-75
3.2.7 EMERGENCY VEHICLE ACCESS 3-77

4.0 AFFECTED ENVIRONMENT 4-1
4.1 LAND USE 4-1
4.1.1 ADOPTED PLANS AND POLICIES 4-1
4.1.2 PROPOSED PLANS AND PROJECTS IN THE CORRIDOR 4-17
4.1.3 EXISTING LAND USES IN THE CORRIDOR 4-20
4.2 SOCIOECONOMIC CHARACTERISTICS 4-25
4.2.1 POPULATION 4-25
4.2.2 HOUSING AND HOUSEHOLD CHARACTERISTICS 4-26
4.2.3 EMPLOYMENT 4-27
4.2.4 FISCAL AND ECONOMIC CHARACTERISTICS 4-28
4.2.5 ENVIRONMENTAL JUSTICE CONSIDERATIONS 4-29
4.3 COMMUNITY FACILITIES AND SERVICES 4-35
4.3.1 PUBLIC AND COMMUNITY FACILITIES 4-35
4.3.2 POLICE, FIRE, AND EMERGENCY SERVICES 4-35
4.3.3 PARKS AND RECREATIONAL FACILITIES 4-35
4.4 CULTURAL RESOURCES 4-40
4.4.1 REGULATORY FRAMEWORK 4-40
4.4.2 ARCHAEOLOGICAL RESOURCES 4-41
4.4.3 HISTORIC ARCHITECTURAL RESOURCES 4-50
4.5 VISUAL AND AESTHETIC RESOURCES 4-78
4.5.1 VIEWSHED 4-78
4.5.2 VISUAL CHARACTER 4-78
4.6 UTILITIES AND ENERGY 4-84
4.6.1 UTILITIES 4-84
4.6.2 ENERGY 4-84
4.7 GEOLOGY AND SEISMICITY 4-86
4.7.1 TOPOGRAPHY 4-86
4.7.2 GEOLOGY 4-86
4.7.3 SEISMICITY 4-89
4.8 HYDROLOGY AND WATER QUALITY 4-94
4.8.1 REGULATORY FRAMEWORK 4-94
4.8.2 SURFACE WATER 4-94
4.8.3 FLOODING/TSUNAMIS 4-97
4.8.4 GROUNDWATER 4-99
4.9 BIOLOGICAL AND WETLAND RESOURCES 4-101
4.9.1 SPECIAL-STATUS SPECIES 4-101
4.9.2 WETLANDS 4-101
4.10 HAZARDOUS MATERIALS 4-103
4.10.1 REGULATORY FRAMEWORK 4-103
4.10.2 WASTE CLASSIFICATION AND MANAGEMENT 4-105
4.10.3 HEALTH AND SAFETY 4-106
4.10.4 POTENTIAL AND KNOWN SOIL AND GROUNDWATER CONTAMINATION ON SITES ALONG LIGHT CENTRAL SUBWAY ALIGNMENT 4-106
4.11 AIR QUALITY 4-112
4.11.1 AIR QUALITY STANDARDS 4-112
4.11.2 AIR POLLUTANTS OF CONCERN 4-112
4.11.3 METEOROLOGY AND TOPOGRAPHY 4-114
4.11.4 EXISTING AIR QUALITY AND REGIONAL ATTAINMENT STATUS 4-115
4.11.5 PROJECT CONFORMITY 4-118
4.11.6 EXISTING POLLUTANT SOURCES 4-119
4.11.7 SENSITIVE RECEPTORS 4-120

4.11.8 CLIMATE CHANGE/GREENHOUSE GAS EMISSIONS ... 4-120
4.12 NOISE AND VIBRATION ... 4-122
4.12.1 NOISE AND VIBRATION MEASURES ... 4-122
4.12.2 NOISE AND VIBRATION STANDARDS ... 4-124
4.12.3 EXISTING NOISE CONDITIONS AT SENSITIVE RECEPTORS ... 4-130
4.12.4 EXISTING VIBRATION CHARACTERISTICS ... 4-137

5.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES ... 5-1
5.1 LAND USE ... 5-1
5.1.1 INTRODUCTION ... 5-1
5.1.2 CONSISTENCY WITH ADOPTED PLANS AND POLICIES AND LAND USE COMPATIBILITY ... 5-2
5.2 SOCIOECONOMIC CHARACTERISTICS ... 5-7
5.2.1 DEMOGRAPHIC AND ECONOMIC IMPACTS ... 5-7
5.2.2 ACQUISITION AND DISPLACEMENT OF EXISTING USES ... 5-9
5.2.3 ENVIRONMENTAL JUSTICE FINDINGS ... 5-10
5.3 COMMUNITY FACILITIES AND SERVICES ... 5-13
5.3.1 INTRODUCTION ... 5-13
5.3.2 PUBLIC AND COMMUNITY FACILITIES ... 5-13
5.3.3 POLICE, FIRE AND EMERGENCY SERVICES ... 5-15
5.3.4 PARKS AND RECREATIONAL FACILITIES ... 5-16
5.4 CULTURAL RESOURCES ... 5-19
5.4.1 INTRODUCTION ... 5-19
5.4.2 PREHISTORIC AND HISTORICAL ARCHAEOLOGICAL RESOURCE IMPACTS ... 5-20
5.4.3 HISTORIC ARCHITECTURAL RESOURCE IMPACTS ... 5-21
5.5 VISUAL AND AESTHETIC RESOURCES ... 5-26
5.5.1 INTRODUCTION ... 5-26
5.5.2 IMPACT CRITERIA ... 5-26
5.5.3 VISUAL IMPACTS ... 5-26
5.6 UTILITIES AND ENERGY ... 5-44
5.6.1 INTRODUCTION ... 5-44
5.6.2 IMPACTS TO MAJOR UTILITIES ... 5-44
5.6.3 ENERGY IMPACTS ... 5-45
5.7 GEOLOGY AND SEISMICITY ... 5-49
5.7.1 INTRODUCTION ... 5-49
5.7.2 EXPOSURE OF CONSTRUCTION WORKERS AND/OR THE PUBLIC TO GEOLOGIC HAZARDS AND POTENTIAL DAMAGE TO PROJECT COMPONENTS ... 5-49
5.7.3 DAMAGE TO EXISTING AND FUTURE IMPROVEMENTS FROM SETTLEMENT OR INSTABILITY OF SUBSURFACE MATERIALS ... 5-50
5.8 HYDROLOGY AND WATER QUALITY ... 5-56
5.8.1 INTRODUCTION ... 5-56
5.8.2 FLOODING ... 5-56
5.8.3 WATER QUALITY ... 5-57
5.8.4 GROUNDWATER RECHARGE ... 5-60
5.9 BIOLOGICAL AND WETLAND RESOURCES ... 5-61
5.9.1 INTRODUCTION ... 5-61
5.9.2 IMPACTS ... 5-61
5.10 HAZARDOUS MATERIALS ... 5-63
5.10.1 INTRODUCTION ... 5-63
5.10.2 EXPOSURE OF SITE WORKERS AND PUBLIC TO HAZARDOUS MATERIALS ... 5-63
5.11 AIR QUALITY ... 5-66
5.11.1 INTRODUCTION ... 5-66
5.11.2 SIGNFICANCE THRESHOLDS ... 5-67
5.11.3 AIR POLLUTANT EMISSIONS ... 5-70
5.12 NOISE AND VIBRATION ... 5-77
5.12.1 INTRODUCTION ... 5-77

5.12.2 IMPACTS 5-77

6.0 CENTRAL SUBWAY CONSTRUCTION METHODS, IMPACTS, AND MITIGATION MEASURES..... 6-1

6.1 PROPOSED CONSTRUCTION METHODS..... 6-1
6.1.1 TUNNEL BORING MACHINE (TBM) (ALTERNATIVE 3 - FOURTH/STOCKTON ALIGNMENT, OPTIONS A AND B)..... 6-2
6.1.2 CUT-AND-COVER (C&C) (ALTERNATIVE 2 – ENHANCED EIS/EIS ALIGNMENT AND ALTERNATIVE 3 - FOURTH/STOCKTON ALIGNMENT, OPTIONS A AND B) 6-2
6.1.3 SEQUENTIAL EXCAVATION METHOD (SEM) - (ALTERNATIVE 2 – ENHANCED EIS/EIR ALIGNMENT AND ALTERNATIVE 3 - FOURTH/STOCKTON ALIGNMENT, OPTIONS A AND B)..... 6-5
6.1.4 SPECIAL EXCAVATION METHOD (SXM) (ALTERNATIVE 2 - ENHANCED EIS/EIR ALIGNMENT) 6-6
6.2 DESCRIPTION OF CONSTRUCTION METHODS FOR BUILD ALTERNATIVES 6-8
6.2.1 ENHANCED EIS/EIR ALIGNMENT – ALTERNATIVE 2 6-8
6.2.2 FOURTH/STOCKTON ALIGNMENT OPTION A – ALTERNATIVE 3A 6-18
6.2.3 FOURTH/STOCKTON ALIGNMENT OPTION B – ALTERNATIVE 3B 6-27
6.3 CONSTRUCTION IMPACTS AND MITIGATION FOR TRANSPORTATION 6-34
6.3.1 TRANSIT..... 6-34
6.3.2 TRAFFIC 6-36
6.3.3 FREIGHT AND LOADING 6-39
6.3.4 PARKING..... 6-41
6.3.5 PEDESTRIANS 6-42
6.3.6 BICYCLES 6-44
6.3.7 EMERGENCY VEHICLE ACCESS..... 6-45
6.4 CONSTRUCTION IMPACTS AND MITIGATION FOR LAND USE 6-47
6.4.1 LAND USE..... 6-47
6.5 CONSTRUCTION IMPACTS AND MITIGATION FOR SOCIOECONOMICS 6-48
6.5.1 SOCIOECONOMICS 6-48
6.5.2 ACQUISITION AND DISPLACEMENT 6-48
6.5.3 ENVIRONMENTAL JUSTICE FINDINGS 6-54
CONSTRUCTION IMPACTS AND MITIGATION FOR..... 6-55
6.6 COMMUNITY FACILITIES AND SERVICES 6-55
6.6.1 PUBLIC AND COMMUNITY FACILITIES..... 6-55
6.6.1 POLICE, FIRE, AND EMERGENCY SERVICES 6-56
6.6.1 PARKS AND RECREATION FACILITIES..... 6-57
6.7 CONSTRUCTION IMPACTS AND MITIGATION FOR CULTURAL RESOURCES..... 6-60
6.7.1 PREHISTORIC AND HISTORICAL ARCHAEOLOGICAL RESOURCES 6-60
6.7.2 HISTORICAL ARCHITECTURAL RESOURCES..... 6-72
6.8 CONSTRUCTION IMPACTS AND MITIGATION MEASURES FOR VISUAL AND AESTHETIC RESOURCES..... 6-83
6.9 CONSTRUCTION IMPACTS AND MITIGATION FOR UTILITIES AND ENERGY 6-85
6.9.1 UTILITIES..... 6-85
6.9.2 ENERGY 6-89
6.10 CONSTUCTION IMPACTS AND MITIGATION FOR GEOLOGY AND SEISMICITY 6-90
6.10.1 GEOLOGIC HAZARDS 6-90
6.10.2 SETTLEMENT OR INSTABILITY OF SUBSURFACE MATERIALS 6-90
6.11 CONSTRUCTION IMPACTS AND MITIGATION FOR HYDROLOGY..... 6-95
6.11.1 FLOODING 6-95
6.11.2 WATER QUALITY..... 6-95
6.12 CONSTRUCTION IMPACTS AND MITIGATION FOR BIOLOGICAL AND WETLAND RESOURCES..... 6-99
6.13 CONSTRUCTION IMPACTS AND MITIGATION FOR HAZARDOUS MATERIALS..... 6-100
6.14 CONSTRUCTION IMPACTS AND MITIGATION FOR AIR QUALITY 6-110
6.15 CONSTRUCTION IMPACTS AND MITIGATION FOR NOISE AND VIBRATION..... 6-115

7.0 CEQA CONSIDERATIONS 7-1
7.1 SIGNIFICANCE CRITERIA 7-1
7.2 FINDINGS OF SIGNIFICANCE 7-8
7.3 SIGNFICANT ENVIRONMENTAL EFFECTS WHICH CAN NOT BE AVOIDED 7-8
7.3.1 TRAFFIC (CONGESTION) 7-8
7.3.2 POPULATION, HOUSING, AND EMPLOYMENT (SOCIOECONOMIC CHARACTERISTICS) 7-46
7.3.3 CULTURAL RESOURCES 7-47
7.4 SUMMARY OF CUMULATIVE IMPACTS 7-49
7.4.1 REGIONAL CONTEXT 7-50
7.4.2 LOCAL CONTEXT 7-50
7.5 GROWTH INDUCING IMPACTS 7-51
7.6 IRREVERSIBLE AND IRRETREIVABLE COMMITMENT OF RESOURCES 7-52
7.7 ENVIRONMENTALLY SUPERIOR ALTERNATIVE 7-53

8.0 FINANCIAL FEASIBILITY 8-1
8.1 COSTS AND AVAILABLE REVENUES 8-1
8.1.1 CAPITAL COSTS 8-1
8.1.2 OPERATING AND MAINTENANCE COSTS 8-6
8.1.3 PROJECT FUNDING 8-7
8.1.4 CAPITAL AND OPERATING SHORTFALL 8-14
8.1.5 ADDITIONAL REVENUE SOURCES 8-15
8.1.6 RISK AND UNCERTAINTY 8-16

9.0 EVALUATION OF ALTERNATIVES 9-1
9.1 EVALUATION METHODOLOGY 9-1
9.1.1 TRANSIT OPTIONS EVALUATED 9-2
9.1.2 EVALUATION FRAMEWORK 9-2
9.2 MOBILITY IMPROVEMENTS 9-3
9.2.1 SUMMARY OF MOBILITY IMPROVEMENTS EVALUATION 9-3
9.3 ENVIRONMENTAL BENEFITS 9-6
9.3.1 SUMMARY OF ENVIRONMENTAL BENEFITS EVALUATION 9-6
9.4 OPERATING EFFICIENCIES 9-9
9.4.1 SUMMARY OF OPERATING EFFICIENCIES EVALUATION 9-9
9.5 COST EFFECTIVENESS 9-11
9.5.1 SUMMARY OF COST EFFECTIVENESS EVALUATION 9-12
9.6 TRANSIT SUPPORTIVE EXISTING LAND USE AND FUTURE PATTERNS 9-13
9.6.1 TRANSIT SUPPORTIVE LAND USE EVALUATION 9-13
9.7 OTHER FACTORS 9-15
9.7.1 OTHER LOCAL EVALUATION FACTORS 9-15
9.8 LOCAL FINANCIAL COMMITMENT 9-17
9.8.1 LOCAL FINANCIAL COMMITMENT EVALUATION 9-18

10.0 SECTION 4(f) 10-1
1.0 BACKGROUND INFORMATION 10-7
1.1 SECTION 4(f) 10-7
1.2 PURPOSE AND NEED 10-9
1.3 PROJECT DESCRIPTION 10-11
1.4 BUILD ALTERNATIVES 10-12
1.4.1 ALTERNATIVE 2 - ENHANCED FEIS/FEIR ALIGNMENT 10-12
1.4.2 ALTERNATIVE 3 – FOURTH/STOCKTON ALIGNMENT OPTION A (LOCALLY PREFERRED ALTERNATIVE - LPA) 10-13
1.4.3 ALTERNATIVE 3 – FOURTH/STOCKTON ALIGNMENT OPTION B (MODIFIED LPA) 10-15
1.4.4 NORTH BEACH TUNNEL CONSTRUCTION VARIANT 10-16
1.5 OTHER PROJECT ALTERNATIVES 10-16

1.5.1 ALTERNATIVE 1 NO PROJECT/TSM 10-16
2.0 SECTION 4(F) RESOURCES........ 10-17
2.1 PARK RESOURCES 10-18
2.1.1 UNION SQUARE........ 10-18
2.1.2 WILLIE "WOO WOO" WONG PLAYGROUND 10-21
2.1.3 WASHINGTON SQUARE........ 10-22
2.2 HISTORIC RESOURCES 10-25
3.0 IMPACTS TO SECTION 4(F) RESOURCES 10-28
3.1 UNION SQUARE........ 10-29
3.1.1 ALTERNATIVE 2 – CONSTRUCTION IMPACTS 10-29
3.1.2 ALTERNATIVE 2 - OPERATION IMPACTS 10-29
3.1.3 ALTERNATIVE 3 OPTION A – CONSTRUCTION IMPACTS........ 10-31
3.1.4 ALTERNATIVE 3 OPTION A – OPERATION IMPACTS........ 10-32
3.1.5 ALTERNATIVE 3 OPTION B – CONSTRUCTION IMPACTS........ 10-33
3.1.6 ALTERNATIVE 3 OPTION B –OPERATION IMPACTS 10-34
3.2 WILLY "WOO WOO" WONG PLAYGROUND........ 10-36
3.2.1 ALTERNATIVE 2 – CONSTRUCTION IMPACTS 10-36
3.2.2 ALTERNATIVE 2 –OPERATION IMPACTS 10-37
3.2.3 ALTERNATIVE 3 OPTION A – CONSTRUCTION IMPACTS........ 10-38
3.2.4 ALTERNATIVE 3 OPTION A –OPERATION IMPACTS........ 10-40
3.2.5 ALTERNATIVE 3 OPTION B –CONSTRUCTION AND OPERATION IMPACTS........ 10-40
3.3 WASHINGTON SQUARE PARK 10-40
3.3.1 ALTERNATIVE 2 - CONSTRUCTION AND OPERATION IMPACTS........ 10-40
3.3.2 ALTERNATIVES 3 OPTION A AND OPTION B – CONSTRUCTION IMPACTS........ 10-40
3.3.3 ALTERNATIVES 3 OPTION A AND 3 OPTION B – OPERATION IMPACTS........ 10-41
3.4 HISTORIC RESOURCES 10-41
4.0 AVOIDANCE ALTERNATIVES........ 10-42
4.1 EVALUATION OF AVOIDANCE ALTERNATIVES 10-44
4.1.1 LOCATION ALTERNATIVES 10-44
4.1.2 DESIGN ALTERNATIVES 10-45
5.0 MEASURES TO MINIMIZE HARM TO SECTION 4(F) RESOURCES 10-46
5.1 UNION SQUARE........ 10-46
5.2 WILLIE "WOO WOO" WONG PLAYGROUND 10-47
5.3 WASHINGTON SQUARE PARK 10-47
5.4 HISTORIC RESOURCES 10-49
6.0 COORDINATION........ 10-49
7.0 REFERENCES 10-50

11.0 COORDINATION AND CONSULTATION 11-1
11.1 NOTICE OF PREPARATION........ 11-1
11.2 PUBLIC INVOLVEMENT PROGRAM 11-5
11.3 COMMUNITY ADVISORY GROUP........ 11-8
11.4 AGENCY CONSULTATION 11-9
11.5 PERSONS AND ORGANIZATIONS CONSULTED (SEIS/SEIR DISTRIBUTION) 11-9

APPENDICES

A. LIST OF PREPARERS

B. NOTICE OF PREPARATION

C. PROGRAMMATIC AGREEMENT WITH STATE HISTORIC PRESERVATION OFFICE (SHPO)
2008 MEMORANDUM OF AGREEMENT

D. FTA LETTER TRANSMITTING APE 2007 MAPS
SHPO LETTER APPROVING APE 2007MAPS
SHPO LETTER OF CONCURRENCE WITH FINDINGS OF EFFECT

E. TRANSPORTATION BACKUP

F. HISTORICAL ARCHITECTURAL RESOURCES

G. HAZARDOUS MATERIALS BACKGROUND

H. 2009 NEW STARTS COST EFFECTIVENESS

I. MITIGATION MONITORING AND REPORTING PROGRAM

J. SECTION 4(F) "DE MINIMIS" CONCURRENCE LETTERS FROM RECREATION AND PARKS DEPARTMENT

K. SHADOW ANALYSIS, ALTERNATIVE 3B, CHINATOWN STATION

LIST OF TABLES

TABLE 1-1: POPULATION AND EMPLOYMENT PROJECTIONS 2000 AND 2030 1-6
TABLE 1-2: COMPARISON OF 2000 AND 2030 DAILY PERSON TRIPS 1-8
TABLE 1-3 GOALS AND OBJECTIVES SUMMARY 1-13
TABLE 2-1: ALTERNATIVE 2 - ENHANCED EIS/EIR ALIGNMENT STATION LOCATIONS 2-21
TABLE 2-2: ANNUAL OPERATING STATISTICS ALTERNATIVE 2 - ENHANCED EIS/EIR ALIGNMENT 2-23
TABLE 2-3: CENTRAL SUBWAY FOURTH/STOCKTON ALIGNMENT OPTION A STATIONS 2-33
TABLE 2-4: ANNUAL OPERATING STATISTICS ALTERNATIVE 3 –FOURTH/STOCKTON ALIGNMENT OPTION A 2-35
TABLE 2-5: CENTRAL SUBWAY FOURTH/STOCKTON ALIGNMENT OPTION B STATION LOCATIONS 2-47
TABLE 2-6: ANNUAL OPERATING STATISTICS FOR ALTERNATIVE 3 – FOURTH/STOCKTON ALIGNMENT OPTION B 2-48
TABLE 2-7: CAPITAL COST SUMMARY (IN $MILLIONS) 2-50
TABLE 2-8: OPEARATING AND MAINTENANCE COST SUMMARY (MILLIONS $ / YEAR OF OPERATING EXPENSES) 2-51
TABLE 2-9: AGENCY APPROVALS 2-64
TABLE 3-1: 2007 MUNI EQUIPMENT DEMAND BY MODE 3-2
TABLE 3-2: GUIDE TO FREQUENCY OF SERVICE (AVERAGE TIME IN MINUTES) 3-3
TABLE 3-3: EXISTING WEEKDAY TRAFFIC VOLUMES IN THE CORRIDOR 3-21
TABLE 3-4: EXISTING INTERSECTIONS LEVEL OF SERVICE CONDITIONS 3-22
TABLE 3-5: EXISTING TRAFFIC TRAVEL SPEEDS 3-23
TABLE 3-6: EXISTING ON-STREET PARKING CONDITIONS IN CORRIDOR 3-25
TABLE 3-7: EXISTING PEDESTRIAN LEVEL OF SERVICE AT PROPOSED STATION ENTRANCES 3-30
TABLE 3-8: ESTIMATED WEEKDAY TRANSIT RIDERSHIP EXISTING AND 2030 CONDITIONS 3-37
TABLE 3-9: ESTIMATED WEEKDAY RIDERSHIP BY CENTRAL SUBWAY STATION 2030 CONDITIONS 2030 ESTIMATED P.M. PEAK PERIOD RIDERSHIP 3-39
TABLE 3-11: IN-VEHICLE TRAVEL TIMES FOR SELECTED TRANSIT TRIPS EXISTING AND 2030 CONDITIONS 3-39
TABLE 3-12: PROJECTED 2030 WEEKDAY TRAFFIC INCREASES UNDER THE NO PROJECT/TSM ALTERNATIVE 3-46
TABLE 3-13: 2030 A.M. INTERSECTION LOS / AVERAGE SECONDS OF DELAY 3-47
TABLE 3-14: 2030 P.M. INTERSECTION LOS 3-48
TABLE 3-15: TRAFFIC P.M. PEAK PERIOD TRAVEL SPEED COMPARISON 3-49
TABLE 3-16: 2030 PARKING CONDITIONS IN CORRIDOR 3-60
TABLE 3-17: EXISTING AND PROJECTED PEDESTRIAN LEVEL OF SERVICE AT PROPOSED STATION ENTRANCES 3-66

TABLE 4-1: POPULATION, RACE, HISPANIC ORIGIN AND AGE: 2000 4-26

TABLE 4-2: HOUSING CHARACTERISTICS: 2000 4-26

TABLE 4-3: RESIDENT EMPLOYMENT CHARACTERISTICS BY SEGMENT: 2000 4-27

TABLE 4-4: ECONOMIC CHARACTERISTICS BY SEGMENT: 2000 4-28

TABLE 4-5: POPULATION AND RACE/ETHNICITY CHARACTERISTICS, 2000 4-32

TABLE 4-6: INCOME CHARACTERISTICS, 2000 4-33

TABLE 4-7: PUBLIC AND COMMUNITY FACILITIES WITHIN THE CORRIDOR 4-37

TABLE 4-8: KNOWN ARCHAEOLOGICAL RESOURCES WITHIN OR ADJACENT TO THE APE 4-43

TABLE 4-9: HISTORIC AND CONSERVATION DISTRICTS IN THE APE BY ALTERNATIVE 4-53

TABLE 4-10: NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE AREA OF POTENTIAL EFFECT (APE) IN THE SOUTH END HISTORIC DISTRICT AND THE RINCON POINT/SOUTH BEACH HISTORIC INDUSTRIAL WAREHOUSE DISTRICT 4-56

TABLE 4-11: NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE IN THE PROPOSED SOUTH PARK HISTORIC DISTRICT 4-57

TABLE 4-12: NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE KEARNY-MARKET-MASON-SUTTER CONSERVATION DISTRICT 4-58

TABLE 4-13: NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE LOWER NOB HILL APARTMENT HOTEL DISTRICT 4-64

TABLE 4-14: NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE CHINATOWN HISTORIC DISTRICT 4-66

TABLE 4-15: NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE NORTH BEACH, WASHINGTON SQUARE, AND POWELL STREET HISTORIC DISTRICTS 4-71

TABLE 4-16: CATEGORY RATED BUILDINGS WITHIN THE PROJECT APE NOT ASSOCIATED WITH A HISTORIC DISTRICT OR A CONSERVATION DISTRICT 4-73

TABLE 4-17: SAN FRANCISCO LANDMARKS IN THE STUDY AREA 4-73

TABLE 4-18: CALIFORNIA HISTORICAL LANDMARKS IN THE STUDY AREA 4-74

TABLE 4-19: HISTORIC RESOURCES LISTED IN THE CALIFORNIA REGISTER OF HISTORIC RESOURCES 4-74

TABLE 4-20: NATIONAL REGISTER-LISTED HISTORIC PROPERTIES IN THE STUDY AREA 4-75

TABLE 4-21: HISTORIC ARCHITECTURAL RESOURCES WITHIN THE APE IN ADDITION TO THOSE EVALUATED IN CORBETT ET AL. (1997) 4-77

TABLE 4-22: APPROXIMATE SURFACE ELEVATIONS ALONG CENTRAL SUBWAY ALIGNMENTS 4-86

TABLE 4-23: MAJOR SAN FRANCISCO BAY AREA EARTHQUAKE FAULTS AND THEIR MAXIMUM MOMENT MAGNITUDE 4-90

TABLE 4-24: CALIFORNIA AND NATIONAL AMBIENT AIR QUALITY STANDARDS 4-113

TABLE 4-25: SAN FRANCISCO AIR POLLUTANT SUMMARY, 2002-2006 4-116

TABLE 4-26: ESTIMATED 2006 MOTOR VEHICLE EMISSIONS IN THE STUDY AREA (IN POUNDS/DAY) 4-119

TABLE 4-27: FTA GUIDELINES FOR IMPACT FROM CONSTRUCTION NOISE 4-124
TABLE 4-28: DAMAGE RISK VIBRATION CRITERIA 4-127
TABLE 4-29: FTA NOISE IMPACT CRITERIA 4-129
TABLE 4-30: GROUND-BORNE VIBRATION (GBV) AND GROUND-BORNE NOISE (GBN) IMPACT CRITERIA 4-130
TABLE 4-31: INTERPRETATION OF DETAILED VIBRATION ANALYSIS CRITERIA 4-132
TABLE 4-32: SUMMARY OF NOISE MONITORING RESULTS 4-136
TABLE 4-33: TRAFFIC COUNTS DURING SHORT-TERM MEASUREMENTS 4-136
TABLE 4-34: AMBIENT VIBRATION MONITORING RESULTS 4-138
TABLE 4-35: VIBRATION PROPAGATION TEST LOCATIONS 4-138
TABLE 5-1: CONSTRUCTION AND EMPLOYMENT IMPACTS (COSTS IN $MILLIONS) 5-7
TABLE 5-2: ESTIMATED CHANGE IN 2030 REGIONAL ENERGY CONSUMPTION BETWEEN THE NO PROJECT/TSM ALTERNATIVE AND THE CENTRAL SUBWAY ALTERNATIVES 5-46
TABLE 5-3: GENERAL THRESHOLDS OF SIGNIFICANCE FOR PROJECT OPERATIONS 5-67
TABLE 5-4: ESTIMATED 2030 REGIONAL EMISSIONS GENERATED FROM VEHICULAR TRAFFIC (POUNDS PER DAY) 5-68
TABLE 5-5: 2030 PEAK HOUR TRAFFIC VOLUMES AND LEVEL OF SERVICE FOR STUDY INTERSECTIONS 5-69
TABLE 5-6: ESTIMATED CARBON DIOXIDE EMISSIONS FOR EXISTING CONDITONS (2006) AND 2030 GENERATED BY VEHICULAR TRAFFIC (POUNDS PER DAY) 5-73
TABLE 5-7: PROJECT TRAFFIC NOISE LEVELS 5-78
TABLE 5-8: PROJECT NOISE LEVELS AT BUILDING STRUCTURES ALONG THE AT-GRADE ALIGNMENT 5-80
TABLE 5-9: SUMMARY OF INTERIOR GROUND VIBRATION ESTIMATES – ALTERNATIVE 2 5-80
TABLE 5-10: SUMMARY OF INTERIOR GROUND-BORNE NOISE ESTIMATES – ALTERNATIVE 2 5-82
TABLE 5-11: OPERATIONAL MITIGATION MEASURES 5-83
TABLE 5-12: SUMMARY OF INTERIOR GROUND VIBRATION ESTIMATES – ALTERNATIVE 3 5-84
TABLE 5-13: SUMMARY OF INTERIOR GROUND-BORNE NOISE ESTIMATES – ALTERNATIVE 3 5-86
TABLE 6-1 SUMMARY OF GUIDEWAY CONSTRUCTION METHODS 6-9
TABLE 6-2 ACQUISITION AND RELOCATION REQUIREMENTS 6-50
TABLE 6-3 ESTIMATED PEAK HOUR CONSTRUCTION NOISE LEVELS 6-115
TABLE 6-4 VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT 6-116
TABLE 7-1: CEQA SIGNIFICANCE CRITERIA 7-3
TABLE 7-2: SUMMARY OF ENVIRONMENTAL IMPACTS 7-9
TABLE 8-1 CENTRAL SUBWAY CAPITAL COSTS (IN $MILLIONS) 8-5
TABLE 8-2 CENTRAL SUBWAY INCREMENTAL OPERATING COSTS (IN YOE$ MILLIONS) 8-7

TABLE 8-3 CENTRAL SUBWAY CAPITAL FUNDING PLAN (IN SMILLIONS) 8-8
TABLE 8-4 TWENTY-YEAR CAPITAL PLAN - STATE OF GOOD REPAIR EXPENDITURES (IN YOE $MILLIONS) 8-10
TABLE 8-5 TWENTY-YEAR CAPITAL PLAN - STATE OF GOOD REPAIR FUNDING PROJECTIONS (IN $MILLIONS YEAR OF OCCURRENCE) 8-11
TABLE 8-6 CAPTIAL FUNDING ESTIMATES BASED ON CURRENT FUNDING LEVELS (IN $MILLIONS YEAR OF OCCURRENCE) 8-11
TABLE 8-7 2030 CENTRAL SUBWAY OPERATING REVENUES (NOMINAL$) 8-12
TABLE 8-8 MTA 20-YEAR FINANCIAL PLAN INCLUDING CENTRAL SUBWAY ALTERNATIVE 3A (YOE $MILLIONS) 8-13
TABLE 9-1 CRITERIA FOR EVALUATING MOBILITY IMPROVEMENTS 9-4
TABLE 9-2 SUMMARY OF MOBILITY IMPROVEMENTS EVALUATION 9-4
TABLE 9-3 CRITERIA FOR EVALUATING ENVIRONMENTAL BENEFITS 9-6
TABLE 9-4 SUMMARY OF ENVIRONMENTAL BENEFITS EVALUATION 9-7
TABLE 9-5 CRITERIA FOR EVALUATING OPERATING EFFICIENCIES 9-9
TABLE 9-6 OPERATING EFFICIENCIES - 2030 9-10
TABLE 9-7 SUMMARY OF OPERATING EFFICIENCIES 9-10
TABLE 9-8 CRITERIA FOR EVALUATING COST EFFECTIVENESS 9-11
TABLE 9-9 SUMMARY OF COST EFFECTIVENESS 9-12
TABLE 9-10 CRITERIA FOR EVALUATING TRANSIT SUPPORTIVE LAND USE AND FUTURE PATTERNS 9-14
TABLE 9-11 SUMMARY OF TRANSIT SUPPORTIVE LAND USE AND FUTURE PATTERNS 9-14
TABLE 9-12 CRITERIA FOR EVALUATING OTHER FACTORS 9-16
TABLE 9-13 SUMMARY OF OTHER LOCAL EVALUATION FACTORS 9-16
TABLE 9-14 CRITERIA FOR EVALUATING LOCAL FINANCIAL COMMITMENT 9-18
TABLE 9-15 SUMMARY OF LOCAL FINANCIAL COMMITMENT 9-18
TABLE 10-1 PERMITTED EVENTS AT PROJECT AREA PARKS IN 2006 10-21
TABLE 10-2 HISTORIC DISTRICTS IN THE APE CROSSED BY ALTERNATIVE ALIGNMENTS 10-26
TABLE 10-3 HISTORIC ARCHITECTURAL RESOURCES WITHIN THE APE IN ADDITION TO THOSE EVALUATED IN CORBETT ET AL. (1997) 10-27
TABLE 10-4 SECTION 4(F) PARK PROPERTIES 10-28
TABLE 10-5 SUMMARY OF IMPACTS BY BUILD ALTERNATIVE 10-43
TABLE 10-6 EVALUATION OF AVOIDANCE ALTERNATIVES 10-48
TABLE 11-1 SUMMARY OF PUBLIC COMMENTS RECEIVED DURING THE 2005 SCOPING PROCESS 11-1
TABLE 11-2 SUMMARY OF PUBLIC COMMENTS RECEIVED DURING THE 2006 NOP PROCESS 11-4
TABLE 11-3 COMMUNITY OUTREACH PRESENTATIONS & BRIEFINGS 11-6

LIST OF FIGURES

FIGURE 1-1: CENTAL SUBWAY STUDY AREA LOCATION 1-3
FIGURE 1-2: STUDY AREA POPULATION AND EMPLOYMENT 1-7
FIGURE 1-3: CENTRAL SUBWAY AND THIRD STREET CORRIDOR PROJECTED 2030 LEVEL OF SERVICE (LOS) AT VARIOUS LOCATIONS 1-10
FIGURE 2-1: CENTRAL SUBWAY BUILD ALTERNATIVES 2-2
FIGURE 2-2: ALTERNATIVE 1 – NO PROJECT/TSM 2-4
FIGURE 2-3: NO PROJECT/TSM ALTERNATIVES TRANSIT AND ROADWAY IMPROVEMENTS 2-7
FIGURE 2-4: ALTERNATIVE 2 – ENHANCED EIS/EIR ALIGNMENT 2-10
FIGURE 2-5: ENHANCED EIS/EIR ALIGNMENT PROFILE BETWEEN FOURTH/KING AND MARKET/THIRD STREETS 2-11
FIGURE 2-6: ENHANCED EIS/EIR ALIGNMENT PROFILE BETWEEN MARKET/ THIRD STREET AND STOCKTON/JACKSON STREETS 2-12
FIGURE 2-7: ENHANCED EIS/EIR ALIGNMENT - MOSCONE STATION 2-15
FIGURE 2-8: ENHANCED EIS/EIR ALIGNMENT – MARKET STREET STATION 2-16
FIGURE 2-9: ENHANCED EIS/EIR ALIGNMENT - UNION SQUARE STATION 2-18
FIGURE 2-10: ENHANCED EIS/EIR ALIGNMENT - CHINATOWN STATION 2-20
FIGURE 2-11: ALTERNATIVE 3 -FOURTH STOCKTON ALIGNMENT OPTION A (LPA) 2-25
FIGURE 2-12: FOURTH/STOCKTON ALIGNMENT OPTION A PROFILE BETWEEN FOURTH/KING AND STOCKTON/JACKSON STREETS 2-27
FIGURE 2-13: FOURTH/STOCKTON ALIGNMENT OPTION A - MOSCONE STATION 2-29
FIGURE 2-14: FOURTH/STOCKTON ALIGNMENT OPTION A UNION SQUARE/ MARKET STREET STATION 2-30
FIGURE 2-15: FOURTH/STOCKTON ALIGNMENT OPTION A - CHINATOWN STATION 2-32
FIGURE 2-16: ALTERNATIVE 3 –FOURTH/STOCKTON ALIGNMENT OPTION B (MODIFIED LPA) 2-37
FIGURE 2-17: FOURTH/STOCKTON ALIGNMENT OPTION B PROFILE 2-38
FIGURE 2-18: FOURTH/STOCKTON ALIGNMENT OPTION B CONFIGURATION ON FOURTH STREET SEMI-EXCLUSIVE RIGHT-OF-WAY 2-39
FIGURE 2-19: FOURTH/STOCKTON ALIGNMENT OPTION B CONFIGURATION ON FOURTH STREET MIXED RIGHT-OF-WAY 2-41
FIGURE 2-20: FOURTH/STOCKTON ALIGNMENT OPTION B - MOSCONE STATION 2-43
FIGURE 2-21: FOURTH/STOCKTON ALIGNMENT OPTION B - UNION SQUARE/ MARKET STREET STATION 2-44
FIGURE 2-22: FOURTH/STOCKTON ALIGNMENT OPTION B - CHINATOWN STATION 2-46
FIGURE 2-29: THIRD STREET LIGHT RAIL PHASE 1 INITIAL OPERATING SEGMENT AND PHASE 2 CENTRAL SUBWAY 2-53
FIGURE 3-1: EXISTING MUNI ROUTES SERVING THE STUDY AREA 3-6

FIGURE 3-2: PROPOSED MISSION BAY ROUTE CHANGES 3-11
FIGURE 3-3: ORIGIN - DESTINATION DISTRICTS 3-12
FIGURE 3-4: BICYCLE ROUTES AND BAY TRAIL IN THE THIRD STREET CORRIDOR 3-29
FIGURE 4-1: AREA PLAN BOUNDARIES 4-4
FIGURE 4-2: REDEVELOPMENT PLAN BOUNDARIES 4-8
FIGURE 4-3: GENERALIZED LAND USE 4-21
FIGURE 4-4: PUBLIC FACILITIES ALONG CENTRAL SUBWAY CORRIDOR 4-36
FIGURE 4-5: HISTORIC DISTRICTS 4-54
FIGURE 4-6: FOURTH STREET LOOKING TO I-80 (TUNNEL & STAGING AREA) 4-79
FIGURE 4-7: UNION SQUARE LOOKING WEST 4-80
FIGURE 4-8: UNION SQUARE FROM MAIDEN LANE 4-80
FIGURE 4-9: CHINATOWN, STOCKTON STREET AT SACRAMENTO, 814-828 STOCKTON STREET LOCATION 4-82
FIGURE 4-10: WILLIE “WOO WOO” WONG PARK PLAYGROUND VIEW 4-82
FIGURE 4-11: WASHINGTON SQUARE PARK 4-83
FIGURE 4-12: GENERAL VICINITY MAP OF STUDY AREA 4-108
FIGURE 4-13: DETAILED GROUND-BORNE VIBRATION CRITERIA 4-131
FIGURE 4-14: NOISE AND VIBRATION MEASUREMENT POSITIONS (ENHANCED 1998 EIS/EIR ALIGNMENTS SITES N1 - N6) 4-134
FIGURE 4-15: NOISE AND VIBRATION MEASUREMENT POSITIONS FIGURE 4-15: NOISE AND VIBRATION MEASUREMENT POSITIONS (FOURTH/STOCKTON ALIGNMENT - SITES 1 - 3, AND SITES A - F) 4-135
FIGURE 5-1: TUNNEL ALTERNATIVE AT THIRD/BRYANT - VISUAL SIMULATION ALTERNATIVE 2 5-28
FIGURE 5-2: MOSCONE GARAGE - SIMULATION OF STATION ENTRY ALTERNATIVE 2 5-29
FIGURE 5-3: MARKET STREET STATION ENTRY SIMULATION ALTERNATIVE 2 5-30
FIGURE 5-4: UNION SQUARE STATION ENTRY SIMULATION ALTERNATIVES 2 AND 3A 5-31
FIGURE 5-5: CHINATOWN STATION ENTRY SIMULATION ALTERNATIVES 2 AND 3A 5-32
FIGURE 5-6: CHINATOWN STATION SIMULATION VIEWED FROM PAGODA ALLEY ALTERNATIVES 2 AND 3A 5-33
FIGURE 5-7: SHADOWS ON WILLY “WOO WOO” WONG PLAYGROUND ALTERNATIVES 2 AND 3A 5-35
FIGURE 5-8: FOURTH STREET PORTAL SIMULATION ALTERNATIVE 3A 5-36
FIGURE 5-9: MOSCONE STATION ENTRANCE SIMULATION ALTERNATIVES 3A AND 3B 5-38
FIGURE 5-10: FOURTH STREET PORTAL SIMULATION ALTERNATIVE 3B 5-40
FIGURE 5-11: UNION SQUARE STATION GEARY STREET ENTRY SIMULATION ALTERNATIVE 3B 5-41
FIGURE 5-12: CHINATOWN STATION STOCKTON STREET ENTRY SIMULATION ALTERNATIVE 3B 5-42

FIGURE 5-13 CHINATOWN STATION SIMULATION LOOKING EAST FROM WASHINGTON STREET ALTERNATIVE 3B 5-43

FIGURE 6-1: EARTH PRESSURE BALANCE TUNNEL BORING MACHINE 6-3

FIGURE 6-2: CUT-AND-COVER TUNNEL CONSTRUCTION 6-4

FIGURE 6-3: TUNNEL CONSTRUCTION USING SEQUENTIAL EXCAVATION METHOD (SEM) 6-6

FIGURE 6-4: SPECIAL EXCAVATION METHOD (SXM) CONCEPT DEVELOPED FOR THE 1998 FEIS/FEIR 6-7

FIGURE 6-5: CONSTRUCTION DURATIONS FOR ALTERNATIVES 2, 3A AND 3B 6-10

FIGURE 6-6: ALT. 2 AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION 6-12

FIGURE 6-7: ALT. 2 MARKET STREET STATION AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION 6-13

FIGURE 6-8: ALT. 2 UNION SQUARE STATION AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION 6-14

FIGURE 6-9: ALT. 2 CHINATOWN STATION AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION 6-15

FIGURE 6-10: CONSTRUCTION ACTIVITIES AND DURATIONS FOR UNION SQUARE AND UNION SQUARE/MARKET STREET STATIONS 6-19

FIGURE 6-11: ALT. 3A MOSCONE STATION AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION 6-21

FIGURE 6-12: ALT. 3A UNION SQUARE/MARKET STREET STATION AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION 6-22

FIGURE 6-13: ALT. 3A CHINATOWN STATION AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION 6-24

FIGURE 6-14: ALT. 3B MOSCONE STATION AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION 6-28

FIGURE 6-15: ALT. 3B UNION SQUARE/MARKET STREET STATION AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION 6-30

FIGURE 6-16: ALT. 3B CHINATOWN STATION AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION 6-31

FIGURE 6-17: 814-828 STOCKTON STREET PROPOSED FOR DEMOLITION UNDER ALTERNATIVES 2 AND 3A 6-72

FIGURE 6-18: 933-949 STOCKTON STREET PROPOSED FOR DEMOLITION UNDER ALTERNATIVE 3B 6-79

FIGURE 10-1: SECTION 4(f) PROPERTIES 10-10

FIGURE 10-2: ALTERNATIVES 2, 3A, AND 3B 10-14

FIGURE 10-3: UNION SQUARE LOOKING WEST FROM MAIDEN LANE 10-19

FIGURE 10-4: UNION SQUARE PARK SCHEMATIC PLAN 10-20

FIGURE 10-5: UNION SQUARE SEATING AREA FOR OUTDOOR CAFÉ, LOOKING NORTH 10-20

FIGURE 10-6: WILLIE “WOO WOO” WONG PLAYGROUND LOOKING NORTH 10-23

FIGURE 10-7: PLAQUE ON THE WALL OF PAGODA/HANG AH ALLEY 10-23

FIGURE 10-8: WILLIE “WOO WOO” WONG PLAYGROUND SCHEMATIC PLAN 10-24

FIGURE 10-9: WASHINGTON SQUARE PARK SCHEMATIC PLAN........10-25
FIGURE 10-10: PLAN DRAWING OF UNION SQUARE STATION FOR PROPOSED ALTERNATIVE 2.10-30
FIGURE 10-11: PLAN DRAWING OF UNION SQUARE STATION FOR PROPOSED ALTERNATIVE 3 OPTION A........10-33
FIGURE 10-12: UNION SQUARE LOOKING EAST, POTENTIAL SITE OF FUTURE STATION........10-35
FIGURE 10-13: PLAN DRAWING OF UNION SQUARE STATION FOR PROPOSED ALTERNATIVE 3 OPTION B........10-36
FIGURE 10-14: PLAN DRAWING OF CHINATOWN STATION FOR PROPOSED ALTERNATIVE 2......10-38
FIGURE 10-15: SHADOW ANALYSIS WILLIE “WOO WOO” WONG PLAYGROUND........10-39
FIGURE 10-16: WASHINGTON SQUARE LOOKING NORTHEAST ACROSS COLUMBUS AVENUE...10-42

VOLUME II

CHAPTERS

1.0 INTRODUCTION........1-1
2.0 LIST OF PERSONS COMMENTING........2-1
3.0 WRITTEN COMMENTS AND RESPONSES........3-1
4.0 PUBLIC HEARING COMMENTS AND RESPONSES........4-1
5.0 STAFF INITIATED TEXT CHANGES........5-1

LIST OF TABLES VOLUME II

REVISED TABLE 4-7........3-159
REVISED TABLE S-5........5-6
REVISED TABLE S-6........5-7
REVISED TABLE S-8........5-8
REVISED TABLE 2-1........5-11
REVISED TABLE 2-5........5-13
REVISED TABLE 3-8........5-18
REVISED TABLE 3-9........5-19
REVISED TABLE 3-10........5-19
REVISED TABLE 3-11........5-20
REVISED TABLE 3-13........5-20
REVISED TABLE 3-14........5-21
REVISED TABLE 6-2........5-23
REVISED TABLE 9-4........5-26

LIST OF FIGURES **VOLUME II**

REVISED FIGURE 2-16....3-56
REVISED FIGURE 2-18....3-59
REVISED FIGURE 2-19....3-60
REVISED FIGURE 5-10....3-61
REVISED FIGURE 4-4....3-161
REVISED FIGURE 2-29....5-15
REVISED FIGURE 3-3....5-17

S.0 EXECUTIVE SUMMARY

S.1 INTRODUCTION

The San Francisco Municipal Transportation Agency (MTA) is proposing the Central Subway Project (Project), as the second phase of the Third Street Light Rail Project that was evaluated under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) in the Third Street Light Rail Project Final Environmental Impact Study and Final Environmental Impact Report (FEIS/FEIR) (Case No. 96.281E) in 1998. The Federal Transit Administration (FTA) issued a Record of Decision (ROD) for the Third Street Light Rail Project and the San Francisco Public Transportation Commission (PTC) approved the Project in 1999. The PTC was the predecessor policy board to the San Francisco Municipal Transportation Agency (MTA), which now oversees the San Francisco Municipal Railway (Muni) and the Department of Parking and Traffic (DPT). The Phase 1 Initial Operating Segment (IOS) opened for service in spring of 2007.[1] The IOS is now referred to as the T-Third Line.

This Supplemental Environmental Impact Statement/Supplemental Environmental Impact Report (SEIS/SEIR) updates information in the Central Subway Project Study Area and focuses on changes to the Central Subway portion of the Third Street Light Rail Project that have occurred since the certification of the 1998 FEIS/FEIR. Proposed changes to the Central Subway portion of the Light Rail Project include: a new segment along Fourth and Stockton Streets between Brannan and Geary Streets as an alternative to use of Third, Harrison, Kearny, and Geary Streets; extension of the planning horizon year from 2015 to 2030; the addition of above ground ventilation shafts for tunnel segments and stations; the use of off-street access to stations; a deep tunnel under Market Street; and the potential extension of a construction tunnel under Stockton Street and Columbus Avenue to the north end of the Project near Washington Square for removing the Tunnel Boring Machine (TBM).

This SEIS/SEIR evaluates three alternatives for the Central Subway Project: a No Project/Transportation Systems Management (TSM) Alternative; an Enhanced EIS/EIR Alternative with an alignment along both Third and Fourth Streets south of Market Street and a shallow tunnel under Market Street, as in the original 1998 FEIS/FEIR; and a Fourth/Stockton Street Alternative with a deep tunnel under Market Street and two design options.

[1] The 1998 FEIS/FEIR used *Initial Operation Segment* to define the Phase 1 portion of the Third Street Light Rail Project. This Phase of the project initiated passenger service in April 2007 and is now referred to as the *T-Third Line*. This Supplemental SEIS/SEIR uses *T-Third Line* with reference to the Phase 1 segment, where appropriate.

S.2 PROJECT PURPOSE AND NEED

S.2.1 PURPOSE OF PROPOSED ACTION

As the Project Sponsor, MTA's objective for the proposed Project is to complete the second phase of the Third Street Light Rail Project by providing Muni transit service improvements from the present terminus of the T-Third Line at Fourth and King Streets through South of Market, Downtown and Chinatown in the Central Subway Corridor. MTA is seeking federal funding assistance to construct the proposed Central Subway Project. Phase 1 of the Third Street Light Rail Project was originally included in the Metropolitan Transportation Commission Regional Transportation Plan (RTP) as a locally-funded Project. The Phase 1 T-Third line was supported primarily by Proposition B local sales tax revenues; over $300 million in 1997 dollars. In 2001, the Phase 2 Central Subway was incorporated into the RTP as a Project eligible for federal funds. The funding plan included a combination of local, regional and federal funds for implementation of the two Project phases and noted that an updated cost estimate would be provided for the Central Subway following selection of the Locally Preferred Alternative (LPA) by the Municipal Transportation Agency (MTA).

The Federal Transit Administration (FTA) action is to determine if the preferred alternative for the Central Subway Project meets their transit investment objectives and whether to recommend federal funding for the Project as part of the New Starts Program.

The FTA makes major transit funding decisions through a process designed to aid in the selection of transit solutions for the region. Through this process, FTA identifies transit investments that:

- Achieve transit service and mobility goals, while minimizing social, economic, and environmental impacts;
- Increase transit use and reduce travel time at a reasonable cost;
- Link public transportation investments with land use planning and community revitalization;
- Have strong public and political support and compatibility with local, regional, and state planning initiatives; and
- Enhance and preserve the environment, particularly in terms of reduced air and noise pollution and congestion relief.

S.2.2 NEED FOR TRANSPORTATION IMPROVEMENTS IN THE CORRIDOR

The Central Subway Project would help to address mobility and transit deficiencies by improving connections to communities in the northeastern and southeastern parts of the City and improving reliability of transit services. Transit deficiencies include those that exist at present and those that are anticipated to exist during the 20-year plus planning horizon (2030). The Central Subway Project is also intended to serve as a key infrastructure improvement to help ease congestion in the Study Area; improve transit service to the large transit-dependent population that resides along the Corridor; accommodate the increasing number of residents in the South of Market area; and serve mobility needs for the new jobs that are expected to be created in the Study Area.

For the Central Subway Project, transit accessibility along the Corridor is particularly critical as the population has a higher degree of transit dependency (72 percent of households along the Central Subway Corridor are without a vehicle compared to 29 percent citywide) and higher unemployment rates than other parts of the City (9 percent unemployed in the Central Subway Corridor versus 4.6 percent citywide unemployment).

S.2.3 PROJECT GOALS AND OBJECTIVES

The seven principal goals that Muni identified for the phased Third Street Light Rail Project to guide the evaluation of alternatives are still applicable to the Phase 2 Central Subway Project. They are:

1. Travel and Mobility Goal Improve Muni service reliability in the Central subway Corridor, as part of the Third Street Light Rail Corridor, thereby enhancing the mobility of Corridor residents, business people and visitors.
2. Equity Goal Bring transit service in the Corridor to the level and quality of service available in other sections of the City and improve the inadequate connections with other transit lines serving the region.
3. Economic Revitalization/Development Goal Design transportation improvements that support economic revitalization and development initiatives within the Corridor.
4. Transit-supportive Land Use Goal Ensure compatibility with City land use plans and policies and transportation improvements so that transit ridership can be maximized and the number of auto trips reduced.
5. Environmental Goal Provide transit improvements that enhance and preserve the social and physical environment and minimize potential negative impacts during construction and operation of the line.
6. Financial Goal Implement transit improvements that provide for the efficient use of limited financial resources.

7. Community Acceptance and Political Support Goal Provide a transportation system that reflects the needs and desires of Corridor residents and business people and is compatible with the City's planning initiatives.

Objectives include: increasing transit ridership; improving service reliability; reducing 2030 travel time; improving transit operating speed in downtown and South of Market; enhancing the opportunity to expand Muni's Light Rail System; improving access to downtown employment opportunities; improving access to Chinatown; maintaining auto and truck access in the commercial core; maintaining adequate transit and vehicular circulation in the commercial core; providing opportunities for revitalization in the commercial core; enhancing urban design in the commercial core; supporting the coordination of land use and transportation planning; serving major activity centers in the Corridor; minimizing permanent displacement of homes and businesses; minimizing impacts on parklands/cultural resources; minimizing air quality impacts; minimizing adverse construction impacts; providing beneficial environmental impact to the community; developing a viable financial plan to cover total capital costs for the alternatives; developing a viable financial plan to cover total annual operating and maintenance costs; maximizing transit operating efficiency while accommodating 2030 travel demand; gaining community support for the preferred investment strategy; gaining City Commission and elected officials support for the preferred investment strategy; and gaining support from appropriate regional, state and federal agencies.

S.3 ALTERNATIVES

This document analyzes three alternatives for the Central Subway. The alternatives are summarized in Table S-1 and Figure S-1 and described in further detail below.

Alternative 1 - No Project/TSM was developed in conformance with California Environmental Quality Act (CEQA) Guidelines and National Environmental Policy Act (NEPA) requirements. The T-Third Line (Phase 1 of the Third Street Light Rail Project) and associated bus changes implemented in April 2007 are included in this alternative as are the funded projects programmed in the Regional Transportation Plan and the Muni Short Range Transit Plan. This alternative would not fully accommodate 2030 projected travel demand.

Since implementation of the T-Third line, the Project Purpose and Need have not changed. Bus service is already provided at three minute frequencies or better for much of the Central Subway Corridor and the streets, particularly Stockton Street, are operating at capacity. As a result, additional bus service would not be a viable TSM alternative. Introduction of a Bus Rapid Transit facility as a TSM Alternative would

TABLE S-1

SUMMARY OF CENTRAL SUBWAY ALTERNATIVES

Characteristic	**Alternative 1 - No Project/TSM**	**Alternative 2 - EIS/EIR Enhanced Alignment**	**Alternative 3A - Fourth/Stockton Alignment Option A**	**Alternative 3B - Fourth/Stockton Alignment Option B**
Length in Miles	N/A	1.75 miles	1.7 miles	1.7 miles
Number of Stations	N/A	4 subway + 1 surface	3 subway	3 subway + 1 surface
Platform Configuration	N/A	Two level stacked at Moscone and Union Square; Single level side at Market Street and Chinatown	Single level Center Platforms	Single Level Center Platforms
2030 Weekday Ridership T-Third Line	~~60,030~~ 24,600	~~89,790~~ 76,300	~~88,840~~ 77,600	~~99,230~~ 76,600
Central Subway Net New Transit Riders	--	21,000	19,000	18,400
Transit Travel Time in Minutes (Fourth/King to Chinatown Station in 2030)	17.0	7.0	4.6	6.3
Construction Duration	N/A	6 years	6 years	5.5 years
Subway Construction Methods	N/A	Portal to Moscone Station – SXM. Moscone to Union Square – SXM, Cut-and-Cover. Union Square to north of Chinatown - SEM.	Portal to Brannan Street – Cut-and-Cover Brannan Street to Chinatown – TBM. North of Chinatown – SEM or TBM. North Beach – TBM.	Portal to Union Square/Market Street – TBM. Union Square/Market Street to Chinatown – TBM and SEM. North of Chinatown – SEM or TBM. North Beach – TBM.

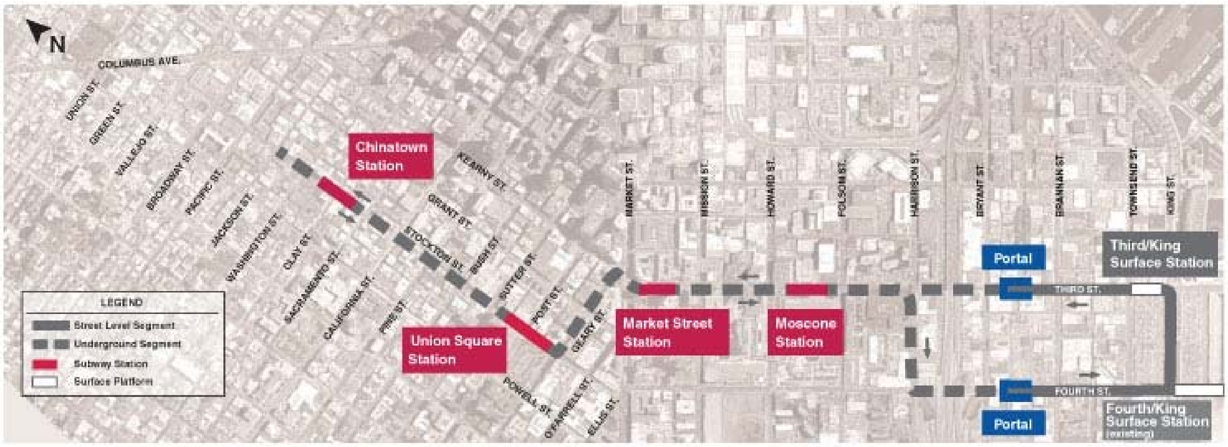
Note: SXM – Special Excavation Method; SEM – Sequential Excavation Method; TBM – Tunnel Boring Machine
N/A = Not Applicable
Ridership is defined as the number of passenger boardings.
Source: PB/Wong 2007

not meet the Project goals and objectives as it would increase rather than reduce congestion on surface streets. Therefore, the No Project and TSM Alternative are combined for this SEIS/SEIR.

The No Project/TSM Alternative has a projected weekday ridership of ~~60,030~~ 24,600 passengers for 2030 on the T-Third Line. The transit travel time between Fourth and King Streets and Chinatown would be 17.0 minutes in 2030.

FIGURE S-1

CENTRAL SUBWAY BUILD ALTERNATIVES



ALTERNATIVE 2: Enhanced EIS/EIR Alignment

ALTERNATIVE 3 (Option A LPA): Fourth/Stockton Alignment

ALTERNATIVE 3 (Option B Modified LPA): Fourth/Stockton Alignment

Source: PB/Wong
Not to scale

Alternative 2 – Enhanced EIS/EIR Alignment, as analyzed in the 1998 FEIS/FEIR, uses Third, Fourth, Harrison, Kearny, Geary, and Stockton Streets. It crosses Market Street in a shallow subway and includes a surface platform on Third Street at King Street and four subway stations (Moscone, Market, Union Square and Chinatown). Enhancements to the original FEIS/FEIR alternative include above-ground emergency ventilation shafts, off-sidewalk station entries where feasible, and the provision of a closed barrier fare system.

In the Enhanced EIS/EIR Alignment, the 1.75 mile light rail service would operate between Fourth and King Streets and Stockton and Jackson Streets. North of King Street, the rail would travel in a surface configuration northbound on Third Street and southbound on Fourth Street, transitioning to subway operation at two-single track portals located between Brannan and Bryant Streets. The service would operate independent of the existing Muni Metro Market Street subway.

This alternative follows the 1998 FEIS/FEIR Alignment, but also incorporates design changes to meet current fire codes, new Muni fare collection policy, and pedestrian access and circulation issues. Above-ground emergency ventilation shafts would be located off-street rather that provided through an in-street ventilation system as originally planned. Most station entries have been moved off crowded sidewalks to private or public property and combined wherever possible with vent shafts. For the Enhanced EIS/EIR Alignment, one-car trains would operate as an independent line from the southern terminus in Visitacion Valley, via the existing T-Third alignment to Fourth and King Streets, and then via the Central Subway to the northern terminus in Chinatown. Stations would be two level stacked platforms at Moscone and Union Square and single level side platforms at Market Street and Chinatown. <u>Platform lengths would be approximately 250 feet at all subway stations.</u>

To make efficient use of the Central Subway, bus operations in the Corridor would be restructured. The Enhanced EIS/EIR Alignment bus system would be similar to the No Project/TSM Alternative including the extension of the 45-Union/Stockton trolley bus line from the Caltrain Terminal through Mission Bay and Potrero Hill to a new terminus at Third and 20th Streets and the rerouting of the 22-Fillmore trolley bus line along 16th, Third, and Mission Rock Streets to a terminus in Mission Bay. In both bus plans the 9X San Bruno Express and 30-Stockton lines would have five and nine-minute peak period frequencies respectively, which are the current peak headways for those lines. Changes from the No Project/TSM Alternative associated with the Enhanced EIS/EIR bus plan include the elimination of the 30-Stockton short line between Van Ness Avenue and North Point Street and the Caltrain Terminal at Fourth and Townsend Streets, and minor frequency adjustments.

The Enhanced EIS/EIR Alignment has a projected weekday ridership of ~~89,790~~ 76,300 passengers for the year 2030 on the T-Third Line. The transit travel time between Fourth and King Streets and Chinatown would be 7.0 minutes in 2030 or a 10 minute savings over the No Project/TSM Alternative.

Alternative 3 – Fourth/Stockton Alignment was developed as an alternative that would operate exclusively on Fourth and Stockton Streets with a deep tunnel (rather than shallow) crossing of Market Street. The Fourth/Stockton Alignment would start as a double-track surface line at Fourth and King Streets and would proceed north along Fourth Street to a portal where it would transition from surface to subway operation. For Option A, the portal would be located between Townsend and Brannan Streets and between Bryant and Harrison Streets for Option B. It would continue north under Fourth and Stockton Streets as a double-track operation to a terminus in the vicinity of Stockton and Jackson Streets. The pedestrian connection to the Market Street Subway would be at the BART/Muni Metro Powell Street Station.

The 30-Stockton and 45-Union/Stockton trolley bus lines would continue operation on the east side of Fourth Street, south of Bryant Street, to the bus terminal east of Fourth Street on Townsend Street. Existing bus stops would be retained on Fourth Street, just north of Bryant Street, but the island stop at Brannan Street would be moved from the north to the south side of the street. No major overhead wire relocations would be necessary under this option.

As in the case of the Enhanced EIS/EIR Alignment, above-ground emergency ventilation shafts are proposed to be located in off-street locations and, wherever feasible, station access is located off-sidewalk in property to be acquired by Muni. Fare gates are provided at the mezzanine level for all stations. The location and number of stations varies for the two design options.

There is a construction variant for this alternative to extend the tunnel another 2,000 feet north of Jackson Street to facilitate construction and extraction of the Tunnel Boring Machine (TBM). In this approach the tunnel would continue north on Stockton Street to a temporary shaft on Columbus Avenue near Washington Square Park where the TBM would be extracted and construction equipment and materials could be delivered.

Alternative 3A

This alternative was selected as the Locally Preferred Alternative (LPA) by the MTA Board at its meeting of June 7, 2005, but was replaced by Alternative 3B as the LPA by MTA Board action on February 19, 2008. It would extend 1.7 miles north from the T-Third line terminus at Fourth and King Streets via Fourth and Stockton Streets to the Central Subway terminus in Chinatown. After stopping at the existing T-Third line station platform on Fourth Street at King Street, LRVs would continue north on Fourth Street in a semi-exclusive double-track median to a portal between Townsend and Brannan

Streets. This option would include three subway stations at Moscone, Union Square/Market Street, and Chinatown.

The subway station platforms would be ~~200~~ 250 feet in length (~~compared with 250 feet in~~ similar to Alternative 2) and ~~narrower in~~ of varying widths and ~~but~~ would accommodate ~~two~~ three car trains using high-floor LRVs. To accommodate access via Union Square and the Powell Station at Market Street, the Union Square/Market Street Station would have a much longer layout than the Moscone and Chinatown Stations. Like Alternative 2, this alternative would accommodate fare gates and ticket vending machines (TVMs) and a closed barrier fare collection system. All subway station platforms are on one level with a center platform and a mezzanine (concourse) level above the platform.

Alternative 3A has a projected weekday ridership of ~~88,840~~ 77,600 passengers for 2030 on the T-Third Line. The transit travel time between Fourth and King Streets and Chinatown would be 4.6 minutes in 2030 or a 12.4 minute savings over the No Project/TSM Alternative.

Alternative 3B

This alternative was selected as the LPA by the MTA Board on February 19, 2008, replacing 3A. Fourth/Stockton Alignment Option B would extend 1.7 miles north from the T-Third line terminus at Fourth and King Streets via Fourth and Stockton Streets to the Central Subway terminus in Chinatown. After stopping at the existing T-Third station platform on Fourth at King Streets, light rail would continue north on Fourth Street to a double-track portal between Bryant and Harrison Streets under I-80. There would be one surface station on Fourth Street, north of Brannan Street, and three subway stations at Moscone, Union Square/Market Street, and Chinatown. The subway platforms would be 200 feet in length (compared to 250 feet in Alternative 3A) and 26 feet in width and would accommodate two-car trains using high-floor LRVs.

LRVs would operate between Fourth and King Streets to the portal under I-80 in a semi-exclusive double-track right-of-way, separated from adjacent traffic by six-inch curbs. Alternatively, LRVs would operate between Fourth and King Street to the portal under I-80 in mixed-flow, with trains and vehicles sharing the double-track right-of-way. This latter approach would increase the availability of parking, address traffic circulation issues, and enhance the streetscape with median landscaping.

Alternative 3B has a projected weekday ridership of ~~99,230~~ 76,600 passengers for 2030 on the T-Third Line. The transit travel time between Fourth and King Streets and Chinatown would be 6.3 minutes in 2030 or a 10.7 minute savings over the No Project/TSM Alternative.

Construction Methods and Duration

The Central Subway requires a number of underground structures, including guideway tunnels, stations, tail tracks, rail crossovers, and emergency cross-passages. These structures would be constructed in a variety of geologic conditions, ranging from rock to soft ground, and would be located adjacent to existing structures and utilities that are sensitive to ground movements. Available geologic information for the alternative Central Subway alignments indicates the tunnels would encounter highly variable conditions ranging from saturated sand, silt and clays to weathered and highly fractured sandstone and siltstone bedrock of the Franciscan Formation. Mixed-face conditions (i.e., rock and soil in the excavation face) are expected where the tunnels transition into and out of the bedrock. To deal with the different alignment and profile options and the varying geologic and groundwater conditions, several different tunnel construction methods are being considered, including excavation by Tunnel Boring Machine (TBM), cut-and-cover (C&C), and sequential excavation methods (SEM). Another method referred to as the Special Excavation Method (SXM) was introduced in the 1998 FEIS/FEIR.

The construction methods used in each of the Alternatives is summarized in Table S-1. Because of the different construction methods, the construction time would vary by alternative. Construction of Alternatives 2 and 3A would take approximately six years to complete and construction of Alternative 3B would be reduced to approximately 5.5 years.

S.3.1 DEVELOPMENT AND SELECTION OF ALTERNATIVES

The 1998 FEIS/FEIR proposed a Central Subway Downtown alignment with a shallow crossing of the BART/Muni Metro subway at Third Street with a pedestrian connection to the BART/Muni Montgomery Street Station. At the time the alternative was conceived, a shallow excavation method was thought to be the most cost-effective construction approach. It was concluded that there was sufficient room above the BART/Muni Subway at Third and Market Streets to accommodate a shallow crossing. A shallow crossing at Fourth and Market Streets was not considered because of conflicts with the Powell Street Station structure. Because of a concern about the impact of surface construction and the circuitous alignment required for a shallow alignment, the Central Subway design team recommended consideration of a deep (rather than a shallow) crossing of Market Street at Third Street that would go under the existing Muni Metro and BART subway tunnels using Tunnel Boring Machines (TBMs).[2]

In addition, studies were performed to evaluate several alternative portal locations in the South of Market area.[3] The findings from the station design, construction methodology, portal location, and other studies were discussed at seven public meetings and five Third Street Light Rail Community Advisory Group (CAG) meetings in 2004. The portal options and Project construction methods were presented to the public in an August 2004 meeting. The options included: (1) a single-portal on Third Street between

2 San Francisco Municipal Railway, “Recommended Tunnel Construction Methods Report,” March 16, 2004.
3 San Francisco Municipal Railway, “Portal and Surface Station Locations Study,” December 23, 2004

Townsend and Brannan Streets, one block south of the original location, with a single portal remaining on Fourth Street between Brannan and Bryant Streets; and, (2) a double-track portal on Fourth Street between Townsend and Brannan Streets that used a two-track alignment via Third, Fourth, Harrison, Kearny, Geary Streets and Stockton Streets. The public preference was for a double-portal on Fourth Street. Members of the public also suggested a Fourth Street alignment, which was possible using a deep crossing at Fourth/Stockton and Market Streets.

The "Special Alignment and Validation Studies," finalized in June 2005, evaluated a Fourth/Stockton Alignment with a double track portal on Fourth Street between Townsend and Brannan Streets and a deep crossing below the BART/Muni Metro Market Street subway at Fourth Street.[4] It maintained the Chinatown Station on Stockton Street ~~in the vicinity of Clay and Washington Streets~~ at Clay Street, combined the Union Square/Market Street Stations with northern entries in the vicinity of Union Square and southern entries using BART/Muni Metro Powell Street Station entrances; and relocated the Moscone Station to Fourth Street between Howard and Folsom Streets. The Fourth/Stockton Alignment had improvements in transit and vehicular travel time and localized traffic circulation, particularly on Third Street. This alignment, ~~with~~ using a Tunnel Boring Machine (TBM), also reduced surface-related construction impacts as compared to the shallow construction method proposed for the 1998 FEIS/FEIR alignment.

The station locations and the northern boundary of the ~~Phaase~~Phase 2, Central Subway were initially established as part of the Third Street Light Rail planning process and were analyzed in the 1998 EIS/EIR. Early in the Phase 2 planning process, studies were undertaken to evaluate options for moving many of the station entrances out of sidewalk locations to outside the public right-of-way. As a result of these efforts, off-sidewalk subway station entrances were identified for the Enhanced EIS/EIR Alternative and incorporated into the Fourth/Stockton Alignment Option A.

Based on results from these studies, the MTA approved the designation of the Fourth/Stockton Alignment as the Locally Preferred Alternative (LPA) on June 7, 2005. This designation allowed the Fourth/Stockton Alignment, rather than the 1998 FEIS/FEIR Alignment, to be evaluated as the LPA in the FTA New Starts Program. After the publication of the NOP in June 2005, a Fourth/Stockton Alignment Option B was developed based on public input, and design studies and to reduce the costs of the Project. This option reduced the size of the stations and provided new station entrance options for Union Square/Market Street and a new station location and entrance options for Chinatown. On February

4 San Francisco Municipal Railway, "Special Alignment and Validation Studies," June 30, 2005.

19, 2008, subsequent to publication of the Draft SEIS/SEIR, the MTA Board voted to replace Alternative 3A with Alternative 3B as the LPA.

S.3.4 OPERATING STATISTICS FOR THE CENTRAL SUBWAY, NO PROJECT/TSM ALTERNATIVES

Table S-2 shows the comparative operating statistics for the existing transit service, the future 2030 transit service under the No Project/TSM Alternative and the three Build Alternatives. The Light Rail and bus operating plans would be the same for all Build Alternatives. All Alternatives would require four additional LRVs (three peak LRVs and one spare) beyond the requirements for the No Project/TSM Alternative. Muni's total LRV fleet size, including spares, would be 175 LRVs though the peak demand would vary from ~~127-130~~ 139-142 LRVs by alternative. The diesel bus fleet would ~~remain the same as~~ increase by 23 buses from the existing condition in 2030 for all alternatives, but ~~and No Project/TSM fleets, with~~ the ~~same~~ peak demand would not change. The trolley bus fleet would ~~remain the same~~ increase by five buses in 2030, but peak demand would be reduced by six trolleys over existing conditions and by eleven trolleys over No Project/TSM with the Project.

TABLE S-2

ANNUAL OPERATING STATISTICS

Alternative	Peak Headways 9-X Line[2]	Diesel/Trolley Peak Demand (~~Systemwide~~ Fleet size) [1]	Total Annual Diesel/Trolley Bus Hours (Systemwide) [1]	Peak Headways T-Third[2]	LRV Fleet Peak Demand[3] (~~Systemwide~~ Fleet size) [~~1~~3]	Total Annual LRV Car Hours T-Line (Systemwide)
Existing (2007) T-Third	5 minutes	377 (~~495~~ 473) diesel buses; 225 (~~333~~ 331) trolley buses	2,592,230	9 minutes	~~118~~ 119 (151) LRVs	~~84,800~~ 109,400 ~~(568,500)~~ (570,200)
No Project/TSM (2030)	5 minutes	377 (495) diesel buses; 230 (~~333~~ 336) trolley buses	2,622,030	7 minutes	~~129~~ 137 (171) LRVs	~~80,400~~ 117,000 ~~(609,500)~~ (602,700)
Enhanced EIS/EIR Alignment (2030)	5 minutes	377 (495) diesel buses; 219 (~~333~~ 336) trolley buses	2,545,630	~~5~~ 6 minutes	~~130~~ 142 (175) LRVs	~~87,500~~ 83,900 ~~(591,200)[3]~~ (621,800)[3]
Fourth/Stockton Alignment Option A (2030)	5 minutes	377 (495)diesel buses; 219 ~~(333~~ 336) trolley buses	2,545,630	~~5~~ 6 minutes	~~127~~ 139 (175) LRVs	~~78,000~~ 76,700 ~~(581,700)[3]~~ (614,500)[3]
Fourth/Stockton Alignment Option B (2030)	5 minutes	377 (495) diesel buses; 219 (~~333~~ 336) trolley buses	2,545,630	~~5~~ 6 minutes	~~130~~ 140 (175) LRVs	~~86,400~~ 78,000 ~~(590,100)[3]~~ (615,900)[3]

Notes: [1] Source for 2007 bus equipment demand and bus hours is the Muni 2006-2025 Short Range Transit Plan, December 2005 and Dan Rosen, MTA, May 2007. Revised Dan Rosen, MTA, January 2008.
[2] Headway refers to the time between transit vehicles on a given line.
[3] Assumes one-car trains operating in the peak for the Central Subway on both the long and short lines and two car trains on the very short line.

S.3.5 CAPITAL COST SUMMARY

The capital cost methodology follows the current FTA guidelines. Systemwide estimates were developed for train control, communications, transit vehicles, and the electrification system. Site-specific ~~detailed~~

conceptual engineering was used to develop capital costs for the proposed stations. Cost data was based on previous local light rail projects and similar projects nationwide. The capital cost estimates account for engineering and management, contingency, and Project reserve. Escalation factors were applied to the ~~Project~~ costs to account for ~~recent~~ escalation trends experienced in major transportation infrastructure projects to arrive at ~~2007~~ Year-of-Expenditure (YOE) costs. See Table S-3 for a summary of the capital costs by Alternative.

TABLE S-3

CAPITAL COST SUMMARY ($MILLIONS)

	2007 Alternative 2	**2007 Alternative 3A[1]**	**2007 Alternative 3B[1]**
Guideway & Track Elements	$364	$248	$244
Station, Stops, Terminals, Intermodals	$376	$376	$325
Site Work & Special Conditions	$94	$70	$47
Systems	$118	$110	$94
Construction Subtotal	**$952**	**$804**	**$710**
ROW, Land, Existing Improvements	$15	$20	$20
Vehicles	$21	$21	$21
Professional Services	$229	$202	$188
Unallocated Contingency	$97	$84	$75
Total	**$1,345**	**$1,131**	**$1,014**
Escalation	$340	$276	$221
Year of Expenditure Total	**$1,685**	**$1,407**	**$1,235**

[1] Costs for Alternatives 3A and 3B do not include the North Beach Construction Variant, which is estimated to costs $54 million in Year of Expenditure (YOE) dollars.

Source: PB/Wong 2007

As indicated in the total capital cost for the Enhanced EIS/EIR Alignment, including the purchase of four additional LRVs (3 peak and 1 float vehicle) to accommodate 2030 demand is estimated at $1~~,~~.345 billion ($1~~,~~.685 billion in Year of Expenditure (YOE)**)**. The total capital cost for the Central Subway Fourth/Stockton Alignment Option A is estimated at $1.131 billion ($1~~,~~.,407 billion in YOE**)** and the total capital cost for the Fourth/Stockton Alignment Option B is estimated at $1.014 billion ($1~~,~~.235 billion in YOE**)**.

S.3.6. OPERATING AND MAINTENANCE COST SUMMARY

The Operating and Maintenance (O&M) cost model was developed based on Muni’s actual operating expenses for fiscal year 2005/2006. O&M cost calculations accounted for the level of Muni service provided for the No Project/TSM Alternative, the Enhanced EIS/EIR Alignment, and the Fourth/Stockton Alignment Options A and B. For each alternative, bus and light rail variables related to route miles, service frequencies, and travel times were derived from engineering and travel demand requirements. See Chapter 7.0 for a detailed description of cost estimation methodology.

Operations inputs, such as revenue miles and hours per mode, were calculated independently using operating plans developed specifically for the Central Subway Project.

Table S-4 summarizes the ~~total~~ annual operating and maintenance costs for the Muni system, broken out by vehicle type, for each alternative.

TABLE S-4

~~OPEARATING~~ OPERATING AND MAINTENANCE COST SUMMARY

(MILLIONS $ / YEAR OF OPERATING EXPENSES)

	No Project	Alternative 2	Alternative 3A	Alternative 3B
2016	~~$707.9~~ $852.61	~~$693.4~~ $852.73	~~$693.0~~ $849.65	~~$693.2~~ $849.41
2030	~~$1,145.9~~ $1,261,49	~~$1,122.3~~ $1,262.13	~~$1,121.7~~ $1,257.77	~~$1,122.1~~ $1,258.31
Increment Over No Project/TSM				
2016	N/A	~~($14.3)~~ $0.11	~~($14.9)~~ ($2.96)	~~($14.7)~~ ($3,20)
2030	N/A	~~($23.6)~~ $0.64	~~($24.2)~~ ($3.72)	~~($23.8)~~ ($3.18)
Source: ~~MTA, May 2007~~ AECOM Consult Inc. April, 2008.				

S.4 TRANSPORTATION ANALYSIS

Section S.4.1 provides a summary of major transportation impacts (transit, traffic freight, parking pedestrian, bicycle, and emergency access) for the Project Alternatives.

S.4.1 SUMMARY OF GENERAL TRANSPORTATION FINDINGS

Transit Demand

Table S-5 presents the existing and 2030 weekday transit ridership estimates for the corridor. Currently about ~~92,870 person~~ 93,300 transit trips are made in the Corridor each weekday. Substantial increases in population and employment are projected in the future in the Study Area. By 2030, it is estimated that transit ridership would increase to somewhere between ~~147,450~~142,600 to ~~162,610~~145,200 passengers in the Corridor depending on the Alternative. Without implementation of the rail service in the Central Subway Corridor, transit ridership would be constrained as the transit trip between the Visitacion Valley and Chinatown would take longer and would be less reliable.

TABLE S-5

ESTIMATED WEEKDAY TRANSIT RIDERSHIP

EXISTING AND 2030 CONDITIONS

LRT/BUS LINE	2000	2030 NO PROJECT/TSM	2030 ENHANCED EIS/EIR ALIGNMENT	2030 FOURTH / STOCKTON ALIGNMENT OPTION A (LPA)	2030 FOURTH / STOCKTON ALIGNMENT OPTION B (MODIFIED LPA)
CORRIDOR BOARDINGS					
RAIL					
T Long Line[1]	n/a	~~60,030~~ 24,600[4]	~~59,710~~ 44,500	~~60,670~~ 45,800	~~65,830~~ 44,900
T Short ~~l~~Line	n/a	n/a	~~30,080~~ 18,900	~~28,170~~ 19,000	~~33,400~~ 18,900
T-Third Very Short Line	n/a	n/a	12,900	12,800	12,800
Subtotal		**~~60,030~~ 24,600**	**~~89,790~~ 76,300**	**~~88,840~~ 77,600**	**~~99,230~~ 76,600**
BUS					
Line 15[2]	~~31,130~~ 28,300	n/a	n/a	n/a	n/a
Lines 9X, 9AX, 9BX	~~9,320~~ 10,600	~~29,560~~ 23,000	~~30,790~~ 22,300	~~30,760~~ 20,800	~~24,770~~ 21,200
Lines 30, 45 [3]	~~52,420~~ 54,400	~~57,860~~ 76,600	~~42,030~~ 46,600	~~42,510~~ 44,800	~~38,290~~ 44,800
Subtotal	**~~92,870~~ 93,300**	**~~87,420~~ 99,600**	**~~72,820~~ 68,900**	**~~73,270~~ 65,600**	**~~63,060~~ 66,000**
TOTAL IN CORRIDOR:	**~~92,870~~ 93,300**	**~~147,450~~ 124,200**	**~~162,610~~ 145,200**	**~~162,110~~ 143,200**	**~~162,290~~ 142,600**
Increase Over Existing:	0	~~54,580~~ 30,900	~~69,740~~ 51,900	~~69,240~~ 49,900	~~69,420~~ 49,300
Increase Over No Project/TSM:	**0**	**0**	**~~15,160~~ 21,000**	**~~14,660~~ 19,000**	**~~14,840~~ 18,400**

Notes:
1 Central Subways T-Third long-line to Visitacion Valley, ~~and~~ T-Third short-line to 18th and Third Streets, and T-Third very short line to Fourth and Townsend Streets.
2 Line 15-Third shifts to 9X San Bruno.
3 45 Extended into Mission Bay
n/a Not Applicable
Ridership is defined as the number of passengers boarding.

Source: San Francisco Model, January 2007. Revised 2008.

Transit Travel Times

As traffic demand grows in the future, the resulting increased congestion and delays would result in longer bus travel times and less service reliability. By 2030, Muni patrons on surface bus routes would experience longer travel times (17.0_minutes) when compared to existing conditions (11.8_minutes) as shown in Table S-6. The introduction of light rail in exclusive or semi-exclusive in the Central Subway Corridor would reduce the travel times for Muni patrons to between ~~5.0~~ 4.6 and 7.0 minutes as noted for the Build Alternatives.

Traffic Volumes and Intersection Levels of Service

Traffic volumes are projected to increase on almost all of the key streets serving the Study Area by 2030 as a result on continued regional and Corridor wide population and employment growth. As a result of the increase in traffic volumes, a greater number of intersections would experience congestion and delays.

TABLE S-6

IN-VEHICLE TRAVEL TIMES FOR SELECTED TRANSIT TRIPS

EXISTING AND 2030 CONDITIONS

TRANSIT TRAVEL TIME (minutes)					
ORIGIN-DESTINATION	**2000**	**2030 NO PROJECT / TSM ALIGNMENT**	**2030 ENHANCED EIS/EIR ALIGNMENT**	**2030 FOURTH / STOCKTON ALIGNMENT OPTION A (LPA)**	**2030 FOURTH / STOCKTON ALIGNMENT OPTION B (MODIFIED LPA)**
Fourth/King – Chinatown Station[1]	11.8	17.0	7.0	4.6	6.3

Notes: [1] The Chinatown Station is at Stockton/Clay for the Enhanced EIS/EIR and Fourth/Stockton Alignment Option A (LPA) Alternatives, and at Stockton/Washington for the Fourth/Stockton Option B (Modified LPA) Alternative.

Source: PB/Wong, April 2007.

In 2030, under the No Project/TSM Alternative three of the five Study Area intersections (Third~~Fourth~~/King~~ Streets, Fourth Harrison Streets,~~ and Sixth/Brannan Streets) would operate at LOS E or F in the a.m. and p.m. peak hour~~ and three intersections (Third/King Streets, Fourth/King Streets, and Sixth/Brannan Streets) would operate at LOS F in the p.m. peak hour~~. While most of these intersections already operate at LOS E or F as they serve as the major access points to the regional freeway system, the traffic delays would increase in the future. For the No Project/TSM Alternative, the ~~Fourth and Harrison~~ Third and King Streets intersection would degrade from LOS ~~B~~ D to LOS E in the a.m. peak hour. ~~Implementation of striping changes at the Fourth/Harrison intersection would mitigate these adverse impacts.~~

Implementation of the Enhanced EIS/EIR Alignment would reduce traffic delays on Fourth Street in the a.m. peak hour, but would increase delays experienced by motorists at the Third and King Streets and Sixth and Brannan Streets intersections when compared to the No Project/TSM Alternative. The intersection of Third and King Streets would degrade from LOS ~~D~~ E to LOS F in the a.m. peak hour as a result of the implementation of this alternative and the Sixth and Brannan Streets intersection would continue to operate at LOS F. During the p.m. peak hour, the Third and King~~, Fourth and King,~~ and Sixth and Brannan Streets intersections would all continue to operate at LOS F, but with increased delays.

Implementation of either the Fourth/Stockton Alignment Option A or Option B rather than the Enhanced EIS/EIR Alignment would alleviate some of the delays on Third Street, but result in greater delays on Fourth Street. The Third and King and Sixth and Brannan Streets intersections under Alternatives 3A or 3B would operate as LOS F during the a.m. (a degradation from LOS ~~D~~ E at Third/King Streets resulting from the Project) and p.m. peak hour (continued LOS F operation) while the Fourth and King Streets intersection would continue to operate at LOS E during the a.m. peak hour and LOS F during the p.m. peak hour. The intersection of Fourth and Harrison Streets would degrade from LOS ~~B~~ C ~~to LOS F for Alternative 3B in the a.m. peak hour and from LOS B~~ to LOS E for Alternative 3A and to LOS F for Alternative 3B in the p.m. peak hour.

Freight Movements

With the implementation of the Project, the removal of parking along the surface alignment and at the station entrances and portal location would impact freight loading for adjacent businesses and residences, for example, at 601 Fourth Street under Alternative 3A. While additional truck loading spaces would be provided on surface streets adjacent to the Corridor along Third and Fourth Streets, existing loading zones in the Union Square and Chinatown station areas would be expected to accommodate the freight delivery and loading needs in the areas where on-street yellow zones are eliminated.

Stockton Street is a mix of on-street metered parking, on-street loading zones, and bus zones. In some blocks, between Market and Sutter Street, on-street parking and loading has been removed completely to accommodate the flow of traffic, access to the public parking garages, and bus stops. The on-street loading spaces in both Union Square and Chinatown are important to servicing the adjacent retailers as off-street loading docks are limited.

On Columbus Avenue, between Union and Powell Streets, there are no off-street loading spaces.

Parking

On-street and off-street parking would be affected with the implementation of each of the Build Alternatives along the segments of the Corridor that would have surface light rail operations and where station entrances and vent shafts are proposed to be located in off-street parking garages. For the Enhanced EIS/EIR Alternative, 111 on-street parking spaces would be removed on Third Street between King and Bryant; on Fourth Street between Townsend and Harrison Streets; and on Stockton Street between Geary and Post Streets and Clay and Washington Streets. In addition this alternative would eliminate 59 off-street parking spaces in the Hearst and Union Square parking garages. The Fourth/Stockton Alignment Option A would eliminate 29 on-street parking spaces on the blocks of Fourth and Stockton Streets on the street segments identified above and 29 off-street parking spaces in the Union Square parking garage. The Fourth/Stockton Alignment Option B would eliminate 82 on-street parking spaces under the semi-exclusive option and ~~81~~79 parking spaces under the mixed-flow option (this option also retains some off-peak spaces on Fourth Street) in the Fourth and Stockton

Street segments identified above. In addition, this alternative would potentially eliminate 3 parking spaces on the north side of Ellis Street to accommodate an expansion of the station access/egress at One Stockton Street (the Apple Store) and a total of 59 off-street parking spaces from the Ellis/O'Farrell and Union Square parking garages.

Pedestrian

Though pedestrian volumes are heavy on many of the sidewalks in the Moscone, Union Square, and Chinatown districts, the sidewalks located at the proposed station entrances are currently operating at a LOS A. Under each of the alternatives, sidewalk reductions would need to be implemented at the following locations: Market Street and Union Square Stations for the Enhanced EIS/EIR Alignment; Moscone and Union Square/Market Street Stations for the Fourth/Stockton Alignment Option A; and Union Square/Market Street Station for the Fourth/Stockton Alignment Option B. Even with these sidewalk reductions, the pedestrian level of service would continue to be LOS A. Under Alternative 3B, the pedestrian level of service would be reduced to LOS B, at the Chinatown Station, as a result of the increase in pedestrian activity rather than a reduction of effective sidewalk width.

Bicycle

Bicycle routes #11 on Second Street and #19 on Fifth Street and the improvements proposed along these routes to accommodate bicyclists could be affected by the Project implementation. The diversion of traffic to Second and Fifth Streets from Third and Fourth Streets as the result of increased delays in the future that would be compounded by the introduction of surface rail operations could affect bicycle travel on these two bicycle routes. Implementation of the proposed bicycle improvements on these streets would protect bicycle travel in the future.

Emergency Vehicle Access

The implementation of surface rail~~s~~ operations along Fourth Street would potentially impact the circulation and accessibility of fire trucks leaving Fire Station #8 located on Bluxome Street. The rail median would be designed so as to preserve the ability for fire trucks to cross the median to travel on Fourth Street so as to minimize the impacts on emergency response times.

Construction

Construction of the Central Subway Project would temporarily affect transit service, traffic flows, freight movements and delivery activities, on-street parking, and pedestrian and bicycle circulation. There would also be a temporary increase in truck traffic along the light rail alignment as a result of truck traffic associated with the removal of excavated soils and backfill around the guideway and station areas and delivery of materials. The impacts would not be significant and improvement measures such as detour routes, exclusive bus zones, short-term parking limits, maintenance of sidewalks, and provisions for emergency vehicles would alleviate the adverse impacts.

S. 5 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

A summary of the significant environmental impacts and mitigation measures for the Project Alternatives are presented in Table S-7. The potentially significant impacts are briefly summarized below for the Build Alternatives and the No Project/TSM Alternative.

TABLE S-7

SUMMARY OF SIGNIFICANT ENVIRONMENTAL IMPACTS

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
TRANSPORTATION **Traffic** Operation/Cumulative	*Significant Impacts:* ~~Increases in traffic congestion and delays would occur in 2030 at all of the five intersections evaluated as a result of cumulative traffic growth.~~ Third/King ~~(a.m. peak only),~~ Streets intersection would degrade from LOS E to LOS F in the a.m. peak hour and would continue to operate at LOS F in the p.m. peak hour. Fourth/King~~,~~ and Sixth/Brannan Streets intersections would continue to operate at LOS E or F conditions in the a.m. and p.m. peak hours. ~~The intersection of Fourth and Harrison Streets would degrade from LOS B to LOS E when compared to the existing conditions.~~ ~~*Mitigation Measure:*~~ ~~Restriping the southbound curb lane of Fourth Street to accommodate a shared through/right-turn lane to Harrison Street would mitigate the impacts to LOS B resulting in a less-than-significant impact.~~	*Significant Impacts:* ~~Increases in traffic congestion and delays would occur in 2030 at three out of the five intersections evaluated.~~ The Project would have a significant traffic impact at the Third/King Streets intersection in the a.m. peak hour due to degradation in LOS from ~~D~~ E to F when compared to the No Project/TSM Alternative and a cumulatively considerable contribution to the cumulative traffic impacts at the Sixth/Brannan Streets intersection during the p.m. peak hour in 2030. *Significant environmental effects which can not be avoided:* The traffic impacts at Third/King and Sixth/Brannan Streets intersections could not be reasonably mitigated to a less-than-significant level.	*Significant Impacts:* ~~Increases in traffic congestion and delays would occur in 2030 at three out of the five intersections evaluated.~~ The Project would have a significant traffic impact at the Third/King Streets intersection in the a.m. peak hour due to a degradation in LOS from ~~D~~ E to F and at the Fourth/Harrison Streets intersection in the p.m. peak hour due to a degradation in LOS from C to E when compared to the No Project/ TSM Alternative. This alternative would have a cumulatively considerable contribution to the adverse cumulative traffic impacts at the King Street intersections with Third and Fourth Streets and the Fourth/Harrison Streets intersection during the p.m. peak hour in 2030. *Mitigation Measure:* Restriping the southbound curb lane of Fourth Street to accommodate a shared through/right-turn lane to Harrison Street would mitigate	*Significant Impacts:* 1. Same as Alternative 3A, except the Project would also have ~~a significant impact at the Fourth/Harrison Streets intersection during the a.m. peak hour when compared to the No Project/TSM Alternative and~~ a cumulatively considerable impact on the cumulative traffic impacts at the King Street and Third Streets intersection during a.m. peak hour ~~and the Fourth/Harrison Streets intersection during the p.m. peak hour~~ in 2030. 2. In addition, the portal at Fourth Street under I-80 may restrict ~~access to the proposed bus storage facility at Perry Street and~~ large truck movements onto Stillman Street. *Mitigation Measures:* Same as Alternative 3A, in addition SFMTA will explore options ~~design modifications to the portal location~~ with Caltrans, the TJPA, and Golden Gate Transit that will permit ~~bus access to Perry Street and~~ truck access to Stillman Street ~~that~~

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
	Significant environmental effects which can not be avoided: ~~None of the remaining traffic impacts could be reasonably mitigated.~~ The traffic impacts at Third/King, Fourth/King, and Sixth/Brannan Streets intersections could not be reasonably mitigated to a less-than-significant level.		the impacts to LOS B resulting in a less-than-significant impact. *Significant environmental effects which can not be avoided:* The traffic impacts at the Third/King and Fourth/King Streets intersections could not be reasonably mitigated to a less- than-significant level.	~~will~~ to reduce the impacts to a less-than-significant level. *Significant environmental effects which can not be avoided:* Same as Alternative 3A.
Freight and Loading Construction				*Significant Impacts:* Cumulative construction impacts could occur on the block bounded by Perry, Third, Stillman, and Fourth Streets due to sequential construction of the I-80 retrofit, Golden Gate Transit bus storage facility, and the Central Subway projects. *Mitigation Measures:* DPT will work with the property and business owners on Perry and Stillman Streets to develop temporary detour routes for traffic to maintain property access during construction. With the implementation of this mitigation measure, the construction freight and loading impacts on this block would be

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
				mitigated to a less-than-significant level.
SOCIOECONOMIC (Population and Housing) Operation/Cumulative		*Significant Impacts:* Acquisition of one parcel for the Chinatown Station would cause the displacement of 10 small businesses~~ and one or two residential units~~ in a predominantly minority and low income neighborhood. *Mitigation Measures:* Redevelop the Chinatown Station site with affordable housing units above the station and ground floor retail where possible. *Significant environmental effects which can not be avoided:* The construction of new ~~affordable housing units/~~ground floor retail would not mitigate to a less-than-significant level the disruption to existing ~~residents and~~ small businesses associated with the temporary dislocation as new units are constructed.	*Significant Impacts:* Same as Alternative 2. *Mitigation Measures:* Same as Alternative 2. *Significant environmental effects which can not be avoided:* Same as Alternative 2.	*Significant Impacts:* Acquisition of one parcel for the Chinatown Station would cause the displacement of 8 small businesses and 17 residential units in a predominantly minority and low income neighborhood. *Mitigation Measures:* Same as Alternative 2. *Significant environmental effects which can not be avoided:* Same as Alternative 2, except the loss of affordable housing would not mitigate to a less-than significant level the disruption to existing residents as well as businesses.
CULTURAL RESOURCES **Archaeological** Construction		*Significant Impacts:* 1. One known prehistoric archaeological resource (CA-SFR-2) may be impacted as a result of construction trenching on Third Street, between Folsom and Bryant Streets.	*Significant Impacts:* 1. At least 6 locations were identified in this alignment as sensitive for the presence of prehistoric archaeological resources. 2. One known historical	*Significant Impacts:* Same as Alternative 3A, except 13 locations have been identified along the alignment, where historical archaeological resources may be uncovered during construction.

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
		2. At least 14 locations were identified in this alignment as sensitive for the presence of prehistoric archaeological resources. 3. Six locations where historical archaeological resources might be uncovered were identified in the alignment. *Mitigation Measures:* 1. Consistent with the SHPO Programmatic Agreement and the MOU with the City, MTA would work with a qualified archaeologist to ensure that all state and federal regulations regarding Native American concerns are enforced. 2. Limited subsurface testing in identified archaeologically sensitive areas shall be conducted once an alignment has been selected. 3. During construction, archaeological monitoring shall be conducted in those sections of the alignment identified in the HCASR and through pre-construction testing as moderately to highly sensitive for prehistoric and historic-era archaeological deposits. 4. Upon completion of archaeological field investigations, a comprehensive technical report shall be prepared	archaeological resource (CA-SFR-137H) may be impacted as a result of the placement of a construction yard in this alignment. 3. Fifteen locations where historical archaeological resources might be uncovered were identified in the alignment. *Mitigation Measures:* Same as Alternative 2.	*Mitigation Measures:* Same as Alternative 2.

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
		for approval by the San Francisco Environmental Review Officer and SHPO that describes the archaeological findings and interpretations in accordance with state and federal guidelines. 5. If unanticipated cultural deposits are found during subsurface construction, soil disturbing activities in the vicinity of the find shall be halted until a qualified archaeologist can assess the discovery and make recommendations for evaluation and appropriate treatment in keeping with adopted regulations and policies. *Significant environmental effects which can not be avoided:* There is no absolute assurance that the impacts to archaeological resources can be mitigated to a less-than-significant level.		
Historic Architectural Resources Construction		*Significant Impacts:* 1. One historical architectural resource located at 814-828 Stockton Street that is contributory to the Chinatown Historic District would be demolished to construct the Chinatown Station. Removal of this building would have an adverse effect on the Historic District. 2. 34 historical architectural	*Significant Impacts:* Same as Alternative 2, except 25 (34 if the North Beach Construction Variant is implemented) historical architectural resources have the potential for temporary construction effects from ground-borne vibration or visual disturbance. *Mitigation Measures:*	*Significant Impacts:* 1. One historical architectural resource located at 933-949 Stockton Street that is contributory to the Chinatown Historic District would be demolished to construct the Chinatown Station. This would have an adverse effect on the Historic District. 2. 25 historical architectural resources along the alignment

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
		resources along the alignment could potentially be affected by temporary construction-related ground-borne vibration or visual impacts. *Mitigation Measures:* 1. Partial preservation of 814-828 Stockton Street or incorporation of elements of 814-828 Stockton Street into the design of the new station building; salvage significant architectural features from the building for conservation into a historical display or exhibit in the new Chinatown station or in museums; and/or develop a permanent interpretive display for public use on the T-Third line cars or station walls. *Significant environmental effects which can not be avoided:* Implementation of these mitigation measures would not reduce the impacts to historical resources to a less-than-significant level; significant adverse impacts to historic resources and the Historic District would occur. *Improvement Measures*: 1. If the 814-828 Stockton Street building is demolished, perform a	Same as Alternative 2.	could potentially be impacted by construction-related ground-borne vibration and visual disturbance. *Mitigation Measures:* Same as Alternative 2, except the historic resource is 933-949 Stockton Street.

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
		Historic American Buildings Survey/Historic American engineering Record documentation. 2. Pre-drilling for pile installation in areas that would employ secant piles with ground-supporting walls in the cut-and-cover areas would reduce the potential effects of vibration. 3. Vibration monitoring of historic structures adjacent to tunnels and portals will be specified in the construction documents to ensure that historic properties do not sustain damage during construction. Vibration impacts would be mitigated to a less-than-significant level. If a mitigation monitoring plan provides the following: a. The contractor will be responsible for the protection of vibration-sensitive historic building structures that are within 200 feet of any construction activity. b. The maximum peak particle vibration (PPV) velocity level, in any direction, at any of these historic structures should not exceed 0.12 inches/second for any length of time. c. The Contractor will be required to perform periodic vibration monitoring at the closest structure to ground		

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
		disturbing construction activities, such as tunneling and station excavation, using approved seismographs. d. If at any time the construction activity exceeds this level, that activity will immediately be halted until such time as an alternative construction method can be identified that would result in lower vibration levels.		
Operation		*Significant Impacts:* 1. Construction of a new station in Chinatown on a site occupied by an historic structure would create a visual break in the cohesive grouping of contextually-related buildings resulting in potential adverse impacts to the Chinatown Historic District. *Mitigation Measures:* Same as outlined for Construction impacts above. *Significant environmental effects which can not be avoided:* Implementation of these mitigation measures would not reduce the impacts to historical resources to a less-than-significant level; significant adverse impacts to historic resources would occur.	*Significant Impacts:* Same as Alternative 2. *Mitigation Measures:* Same as Alternative 2. *Significant environmental effects which can not be avoided:* Same as Alternative 2. *Improvement Measures:* Same as Alternative 2.	*Significant Impacts:* Same as Alternative 2. *Mitigation Measures:* Same as Alternative 2. *Significant environmental effects which can not be avoided:* Same as Alternative 2. *Improvement Measures:* Same as Alternative 2.

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
GEOLOGY AND SEISMICITY Construction		*Significant Impacts:* 1.Construction period settlement could cause damage to existing building foundations, subsurface utilities, and surface improvements. 2. Construction of the shallow subway crossing over the BART tunnel would be expected to result in reduction of ground loads and upward displacement of the BART/Muni Metro tunnels. *Mitigation Measures:* 1. Provisions such as concrete diaphragm walls to support the excavation and instrumentation to monitor settlement and deformation would be used to ensure that structures adjacent to tunnel alignments are not affected by excavations. 2. Tunnel construction methods that minimize ground movement, such as pressure-faced TBMs, Sequential Excavation Method, and ground improvement techniques such as compensation grouting, jet grouting or underpinning will be used. 3. Rigorous geomechanical instrumentation would be used to monitor underground excavation and grouting or underpinning will be employed to avoid	*Significant Impacts:* Same as Alternative 2, except the use of TBMs for deep tunnel construction would minimize the impact to BART/Muni Metro tunnels. Similar to Alternative 2, the construction of a deep tunnel could result in the potential downward displacement of the BART structures. *Mitigation Measures:* Same as Alternative 2.	*Significant Impacts:* Same as Alternative ~~2~~ 3A. *Mitigation Measures:* Same as Alternative 2.

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
		displacement of structures. 4. Automated ground movement monitoring will be used to detect distortion on the BART/Muni Metro tunnels and grout pipes will be placed prior to tunnel excavation to allow immediate injection of compensation grouting to replace ground losses if deformation exceeds established thresholds. With the implementation of these mitigation measures the impacts would be less-than-significant.		
HYDROLOGY AND WATER QUALITY Construction		*Significant Impacts:* Construction activities at the Union Square Station could increase or otherwise disrupt flow of ground water to the Powell Street Station. *Mitigation Measures:* Watertight shoring and fully waterproof station structures will be designed and constructed to avoid compounding ground water inflows to the Powell Street Station. With the implementation of these mitigation measures, the impacts would be less-than-significant.	*Significant Impacts:* Same as Alternative 2. *Mitigation Measures:* Same as Alternative 2.	*Significant Impacts:* Same as Alternative 2. *Mitigation Measures:* Same as Alternative 2.
HAZARDOUS MATERIALS		*Significant Impacts:* 1. Previous subsurface soils	*Significant Impacts:*	*Significant Impacts:*

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
Construction		investigations indicate the potential for exposure of site workers and the public to potentially hazardous materials, including metals, volatile organic compounds (VOCs), and semi-VOCs, during site excavation or transport of excavated soil materials (35,000 cubic yards) which would be disposed of at a Class I facility. Servicing and fueling of diesel-powered construction equipment on-site could result in exposure to lubricants, diesel fuel, antifreeze, motor oils, degreasing agents, and other hazardous materials. Properties landside of the 1851 highwater mark that are not subject to Article 20 would have potential for exposure to hazardous materials. *Mitigation Measures:* Implementation of mitigation measures similar to those required for properties under the jurisdiction of Article 20: preparation of a Site History Report; Soil Quality Investigation, including a Soils Analysis Report and a Site Mitigation Report (SMR); description of Environmental Conditions; Health and Safety Plan (HSP); Guidelines for the Management and Disposal of Excavated Soils; and a	Same as Alternative 2. *Mitigation Measures:* Same as Alternative 2.	Same as Alternative 2. *Mitigation Measures:* Same as Alternative 2.

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
		Certification Statement that confirms that no mitigation is required or the SMR would mitigate the risks to the environment of human health and safety. This measure would ensure that the project impacts are mitigated to a less-than-significant level.		
NOISE AND VIBRATION Construction		*Significant Impacts:* Historic buildings within 200 feet of a construction area may be subject to adverse vibration impacts if the maximum peak particle vibration (PPV) velocity level in any direction exceeds 0.12 inches/second for any length of time. *Mitigation Measures:* 1. The Contractor shall be required to perform periodic vibration monitoring using approved seismographs at the historic structure closest to the construction activity. If the construction activity exceeds a 0.12 inches/second level, the construction activity shall be immediately halted until an alternative construction method that would result in lower vibration levels can be identified. 2. During final design engineering, a more detailed construction noise and vibration	*Significant Impacts:* Same as Alternative 2. *Mitigation Measures:* Same as Alternative 2.	*Significant Impacts:* Same as Alternative 2. *Mitigation Measures:* Same as Alternative 2.

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
		analysis will be prepared to address construction staging areas, tunnel portals, cut-and-cover construction, and underground mining and excavation operations. Implementation of these mitigation measures would reduce the impacts to a less-than-significant level.		
Operation/Cumulative		*Significant Impacts:* The FTA vibration criteria of 72 VdB would be exceeded at one residential building at 570 Fourth Street at Freelon Alley and the FTA ground-borne noise criteria of 35 dBA would be exceeded at two residential buildings at 527 and 529 Third Street. All locations have residential development over ground-floor commercial. *Mitigation Measures:* Vibration propagation testing will be conducted at these locations during final engineering to determine the predicted impacts and finalize the mitigation measures. MTA will select one of the following mitigation measures during final design of the project: high resilience (soft) direct fixation fasteners for	*Significant Impacts:* The FTA vibration criteria of 72 VdB would be exceeded at one residential building at 570 Fourth Street at Freelon Alley. *Mitigation Measures:* Mitigation measure same as Alternative 2.	*Significant Impacts:* Impacts same as Alternative 3A. *Mitigation Measures:* Mitigation measure same as Alternative 2.

Environmental Area/Impacts	Alternative 1 -No Project/TSM	Alternative 2 - EIS/EIR Enhanced Alignment	Alternative 3A - Fourth/Stockton Alignment Option A	Alternative 3B - Fourth/Stockton Alignment Option B
		embedded track and in underground subway tunnels or ballast mat for ballast and tie track. Implementation of these measures would reduce the impacts to a less-than-significant level.		

S.5.1 CENTRAL SUBWAY BUILD ALTERNATIVES

Implementation of the Build Alternatives would result in significant impacts as noted below:

- traffic impacts in 2030 at the following locations: Fourth/Harrison Streets intersection (~~No Project/TSM Alternative – LOS B to LOS E in a.m. peak hour,~~ Alternative 3A, LOS ~~B~~ C to LOS E in ~~a.~~ p.m. peak hour, and Alternative 3B – LOS ~~B~~ C to LOS F in ~~a.m. and~~ p.m. peak hour) and Third/King Streets intersection (Alternatives 2, 3A, and 3B – LOS ~~D~~ E to LOS F in a.m. peak hour) all as a result of project implementation. Considerable contribution to cumulative impacts would occur at the Sixth and Brannan Streets intersection in the p.m. peak hour (Alternative 2); the Fourth and Harrison Streets intersection during the p.m. peak hour (Alternatives 3A and 3B); the Third and King and Fourth and King Streets intersections during the p.m. peak hour for Alternatives 3A and 3B; and during the a.m. peak hour at the Third/King Streets intersection for Alternative 3B.
- displacement of 10 small businesses (10 or fewer employees) ~~and 1 or 2 residential units~~ for Alternatives 2 and3A and displacement of 8 small businesses (10 or fewer employees) and 17 residential units (which would require a Planning Code amendment) for Alternative 3B in the predominantly minority and low-income Chinatown neighborhood;
- potential disruption to one known prehistoric archaeological resources during construction of Alternative 2;
- potential disruption to locations identified as sensitive to the presence of prehistoric archaeological resources (14 for Alternative 2 and 6 for Alternatives 3A and 3B);
- potential disruption to one known historic archaeological resources during construction of Alternatives 3A and 3B);
- potential disruption to locations where historical archaeological resources might be uncovered (6 for Alternative 2, 15 for Alternative 3A, and 13 for Alternative 3B);
- demolition of one historic resource in Chinatown for each of the Build Alternatives (814-828 Stockton Street for Alternatives 2 and 3A and 933-949 Stockton Street for Alternative 3B) out of the total 371 contributory historic buildings in the proposed Chinatown Historic District which would create a visual break in the cohesive grouping of these contextually-related buildings;

- potential disruption to historic architectural resources along the alignment by construction-related ground-borne vibration (34 resources in Alternative 2, 25 resources in Alternatives 3A, and 3B);
- construction period settlement could cause damage to existing building foundation, subsurface utilities, and surface improvements such as roads and sidewalks;
- construction activities and design of the Union Square or Union Square/Market Street Station could alter ground water flows at the Powell Street Station that require daily pumping.
- potential for exposure of workers and the public to potentially hazardous materials during site excavation or transport of excavated soils or servicing of diesel-powered construction equipment on-site on properties landside of the 1851 highwater mark not subject to Article 20;
- exceedance of FTA vibration criteria at one residential building located at 570 Fourth Street for all Build Alternatives; and
- exceedance of FTA ground-borne noise criteria at two residential buildings located at 527 and 529 Third Street under Alternative 2.

All of these impacts, except those related to traffic, residential and small business displacement, archaeological resources, and historical architectural resources could be reduced to a less-than-significant level by implementing mitigation measures as identified in Table S-7. No feasible mitigation measures have been identified for mitigating significant impacts at any of the identified intersections except at Fourth and Harrison Streets, therefore there would be significant environmental effects which could not be avoided. The impact on archaeological resources would be considered significant environmental effects which can not be avoided because there is no assurance as to the level of mitigation for the unidentified resources. The business and residential displacement associated with each of the Build Alternatives would be considered adverse impacts. The impacts would be mitigated through, the required adherence to state and federal regulations on the acquisition of parcels and relocation of businesses and residences, but would still be considered significant effects because of the disruption to and dislocation of low income households.

Each of the Build Alternatives would also require use of Union Square plaza for station entrances and for vent shaft placements (Alternative 2 and 3A only). It has been determined that this use of the plaza would not be considered a significant impact and a de ~~minimus~~ minimis finding for impact on Section 4(f) resources ~~is anticipated~~ for Alternative 3B has been concurred with by the Recreation and Parks Commission (see Appendix J) to satisfy Section 4(f) requirements.

S.5.2 NO PROJECT/TSM ALTERNATIVE

The No Project/TSM Alternative would not have any of the construction-related impacts associated with the Build Alternatives, but it would result in increased future congestion at some locations, reduced transit service reliability, increased transit travel times, increased energy consumption, and increased air pollution when compared to the Build Alternatives.

S.6 FINANCIAL FEASIBILITY

S.6.1 ANALYSIS OF FINANCIAL CAPACITY FOR THE NO BUILD/TSM AND CENTRAL SUBWAY ALTERNATIVES

The U.S. Department of Transportation Section 5309 New Starts program administered by the Federal Transit Administration (FTA) provides discretionary capital grants for construction of new fixed guideway systems or extensions to existing fixed guideway systems. To receive a New Starts grant, projects must complete a planning and project development process that consists of Alternatives Analysis, Preliminary Engineering, and Final Design phases. The funding program is discretionary and highly competitive, with funding decisions made on the basis of New Starts Criteria specified in law and regulation. Near the completion of Final Design, highly-rated projects are eligible to receive a Full Funding Grant Agreement (FFGA), which defines the scope of the project, specifies requirements with which the project sponsor must comply to receive New Starts funds, identifies the multi-year federal financial commitment to the project, and signals federal intent to seek the specified amounts of funding through future appropriations.

The MTA is seeking $762.2 million in Section 5309 New Starts funding. The MTA started receiving New Starts funds for the Central Subway Project in FY 2003. To date, the MTA has received $45.3 million in New Starts funds as follows: $1.5 million in 2003; $8.9 million in 2004; $9.9 million in 2005; and $25 million in 2006. These funds were allocated for preliminary engineering and environmental review.

Table S-3 presents the total capital cost estimates for the Build Alternatives by construction elements, right of way, vehicles and soft costs. Preliminary estimates predict that the Central Subway will begin construction in 2010 and start revenue service in 2016.

Comparative Capital Costs

Alternative 3A would extend light-rail service along Fourth Street as a semi-exclusive double-track surface line for a short distance from the T-Third Line terminus, and it would soon transition to a subway (tunnel), which would be used for the majority of the Project's 1.7-mile length. Three underground subway stations are included in this alternative, and four additional light-rail vehicles (LRVs) are required beyond the No Project/TSM Alternative.

Alternative 3B is similar to Alternative 3A, but it has a shorter tunnel (with a longer surface line), four stations (the fourth is a surface platform), four LRVs more than No Project/TSM Alternative, and a shorter (one-year less) construction period. Tunnel sections and subway stations are typically more expensive to construct than surface lines and surface platforms. Alternative 3B also evaluates two sub-options with mixed-flow or semi-exclusive rail operation on the surface of Fourth Street.

Costs for Alternative 2, were derived from original cost estimates for the shallow tunnel under Market Street. This alternative also includes: operation of a surface line on both Third and Fourth Streets with a portal on each street; five stations (four underground and one surface); and four addition LRVs over the No Project/TSM Alternative

Comparative O&M Costs

The projected incremental operating costs for both the IOS and Central Subway Projects are summarized in Table S-4 in year-of-expenditure dollars (YOE$). The 2016 figures represent the cost at the startup of the Central Subway operations, while the 2030 figures are for a selected forecast year. The increase in cost over time reflects an assumed inflation rate of ~~3.5~~ 2.3 percent.

Due to a faster and more direct alignment, Alternative 3A creates an annual reduction of ~~2,400~~ 40,300 LRV car hours on the Central Subway Corridor and a system-wide annual ~~reduction~~ increase of ~~27,800~~ 11,900 car hours when compared to the No Project/TSM Alternative. Alternative 3A would also reduce the number of system-wide annual bus hours by 76,400. Alternative 3B would save the same number of annual bus hours, however, it would ~~increase~~ reduce the annual LRV car hours by ~~6,000~~ 39,000 on the Central Subway Corridor, while ~~reducing~~ increasing by ~~19,400~~ 13,200 the system-wide LRV hours compared to the No Project/TSM Alternative. Alternative 2 ~~yields~~ would result in an annual ~~increase~~ decrease of ~~7,100~~ 33,100 LRV car hours, a system-wide annual ~~reduction~~ increase of ~~18,300~~ 19,100 car hours, and would reduce the number of system-wide annual bus hours by 76,400 when compared to the No Project/TSM Alternative.

A total of ~~$432.2~~ $473 million in state and local capital funding has been committed to the Central Subway Project. In addition, the MTA is currently seeking $762.2 million in federal "New Starts" funding, for a total of ~~$1,194.4~~ $1,235 million in capital funding identified for the Project (see Table S-8). ~~Additional regional and state funding is being pursued to eliminate the funding shortfall~~.

TABLE S-8

CENTRAL SUBWAY CAPITAL FUNDING PLAN ($MILLIONS)

Source	Amount
Federal-5309 New Starts	$762
State	$306
Local	$~~126~~167
Total	**~~$1,194~~** **$1,235**
Source: MTA Central Subway FY2008 New Starts Financial Plan.	

S.7 EVALUATION OF ALTERNATIVES

The Section 5309 New Starts criteria provide FTA with a consistent framework for evaluating major transit investments seeking federal discretionary funding under the Section 5309 New Starts program. FTA uses an analytical method in which New Start Projects are analyzed against several evaluation criteria and results are displayed and reported annually (see Table S-9).[5] This method is also used to evaluate the alternatives/transit options relative to local goals and objectives. No attempt has been made to provide an overall ranking or single index combining all measures. The community and its decision-makers can apply their own values in weighing the importance of the various measures and selecting a Preferred Investment Strategy. The evaluation completed for the SEIS/SEIR will not necessarily conform to the evaluation by FTA that compares New Start projects nationwide for purposes of recommending projects to Congress for funding.

The local evaluation is summarized by performance ratings assigned to alternatives. Performance ratings were assigned to each alternative based on how well the alternative meets the objective. In some cases there is a clear distinction between alternatives, while in others no clear distinction may exist. The ratings may be adjusted in order to account for significant environmental impacts,

5 Updated analysis was prepared for Alternative 3B (Modified Local Preferred Alternative) only and was included in the August 2007 New Starts Report.

or other criteria, which make a particular alternative significantly more or less desirable than the other.

Using these evaluation criteria, Alternative 3B has the best performance of all alternatives followed by Alternative 3A and Alternative 2. All Build Alternatives perform well for mobility improvements, operating efficiencies, and financial commitment when compared to the No Project/TSM Alternative, with the highest marks for Alternative 3B. While all of the transit

TABLE S-9

SUMMARY OF MOBILITY IMPROVEMENTS EVALUATION

Performance Measures	No Project/TSM Alternative	Central Subway Alternatives		
		Enhanced EIS/EIR Alignment	Fourth/Stockton Alignment Option A	Fourth/Stockton Alignment Option B
MOBILITIY IMPROVEMENTS				
FTA Performance Measures				
Hours of Transportation User Benefits	○	◑	~~◕~~ ●	~~●~~ ◕
Low Income Households Served	◑	●	◕	◕
Employment Near Stations	◑	●	◕	●
Local Performance Measures				
Daily Linked Transit Trips	◔	●	~~◑~~ ◕	~~◕~~ ◑
Exclusive ROW for Transit	○	●	●	●
Travel Time Between Selected Origins & Destinations	◔	◑	●	◕
Average Operating Speed for Transit	◑	◑	◕	◑
Compatibility with SFTA's *Four-Corridor Plan*	◔	●	●	●
ENVIRONMENTAL BENEFITS				
FTA Performance Measures				
Change in Regional Air Pollutant Emissions	○	◕	◑	●
Change in Greenhouse Gases	○	◕	◑	●
Change in Regional Energy Consumption	◔	◑	○	●
EPA Air Quality Designation	◔	◔	◔	◔
Local Performance Measures				
Partial and Full Property Acquisitions	●	~~◑~~ ◕	~~◕~~ ◑	◔
Affected Parkland/Cultural Sites	●	◑	◑	◕
Visual, Noise, and Vibration	●	◑	◕	◕
Displaced Parking During Construction	●	~~◑~~ ◔	~~◔~~ ◕	~~◔~~ ◑
OPERATING EFFICIENCIES				
FTA Performance Measures				
Systemwide Operating Cost per Passenger Mile(1)	~~$0.57~~ $1.24	~~$0.58~~ $1.25	~~$0.57~~ $1.24	~~$0.57~~ $1.24
Local Performance Measures				

Performance Measures	No Project/TSM Alternative	Central Subway Alternatives		
		Enhanced EIS/EIR Alignment	Fourth/Stockton Alignment Option A	Fourth/Stockton Alignment Option B
Systemwide Operating Cost per Passenger[1]	~~$1.82~~ $2.34	~~$1.63~~ $2.31	~~$1.56~~ $2.29	~~$1.52~~ $2.29
Bus Operating Cost per Revenue Bus Hour[2]	~~$254.00~~ $140.02	~~$209.00~~ $140.34	~~$209.00~~ $140.32	~~$209.00~~ $140.32
Light Rail Operating Cost per Revenue Train Hour[2]	~~$303.00~~ $248.20	~~$298.00~~ $260.32	~~$305.00~~ $259.98	~~$299.00~~ $259.84
COST EFFECTIVENESS				
FTA Performance Measures				
Incremental Cost per Hour of Transportation System User Benefit	--	~~$33.58~~ $30.31	~~$22.73~~ $21.12	~~$18.36~~ $21.24
TRANSIT SUPPORTIVE LAND USE AND FUTURE PATTERNS				
FTA Performance Measures				
Existing Land Use	●	●	●	●
Transit Supportive Plans and Policies	●	●	●	●
Performance and Impacts of Policies	●	●	●	●
Other Land Use Considerations	●	●	●	●
Local Performance Measures				
Compatible with City and Area Plans	◔	●	●	●
Support Revitalization Opportunities along the Central Subway Corridor Adjacent to Transit Stops/Stations	◔	●	●	●
Project Serves Major Activity Centers	◑	●	◕	●
OTHER LOCAL CRITERIA				
Travel Time from Fourth/King to Market/Third/Fourth	◔	~~◑~~ ◕	●	~~◕~~ ◑
Travel Time from Fourth/King to Stockton/Washington	◔	◑	●	◕
Parking supply and on-street loading zones on or near Third/Fourth Streets and Stockton Street	●	◔	◕	◑
Community Acceptance and Political Support	◔	◑	◕	●
LOCAL FINANCIAL COMMITMENT				
FTA Performance Measures				
Stability and Reliability of Capital Financing Plan	--	◕	◕	◕
Stability and Reliability of Operating Financing Plan	◔	◑	◑	◑
Local Share to Project Costs	--	●	●	●
Capital Costs Compared to Funding	--	◑	◑	~~◕~~ ●
Operating Costs Compared to Funding	◑	◕	◕	◕
●-High, ◕-Medium High, ◑-Medium, ◔-Medium Low, ○-Low				

investment strategies are supportive of desired land use patterns, the Build Alternatives go further than the No Project/TSM Alternative toward implementing desired City policy and providing opportunities for revitalization along the Central Subway Corridor.

Implementation of the Central Subway Project Build Alternatives would introduce some environmental impacts that do not exist for the No Project/TSM Alternative, but improvements to air quality and energy consumption would also occur with the implementation of the Build Alternatives, particularly Alternative 3B.

S.8 AREAS OF CONTROVERSY/ISSUES TO BE RESOLVED

Topics of concern raised by the public during the environmental review of the Central Subway Alternatives include: loss of on-street parking; loss of loading zones adjacent to businesses; local access concerns, displacement of affordable housing and small businesses, vibration impacts to older buildings, and noise during construction.

S.9 COMMUNITY INVOLVEMENT

Over the past several years, many public meetings have been held to solicit input to the Project. The MTA established a Community Advisory Group (CAG) early in the planning process to provide input to the identification and selection of design options for the Third Street Light Rail Project and to help select the options to carry forward for environmental review. The CAG is composed of a broad cross-section of stakeholder groups from the six primary neighborhoods in the Third Street Corridor: Visitacion Valley, Bayview Hunters Point, Potrero Hill, South of Market, and Chinatown/Downtown. The CAG has met six times since December of 2003 to discuss the Central Subway phase of the Project.

A Notice of Preparation (NOP) and Notice of Scoping Meeting were mailed in June 2005 and a Public Scoping meeting was held in June 2005. Four public informational meetings were also held. In September 2006, a revised Notice of Preparation was mailed. A revised NOP was sent out because a number of property owners did not receive the June 2005 notice and the Project description had changed. To ensure that the NOP was received by the appropriate recipients, the notice was mailed to the following:

- All residents within the 300-foot boundary of the proposed Project alignment, including the North Beach construction variant;

- All property owners within the 300-foot alignment, including the North Beach construction variant as listed with the San Francisco Assessor's Office;
- The citywide Central Subway mailing list; and
- The San Francisco Department of Planning's Standard Environmental Impact Report mailing list.

In October 2006, a series of community meetings were held along the alignment to update the public on the new Fourth/Stockton Alignment as the Central Subway Locally Preferred Alternative (LPA). Since the mailing of the NOP, the Central Subway team has also held over a dozen community meetings in addition to the stakeholder meetings conducted by the executive team members and staff.

S.10 AGENCY COORDINATION AND APPROVALS REQUIRED

Permits and approvals involving local, state, and federal agencies will be required prior to Project implementation. A list of these major approvals is provided in Table S-10.

TABLE S-10
AGENCY APPROVALS

Agency	Approval or Permit
Department of Interior	Section 4(f) approval or “de minimis” finding by FTA.
Advisory Council on Historic Preservation	Approval of Memorandum of Agreement (MOA) describing procedures for protection of and mitigation of impacts to historic and cultural resources pursuant to Section 106 of the National Historic Preservation Act and 36 CFR 800.
California State Historic Preservation Officer (SHPO)	Finding of Effect Determination.
California Public Utilities Commission (CPUC)	Permits required for all at-grade or grade-separated railroad, highway, and street crossings as well as pedestrian crossings of light rail and railroad tracks; public hearings before the CPUC may also be required; a formal application to conform with CPUC Rules of Practice and Procedure (CPUC Code Section 1200) is required; a formal application requesting permission to deviate from the established CPUC General Order (G.O.) standard (such as those regarding the height requirements for overhead wires) must be submitted and approved by the CPUC.
Caltrans	Access Control Properties Review. Permit to Encroach on Caltrans Right-of-Way.
Metropolitan Transportation Commission (MTC) and California Transportation Commission	Consistency with RTP and STIP.
Bay Area Rapid Transit District (BART)	~~Amendment of~~ Consistency with the 1986 Muni/BART ~~j~~Joint ~~use~~ Station Maintenance ~~a~~Agreement, First Supplement ~~for Powell Street station entries,~~ and execution of the 2008 Station Improvement Coordination Plan.
Regional Water Quality Control Board	General Construction Activity Stormwater Permit.
Bay Area Air Quality Management District (BAAQMD)	Conformity determination.
San Francisco Public Utilities Commission	Batch Industrial Wastewater Discharge Permit required for dewatering affluent discharge to the combined sewer system providing the quality of the effluent meets the NPDES General Permit discharge standards.
San Francisco Municipal Transportation Agency	Approve Project. Request from FTA a “Letter of No Prejudice” for New Starts federal funding. Approval required for surface street changes, traffic operation changes, traffic control measures, and on-street parking changes.
San Francisco Department of Public Health	Review and acceptance of site remediation plan in Maher Ordinance Area – Article 20.
San Francisco Planning Commission	General Plan Review/Referral for all aspects of project which occur in public rights-of-way, and amendments to appropriate portions of General Plan, Transportation Element, and Planning Code.
San Francisco Landmarks Preservation Advisory Board	Section 106 Review and Approval of Historical Architectural Report and SEIS/SEIR.
San Francisco Department of Public Works	Approval required for construction in streets and changes to sidewalk widths.
San Francisco Redevelopment Commission	Project review required for portions within existing Redevelopment Project Areas and, if adopted by the Board of Supervisors, within the proposed Redevelopment Areas. No approvals are needed for constructing light rail.
San Francisco Department of Recreation and Parks	Section 4(f) “de minimis” approval. Prop. K review and approval for shadow analysis. ~~Long-term encroachment permits for Union Square plaza.~~
San Francisco Arts Commission	Approval of the Public Arts Element and Civic Design.
San Francisco Board of Supervisors	Approval of General Plan and Planning Code amendments. Adoption of Redevelopment Plan amendments. Approval of property acquisitions, including eminent domain. Approvals required for use of City rights-of-way and Park property.
San Francisco County Transportation Authority	Review and inclusion of the Project in the Countywide Transportation Plan and Capital Improvement Program of the Congestion Management Program for San Francisco funding.

1.0 PURPOSE AND NEED

The San Francisco Municipal Transportation Agency (MTA) is proposing the Central Subway Project (Project), as the second phase of the Third Street Light Rail Project that was evaluated under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) in the Third Street Light Rail Project FEIS/FEIR (Case No. 96.281E) in 1998. The Federal Transit Administration (FTA) issued a Record of Decision (ROD) for the Third Street Light Rail Project in 1999 and the San Francisco Public Transportation Commission (PTC) approved the Project. The PTC was the predecessor policy board to the San Francisco Municipal Transportation Agency (MTA), which now oversees the San Francisco Municipal Railway (Muni) and the Department of Parking and Traffic (DPT). The Phase 1 Initial Operating Segment (IOS) opened for service in spring of 2007.[1] This Supplemental Environmental Impact Statement/Supplemental Environmental Impact Report (SEIS/SEIR) updates information in the Central Subway Project Study Area and focuses on changes to the Central Subway portion of the Third Street Light Rail Project that have occurred since the certification of the 1998 Final Environmental Impact ~~Study~~ Statement and Final Environmental Impact Report (FEIS/FEIR). Proposed changes to the Central Subway portion of the light rail project include: a new segment along Fourth Street between ~~Brannan~~ Harrison and Market Streets and along Stockton Street between Market and Geary Streets as an alternative to use of Third, Harrison, Kearny, and Geary Streets; extension of the planning horizon year from 2015 to 2030; the addition of above ground ventilation shafts for tunnel segments and stations; the use of off-street access to stations; a deep tunnel under Market Street; a closed barrier fare system; and the potential extension of a construction tunnel under Stockton Street and Columbus Avenue to the north end of the Project near Washington Square for removing the Tunnel Boring Machine (TBM).

This SEIS/SEIR evaluates three alternatives for Phase 2 of the Third Street Light Rail Project, which are described in detail in Section 2.0 of this document. Briefly, the Central Subway alternatives are:

- **Alternative 1 – No Project/Transportation Systems Management (TSM),** developed in conformance with California Environmental Quality Act (CEQA) Guidelines and National Environmental Policy Act (NEPA) requirements, includes only the funded projects programmed in

[1] The 1998 FEIS/FEIR used *Initial Operation Segment* to define the Phase 1 portion of the Third Street Light Rail Project. This Phase of the project initiated passenger service in April 2007 and is now referred to as the *T-Third Line*. This Supplemental SEIS/SEIR uses *T-Third Line* with reference to the Phase 1 segment, where appropriate.

the Regional Transportation Plan.[2] The T-Third Line (Phase 1 of the Third Street Light Rail Project) and associated bus changes are included in this alternative.

- **Alternative 2 – Enhanced EIS/EIR Alignment**, as analyzed in the 1998 FEIS/FEIR, uses King, Third, Harrison, Kearny, and Geary Streets as well as Fourth and Stockton Streets, crosses Market Street in a shallow subway at Third Street (Base Case), and includes a surface platform on Third Street at King Street and four subway stations (Moscone, Market, Union Square and Chinatown). Enhancements to the original FEIS/FEIR alternative include above-ground emergency ventilation shafts, off-sidewalk station entries where feasible, and the provision of a closed barrier fare system.

- **Alternative 3 – Fourth/Stockton Alignment** was developed as an alternative that would operate exclusively on Fourth and Stockton Streets with a deep tunnel crossing of Market Street. Two design options for this alternative are being evaluated:

  - Option A (Locally Preferred Alternative or LPA) has a double-track portal on Fourth Street between Townsend and Brannan Streets and three subway stations (Moscone, Union Square/Market Street, and Chinatown), and;

  - Option B (Modified LPA) has a double-track portal on Fourth Street between Bryant and Harrison Streets, a surface platform on Fourth Street at Brannan Street, and three subway stations (Moscone, Union Square/Market Street, and Chinatown). Option B includes semi-exclusive and mixed-flow suboptions of the light rail surface operation on Fourth Street, with trains either physically separated from vehicle traffic (except at intersections and surface stations) or trains and vehicles sharing a lane with an embedded trackway.

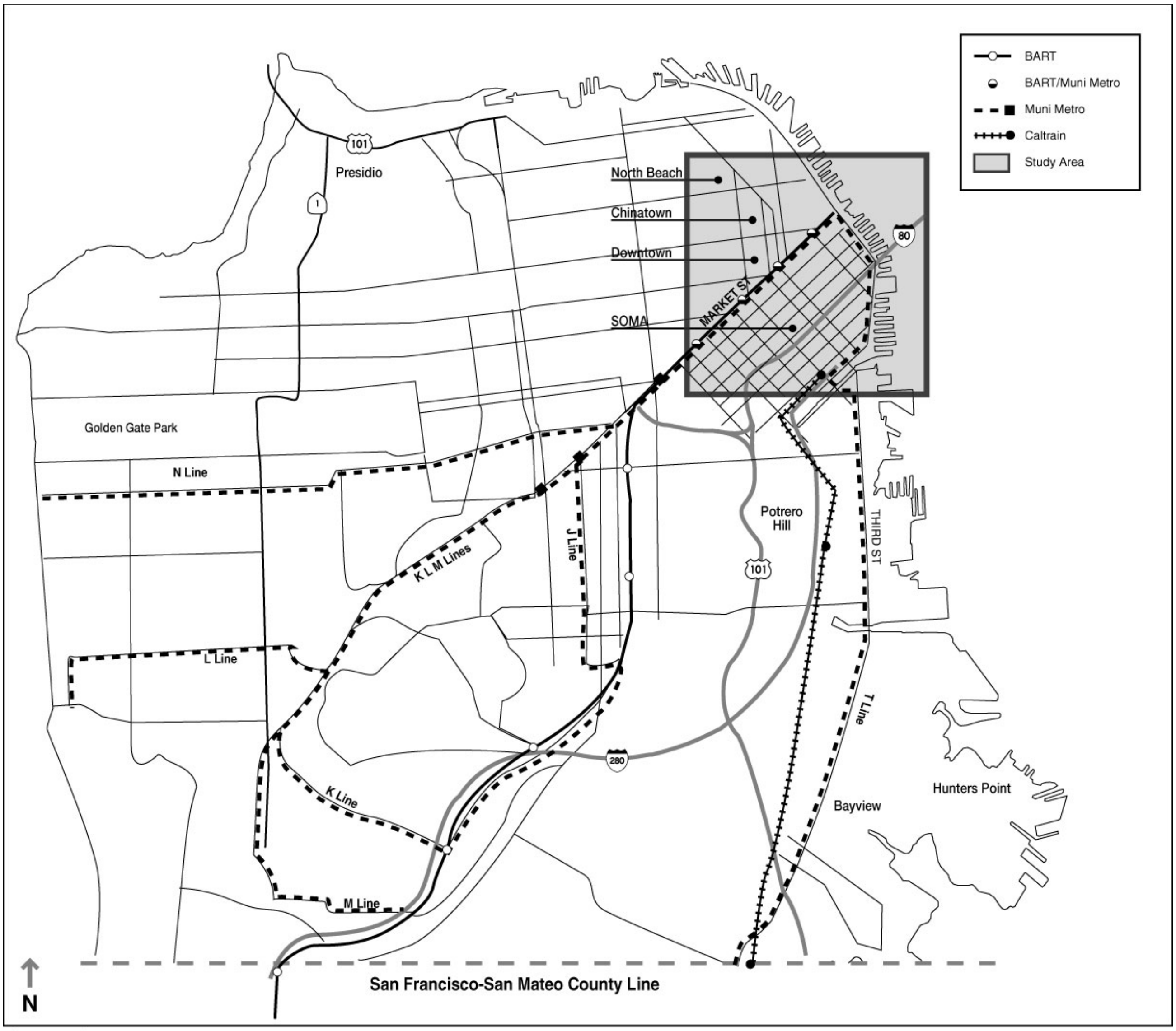
1.1 CORRIDOR LOCATION

The location of the Central Subway Corridor (Corridor) is shown in Figure 1-1. The Study Area extends from South of Market Street along Third and Fourth Streets near King Street, across Market Street to Geary and Stockton Streets in the Downtown, along Stockton Street in Chinatown, and includes a portion of North Beach along Columbus Avenue north of Union Street. The Corridor, which is approximately 1.7 miles long, is located in the northeastern quadrant of San Francisco. It is the northern end of the 7.1-mile Third Street Light Rail Corridor that would extend from Visitacion Valley to Chinatown. The 5.4-

[2] Transportation Systems Management or TSM refers to relatively low-cost capital improvements intended to serve Project objectives without requiring a major capital investment, e.g. improvements to bus service rather than a rail investment.

FIGURE 1-1

CENTRAL SUBWAY STUDY AREA LOCATION



Source: PB/Wong
Not to scale

mile T-Third Line (Phase 1 of the Third Street Light Rail Project) opened in April 2007, connecting Downtown with Mission Bay, Potrero Hill, the Central Waterfront, Bayview Hunters Point, and Visitacion Valley.

1.2 PURPOSE OF PROPOSED ACTION

As the Project Sponsor, MTA's objective for the proposed Project is to complete the second phase of the Third Steet Light Rail Project and provide Muni transit improvements in the Central Subway Corridor. MTA is seeking federal funding assistance to construct the proposed Central Subway Project. In 2003

MTA began conceptual engineering on the 1998 Phase 2 Central Subway alignment that used Third, Harrison, Kearny, and Geary Streets, as well as Fourth and Stockton Streets, and included a shallow tunnel crossing of Market Street at Third Street. In response to a series of community meetings and two years of engineering and design refinement efforts, a new alignment was identified to avoid, minimize, or mitigate potential impacts described in the 1998 FEIS/FEIR. On June 8, 2005, the MTA Board designated the new alignment, that was entirely located on Fourth and Stockton Streets, as the Central Subway Locally Preferred Alternative (LPA). This alternative was developed to avoid surface impacts along Third, Harrison, Kearny, and Geary Streets and to use a deep tunnel crossing of Market Street to avoid the existing sewer system on Mission Street. In June 2005 the City circulated a Notice of Preparation (NOP) to notify the public of the preparation of a Supplemental EIS/EIR (SEIS/SEIR) to evaluate the Central Subway alternatives (Appendix B). After the SEIS/SEIR is completed and the San Francisco Planning Commission has certified the SEIR, the FTA will determine if the preferred alternative meets their transit investment objectives and decide whether to recommend federal funding for the Project. Transit investment objectives include:

- Achieve transit service and mobility goals, while minimizing social, economic, and environmental impacts;
- Increase transit use and reduce travel time at a reasonable cost;
- Link public transportation investments with land use planning and community revitalization;
- Have strong public and political support and compatibility with local, regional, and state planning initiatives; and
- Enhance and preserve the environment, particularly in terms of reduced air and noise pollution and congestion relief.

Once the FTA issues a Record of Decision (ROD), the City and County of San Francisco (City) will consider approval of the Project, as well as commitment of local funds to implement the preferred alternative.

1.3 NEED FOR TRANSPORTATION IMPROVEMENTS IN THE CORRIDOR

The Central Subway Project would help to address mobility and transit deficiencies by improving connections to communities in the northeastern and southeastern part of the City and improving reliability of transit services. Transit deficiencies include those that exist at present and those that are anticipated to exist during the 20-year plus planning horizon (2030). The Central Subway Project is also intended to serve as a key infrastructure improvement to help ease congestion in the Study Area; improve transit service to the large transit-dependent population that resides along the Corridor; accommodate the increasing number of residents in the South of Market area; and serve mobility needs for the new jobs that are expected to be created in the Study Area. The transportation deficiencies and Project needs are further described below.

1.3.1 MUNI SERVICE RELIABILITY PROBLEMS IN THE CENTRAL SUBWAY CORRIDOR

The primary bus lines currently serving the Central Subway Corridor are the 9-San Bruno, 30-Stockton and 45-Union/Stockton. These lines traverse the dense and congested streets in North Beach, Chinatown and the Financial Districts of Downtown San Francisco (Downtown) before traveling into the South of Market, Mission Bay, Bayview, and Visitacion Valley districts. These lines connect with the T-Third Line at Market Street and at King and Fourth Streets. Buses caught in traffic congestion often provide unreliable service in and around the Downtown area. Currently, passengers may experience overcrowding and extended wait times between buses, as well as slower operating speeds and increased travel times. This situation is projected to worsen as traffic along the Corridor increases to projected 2030 levels.

1.3.2 INADEQUATE CONNECTIVITY BETWEEN CORRIDOR TRANSIT LINES AND OTHER TRANSIT SERVICES

As employment and activity centers continue to develop and disperse throughout the Bay Area and as that trend continues to 2030, it will become increasingly important to provide efficient connections from the Central Subway and the Third Street Corridor to transit lines serving all parts of San Francisco and the region. The Third Street Light Rail Project was intended to address the inequality of transit connections to the Muni Metro rail system and to regional transit services such as BART and Caltrain perceived by residents of the corridor. High unemployment rates for the Bayview and Visitacion Valley residents made the need for improved transit connections to regional employment centers particularly critical. Economic vitality was also a key issue for Chinatown residents and businesses that experienced reduced accessibility as a result of the removal of the Embarcadero Freeway following the 1989 earthquake.

For the Phase 2 Central Subway Project, transit accessibility along the Corridor is particularly critical as the population has a higher degree of transit dependency (72 percent of households along the Central Subway Corridor are without a vehicle compared to 29 percent citywide) and higher unemployment rates than other parts of the City (9 percent unemployed in the Central Subway Corridor versus 4.6 percent citywide unemployment).[3] The Phase 2 Central Subway also provides the opportunity for future

[3] 2000 U.S. Census Data

connections to other key transit corridors, such as Geary and North Beach, identified in the 1995 *Four Corridor Plan*.[4]

1.3.3 PROJECTED INCREASES IN 2030 TRANSIT AND AUTO TRAVEL DEMAND IN THE CORRIDOR

As presented in Table 1-1, an ~~55~~ 84 percent increase in Central Subway Corridor population and a ~~26~~ 19 percent increase in the Central Subway Corridor employment is projected by 2030 (see also Figure 1-2). In contrast, in the North Beach area to the immediate north of the Central Subway Corridor, population is expected to decline by 13 percent, while the employment is projected to increase by only six percent.[5] The rate of population increase in the Central Subway Corridor is far greater than the City as a whole, which is expecting a 20 percent population increase. The ~~26~~ 19 percent employment increase in the Central Subway Corridor is slightly lower than the projected citywide employment growth of 28 percent over the same period. Much of the population and employment growth would result from ongoing development in the Mission Bay Area, and projected development in the South of Market Area, which the Central Subway Project would traverse.

TABLE 1-1

POPULATION AND EMPLOYMENT PROJECTIONS

2000 AND 2030

	Population				Employment			
Area	**2000**	**2030**	**Difference**	**% Change**	**2000**	**2030**	**Difference**	**% Change**
Central Subway Corridor	52,160	~~80,690~~ 96,040	~~28,530~~ 43,880	~~55%~~ 84%	280,690	~~352,490~~ 335,030	~~71,800~~ 54,340	~~26%~~ 19%
North Beach Variant	12,120	10,510	(1,610)	(13.3%)	6,100	6,490	390	6.4%
SF	776,730	935,050	158,320	20%	636,670	815,680	179,010	28.0%

Source: San Francisco County Transportation Authority Model, based on Transportation Analysis Zone (TAZ) data derived from 2000 Census Tract information.

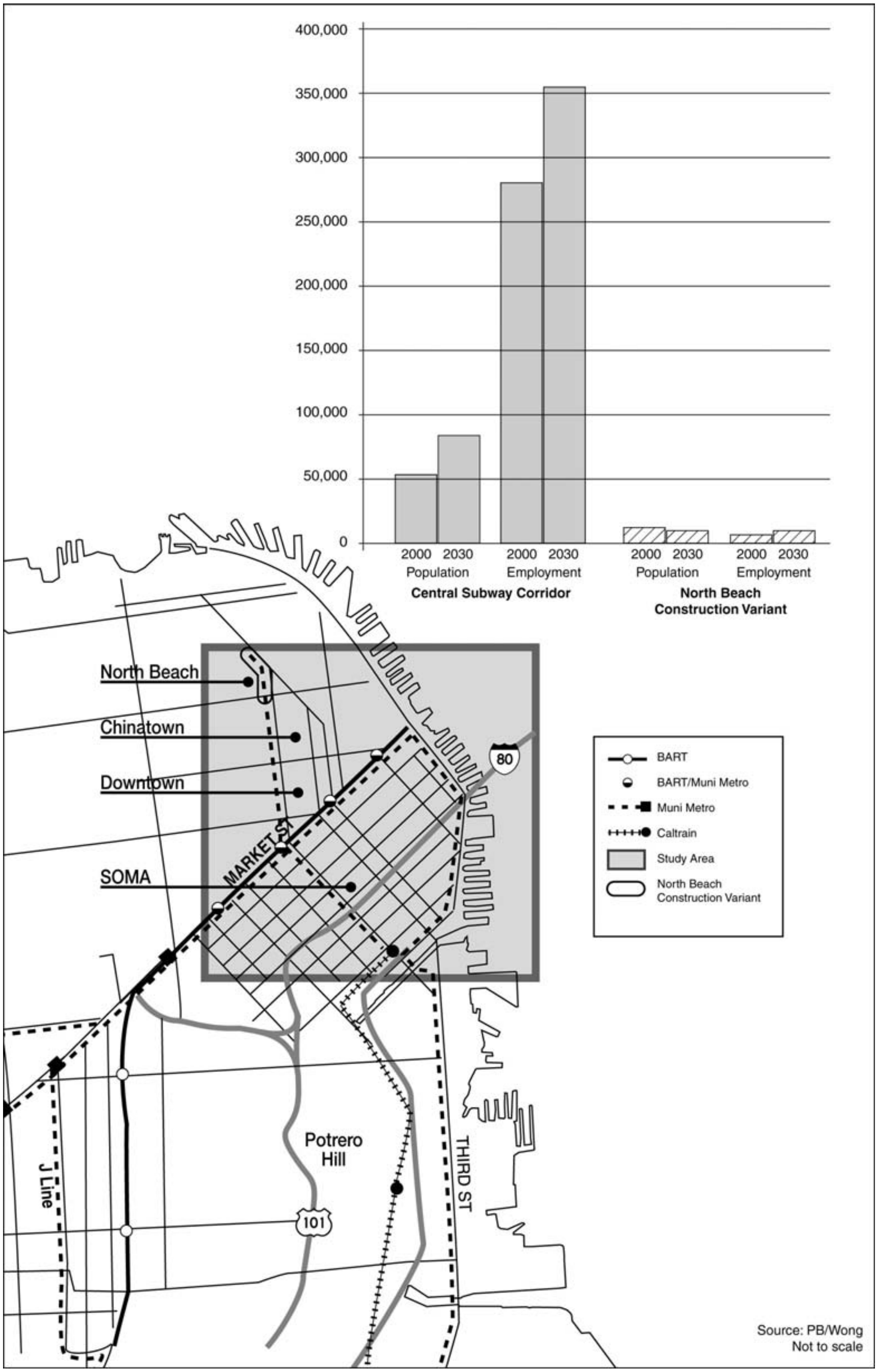
Note: Central Subway is defined by the MTC Travel Analysis Zones(and Census Tracts) that are included in the Study Area identified in Figure 1-2. This includes Census Tracts 113, 114, 117, 118, 119, 121, 123, 125, 176.01, 176.02, 178, 179.01, and 180. The North Beach Tunnel Construction Variant is defined by the MTC Transportation Analysis Zones and Census Tracts 106 and 107. There are minor differences between TAZ and Census Tract information.

4 San Francisco Transportation Authority, *Four Corridor Plan*, June 1995.

5 North Beach would not be served by the Central Subway. A construction variant is being considered that would extend the tunnel to North Beach to remove tunneling machines.

FIGURE 1 – 2

STUDY AREA POPULATION AND EMPLOYMENT



Development resulting from other plans that have recently been adopted or are still in the planning phase, may also create increased travel demand in the Corridor.

These plans are:

- Mid-Market Redevelopment Plan
- Eastern Neighborhood Community Plan (which includes the East South of Market Area)
- Proposed Transit Center District Plan (Transbay Terminal) and the Fourth/King Railyards Plan [6]

In addition, the Bayview and Hunters Point neighborhoods served by the T-Third Line (Phase 1 of the Third Street Light Rail Project), to the south of the Central Subway Project, will continue to grow and increase trips in the Central Subway Corridor. More information about these development proposals and the Redevelopment Plan is presented in Section 4.1, Land Use.

The rapid growth in the Central Subway Corridor would affect travel demand correspondingly. Table 1-2 indicates that daily trips in the Corridor are expected to increase by 20 percent by 2030. For Mission Bay, total trips would increase by over 381 percent by 2030 given the present development scenario. In combination with the increase in trip generation expected to occur in the Third Street Corridor and south of the City, travel demand in the southeastern and northeastern parts of the City, if not accommodated on transit, would compound congested conditions on freeways and surface streets in eastern San Francisco. In addition, the increased travel demand would create a greater demand for Downtown parking, which is constrained in accordance with the City's Transit First Policy.

TABLE 1-2

COMPARISON OF 2000 AND 2030 DAILY PERSON TRIPS

Area	2000	2030	Difference	% Change
Central Subway	1,095,270	1,314,630	219,360	20%
Mission Bay	35,900	172,620	136,720	381%
SF	4,868,620	5,813,730	945,110	19%

Note: Transit patronage estimates used the San Francisco County Transportation Authority travel demand model (San Francisco Model). Population and employment assumptions are based on ABAG Projections, 2003.

Source: San Francisco Transportation Authority Travel Demand Model and Joe Castiglione, February 2007.

[6] In December, 2006, the San Francisco Planning Department initiated planning for the Transit Center District Plan and the Fourth/King Railyards. The Transit Center District Plan will recommend new planning policies and controls for land use, urban form, design, and public improvements for the area around the Transbay Terminal. The Fourth/King Railyards Plan will produce policies, conceptual site plans, and implementation strategies for air-rights development of the rail yards at the Caltrain Terminal.

1.3.4 PROJECTED INCREASES IN 2030 TRAFFIC CONGESTION IN THE CORRIDOR

As a result of the projected population and employment growth along the Central Subway and Third Street Corridors, traffic congestion on major highways and arterials, particularly Highway 80, Highway 280, and Third Street is expected to increase substantially. In the 2030 p.m. peak period, the intersections at Third and King Streets, Fourth and King Streets, and Sixth and Brannan Streets would all operate at Level of Service (LOS) F, with the average seconds of delay increasing considerably at each of these intersections resulting in longer queues (see Figure 1-3). The anticipated congestion will lengthen current operating times for transit in the Corridor, where major trunk lines currently travel in mixed traffic through Downtown and Chinatown.

1.3.5 INTEGRATION OF TRANSPORTATION IMPROVEMENTS WITH COMMUNITY REVITALIZATION ALONG THE CENTRAL SUBWAY CORRIDOR

The Chinatown commercial district along Stockton Street, includes many small neighborhood-serving shops and services. The loss of the Embarcadero Freeway, damaged by the 1989 Loma Prieta Earthquake, severed connections to and from Chinatown via the regional roadway network. This reduction in vehicular access has had an affect on the economic vitality of Chinatown and prompted community leaders to advocate for transit and other access improvements to the area. The Central Subway Project is seen as a key to reestablishing a high level of regional and citywide access to Chinatown and also providing an opportunity to reinvigorate Stockton Street. The *Chinatown Area Plan* of the City's *General Plan* addresses this problem by calling for the integration of transit- and pedestrian-oriented improvements in Chinatown.[7]

There are similar goals of integrating transit with commercial and residential activities along Fourth Street, as documented in the October 2006 Draft *East SOMA Area Plan*.[8] The draft Plan recommends policies that would support conservation and development of the neighborhood with a goal to improve the physical environment and create a more livable neighborhood. This includes the improvement and expansion of transit connections. Specifically, the Plan acknowledges the possibility of a Central Subway Project on Fourth Street, requesting consideration of a stop on Fourth Street between Brannan and Bryant Street. This stop would support new development anticipated in the *East SOMA Area Plan*.

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7 San Francisco Planning Department, Chinatown Area Plan, last revision July, 1995.
8 San Francisco Planning Department, *Draft East SOMA Area Plan*, October 3, 2006.

FIGURE 1-3

CENTRAL SUBWAY AND THIRD STREET CORRIDOR PROJECTED 2030 LEVEL OF SERVICE (LOS) AT VARIOUS LOCATIONS

Source: PB/Wong
Not to scale

1.3.6 AIR QUALITY ISSUES

The San Francisco Bay Area Air Basin is designated as a state non-attainment area and as a marginal federal non-attainment area for ozone.[9] The Bay Area Air Quality Management District (BAAQMD) in cooperation with the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG) has prepared the Bay Area 2005 Ozone Strategy to meet the State requirements. The strategy includes measures that encourage cities and counties in the air basin to develop and implement local plans, policies, and programs to reduce automobile use and to improve air quality. San Francisco has also adopted a "Climate Action Plan" to reduce greenhouse gas emissions (chiefly carbon dioxide) that includes goals for reducing vehicle trips by encouraging a shift to alternative modes, including public transit.

1.4 PROJECT GOALS AND OBJECTIVES

The goals and objectives for the Central Subway Project are based on the goals originally established in the *Bayshore Transit Study for the Third Street Light Rail Project*.[10] These goals are also consistent with the San Francisco *Downtown Plan* and *General Plan* and the San Francisco County Transportation Authority's *Four Corridor Plan*.[11, 12] They also conform to FTA guidelines for evaluating the worthiness of proposed major transit capital investment projects. Prior to 1991, FTA evaluated major transit investment projects primarily on their cost effectiveness and their degree of local financial support. The FTA guidelines have been subsequently updated as part of the 1991 federal Intermodal Surface Transportation and Efficiency Act (ISTEA) and the 2005 SAFETEA-LU to include performance measures as major considerations in the evaluation of proposed capital investment for transit projects. Further modifications to FTA guidelines were initiated in 1997 and again in 2006 as part of the Section 5309 New Starts Criteria. The guidelines added access and mobility improvements, environmental benefits (particularly air quality and energy use reduction), cost-effectiveness, transit system operating efficiencies, such as changes in operating cost per passenger mile, transit-supportive land use, promotion of economic development, and local financial commitment. Measures are developed for each criterion for the purpose of comparing project alternatives.

The seven principal goals, that Muni identified for the overall Third Street Light Rail Project to guide the evaluation of alternatives, are still applicable to the Phase 2 Central Subway Project. They are:

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9 Designation as a non-attainment area means that state and/or federal air quality standards have not been met. Based on data collected at Bay Area air quality monitoring stations by the California Air Resources Board, the EPA classified the Bay Area as a marginal non-attainment area for federal ozone eight-hour standards on April, 15, 2004.

10 San Francisco Municipal Railway, *Bayshore Transit Study Final Report*; December 1993. Available in Project File 96.281E at the San Francisco Planning Department, 1650 Mission Street, San Francisco.

11 San Francisco Planning Department, *General Plan*,. San Francisco Planning Department, *Downtown Plan*, last amendment May, 2005.

12 San Francisco Transportation Authority, June 1995, *Four Corridor Plan*; available for review in Project File 96.281E at the San Francisco Planning Department, 1650 Mission Street, San Francisco.

1. Travel and Mobility Goal Improve transit service to, from, and within the Central Subway Corridor, thereby enhancing the mobility of Central Subway Corridor residents, business people and visitors.
2. Equity Goal**.** Bring transit service in the Central Subway Corridor to the level and quality of service available in other sections of the City.
3. Economic Revitalization/Development Goal Design transportation improvements that support economic revitalization and development initiatives within the South of Market, Downtown and Chinatown Study Area.
4. Transit-supportive Land Use Goal Ensure compatibility with City land use plans and policies and transportation improvements so that transit ridership can be maximized and the number of auto trips reduced.
5. Environmental Goal Provide transit improvements that enhance and preserve the social and physical environment and minimize potential negative impacts during construction and operation of the line.
6. Financial Goal Implement transit improvements that provide for the efficient use of limited financial resources and are cost-effective.
7. Community Acceptance and Political Support Goal Provide a transportation system that reflects the needs and desires of Central Subway Corridor residents and business people and is compatible with the City's planning initiatives.

Each goal has associated objectives, presented in Table 1-3. These goals and objectives are consistent with those presented in the 1998 FEIS/FEIR, but have been revised to specifically focus on the Central Subway Project. The objectives can be measured by employing evaluation criteria that: 1) are quantitative rather than qualitative, to the extent possible; 2) use publicly available information generated as part of this environmental evaluation or from previous related studies; 3) provide perspective on the magnitude of potential impacts as well as the differences between the alternatives; and 4) are expressed in terms that can be understood by decision-makers and the general public.

The evaluation of the Central Subway Alternatives using these goals and objectives for comparison is presented in Chapter 9.0.

TABLE 1-3

GOALS AND OBJECTIVES SUMMARY

TRAVEL AND MOBILITY GOAL
Objective 1: Increase Transit Ridership
Criteria: comparison of daily linked transit trips and percent changes in transit boardings and passenger-miles

TABLE 1-3

GOALS AND OBJECTIVES SUMMARY

traveled per transit market
Objective 2: Improve Service Reliability Criteria: exclusive or semi-exclusive rights-of-way for transit
Objective 3: Reduce 2030 Transit Travel Time Criteria: travel time comparisons between selected origin-destination pairs
Objective 4: Improve Transit Operating Speed in Downtown/South of Market Criteria: average operating speed for transit improved
Objective 5: Enhance the Opportunity to Expand Muni's Light Rail System Criteria: compatibility with the San Francisco Transportation Authority's Four-Corridor Plan
EQUITY GOAL
Objective 1: Improve Access to Downtown Employment Opportunities Central Subway Criteria: comparison of travel time from Fourth/King to Market/Third/Fourth
Objective 2: Improve Access to Chinatown Central Subway Criteria: comparison of travel time between Fourth/King and Stockton/Washington
ECONOMIC REVITALIZATION GOAL
Central Subway Objective 1: Maintain Auto and Truck Access along the Central Subway Corridor Central Subway Criteria: curb parking supply and on-street loading zones on or near Third/Fourth Street and Stockton Street maintained
Central Subway Objective 2: Maintain Adequate Transit and Vehicular Circulation in the Fourth Street and Chinatown (Stockton Street) Commercial Districts Central Subway Criteria: maintain Stockton Street peak period level of service and average transit operating speed
Central Subway Objective 3: Opportunities for Revitalization along the Central Subway Corridor Adjacent to Transit Stops Central Subway Criteria: identify locations for redevelopment opportunities adjacent to transit stops
Central Subway Objective 4: Enhance Urban Design/Streetscape Improvements along Third and Fourth Streets in South of Market Central Subway Criteria: identify areas for urban design/landscape treatments in the Third and Fourth Street commercial areas
TRANSIT-SUPPORTIVE LAND USE GOAL
Objective 1: Support the Coordination of Land Use and Transportation Planning Criteria: compliance with city-wide and area-specific land use plans related to the corridor
Objective 2: Serves Major Activity Centers in the Corridor Criteria: number of activity centers having direct access to transit

ENVIRONMENTAL GOAL
Objective 1: Minimize Permanent Displacement of Homes and Businesses Criteria: number of property acquisitions that displace homes or businesses
Objective 2: Minimize Impacts on Parklands/Cultural Resources Criteria: number of affected sites
Objective 3: Minimize Air Quality Impacts Criteria: pollutants pounds per day
Objective 4: Minimize Adverse Construction Impacts Criteria: number and length of time of blocked streets/blocked truck access/displaced parking
Objective 5: Provide Environmental Benefits to the Community Criteria: number of environmental benefits identified
FINANCIAL GOAL
Objective 1: Develop a Viable Financial Plan to Cover Total Capital Costs for the Alternatives Criteria: capital costs compared with available and projected capital funding
Objective 2: Develop a Viable Financial Plan to Cover Total Annual Operating/Maintenance Costs (System-wide) Criteria: annual operating/maintenance costs compared with available and projected local funding
Objective 3: Maximize Transit Operating Efficiency While Accommodating 2030 Demand Criteria: operating cost per passenger (linked trips), per bus-hour, and per train-hour
COMMUNITY ACCEPTANCE GOAL
Objective 1: Gain Community Support for the Preferred Investment Strategy
Objective 2: Gain City Support for the Preferred Investment Strategy
Objective 3: Gain Support from Appropriate Regional, State, and Federal Agencies

2.0 ALTERNATIVES

Under the National Environmental Policy Act (NEPA) an EIS should provide a full and fair discussion of significant impacts and inform decision-makers and the public of reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment (40 C.F.R. 1502.1). The Alternative's Section of the document shall: "a) rigorously explore and objectively evaluate all reasonable alternatives and, for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated" and "b) devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits." (Source: 43 FR 55994, 1978, CEQ Regulations Section 1502.14)

Under the California Environmental Quality Act (CEQA), an EIR should focus on those alternatives that are capable of avoiding or substantially lessening any significant effects of the project (Public Resources Code 21002.1; CEQA Guidelines 15126.6). Under both NEPA and CEQA, the alternatives considered should meet the Purpose and Need as defined in Section 1.0.

The proposed Central Subway Build Alternatives are shown in Figure 2-1. This chapter describes these alternatives and the development process and screening of alternatives by the community and local agency representatives.

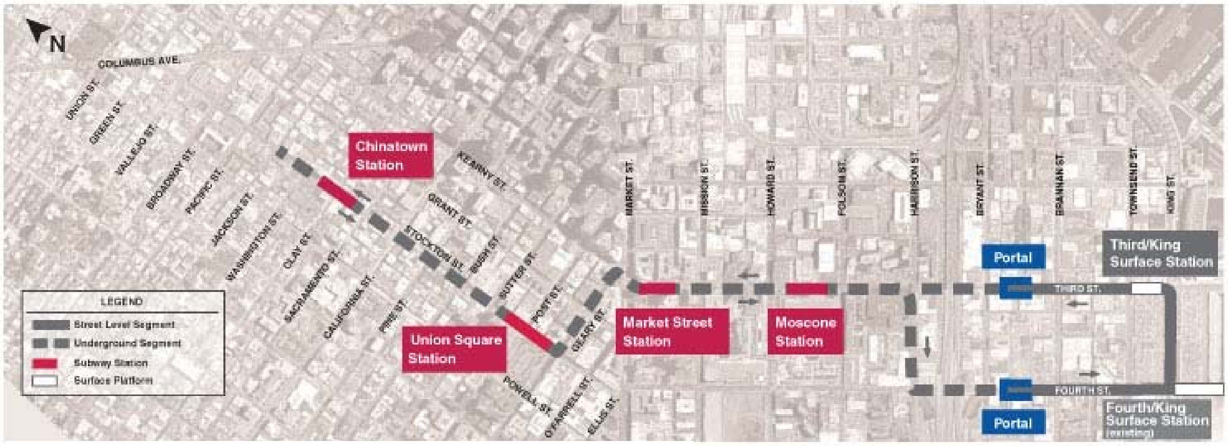
2.1 ALTERNATIVES TO BE ANALYZED IN THE SEIS/SEIR

On June 7, 2005, the Municipal Transportation Agency (MTA) designated the Fourth/Stockton Alignment with a combined double-track portal on Fourth Street between Townsend and Brannan Streets as the Locally Preferred Alternative (Alternative 3A). In response to public input during the 2005 Scoping process and technical recommendations from a Peer Review Panel<u>, and in order to reduce the cost of the project,</u> a new design (Alternative 3B) was subsequently developed for the Fourth/Stockton Alignment. The three alternatives to be analyzed, including design options, are summarized below.

- **Alternative 1 - No Project/TSM:** Includes the projects programmed in the financially constrained Regional Transportation Plan (RTP) including the T-Third Line (formerly Initial Operating Segment - IOS) and associated bus changes. This alternative is required as part of the environmental document by both NEPA and CEQA.
- **Alternative 2 - Enhanced EIS/EIR Alignment:** This alternative is the same alignment along King, Third, Harrison, Fourth, Kearny, Geary, and Stockton Streets as presented in the 1998 FEIS/FEIR with a shallow subway crossing of Market Street at Third Street, modified to include the addition of

FIGURE 2-1

CENTRAL SUBWAY BUILD ALTERNATIVES



ALTERNATIVE 2: Enhanced EIS/EIR Alignment

ALTERNATIVE 3 (Option A LPA): Fourth/Stockton Alignment

ALTERNATIVE 3 (Option B Modified LPA): Fourth/Stockton Alignment

Source: PB/Wong
Not to scale

above-ground emergency ventilation shafts, off-sidewalk subway station entries, and the provision of a closed barrier fare system. This alternative includes one surface platform at Third and King Streets and four subway stations at Moscone, Market Street, Union Square, and Chinatown.

- **Alternative 3 - Fourth/Stockton Alignment**: This alignment would be exclusively on Fourth and Stockton Streets with a deep subway crossing of Market Street and two design options:
  - Option A (LPA) with a double-track portal on Fourth Street between Townsend and Brannan Streets and three subway stations at Moscone, Union Square/Market Street, and Chinatown, or
  - Option B (Modified LPA) with a double-track portal on Fourth Street between Bryant and Harrison Streets, three subway stations at Moscone, Union Square/Market Street, and Chinatown and a surface platform on Fourth Street just north of Brannan Street. This option also evaluates two sub-options with mixed-flow or semi-exclusive rail operation on the surface of Fourth Street.

On February 19, 2008, the MTA, subsequent to publication of the Draft SEIS/SEIR, endorsed Alternative 3B as the LPA.

2.1.1 ALTERNATIVE 1 - NO PROJECT/TSM

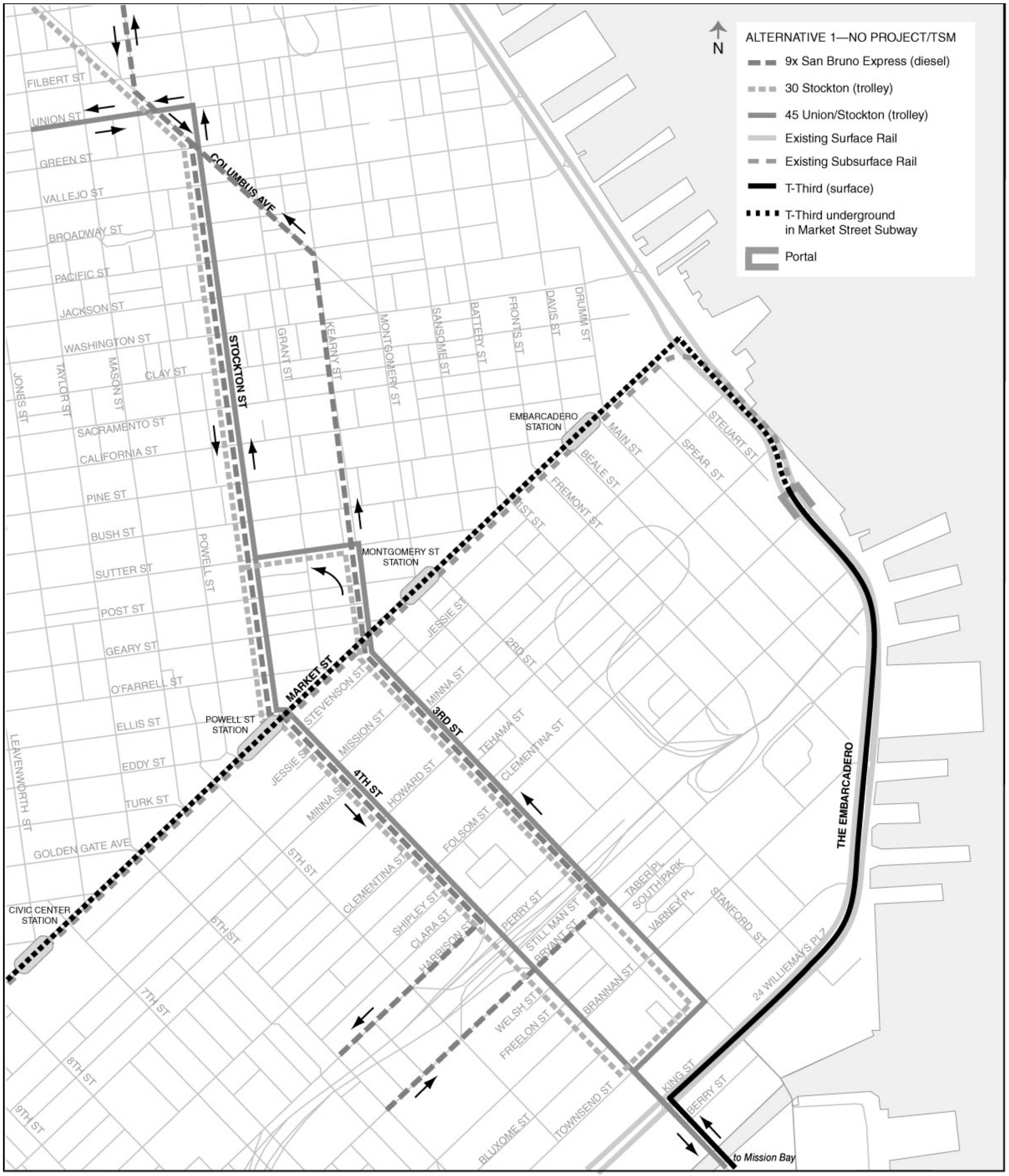
This alternative serves as a 2030 Baseline for comparison with other alternatives. It includes the following key elements that are proposed to be in place by 2030 (see Figure 2-2):

- programmed projects in the approved and financially constrained Regional Transportation Plan (RTP);
- operation of the T-Third line, which opened for passenger service in April 2007 as an extension of the ~~Castro Shuttle~~ K-Ingleside to Visitacion Valley, with associated restructured bus service in Visitacion Valley at the south end of the corridor and bus connections in Chinatown/North Beach at the north end;
- extension of the N-Judah from its existing terminus at Caltrain at King and Fourth Streets to an existing turnaround loop at 18th, Illinois, and 19th Streets, to provide additional service to the UCSF and Mission Bay development.

A No Project Alternative and a No Build/TSM Alternative were independently analyzed in the 1998 FEIS/FEIR. The No Build/TSM Alternative was different from the No Project Alternative and assumed that bus service would increase by about 80 percent by 2015 to meet demand. Among other bus changes, increased frequencies on the 15-Third diesel bus line and a new 15-Third short line between Chinatown and the Central Waterfront were proposed. (The 15-Third bus was discontinued in April 2007.) A new bus maintenance facility to accommodate an additional 27 diesel coaches and 6 trolley coaches was also part of the 1998 No Build/TSM Alternative.

FIGURE 2-2

ALTERNATIVE 1 – NO PROJECT/TSM



Source: PB/Wong
Not to scale

Since implementation of the T-Third line, the Project Purpose and Need have not changed. As bus service is already provided at three minute frequencies or better for much of the Central Subway Corridor and the streets, particularly Stockton Street, are operating at capacity, it would be difficult to introduce additional bus service as a viable TSM alternative. The No Project and TSM Alternative are combined for this SEIS/SEIR.

In conformance with CEQA guidelines, the No Project/TSM Alternative represents the scenario in which the existing transportation system remains unchanged except for the modifications that are already programmed to be implemented in the Third Street/Central Subway Corridor. The 2030 No Project/TSM Alternative, therefore, includes the existing roadway system, the existing Muni route network, fleet size and mix, facilities, and service frequencies (except those as noted below) and the projects programmed in the Muni Short Range Transit Plan and the RTP. The existing roadway system, Muni route network and fleet characteristics are described in Section 3.0.

The No Build/TSM Alternative includes the following bus service frequency changes that would be implemented by 2030 in conjunction with the introduction of the T-Third line service:

- **30-Stockton long line** (terminus at Beach and Broderick Streets):
  - Weekday, midday service frequencies would be improved from nine to seven and a half minutes, and evening service frequencies would be improved from twelve to ten minutes;
  - Saturday, service frequencies would be improved in the evening from twelve to nine minutes;
- **30-Stockton short line** (terminus at Van Ness Avenue and North Point Street):
  - Weekday, midday service frequencies would be reduced from a range of four to five minutes to seven and a half minutes, p.m. peak service frequencies would be reduced from a range of four to five minutes to nine minutes, and evening service frequencies would be improved from twelve to ten minutes;
  - Saturday, service frequencies would be reduced in the midday from a range of three to six minutes to six minutes, and improved in the evening from twelve to nine minutes;
  - Sunday, midday service frequencies that now range from four to eight minutes would be set at six minutes, while evening frequencies would be improved from twelve to nine minutes;

- **45-Union/Stockton line:**
  - Weekday, a.m. and p.m. peak service would be improved from nine to eight minutes, and evening service frequencies would be improved from fifteen to ten minutes;
  - Sunday, service frequencies would be reduced in the evening from twelve to fifteen minutes.

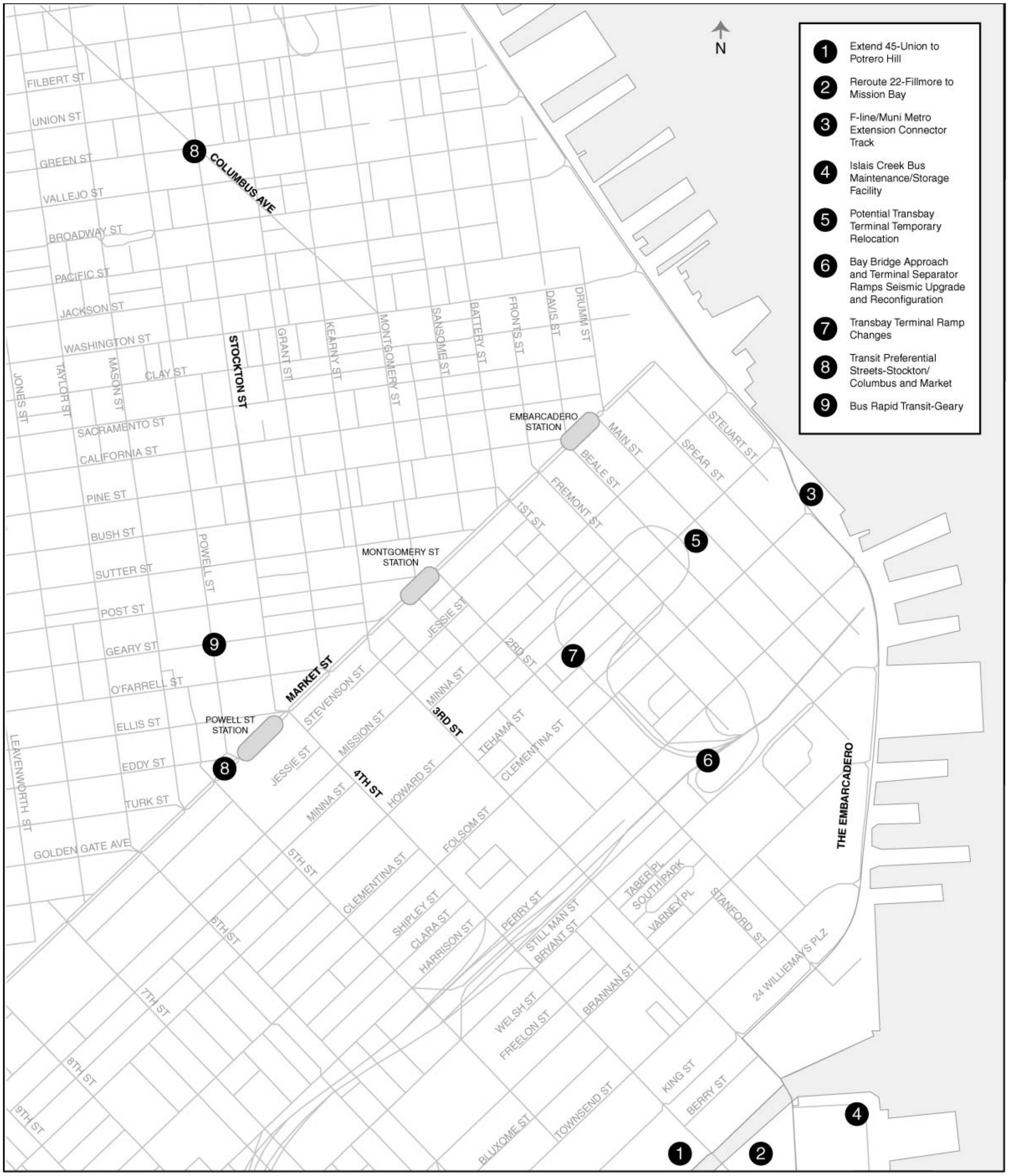
Programmed Transit and Roadway Improvements

Transit improvements currently under construction or planned for the future will be in place by the time that the Project is implemented. These improvements are part of the base transit network for the No Project/TSM Alternative and all of the Build Alternatives. These improvements include: new fare gates in the Market Street Subway, the construction of the new Metro East Light Rail Facility (scheduled for completion in 2008), and the replacement of existing facilities and equipment at the end of their life cycle. Other Muni service improvements that are programmed for implementation in the Central Subway Corridor are identified in the Short Range Transit Plan and/or the RTP and are part of the No Project/TSM Alternative. They are listed below, and those located in the Downtown area north of Mission Bay, are indicated in Figure 2-3.

- 45-Union/Stockton and 22-Fillmore: When demand warrants, the 45-Union/Stockton trolley bus line will be extended from Fourth and Townsend Streets through Mission Bay and Potrero Hill to a new terminus at Third and 20th Streets, replacing 22-Fillmore service in Potrero Hill. At the same time, the 22-Fillmore will be rerouted through Potrero Hill along 16th Street to Third Street, in accordance with the Mission Bay Plan. This extension of trolley service will serve the new Mission Bay and UCSF development.
- F-line/Muni Metro Extension Connector Track. As part of the Mid-Embarcadero Roadway project, a connector track was installed in the median of The Embarcadero roadway from south of the Ferry Building to Folsom Street. The connector track links the F-line with the Muni Metro Extension. This new track permits F-line vehicles to operate to the Giants Ballpark, however, no regular service is planned at this time.
- Bus Rapid Transit (BRT). The Geary Corridor is one of the identified corridors for BRT implementation and planning work is underway.
- Transit Preferential Streets (TPS) Improvements. Corridors identified for TPS improvements are Stockton Street/Columbus Avenue and Market Street.

FIGURE 2-3

NO PROJECT/TSM ALTERNATIVES TRANSIT AND ROADWAY IMPROVEMENTS



Source: PB/Wong
Not to scale

- Islais Creek Bus Maintenance and Storage Facility. In 2008, Muni will begin construction of a new bus maintenance facility at Indiana and Tulare Streets to replace Kirkland Division. The $73 million facility will be situated on a 5.3 acre site that can accommodate a maximum of 165 standard diesel buses. Running and heavy repair functions will be performed at this facility when it becomes operational in 2010.
- BART System Upgrades. This project would improve station access, expand station capacity, and introduce new vehicles to the BART core system to reduce existing system constraints. These projects will be incrementally implemented over the next 20 years.
- Transbay Terminal Muni Bus Facility Relocation. The Transbay Joint Powers Authority, an agency composed of representatives of the City, AC Transit, and CalTrain has approved a project to replace the Transbay Terminal at its existing site. The new facility would accommodate Muni buses as well as AC Transit, SamTrans, Golden Gate Transit and would be capable of accommodating a future Caltrain Peninsula Rail Service and possible high speed rail. During construction of the Transbay Terminal facility, Muni bus service would be temporarily relocated to a site south of Howard Street and between Main and Beale Streets. The first phase of the Transbay Terminal improvements is included in the Metropolitan Transportation Commission's RTP.

The No Project/TSM Alternative also includes roadway improvements in the Corridor that are underway or committed for implementation (refer to Figure 2-3). They are:

- Bay Bridge Approach and Terminal Separator Ramps. Caltrans is providing seismic upgrades to the Bay Bridge west approach structure and rebuilding the Terminal Separator ramps. Expected completion date is 2013.
- Integrated Transportation Management System (ITMS). The ITMS is operated by DPT's SFgo Program. Two of these corridors, Market Street and Mission Street, cross the Central Subway Project Corridor along Fourth Street. The SFgo Program is currently seeking funding to install fiber optic communication cable along the Market Street corridor, and the timetable for installation of the cable is dependent on when funding is secured. The Mission Street corridor has been planned but has not yet been programmed into any funding mechanism at this time. In addition, fiber optic communications cable would be installed along the Project Corridor on Fourth Street between Market and King Streets. The installation of fiber optics is also being considered along streets in the vicinity of Union Square to provide for changeable message signs in the Union Square Garage. Old

traffic signal equipment including controllers, cabinets, conduits, poles, and signal heads would be replaced at signalized intersections affected by the construction in the Corridor.

- Transbay Terminal Roadway Changes. The new Transbay Terminal facility will provide expanded bus and rail service in a new building on the site of the existing Transbay Terminal at First and Mission Streets. Included in the project improvements are new ramps linking the Transit Center to the Bay Bridge and to the planned off-site Bus Storage facilities.

2.1.2 ALTERNATIVE 2 - ENHANCED EIS/EIR ALIGNMENT

In the Enhanced EIS/EIR Alignment, the 1.75 mile light rail service would operate between Fourth and King Streets and Stockton and Jackson Streets. North of the Fourth and King Street IOS surface platform, the rail would travel east ~~of~~ on King Street in a surface configuration and northbound on Third Street and southbound on Fourth Street, transitioning to a subway operation at portals located between Brannan and Bryant Streets. The service would operate independent of the existing Muni Metro Market Street subway (see Figure 2-4).

This alternative follows the 1998 EIS/EIR (Base Case) Alignment with its shallow crossing of Market Street at Third Street, but also incorporates design changes to meet current fire codes and new Muni fare collection policy. (See Alternative 2 profile in Figures 2-5 and 2-6.) In order to meet current fire codes, above-ground emergency ventilation shafts would be located in off-street right-of-way rather that provided through an in-street ventilation system as originally planned. To address public concerns about pedestrian access and space constraints, most subway station entries have been moved off crowded sidewalks to private or public property and combined wherever possible with vent shafts. A description of the Enhanced EIS/EIR Alignment is provided below.

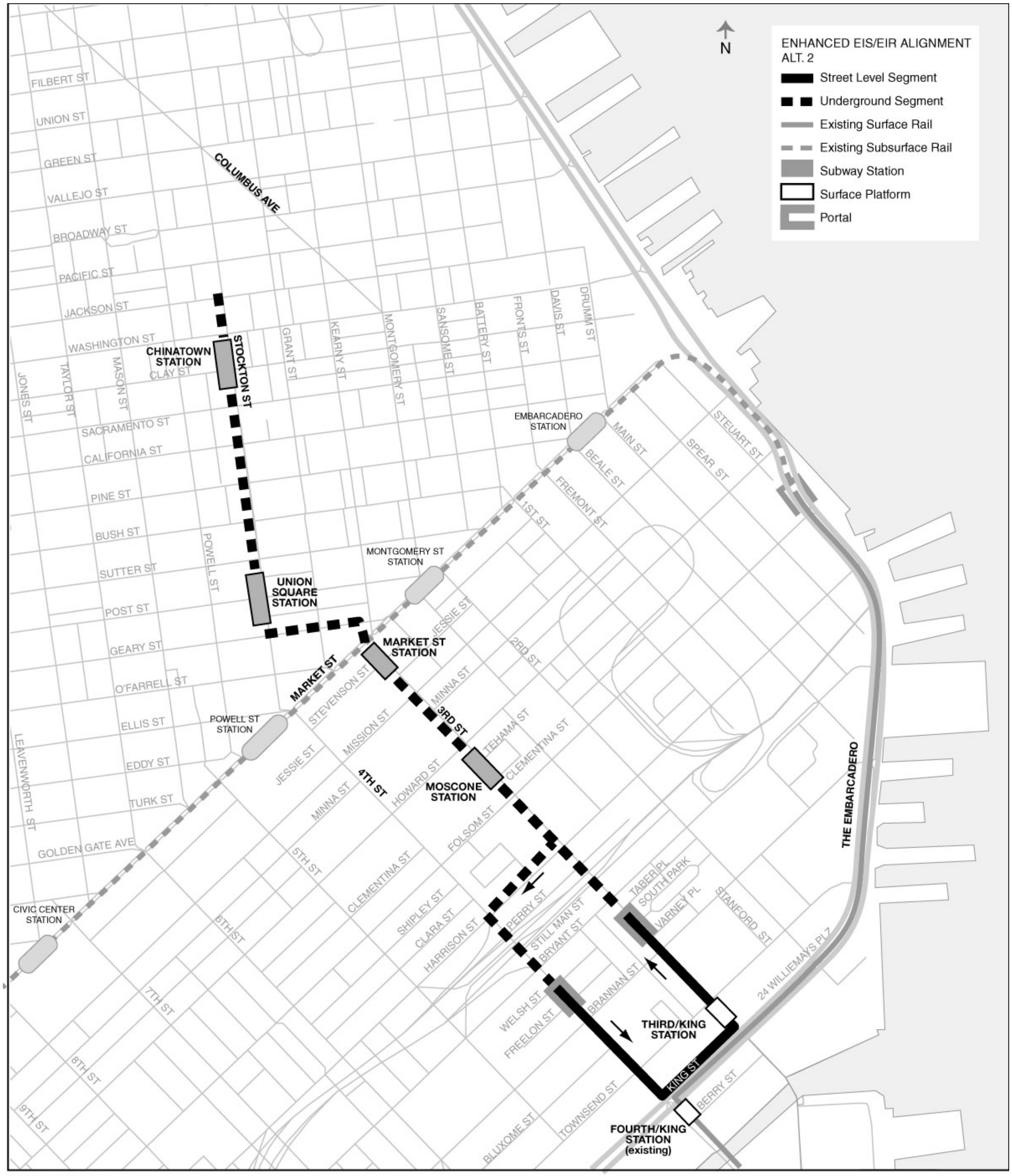
Alignment – Alternative 2

The Enhanced EIS/EIR Alignment would extend the T-Third line north of King Street on Third and Fourth Streets to single-track portals between Brannan and Bryant Streets. This alternative would include a surface station on Third Street across from the ballpark, and four subway stations at Moscone, Union Square, Market Street, and Chinatown.

After stopping at the existing station platform at Fourth and King Streets, light rail vehicles (LRVs) traveling northbound would turn right into the King Street median and follow the Muni Metro Extension tracks to Third Street (refer to Figure 2-4). At Third Street, the northbound track would curve left into

FIGURE 2-4

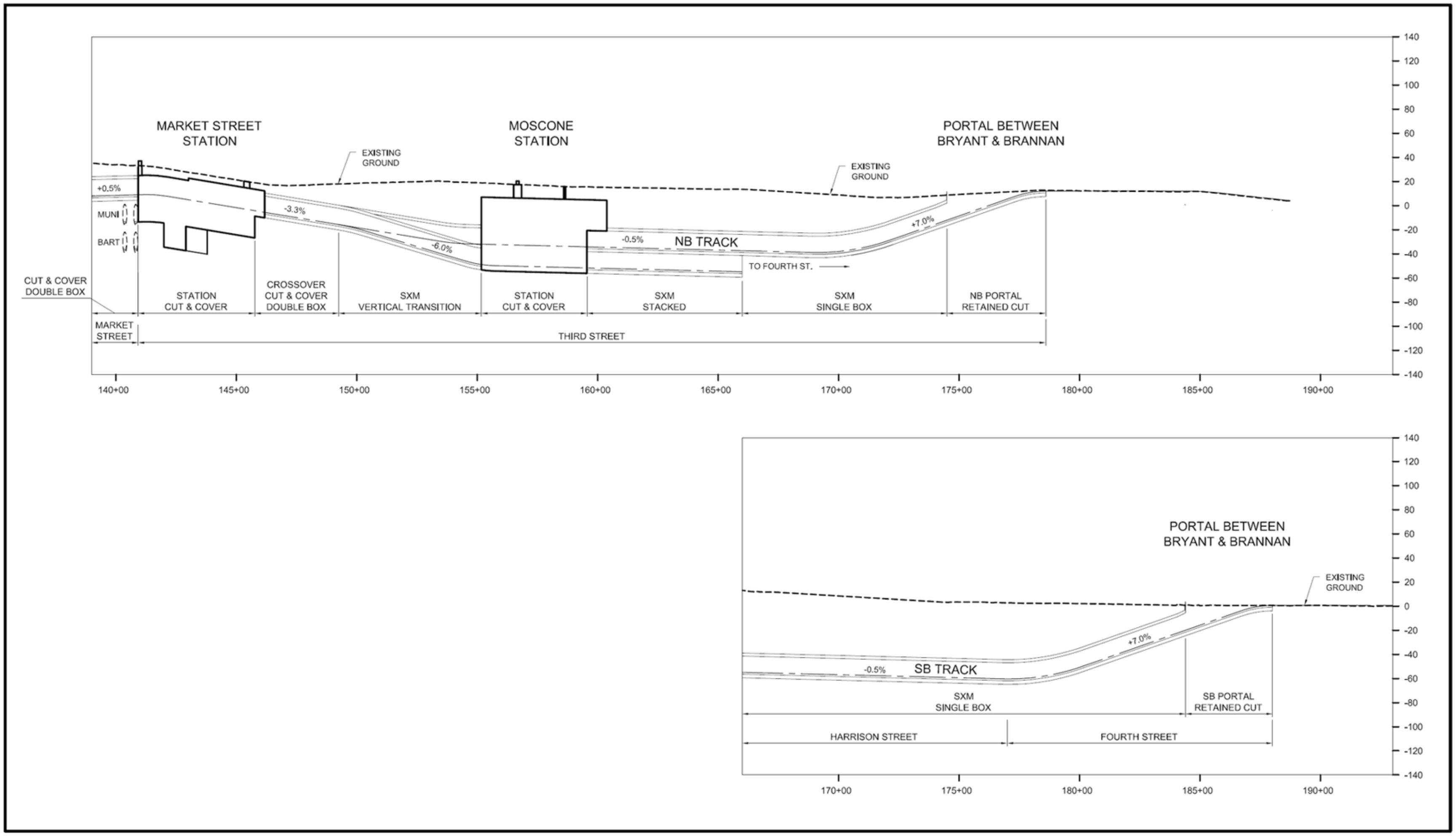
ALTERNATIVE 2 – ENHANCED EIS/EIR ALIGNMENT



Source: PB/Wong
Not to scale

FIGURE 2-5: ENHANCED EIS/EIR ALIGNMENT

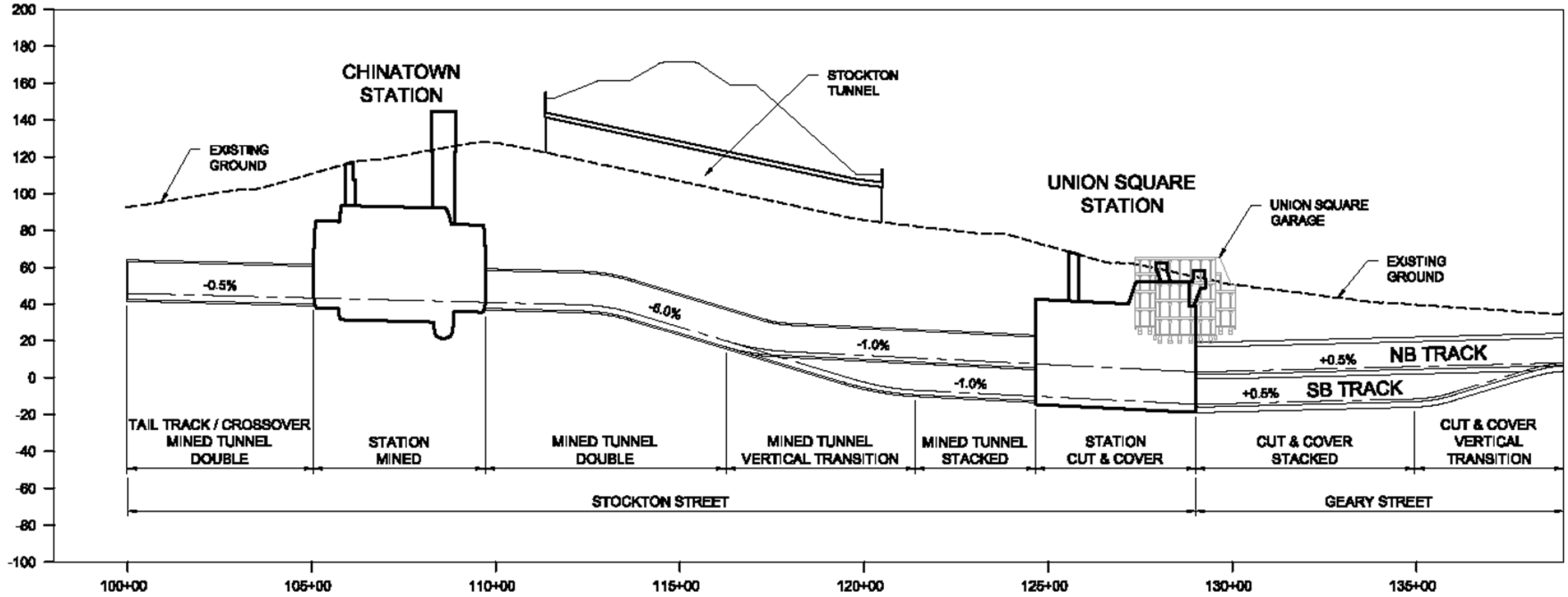
PROFILE BETWEEN FOURTH/KING AND MARKET/THIRD STREETS



Source: PB Wong
Not to scale

FIGURE 2-6: ENHANCED EIS/EIR ALIGNMENT

PROFILE BETWEEN MARKET/THIRD STREET AND STOCKTON/JACKSON STREETS



Source: PB Wong
Not to scale

the curb lane on the west side of Third Street, where a surface station serving the ballpark would be located.

Traffic signals would synchronize the left turn movement of LRVs with left-turning cars and trucks from King Street to Third Street.

North of King Street, LRVs would travel in a semi-exclusive right-of-way northbound on Third Street and southbound on Fourth Street. On Third Street between Townsend and Brannan Streets, the light rail track would be located to the west of three northbound traffic lanes. As LRVs shift into the center of Third Street, north of Brannan Street at the portal, the street configuration would transition to two northbound traffic lanes on each side of the light rail alignment. On Fourth Street between Bryant and Brannan, LRVs would operate with two southbound traffic lanes on each side of the light rail alignment. At Fourth and Townsend Streets, the track would shift slightly to the east to accommodate three southbound traffic lanes west of the tracks and one northbound right turn only traffic lane east of the tracks. The 30-Stockton and 45-Union/Stockton trolley bus lines would continue operation on the east side of Fourth Street, south of Bryant Street, to the Caltrain Terminal west of Fourth Street on Townsend Street. Existing trolley bus stops would be retained on Fourth Street just north of Bryant and Brannan Streets. No major overhead wire relocations would be necessary under this alternative. The bus loading zone would continue to be located on Townsend Street for northbound buses and on Fourth Street adjacent to the Caltrain Terminal for southbound buses. Up to 93 parking spaces would be eliminated between King and Bryant Streets, including 57 of the 92 spaces on Third Street and 36 of the 56 spaces on Fourth Street between Townsend and Bryant Streets. Parking on both sides of Third and Fourth Streets at the portals (Brannan to Bryant Streets) would be eliminated as would all parking on Third Street between King and Townsend Streets.

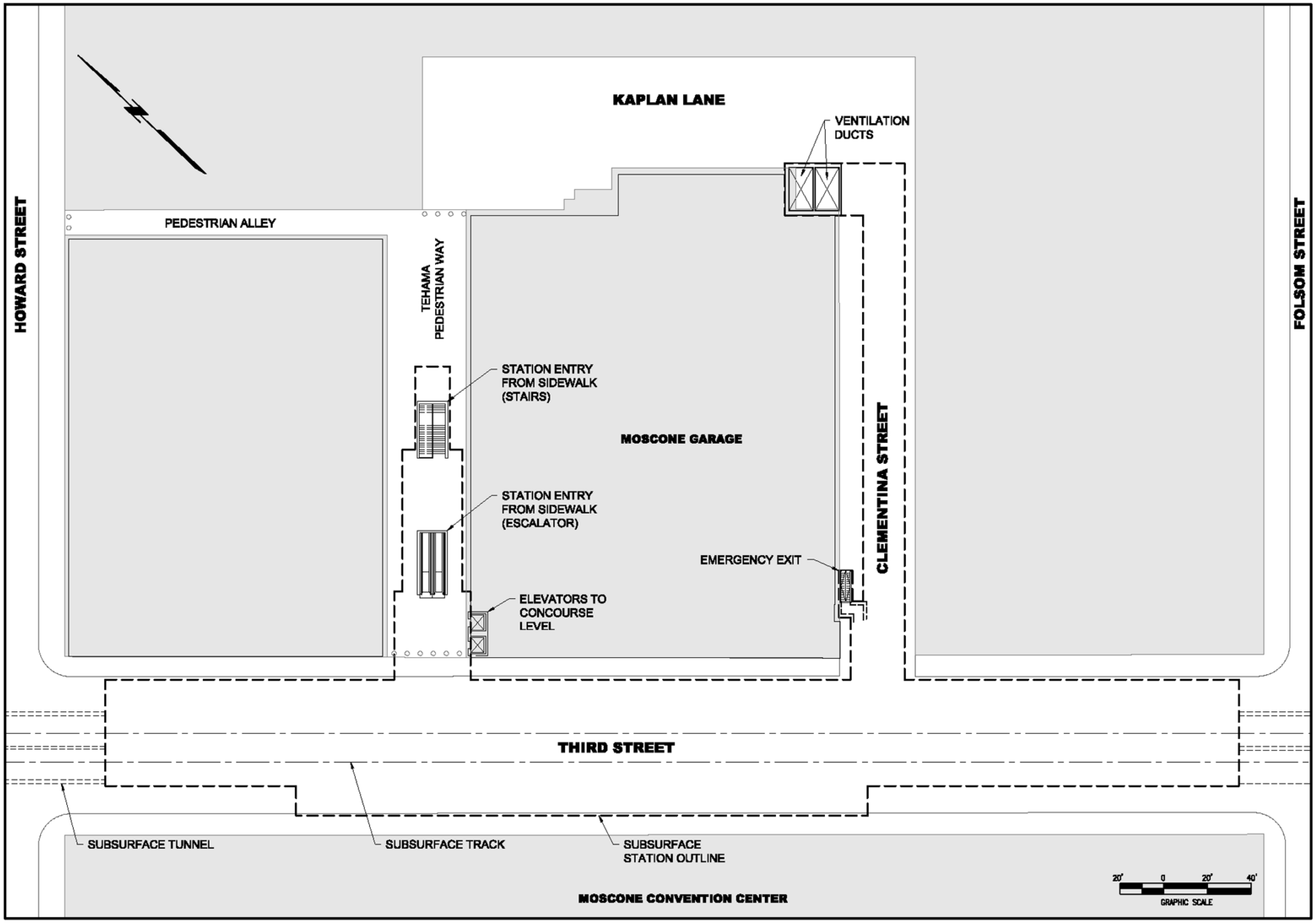
On Third Street, north of Brannan Street, the northbound tracks would enter the subway in a 410-foot long single-track portal structure located in the middle of the street. On Fourth Street, south of Bryant Street, the southbound tracks would exit the subway from a 360-foot single-track portal structure, also located in the street median. Two lanes of traffic would pass on each side of the 18-foot wide single-track portal on both Third and Fourth Streets. The northbound subway would continue under Third Street to Harrison Street. The southbound subway, which would link with the northbound subway at Third and Harrison Streets, would curve under the edge of the property at 425 Fourth Street (Assessor’s Parcel #3762-112) bordering the south side of Harrison Street between Third and Fourth Streets, and then curve north from Harrison Street to Third Street under the property at 370 Third Street (Assessor’s Parcel #3751-157) about 30 feet below the surface for northbound operations with the southbound tunnel running below. Easements would be required under buildings at both locations. Deep (mined) tunneling would be used to avoid affecting the foundations of two buildings located above the subway on Third and Fourth Streets at Harrison Street.

The northbound and southbound subways would converge at Third and Harrison Streets in a stacked configuration with the southbound track located below the northbound track. This configuration was provided to not preclude a future connection of the Central Subway with a possible future Geary subway line traveling under Geary, Kearny, and Third Streets and then east via Folsom Street to the vicinity of the Transbay Terminal. The Geary subway is not analyzed in the Central Subway SEIS/SEIR; the Geary project would be subject to an independent environmental analysis in the future should a project be defined and funding identified. The stacked configuration would continue under Third Street into the Moscone Station located between Folsom and Howard Streets (see Figure 2-7).

Northbound and southbound station platforms would be at two levels and would share a common ~~mezzanine (~~concourse~~).~~ Station access from the surface (stairs/escalators and one elevator) would be permitted only on the east side of Third Street because the presence of truck ramps leading to loading docks underneath the Moscone Center would preclude surface access on the west side of Third Street. The main station entrance (escalators and stairs) would be in the Tehama Pedestrian Way next to retail bays on the north side of the Moscone Garage. One elevator would be located near Third Street and Tehama Pedestrian Way in the northwest corner of the Moscone Garage. Emergency stairs would be provided by a hatch located in the sidewalk off Clementina Street near the southwest corner of the garage. There would be no direct access into the Moscone Center in order to comply with the facility's access control. Two emergency ventilation shafts would extend east of Third Street under Clementina Street, rising along the southeast exterior of the Moscone Garage to a height 16 feet above the garage roof.

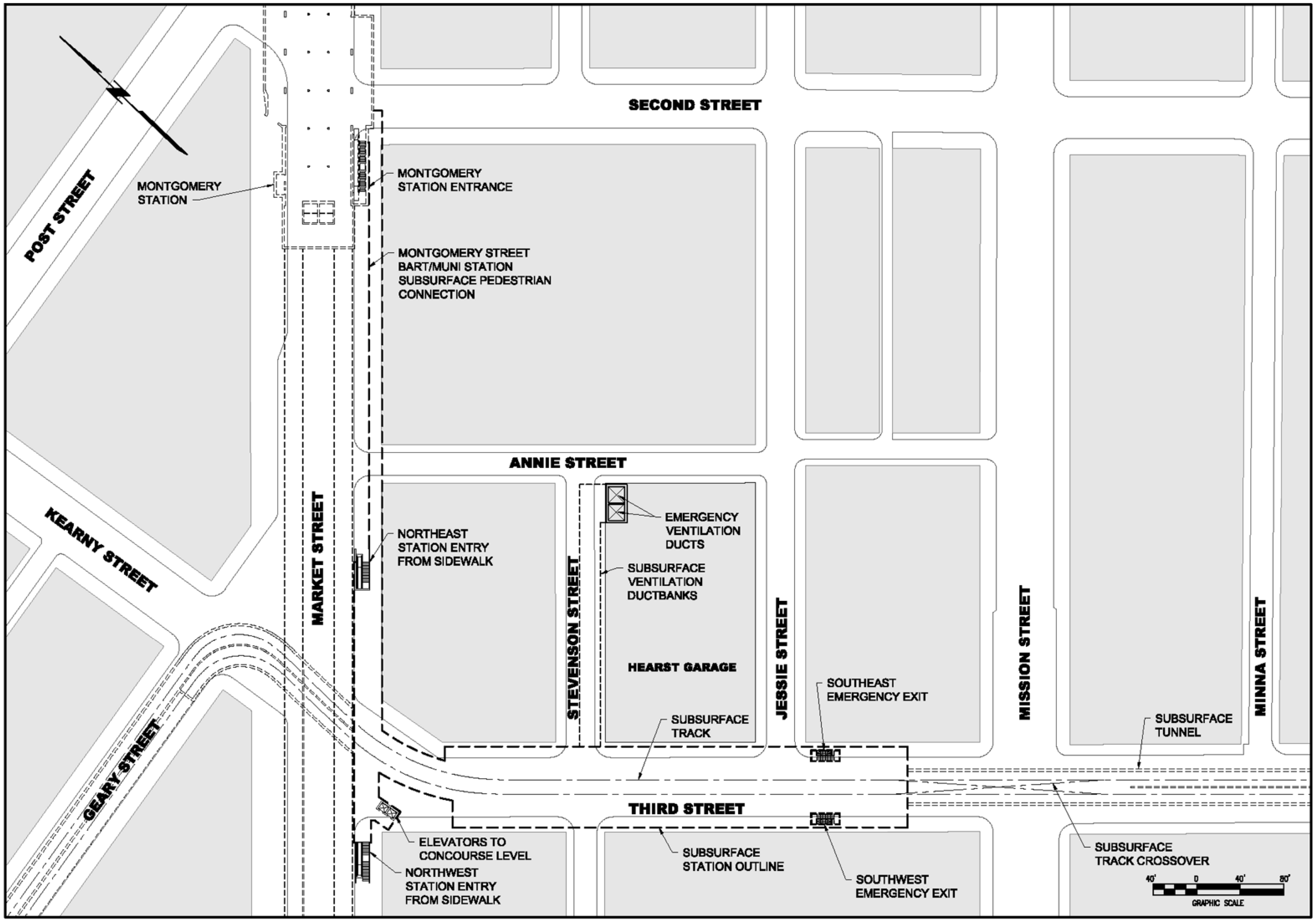
Immediately north of Howard Street, the tracks would ascend and transition to a side-by-side configuration to permit a shallow crossing above the BART/Muni Metro Market Street Subway. The existing BART/Muni Metro Subway is composed of four 18-foot diameter steel plate lined tunnels. The Market Street Station would be located north of Mission Street (see Figure 2-8), linked by an approximately 440-foot long underground pedestrian concourse via Stevenson and Annie Streets to the Montgomery Street BART/Muni Metro Station.

FIGURE 2-7: ENHANCED EIS/EIR ALIGNMENT - MOSCONE STATION



Source: PB Wong

FIGURE 2-8: ENHANCED EIS/EIR ALIGNMENT – MARKET STREET STATION



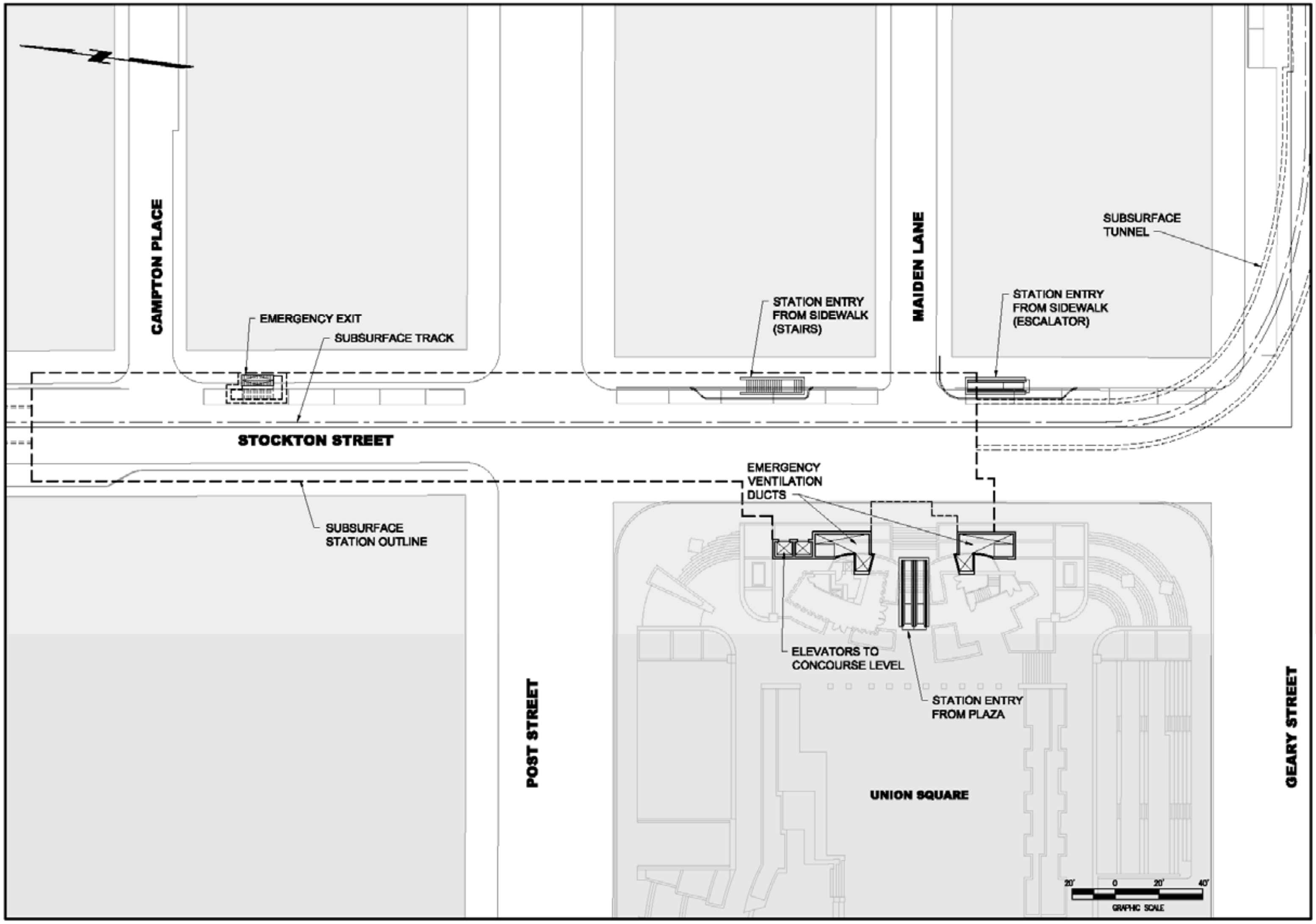
Source: PB Wong

Construction of the Market Street Station would displace an eight-foot diameter trunk sewer line under Mission Street. The trunk sewer line could be relocated or abandoned or, in lieu of these options, a siphon and pump station could be installed under the Third/Mission intersection to force wastewater under the subway (refer to Section 2.2.2, Central Subway Alternative Construction Methods). The shallow configuration of the station would preclude construction of a mezzanine and ~~(~~concourse~~)~~ level above the platform. Instead, access would be provided from street level to a mezzanine and ~~(~~concourse~~)~~ under the platform level for fare payment, and then up to the platform level via subsurface escalators, stairs, and elevators. The main street entrances (escalators and stairs) would be located on the south side of Market Street just west and east of Third Street. Two elevators would be located on the southwest corner of Market and Third Streets next to the escalators and stairs. Two sets of emergency stairs would be provided by a hatch located in sidewalks on the west and east sides of Third Street just south of Jessie Street. Two emergency ventilation shafts would extend east of Third Street under Stevenson Street, rising at the northeast interior of the private Hearst garage at 45 Third Street (Assessors Parcel #3707-058) to a height 26 feet above the roofline. The vent shafts would displace about 30 parking spaces and would require an easement.

After crossing the Market Street Subway, the alignment would turn west under Geary Street and descend into a stacked configuration as shown in Figure 2-9. The stacked subway configuration is provided so as not to preclude a connection with a possible future Geary Street subway line traveling east and westbound from Union Square.[1] The stacked configuration would continue to Union Square Station, which would be located on Stockton Street between Geary and Sutter Streets. The stacked tunnels would affect the design of the Union Square Station, which would include a mezzanine and ~~(~~concourse~~)~~ and two platform levels (refer to Figure 2-9). The main pedestrian entry would be located on the east side of the Union Square Plaza near an existing pedestrian stairway and café. It would include escalators and stairs, rising from the sidewalk level at Stockton Street to the plaza entrance. Additional entries would be located in sidewalk bulb-outs on Stockton Street north (stairs) and south (escalators) of Maiden Lane. Emergency stairs would be provided by a hatch located in the sidewalk on the east side of Stockton Street just south of Campton Place. Two vent shafts would be integrated into the Union Square plaza terrace between the plaza café and the sidewalk on the west side of Stockton Street. Vent shafts would be located on either side of the escalators and stairs. The vent shafts would be about 11 feet high, but would

[1] The possible future Geary subway project is not part of the Central Subway Project and is not analyzed in the Central Subway SEIS/SEIR. The Geary project would be subject to an independent environmental analysis in the future should a project be defined and funding identified.

FIGURE 2-9: ENHANCED EIS/EIR ALIGNMENT - UNION SQUARE STATION



Source: PB Wong

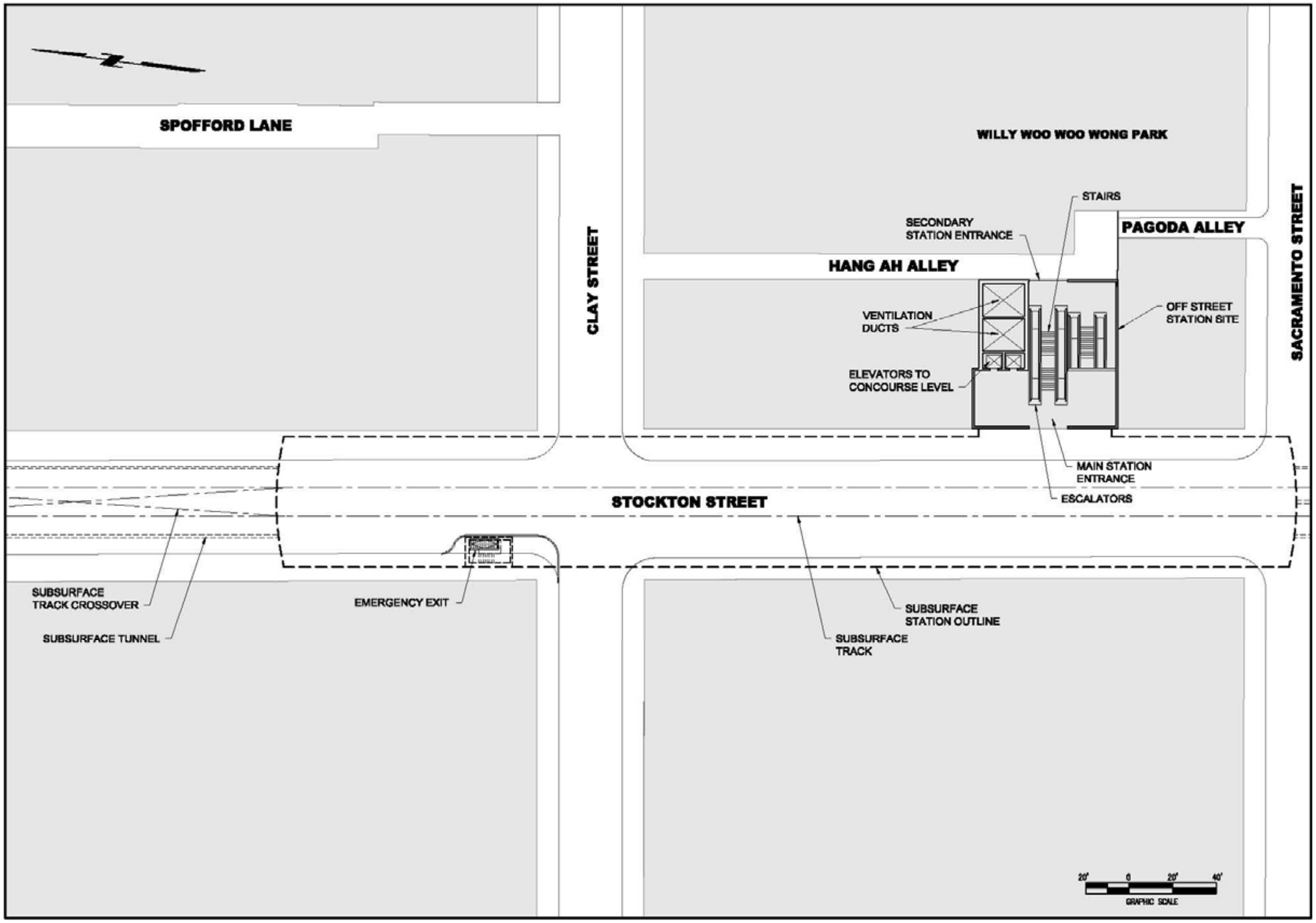
not rise above the plaza because of their location on the terrace grade. The emergency ventilation would be designed in cooperation with BART so as not to impact ventilation in the Powell Street Station. Two elevators would be located north of the northern-most vent shaft with access from the sidewalk on Stockton Street. These facilities would displace about 29 of the 985 parking spaces in the Union Square Garage. The bulb-out for the escalators on the east side of Stockton Street, south of Maiden Lane, would widen the sidewalk by about four feet and would extend a little over 50 feet, displacing two to three truck parking spaces. The bulb-out for the stairs on the east side of Stockton north of Maiden Lane would widen the sidewalk about five feet and would extend a little over 60 feet, displacing three truck parking spaces.

North of the Union Square Station, the subway would continue in a mined tunnel under Stockton Street**.** The north and southbound tunnels would transition to a side-by-side configuration before the Chinatown Station. The station would have side platforms, as well as a crossover and tail tracks required for operator layover. The northern terminus for the Central Subway would be in Chinatown at Stockton and Jackson Streets. The underground station, between Sacramento and Washington Streets on Stockton Street, would have a mezzanine and ~~(~~concourse~~)~~ and one platform level (see Figure 2-10). The main pedestrian entrance would be in a building that Muni would construct at 814-828 Stockton Street near Sacramento (Assessor's Parcel #0225-014) to accommodate escalators, stairs, two elevators, and two emergency ventilation shafts.

Construction of the station entrance would require acquisition of the parcel and relocation of ten businesses~~ and one to two residential units over the businesses~~. The Muni facility would require only one story; a structure of 40-feet in height was assumed on this parcel for this analysis. Transit-oriented development could be proposed as part of an independent project for this site in the future.[2] The maximum allowable height for this property is 65-feet; but, for the purposes of this SEIS/SEIR, it was assumed that Muni would restrict the building height to 40 feet as required to meet height limits in Prop K to minimize shadows on parks (Willy "Woo Woo" Wong Playground to the east of the station). The vent shafts would rise to a height 10 feet above the development roofline on the southeast end of the parcel near Pagoda Alley. Emergency stairs would be provided by a sidewalk hatch located in a bulb-out on the northwest corner of Stockton and Clay Streets. The bulb-out would widen the sidewalk by seven feet and would extend about 40 feet, eliminating one white loading zone and a red zone. A double

2 Any proposal for transit-oriented development on this site would be subject to independent environmental review once a specific proposal is defined.

FIGURE 2-10: ENHANCED EIS/EIR ALIGNMENT - CHINATOWN STATION



Source: PB/Wong
Not to scale

crossover and twin storage tracks, capable of storing two 2-car trains, would extend beyond this subway station to Jackson Street.

Station Locations – Alternative 2

The Enhanced EIS/EIR Alignment would have four subway stations and one surface station, as listed in Table 2-1. The surface station would be located on Third Street, north of King Street, to serve the ballpark. Subway station platforms would be about 250 feet in length, and 16 to 23 feet in width (depending on configuration as side platform or center platform), and would accommodate two-car trains using high-floor LRVs. All subway station designs include fare gates and ticket vending machines (TVMs) per new Muni policy; this specification requires longer station layouts and typically the need for a mezzanine and ~~(~~concourse~~)~~ level.

TABLE 2-1

ALTERNATIVE 2 - ENHANCED EIS/EIR ALIGNMENT STATION LOCATIONS

Station	Type	Location
King Street (northbound only)	Surface Station - Platform adjacent to Sidewalk	Third Street between King and Townsend Streets
Moscone	Underground - Two level stacked platform with a mezzanine and ~~(~~concourse~~)~~ level above the platform level.	Third Street between Folsom and Howard Streets
Market Street	Underground - Single level side platforms with a mezzanine and ~~(~~concourse~~)~~ level below the platform level.	Third Street between Mission and Market Streets
Union Square	Underground - Two level stacked platforms with a mezzanine and ~~(~~concourse~~)~~ level above the platform level.	Stockton Street between Geary and Sutter Streets
Chinatown	Underground – Single level side platforms with a mezzanine and ~~(~~concourse~~)~~ level above the platform level.	Stockton Street between Sacramento and Washington Streets

Light Rail Operating Plan – Alternative 2

For the Enhanced EIS/EIR Alignment, one-car trains would operate as an independent line (not linked with Muni Metro) from the southern terminus in Visitacion Valley, via the existing T-Third alignment to Fourth and King Streets, and then via the Central Subway to the northern terminus in Chinatown. This service would be called the T-Third long line. The T-Third short line would extend from the Mission Bay Turnaround Loop (18th, Illinois, 19th, and Third Streets) to Chinatown, also operating with one-car trains and the T-Third very short line would operate from Fourth and Berry Streets to Chinatown. Service frequencies for each line would be ~~five~~ six minutes in the peak period and ten minutes during the

Midday, except for the short line. The ~~Castro Shuttle~~ K-Ingleside would be extended to operate as the T-Third line under the 2030 No

Project/TSM Alternative, but would operate as an independent line for the Enhanced EIS/EIR Alignment, using the 2006 configuration between Castro and Embarcadero Muni Metro Stations.

Bus Operating Plan – Alternative 2

To make efficient use of the Central Subway, bus operations in the Corridor would be restructured. The Enhanced EIS/EIR Alignment bus system would be similar to the No Project/TSM Alternative including the extension of the 45-Union/Stockton trolley bus line from the Caltrain Terminal through Mission Bay and Potrero Hill to a new terminus at Third and 20th Streets and the rerouting of the 22-Fillmore trolley bus line along 16th, Third, and Mission Rock Streets to a terminus in Mission Bay. In both bus plans the 9X-San Bruno Express and 30-Stockton lines would have five and nine-minute peak period frequencies respectively, which are the current peak headways for those lines. Changes from the No Project/TSM Alternative associated with the Enhanced EIS/EIR bus plan include the elimination of the 30-Stockton short line between Van Ness Avenue and North Point Street and the Caltrain Terminal at Fourth and Townsend Streets, and minor frequency adjustments as noted below. All comparisons given below are to the No Project/TSM 2030 bus service.

- **30-Stockton long line:**
  - Weekday, midday service frequencies would be reduced from seven and a half to nine minutes;
  - Saturday, evening service frequencies would be reduced from nine to ten minutes;
  - Sunday service, which is currently provided only on the 30-Stockton short line, would be provided on the 30-Stockton long line. Sunday service frequencies would be reduced in the midday from six to seven minutes and reduced in the evening from nine to ten minutes.
- **30-Stockton short line:**
  - Service would be eliminated during the week and on weekends.
- **45-Union/Stockton line:**
  - Weekday, service frequencies would be reduced in peak periods from eight to nine minutes.

Operating Statistics – Alternative 2

A summary of operating statistics for the Enhanced EIS/EIR Alignment is presented in Table 2-2. The frequency on the 9X-San Bruno Express bus line would remain unchanged at five minutes when compared with the No Project/TSM Alternative. Since the Enhanced EIS/EIR Alignment coincides with the routes for the 30-Stockton and 45-Union/Stockton lines south of Jackson Street, service hours for

TABLE 2-2

ANNUAL OPERATING STATISTICS

ALTERNATIVE 2 - ENHANCED EIS/EIR ALIGNMENT

Alternative	Peak Headways 9-X Line[2]	Diesel/Trolley Peak Demand (~~Systemwide~~ Fleet size)[1]	Total Annual Diesel/Trolley Bus Hours (Systemwide)[1]	Peak Headways T-Third[2]	LRV Fleet Peak Demand[3] (~~Systemwide~~ Fleet size) ~~1~~3	Total Annual LRV Car Hours T-Line (Systemwide)
Existing (2007) T-Third	5 minutes	377 (~~495~~ 473) diesel buses; 225 (~~333~~ 331) trolley buses	2,592,230	9 minutes	~~118~~ 119 (151) LRVs	~~84,800~~ 109,400 ~~(568,500)~~ (570,200)
No Project/TSM (2030)	5 minutes	377 (495) diesel buses; 230 (~~333~~ 336) trolley buses	2,622,030	7 minutes	~~129~~ 137 (171) LRVs	~~80,400~~ 117,000 ~~(609,500)~~ (602,700)
Enhanced EIS/EIR Alignment (2030)	5 minutes	377 (495) diesel buses; 219 (~~333~~ 336) trolley buses	2,545,630	~~5~~ 6 minutes	~~130~~ 142 (175) LRVs	~~87,500~~ 83,900 ~~(591,200)([3])~~ (621,800)[3]

Notes: [1] Source for 2007 bus equipment demand and bus hours is the Muni 2006-2025 Short Range Transit Plan, December 2005 and Dan Rosen, MTA, May 2007. Revised Dan Rosen, MTA, January 2008.
[2] Headway refers to the time between transit vehicles on a given line
[3] Assumes one-car trains operating in the peak for the Central Subway on both the T-Third long and short lines and two-car trains on the T-Third very short line.

these bus lines could be reduced where duplicate service occurs. The Enhanced EIS/EIR Alignment would reduce the peak demand requirements for the combined diesel and trolley fleets over No Project/TSM which would result in a systemwide annual reduction of bus hours by 76,400. Rail headways on T-Third line would improve from the current nine minutes under existing conditions to seven minutes in the No Project/TSM Alternative and to ~~five~~ six minutes under the Enhanced EIS/EIR Alignment. The additional LRV route miles and service frequencies associated with the new Central Subway service would result in an annual ~~increase~~ decrease of ~~7,100~~ 33,100 LRV car hours on the ~~Central Subway Corridor~~ T-Third line, but a system-wide annual reduction of ~~18,300~~ 19,100 car hours.

Transit Fleet Requirements – Alternative 2

The Enhanced EIS/EIR Alignment would require ~~four~~ six additional LRVs (~~three~~ five peak LRVs and one spare) compared to the No Project/TSM Alternative. Muni's total fleet size, including spares, would be 175 LRVs with ~~130~~ 142 LRVs in the peak. The diesel bus fleet would be increased by 23 buses, but the ~~and~~ peak demand would remain the same as under the existing condition and the No Project/TSM Alternative. The trolley bus fleet would ~~remain the same as under~~ increase by five buses from the existing conditions ~~and No Project/TSM Alternative~~ by 2030 for Alternative 2, but the peak demand would be reduced by six vehicles over existing conditions and eleven vehicles over No Project/TSM.[3]

[3] San Francisco Municipal Railway, EIR Supplemental Final Revised *Light Rail and Bus Transit Operating Plan*, August 6, 2006.

Light Rail Maintenance Facility

The Metro East LRV maintenance facility that was analyzed in the 1998 FEIS/FEIR is currently under construction as part of the T-Third line and is expected to become operational in the fall of 2008. It would be used to store and maintain the LRV fleet for the Enhanced EIS/EIR Alignment vehicles as well as for the T-Third line. It also provides a traction power substation facility. Traction Power Distribution System

The T-Third electric power distribution facilities would connect to the Central Subway (Enhanced EIS/EIR Alignment) facilities. The northerly most T-Third electric power substation on Illinois Street near Mariposa Street (analyzed as part of the 1998 FEIS/FEIR) could be used for back-up power as could the Muni Metro Extension electric power substation on King Street, east of Third Street. In addition, the Enhanced EIS/EIR Alignment would be constructed with overhead wire, feeder cable, and two new substations located within the station boxes (non-public areas) for the Moscone and Chinatown Stations.

Signaling and Communications System

The Automatic Train Control System used for Muni Metro would be installed in the subway portion of the Central Subway Project to monitor and control train movements in the subway. The T-Third line, including the Central Subway segment, would operate independently from Muni Metro although it would share the existing control center at West Portal. The Enhanced EIS/EIR Alignment would also have fire suppression, ventilation, and emergency back-up generator systems linked to Central Control.

Fare Collection System in the Central Subway

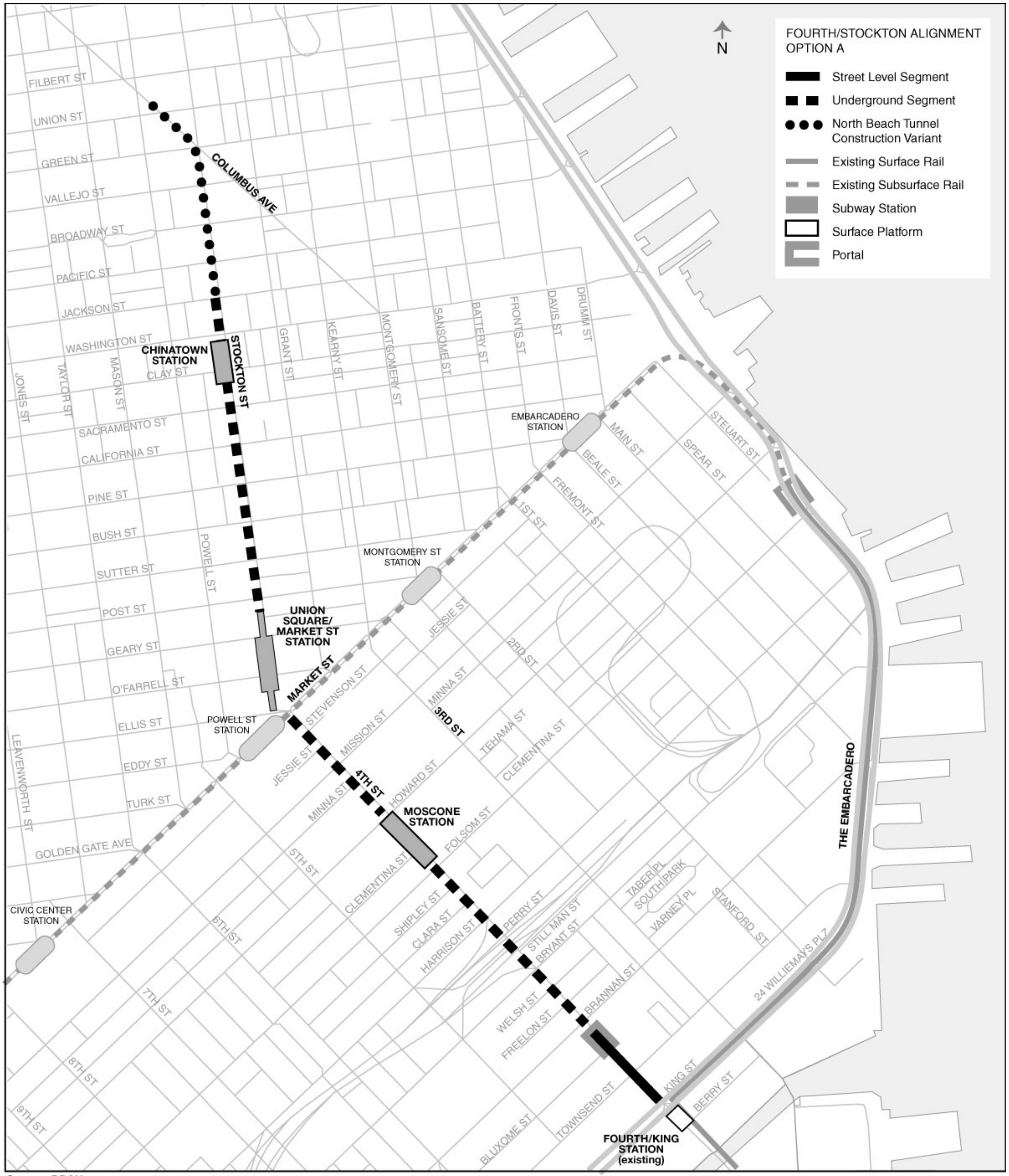
The Proof-of-Payment fare collection system on surface Third Street would be used for the Enhanced EIS/EIR Alignment. However, unlike the T-Third line surface operation, the subway platforms would be considered paid areas. In the subway stations, ticket vending machines and turnstiles similar to those installed at Muni Metro stations would facilitate fare collection.

2.1.3 ALTERNATIVE 3 - FOURTH/STOCKTON ALIGNMENT

The Fourth/Stockton Alignment would start as a double-track surface line at Fourth and King Streets and would proceed north along Fourth Street to a portal, at one of two possible locations, where it would transition from surface to subway operation. It would continue north under Fourth Street as a double-track operation to a terminus in the vicinity of Stockton and Jackson Streets (Figure 2-11). The

FIGURE 2-11

ALTERNATIVE 3 -FOURTH STOCKTON ALIGNMENT OPTION A (LPA)



Source: PB/Wong
Not to scale

pedestrian connection to the Market Street Subway would be at the BART/Muni Metro Powell Street Station.

There is a construction variant for this alternative to extend the running tunnels another 2,000 feet north of the Chinatown Station to facilitate construction and extraction of the tunnel boring machines. In this approach the tunnels would continue north on Stockton Street to a temporary shaft on Columbus Avenue near Washington Square Park where the tunnel boring machines would be extracted and construction equipment and materials could be delivered.

As in the case of the Enhanced EIS/EIR Alignment, above-ground emergency ventilation shafts are proposed to be located in off-street locations and, wherever feasible, station access is located off-sidewalk in property to be acquired by Muni. Fare gates are provided at the mezzanine level for all stations. The location and number of stations varies for the two design options described below.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

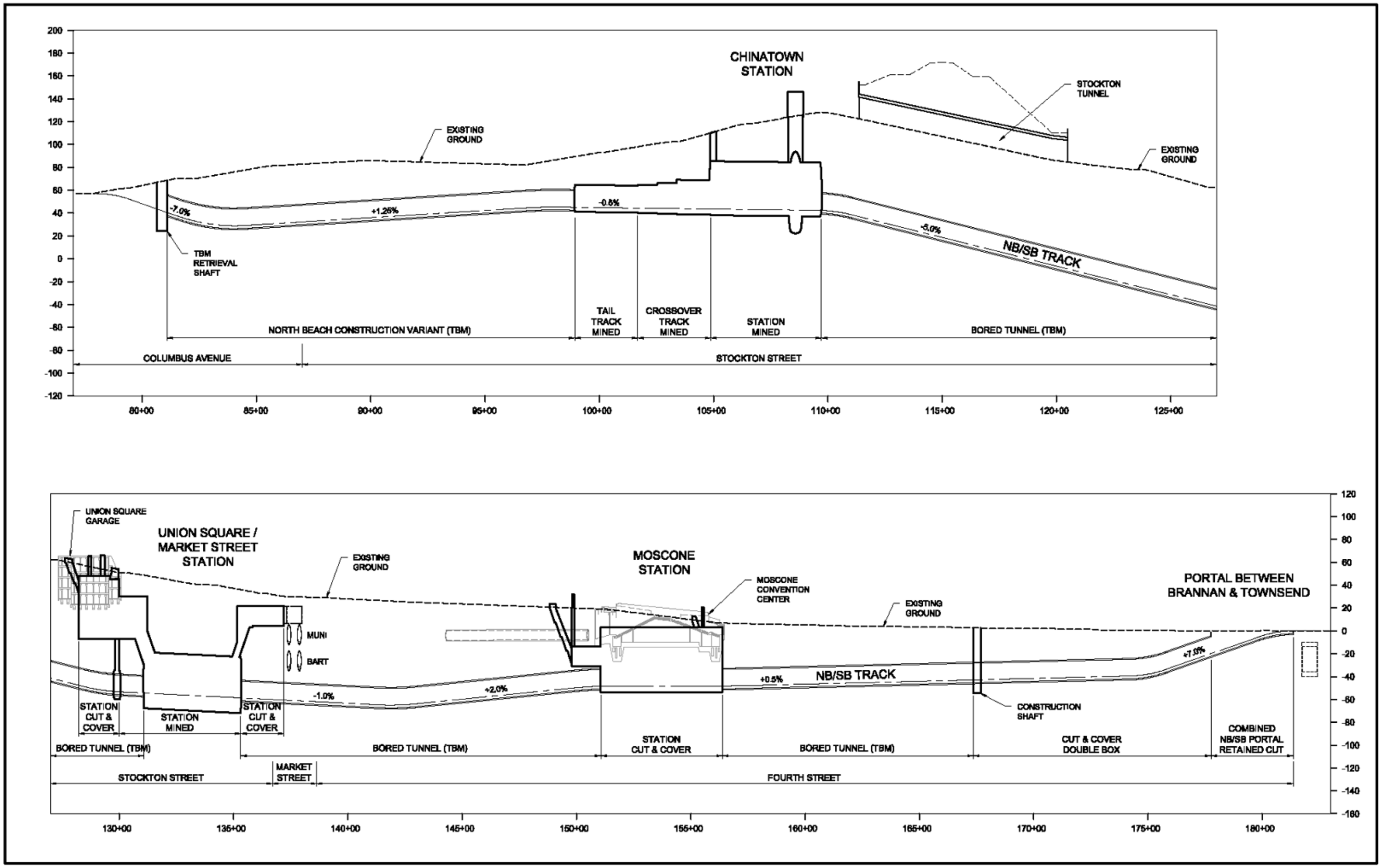
<u>Alignment – Alternative 3A</u>

This alternative was selected as the Locally Preferred Alternative by the MTA Board at its meeting of June 7, 2005. It would extend 1.7 miles north from the T-Third line terminus at Fourth and King Streets via Fourth and Stockton Streets to the Central Subway terminus in Chinatown. After stopping at the T-Third line station platform on Fourth Street at King Street, LRVs would continue north on Fourth Street in a semi-exclusive double-track median to a portal between Townsend and Brannan Streets. This option would include three subway stations at Moscone, Union Square/Market Street, and Chinatown (see profile Figure 2-12). It would not have any operations on King, Harrison, Third, Kearny, or Geary Streets. The 30-Stockton and 45-Union/Stockton trolley bus lines would continue operation on the east side of Fourth Street, south of Bryant Street, to the bus terminal east of Fourth Street on Townsend Street. Existing bus stops would be retained on Fourth Street just north of Bryant Street, but the island stop at Brannan Street would be moved from the north to the south side of the street. No major overhead wire relocations would be necessary under this option.

On Fourth Street between King and Townsend Streets the track would shift slightly to the east to accommodate three southbound traffic lanes west of the trackway and one northbound right turn only traffic lane east of the tracks. At Townsend Street, the easterly lane would provide an exclusive right turn for northbound buses to facilitate use of the south side bus layover and loading zone near Fourth Street. Southbound buses would continue to use the layover and loading zone adjacent to the Caltrain

FIGURE 2-12: FOURTH/STOCKTON ALIGNMENT OPTION A

PROFILE BETWEEN FOURTH/KING AND STOCKTON/JACKSON STREETS



Source: PB Wong
Not to scale

Terminal. There are no existing parking spaces in this segment so none would be eliminated with this lane configuration.

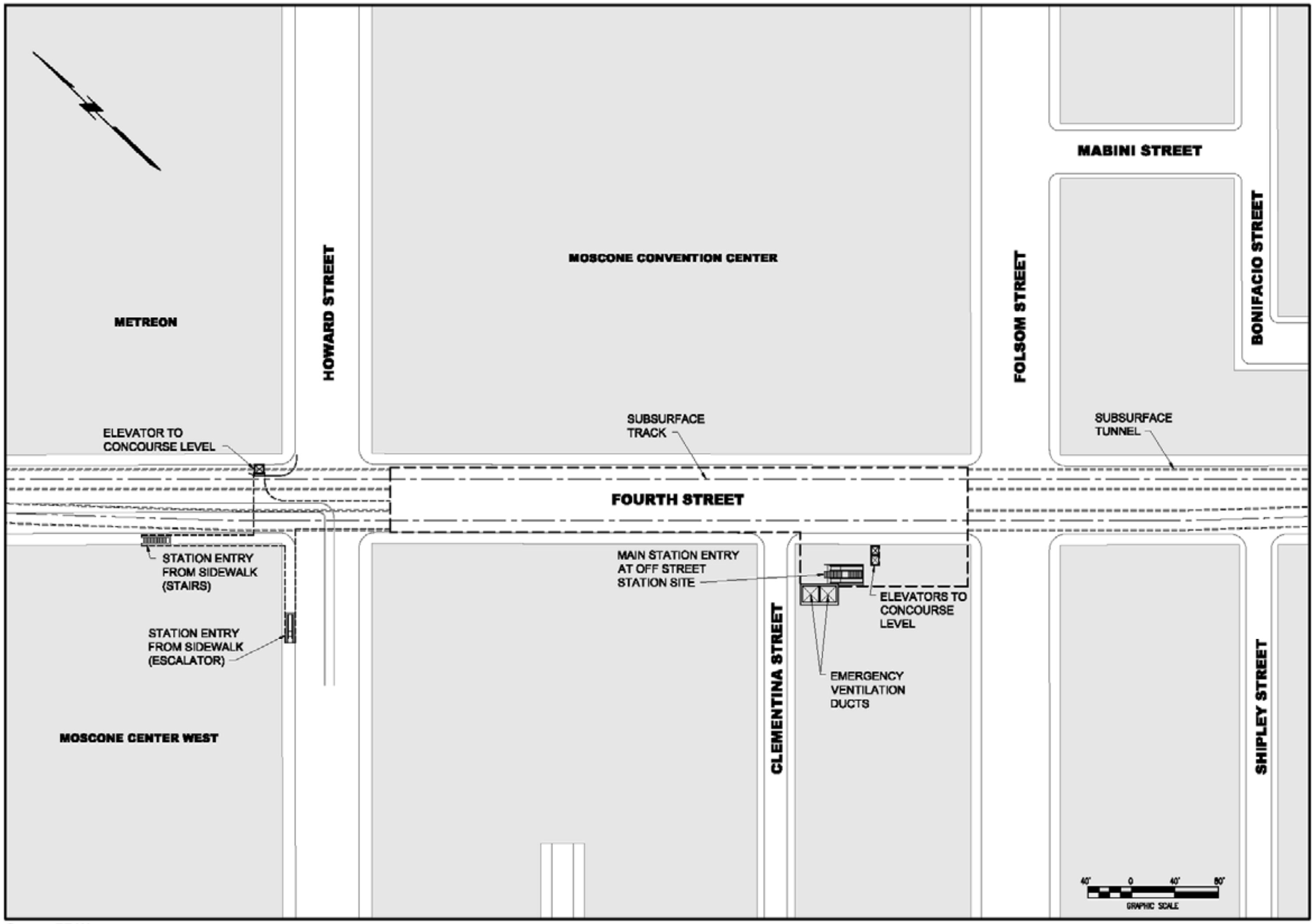
On Fourth Street between Townsend and Brannan Streets, the rail line would enter the subway through a 360-foot double-track portal structure. A Muni bus stop would be located in the median just north of the portal, but south of Bryant Street. There would be three southbound traffic lanes next to the 27.5-foot wide portal: two on the west side of the tracks and one on the east side of the tracks. Between Townsend and Brannan Streets, ~~eight~~ 18 parking spaces would be eliminated on Fourth Street. However, this loss would be partially offset by the creation of three new parking spaces from a bus zone on the west side of Fourth Street south of Brannan that would no longer be needed.

The subway would continue under Fourth Street to the Moscone Station (see Figure 2-13) between Folsom and Howard Streets. This station would have a mezzanine and ~~(~~concourse~~)~~ and one platform level that would serve both northbound and southbound trains. The main station entrance (escalators and stairs and two elevators) would be in an off-street property that Muni would acquire (at 266 Fourth Street, Assessor's Parcel # 3733-093), currently the site of a gas station. The Muni station facility would require only one story. However, for purposes of this environmental review, it is assumed the station entry would be located in a 40-foot high building, with a setback 85-foot tower as permitted under existing zoning. While Muni may propose transit-oriented development for the station site in the future, no specific proposal has been identified at this time. Development at this site would be the subject of an independent environmental review at such time as a specific proposal is submitted to the Planning Department.

The vent shafts would rise 26 feet above the development 40-foot roofline on the north end of the parcel or to a height of 66 feet. An additional stairway ~~set~~ would be located in the sidewalk on the west side of Fourth Street just north of Howard Street and an escalator on the north side of Howard Street, just west of Fourth Street**.** A third elevator would be located directly across the street on the east side of Fourth Street near the corner of Howard Street.

Immediately north of Howard Street, the alignment would descend and continue in a twin side-by-side tunnel configuration to permit a deep crossing of the Market Street Subway and an easement under buildings at 790-798 Market Street/2 Stockton Street (Assessor's Parcel 0328-002) (see Figure 2-14). A combined Union Square/Market Street Station would be located on Stockton Street between Maiden Lane and Market Street, with the station platform extending from just south of Geary Street to about 100 feet south of O'Farrell Street. The station would have a ~~common~~ mezzanine and ~~(~~concourse~~)~~ and one center platform level that would serve both northbound and southbound trains. The south end of the Market Street/Union

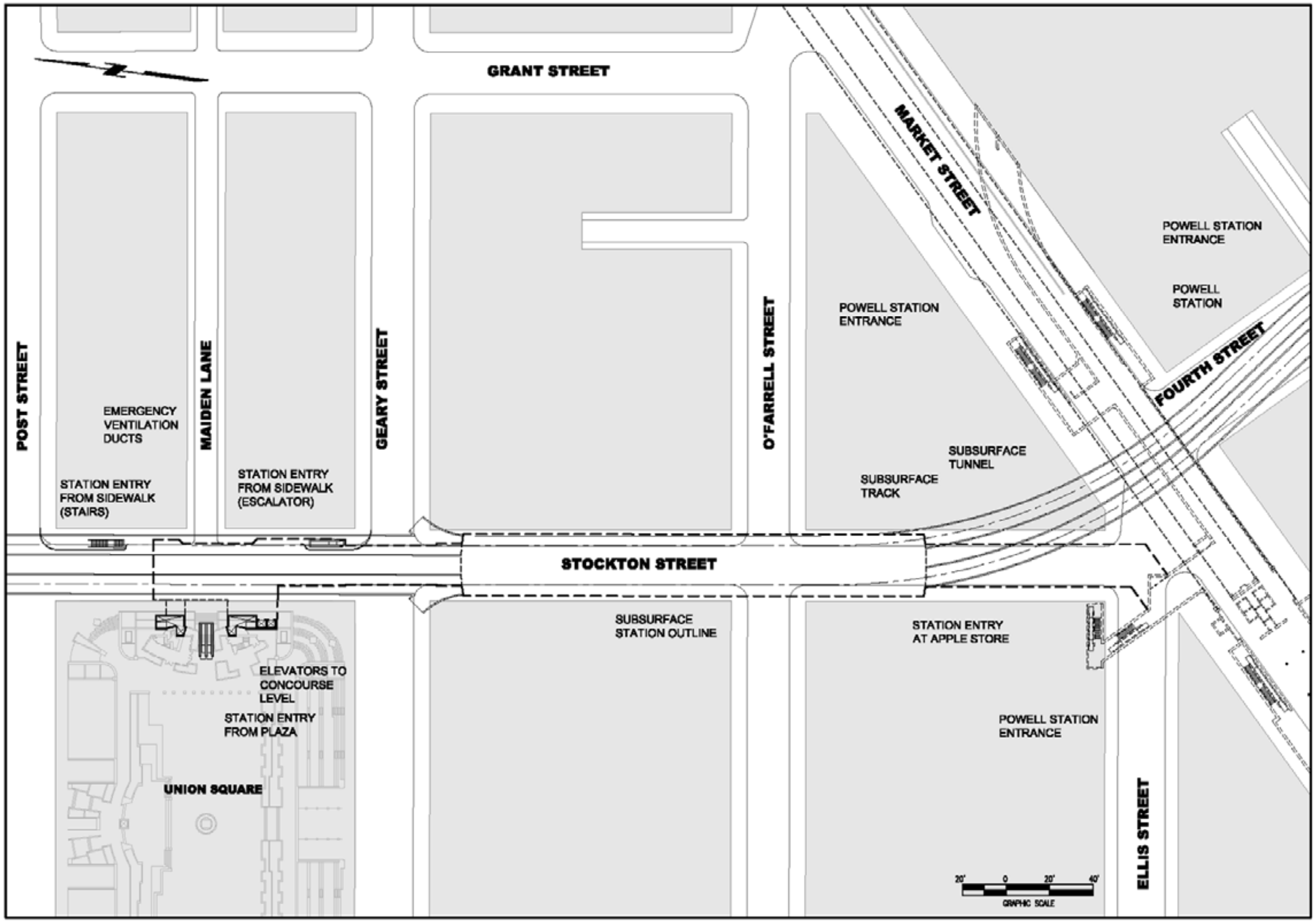
FIGURE 2-13: FOURTH/STOCKTON ALIGNMENT OPTION A - MOSCONE STATION



Source: PB Wong

FIGURE 2-14: FOURTH/STOCKTON ALIGNMENT OPTION A

UNION SQUARE/MARKET STREET STATION



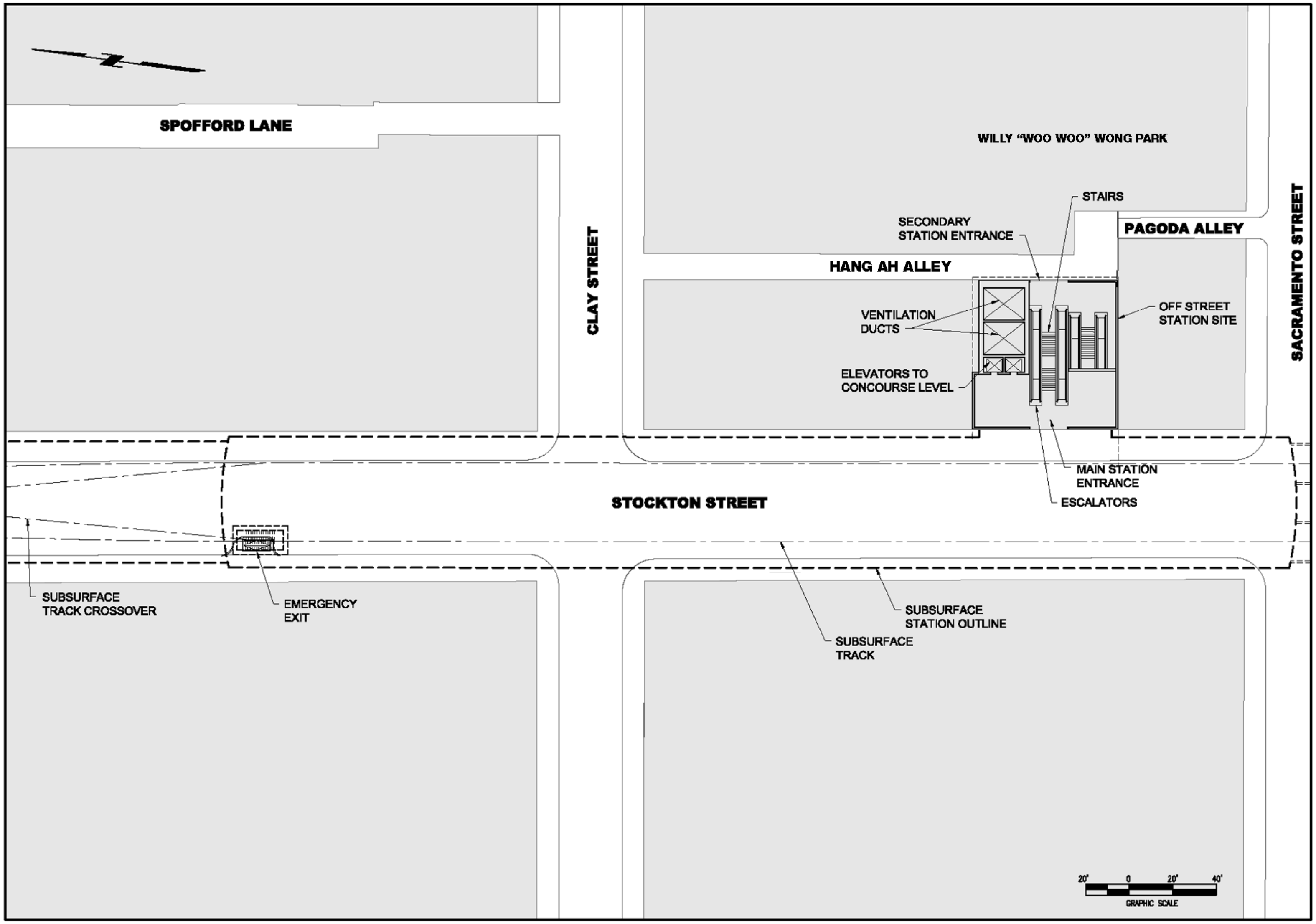
Source: PB Wong

Square Station would connect to the BART/Muni Metro Market Street Subway at the Powell Street Station using existing pedestrian entrances on Market Street and at the northwest corner entrance on Stockton and Ellis Streets.

At the north end of the station the main entrance would be located in the east side of the Union Square plaza near an existing stairway and café. It would include escalators and stairs, rising from the Stockton Street sidewalk to the plaza entrance. Two elevators would be located just south of the escalator/stair set. Additional entries would be located in sidewalk bulb-outs on Stockton Street north (stairs) and south (escalators) of Maiden Lane. No additional emergency stairs would be provided. Two vent shafts would be integrated into the plaza terrace between the plaza café and the sidewalk on the west side of Stockton Street. One vent shaft would be on either side of the escalators and stairs. The vent shafts would be about 11 feet high, but would not rise above the plaza because of their location on the terrace grade. The emergency ventilation would be designed in cooperation with BART so as not to impact ventilation in the Powell Street Station. The entry facilities would displace about 29 parking spaces of the 985 spaces in the Union Square Garage. The bulb-out for the escalators on the east side of Stockton Street south of Maiden Lane would widen the sidewalk by about 4 feet and would extend a little over 50 feet, displacing two to three truck parking spaces. The bulb-out for the stairs on the east side of Stockton Street, north of Maiden Lane, would widen the sidewalk about 5 feet and would extend a little over 60 feet, displacing three truck parking spaces.

North of Union Square, the subway would continue in twin-bored tunnels under Stockton in a side-by-side configuration to the Chinatown terminus. The Chinatown station would have a center platform with a crossover north of the platform and tail tracks for operator layover north of the crossover. Like the Enhanced EIS/EIR Alignment, the Chinatown Station for the Fourth/Stockton Alignment Option A would be on Stockton Street between Sacramento and Washington Streets (see Figure 2-15). It would have a mezzanine and ~~(~~concourse~~)~~ and one platform level for north and southbound trains. The main pedestrian entrance would be in a building that Muni would construct on Stockton near Sacramento (814-828 Stockton Street, Assessor’s Parcel #0225-014) to accommodate escalators, stairs, two elevators, and two emergency ventilation shafts. Construction of the station entrance would require acquisition of the parcel and relocation of 10 businesses~~ and one to two residential units above the businesses~~. The Muni station facility would require only one story. However, for the purposes of this analysis it is assumed that a 40-foot high building consistent with Prop K would be constructed on the site. The maximum allowable height for this property is 65-feet, but Muni would restrict the building height on the site to 40

FIGURE 2-15: FOURTH/STOCKTON ALIGNMENT OPTION A - CHINATOWN STATION



Source: PB/Wong

feet to avoid casting additional shadows on the Willy "Woo Woo" Wong Playground to the east. As with other build alternatives, Muni may propose transit-oriented development on the station site in the future, but no specific proposal has been identified at this time. Development at the site would be the subject of an independent environmental review at such time as a specific proposal is submitted to the Planning Department. The vent shafts would rise 10 feet above the development roofline on the southeast end of the parcel near Pagoda Alley. Emergency stairs would be provided by a sidewalk hatch located in a bulb-out on the west side of Stockton Street near Washington Street. The bulb-out would widen the sidewalk by 7 feet and would extend about 24 feet in length, eliminating one parking stall.

A double crossover and twin storage tracks, capable of storing two ~~three~~ two-car trains, would extend north of this station to Jackson Street.

Station Locations – Alternative 3A

Fourth/Stockton Alignment Option A would have three subway stations (compared with four subway stations in Alternative 2) as listed in Table 2-3. The subway station platforms would be about 250 feet in length and 26 to 28 feet in width and would accommodate two-car trains using high-floor LRVs. The Union Square/Market Street Station has a much longer layout than the Moscone and Chinatown Stations. Like Alternative 2, this alternative would accommodate fare gates and ticket vending machines (TVMs) and a closed barrier fare collection system. All subway station platforms are on one level with a mezzanine and a concourse level above the platform.

TABLE 2-3

CENTRAL SUBWAY FOURTH/STOCKTON ALIGNMENT OPTION A STATIONS

Station	Type	Location
Moscone	Underground – Single level center platform with a mezzanine and ~~(~~concourse~~)~~ level above the platform level.	Fourth Street between Folsom and Howard Streets
Union Square/Market Street	Underground - Single level center platform with a mezzanine and concourse level above the platform level.	Stockton Street between Maiden Lane and Market Streets
Chinatown	Underground - Single level center platform and a mezzanine and concourse level above the platform level.	Stockton Street between Sacramento and Clay Streets

North Beach Tunnel Construction Variant

For both design options in Alternative 3, there is an option to extend the running tunnels north of the original EIS/EIR terminus in Chinatown for construction purposes. This construction variant is shown as an extension of Fourth/Stockton Alignment Option A under Stockton Street for approximately 2,000 feet to a temporary construction shaft in the middle of Columbus Avenue near Washington Square in North Beach. Other options were evaluated and presented to the public, but the location on Columbus Avenue was considered the most technically viable.[4] The initial shaft would be 35 to 60 feet wide by 30 feet long, located in the middle lanes of Columbus Avenue between Union and Filbert Streets, and would occupy two traffic lanes. During the shaft construction period, estimated at five to six months, at least one northbound and one southbound traffic lane would be maintained at all times. Following excavation of the shaft, one half of the footprint would be decked over permanently. The remainder would be temporarily decked so the cover could be removed for construction activities. The latter shaft would be used to extract TBMs and could be used to deliver materials to Chinatown Station. TBM extraction is estimated to take about a week for each TBM. At the conclusion of TBM extraction and material delivery, the shaft would be permanently decked, leaving no surface impacts. The running tunnels would not be finished out with track and other facilities, but could be used to store materials.

Light Rail Operating Plan – Alternative 3A

Light rail operations would be the same as identified under the EIS/EIR Enhanced Alignment (Alternative 2) as described in Section 2.1.3.

Bus Operating Plan – Alternative 3A

To make efficient use of the Central Subway light rail line, bus operations in the Corridor would be restructured. The Fourth/Stockton Alignment Option A bus system would be the same as under the Enhanced EIS/EIR Alignment presented in Section 2.1.3.

Operating Statistics – Alternative 3A

A summary of operating statistics for Fourth/Stockton Alignment Option A is presented in Table 2-4. Operating statistics would be the same as the Enhanced EIS/EIR Alignment for the diesel and trolley bus fleet (see Section 2.1.3). Train headways on the T-Third line would improve from the current nine minutes under existing conditions to seven minutes in the No Project/TSM Alternative and to ~~five~~ six minutes under the Fourth/Stockton Alignment Option A. Even though there is an increase in route miles and service frequencies associated with the new Central Subway service, the result is an annual reduction of ~~2,400~~ 40,300 LRV car hours on the ~~Central Subway Corridor~~ T-Third line and a system-wide annual reduction increase of ~~27,800~~ 11,900 car hours when compared to the No Project/TSM Alternative. This is a result of the more direct alignment and faster travel time for this alternative.

4 Other portal locations along Stockton Street and Union Street would have impacts to traffic and access to local businesses.

TABLE 2-4

ANNUAL OPERATING STATISTICS

ALTERNATIVE 3 –FOURTH/STOCKTON ALIGNMENT OPTION A

Alternative	Peak Headways 9-X Line[2]	Diesel/Trolley Peak Demand (~~Systemwide~~ Fleet size)[1]	Total Annual Diesel/Trolley Bus Hours (Systemwide)[1]	Peak Headways T-Third[2]	LRV Fleet Peak Demand[3] (~~Systemwide~~ Fleet size) ~~1~~3	Total Annual LRV Car Hours T-Line (Systemwide)
Existing (2007) T-Third	5 minutes	377 (~~495~~ 473) diesel buses; 225 (~~333~~ 331) trolley buses	2,592,230	9 minutes	~~118~~ 119 (151) LRVs	~~84,800~~ 109,400 ~~(568,500)~~ (570,200)
No Project/TSM (2030)	5 minutes	377 (495) diesel buses; 230 (~~333~~ 336) trolley buses	2,622,030	7 minutes	~~129~~ 137 (171) LRVs	~~80,400~~ 117,000 ~~(609,500)~~ (602,700
Fourth/Stockton Alignment Option A (2030)	5 minutes	377 (495) diesel buses; 219 (~~333~~ 336) trolley buses	2,545,630	~~5~~ 6 minutes	~~127~~ 139 (175) LRVs	78,000 76,700 ~~(581,700)~~ ~~(3)~~ (614,600) [3]

Notes: [1] Source for 2007 bus equipment demand and bus hours is the Muni 2006-2025 Short Range Transit Plan, December 2005 and Dan Rosen, MTA, 2007. Revised Dan Rosen, MTA, January 2008.
[2] Headway refers to the time between transit vehicles on a given line
[3] Assumes one-car trains operating in the peak for the Central Subway on both the long and short lines and two-car trains on the T-Third very short line.

Transit Fleet Requirements – Alternative 3A

Fourth/Stockton Alignment Option A would require ~~four~~ three additional LRVs (~~three~~ two plus one spare) beyond the 2030 LRV fleet requirements for the No Project/TSM Alternative. In this scenario, Muni's total LRV fleet size, including spares, would be 175 LRVs with ~~127~~ 139 LRVs in the peak period. The diesel bus fleet would ~~remain the same as the under~~ increase by 30 buses from ~~the existing conditions and No Project/TSM (2030) Alternative,~~ in 2030, but ~~with~~ the ~~same~~ peak demand would not change.

The trolley bus fleet would ~~remain the same~~ increase by five buses, but peak demand would be reduced by six trolleys over existing conditions and by eleven trolleys over the No Project/TSM Alternative.[5]

[5] San Francisco Municipal Railway, *EIR Supplemental Final Revised Light Rail and Bus Transit Operating Plan*, August 6, 2006.

The light rail maintenance facility, traction power distribution system, signaling and communication system, and fare collection system previously described for Alternative 2 in Section 2.1.2 would also apply to Alternative 3A.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Alignment – Alternative 3B

Fourth/Stockton Alignment Option B would extend 1.7 miles north from the T-Third line terminus at Fourth and King Streets via Fourth and Stockton Streets to the Central Subway terminus in Chinatown. After stopping at the station platform on Fourth at King Streets, light rail would continue north on Fourth Street to a double-track portal between ~~Bryant~~ Perry and Harrison Streets under I-80 (see Figure 2-16).

There would also be three subway stations at Moscone, Union Square/Market Street, and Chinatown as in Fourth/Stockton Alignment Option A (see Figure 2-17).

In order to accommodate light rail south of the portal, Fourth Street would be converted from one-way southbound to two-way traffic. Overhead wire for the 30-Stockton and 45-Union/Stockton electric trolley bus lines would be relocated from the east to the west side of Fourth Street. Existing bus stops would be retained on Fourth Street, just north of Bryant Street, and on Fourth Street, just north of Brannan Street. The trolleys would continue on a new turnaround loop via Brannan, Fifth and Townsend Streets to the existing bus terminal and loading zone on Townsend Street, just east of Fourth Street.

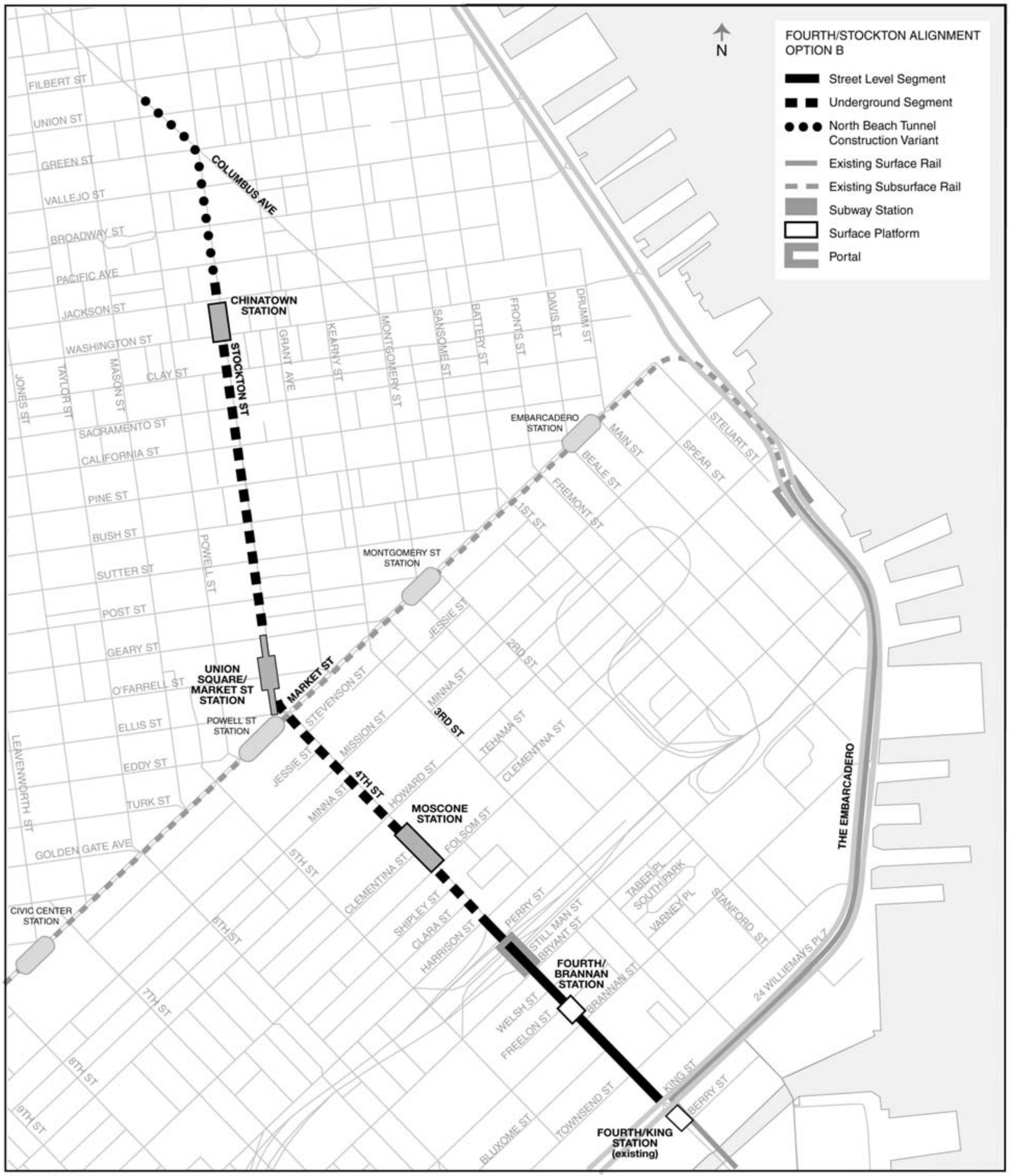
On Fourth Street, the LRVs would operate in one of two lane configuration sub-options: semi-exclusive or mixed-flow. In a semi-exclusive operation trains are physically separated from adjacent traffic except at intersections and at the surface station. In a mixed-flow operation trains and other vehicles share a trackway that is embedded in the street.

Fourth Street Surface Operation: LRVs in Semi-Exclusive Right-of-Way. This sub-option was developed to optimize Muni light rail and roadway operations. In this sub-option LRVs would operate between Fourth and King Streets to the portal under I-80 in a semi-exclusive double-track right-of-way, separated from adjacent traffic by six-inch curbs as shown in Figure 2-18. This sub-option would generally provide two southbound traffic lanes on Fourth Street.

Between King and Townsend Streets the tracks on Fourth Street would shift slightly to the east to accommodate three southbound traffic lanes west of the trackway and one northbound traffic lane east of the tracks. The street configuration from west to east would provide: a southbound right turn only traffic lane next to the Caltrain Terminal, two southbound traffic lanes, a semi-exclusive double-track median, and a northbound traffic lane. Bus loading zones would continue to be located on Townsend Street, just east of Fourth Street, for northbound buses and adjacent to the Caltrain Terminal for southbound buses.

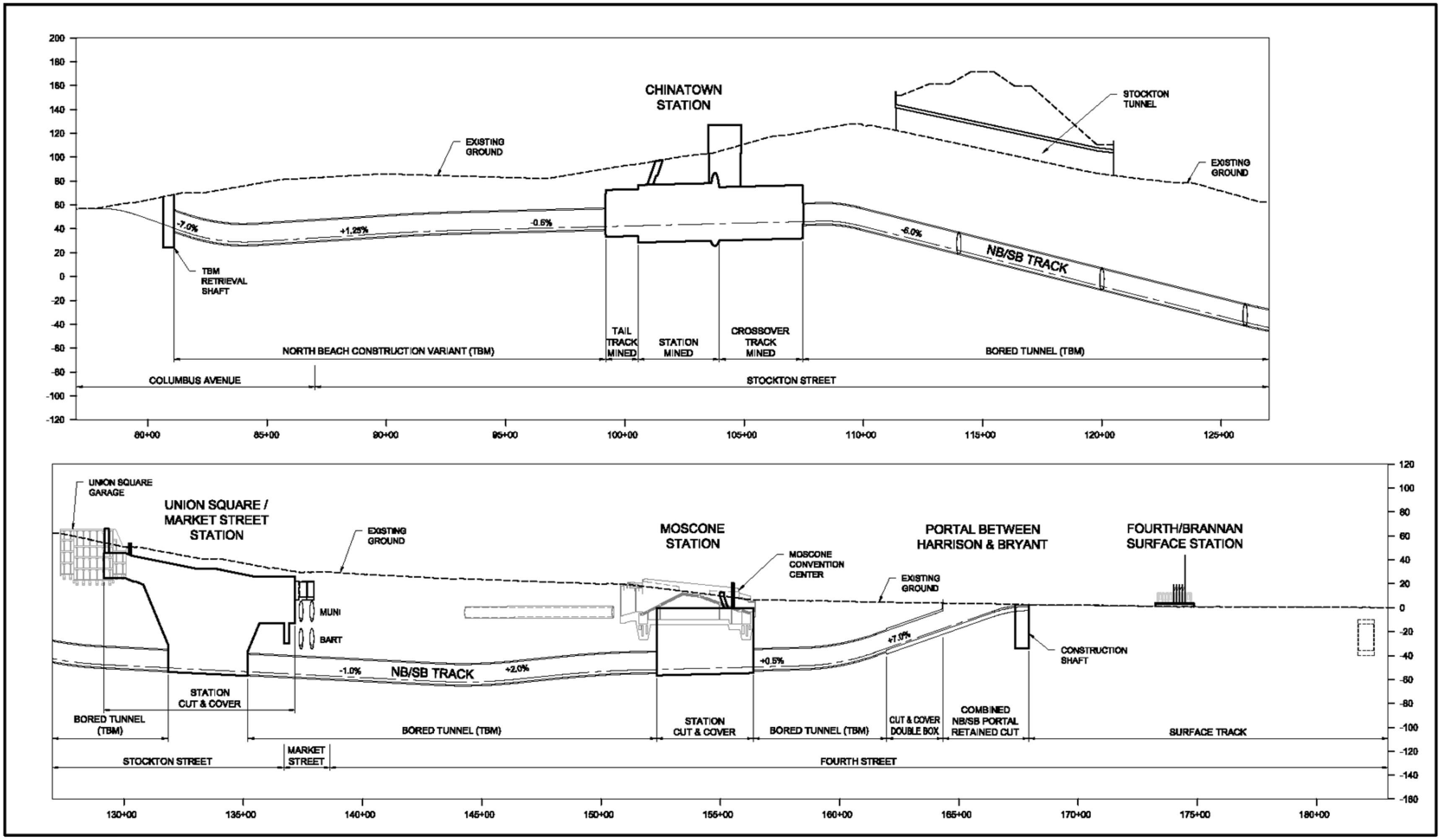
FIGURE 2-16

ALTERNATIVE 3 –FOURTH/STOCKTON ALIGNMENT OPTION B (MODIFIED LPA)



Source: PB/Wong
Not to scale
Revised 1/08

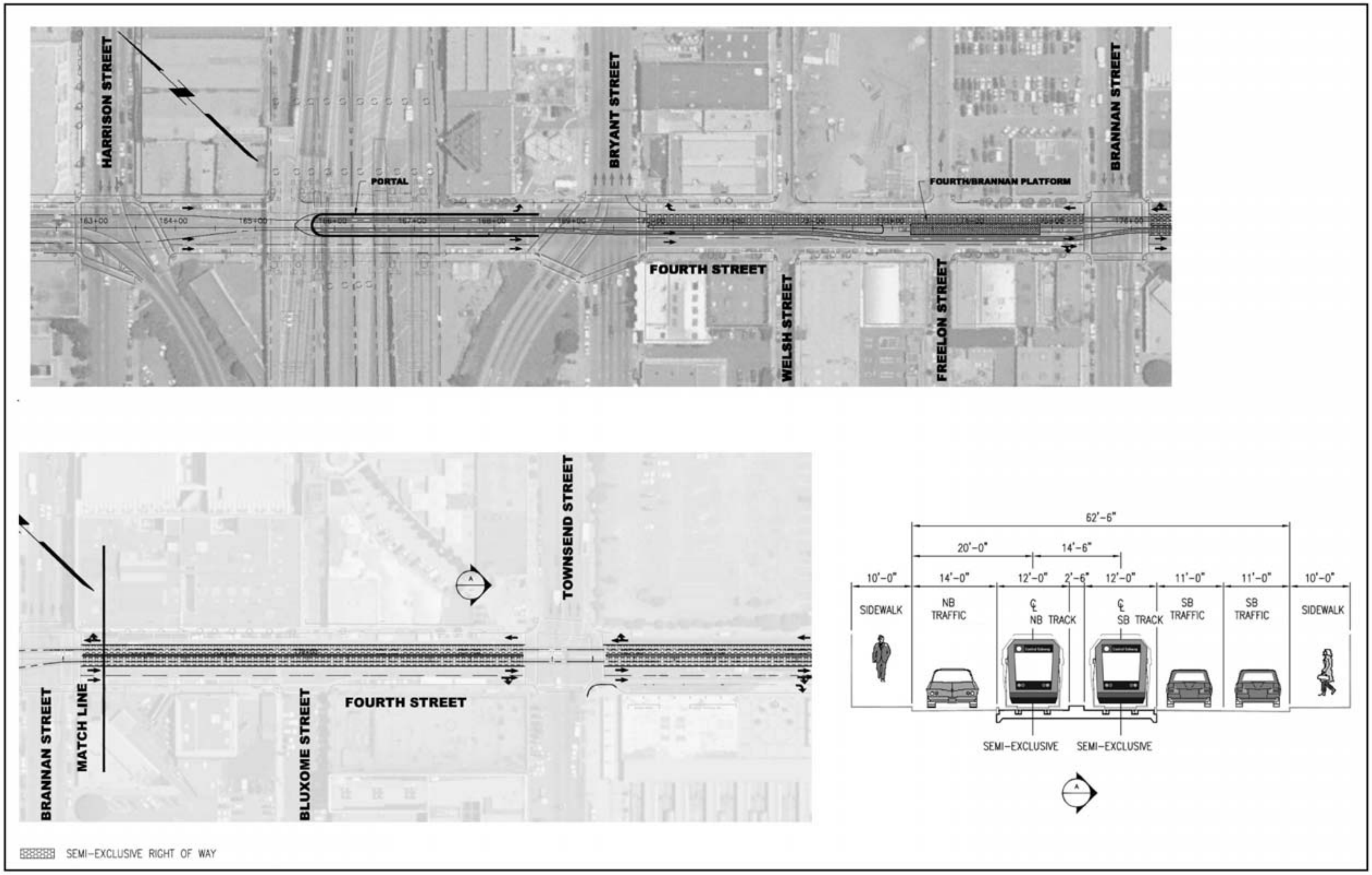
FIGURE 2-17: FOURTH/STOCKTON ALIGNMENT OPTION B PROFILE



Source:PB Wong
Not to scale

FIGURE 2-18: FOURTH/STOCKTON ALIGNMENT OPTION B CONFIGURATION ON FOURTH STREET

SEMI-EXCLUSIVE RIGHT-OF-WAY



Source: PB/Wong
Not to scale
Revised 1/08

There are no existing parking spaces in this segment so none would be eliminated with this lane configuration sub-option.

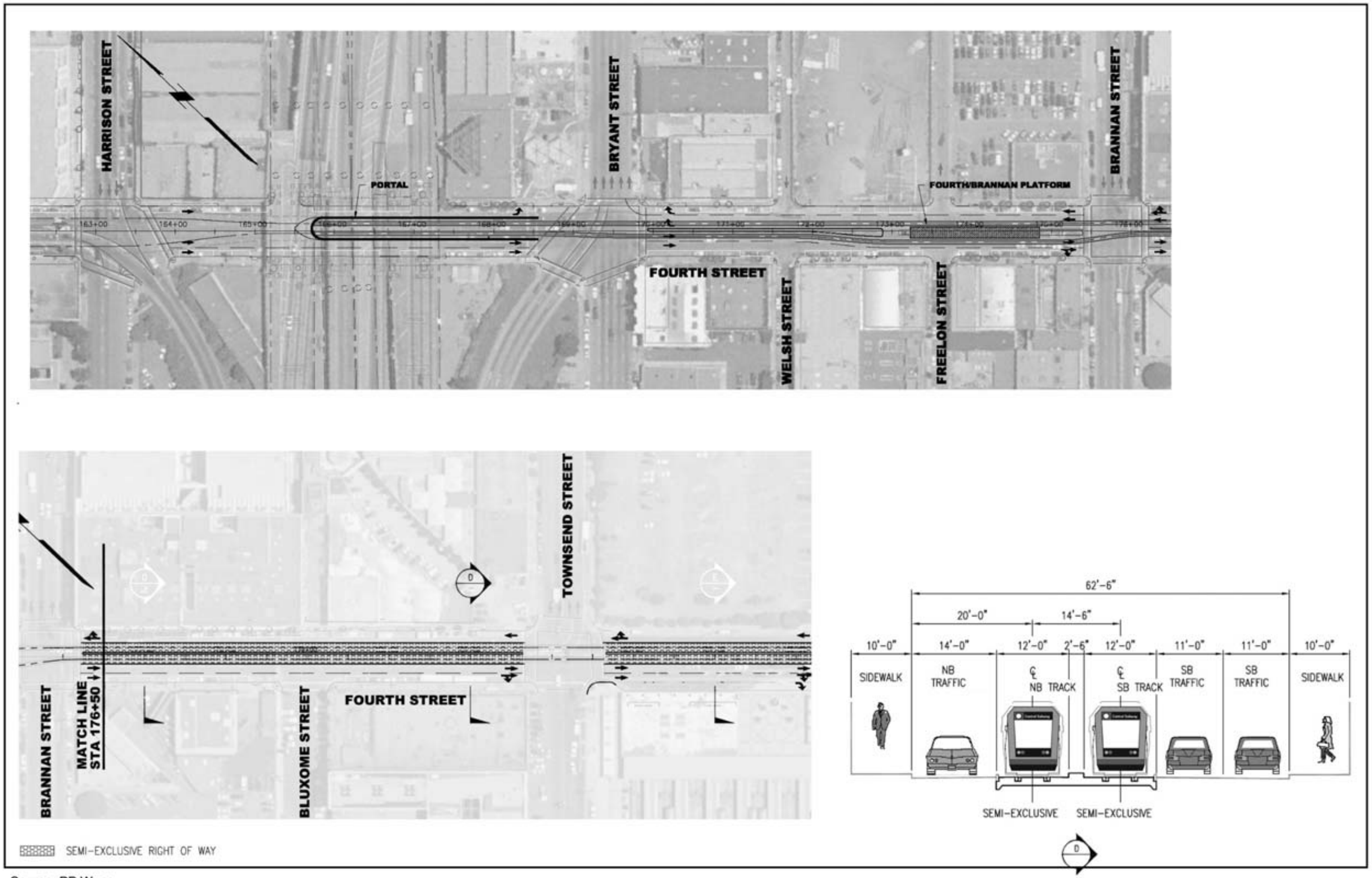
On Fourth Street between Townsend and Brannan Streets, the rail line would continue semi-exclusive median operations. The street configuration from west to east would provide: two southbound traffic lanes, the semi-exclusive double-track median, and one northbound traffic lane. In this segment, ~~all~~ 18 out of 20 parking spaces on Fourth Street would be permanently eliminated. Just north of Brannan Street the tracks would spread to accommodate a center platform between Brannan and Freelon Streets. The street configuration from west to east would provide: a southbound traffic lane (vehicles only), a southbound mixed-flow trackway (vehicles and trains), a 14.5-foot platform, a northbound semi-exclusive trackway, and a northbound traffic lane (vehicles only) with a forced right turn at Bryant Street. The southbound trackway must be mixed-flow in this segment in order to maintain two lanes for southbound traffic. Between Brannan and Bryant Streets 29 out of 36 parking spaces on Fourth Street would be permanently eliminated.

North of the platform the tracks would come back together, crossing Bryant Street to a semi-exclusive right-of-way in the approach to the portal. The rail line would enter the subway portal in the median in a 360-foot retained cut located between Bryant and Harrison Streets. There would be three southbound traffic lanes next to the 27.5-foot portal entrance: two on the west side of the tracks and one on the east side of the tracks. Between Bryant and Harrison Streets, all of the 29 parking spaces on Fourth Street would be permanently eliminated.

Fourth Street Surface Operation: LRVs in Mixed-Flow. This sub-option was developed to increase the availability of parking, address traffic circulation issues, and enhance the streetscape with median landscaping. In this sub-option LRVs would operate between Fourth and King Street to the portal under I-80 in mixed-flow, with trains and vehicles sharing the double-track right-of-way. Three southbound traffic lanes would be provided during the peak between King and Bryant Streets. During the off-peak there would be two southbound lanes and parking on at least one side of the street. Between King and Townsend Streets, the LRVs would operate in mixed-flow, with trains and passenger vehicles using the trackway in both directions, in addition to three southbound traffic lanes and one northbound traffic lane for vehicular use only. The street configuration from west to east would provide: a southbound right turn only traffic lane next to the Caltrain Terminal (vehicles only), two southbound traffic lanes (vehicles only), a southbound mixed-flow trackway (vehicles and trains), a 6.5-foot planted median, a northbound mixed-flow trackway (vehicles and trains), and a northbound traffic lane (vehicles only) (see Figure 2-19). Bus loading zones would continue to be located on Townsend just east of Fourth Street for north-

FIGURE 2-19: FOURTH/STOCKTON ALIGNMENT OPTION B CONFIGURATION ON FOURTH STREET

MIXED RIGHT-OF-WAY



Source: PB Wong
Not to scale
Revised 1/08

bound buses and adjacent to the Caltrain Terminal for southbound buses. There are no existing parking spaces in this segment so none would be eliminated with this lane configuration sub-option.

On Fourth Street between Townsend and Brannan Streets, the rail line would continue median mixed-flow operations. The street configuration from west to east would provide: a 10-foot southbound peak tow-away lane (parking midday and evenings), a southbound traffic lane (vehicles only), a southbound mixed-flow trackway (vehicles and trains) a 6.5-foot planted median, a northbound mixed-flow trackway (vehicles and trains), and northbound traffic lane (vehicles only). In this segment 5 parking spaces would be eliminated on the west side of Fourth Street during the peak, but retained midday/evenings; 15 parking spaces would be permanently eliminated on the east side of Fourth Street.

Just north of Brannan Street the tracks would spread to accommodate a center platform between Brannan and Freelon Streets. The street configuration from west to east would provide: a southbound traffic lane (vehicles only), a southbound mixed-flow trackway (vehicles and trains), a 15-foot platform, a northbound mixed-flow trackway (vehicles and trains), and a northbound traffic lane (vehicles only) with a forced right turn at Bryant Street. Between Brannan and Bryant Streets ~~33~~29 out of 36 parking spaces on Fourth Street would be permanently eliminated. The surface platform displaces space for parking except the few spaces on the west side of Fourth Street, north of Freelon Street.

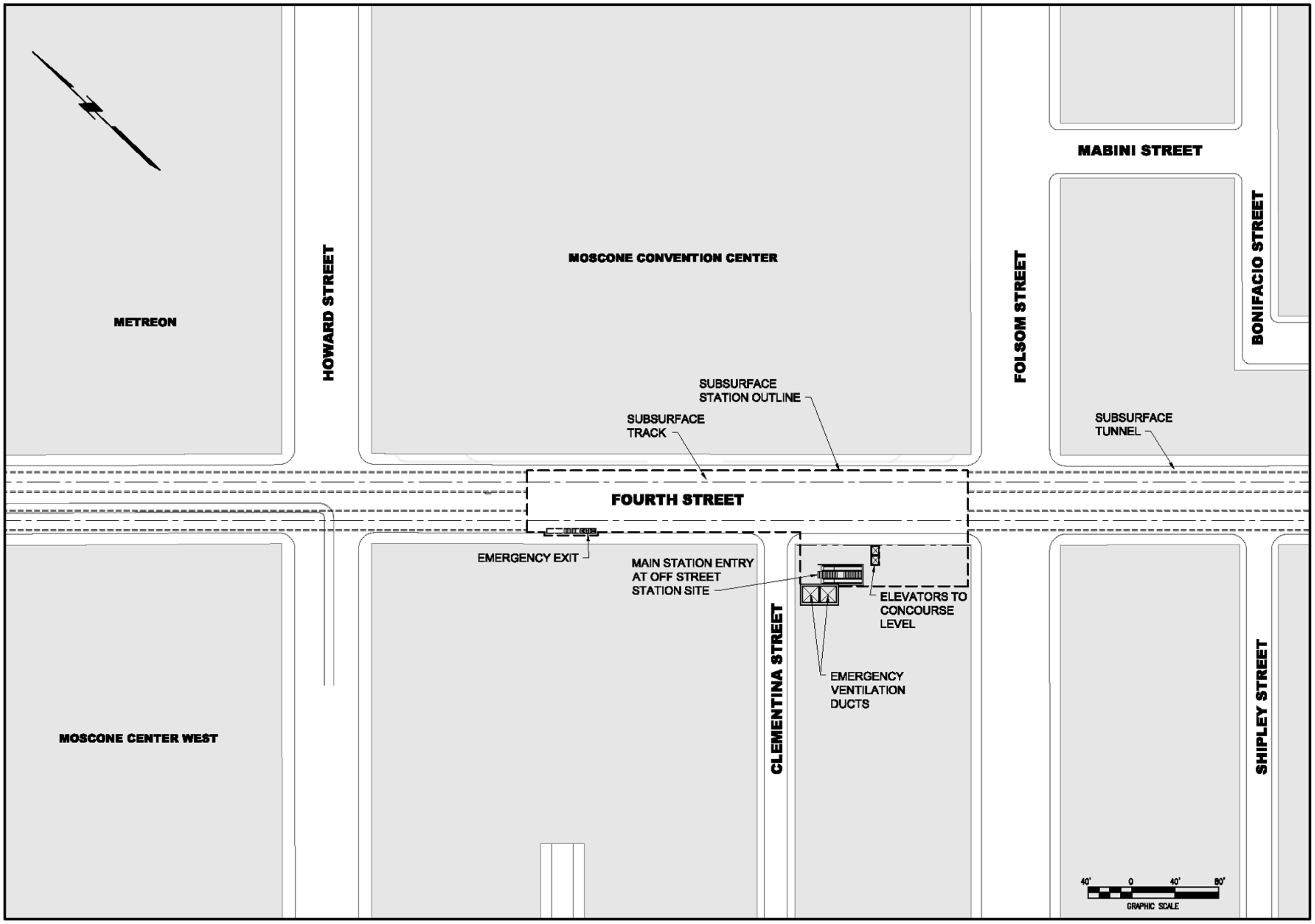
North of the platform, the tracks would come back together, crossing Bryant Street to a semi-exclusive right-of-way in the approach to the portal. The rail line would enter the subway portal in a 360-foot retained cut, located in the middle of the street between Bryant and Harrison Streets. There would be three southbound traffic lanes next to the 27.5-foot wide portal entrance: two on the west side of the tracks and one on the east side of the tracks. Between Bryant and Harrison Streets, all of the 29 parking spaces on Fourth Street would be permanently eliminated due to the portal structure.

The subway for Alternative 3B would continue under Fourth Street to the Moscone Station located between Folsom and Howard Streets (see Figure 2-20)~~, the same as discussed for Alternative 3A on page 2-28~~. Like Alternative 3A, this station would have mezzanine and concourse levels and a platform level that would serve both northbound and southbound trains. The main station entrance (escalators, stairs, and two elevators), would be in the off-street property at 266 Fourth Street. The station would be shorter than the one proposed in Alternative 3A and the emergency exit would be provided on the west side of Fourth Street mid-block between Folsom and Howard Streets.

Immediately north of Howard Street, the alignment would descend and continue in a side-by-side configuration to permit a deep crossing of the Market Street Subway and an easement under buildings at

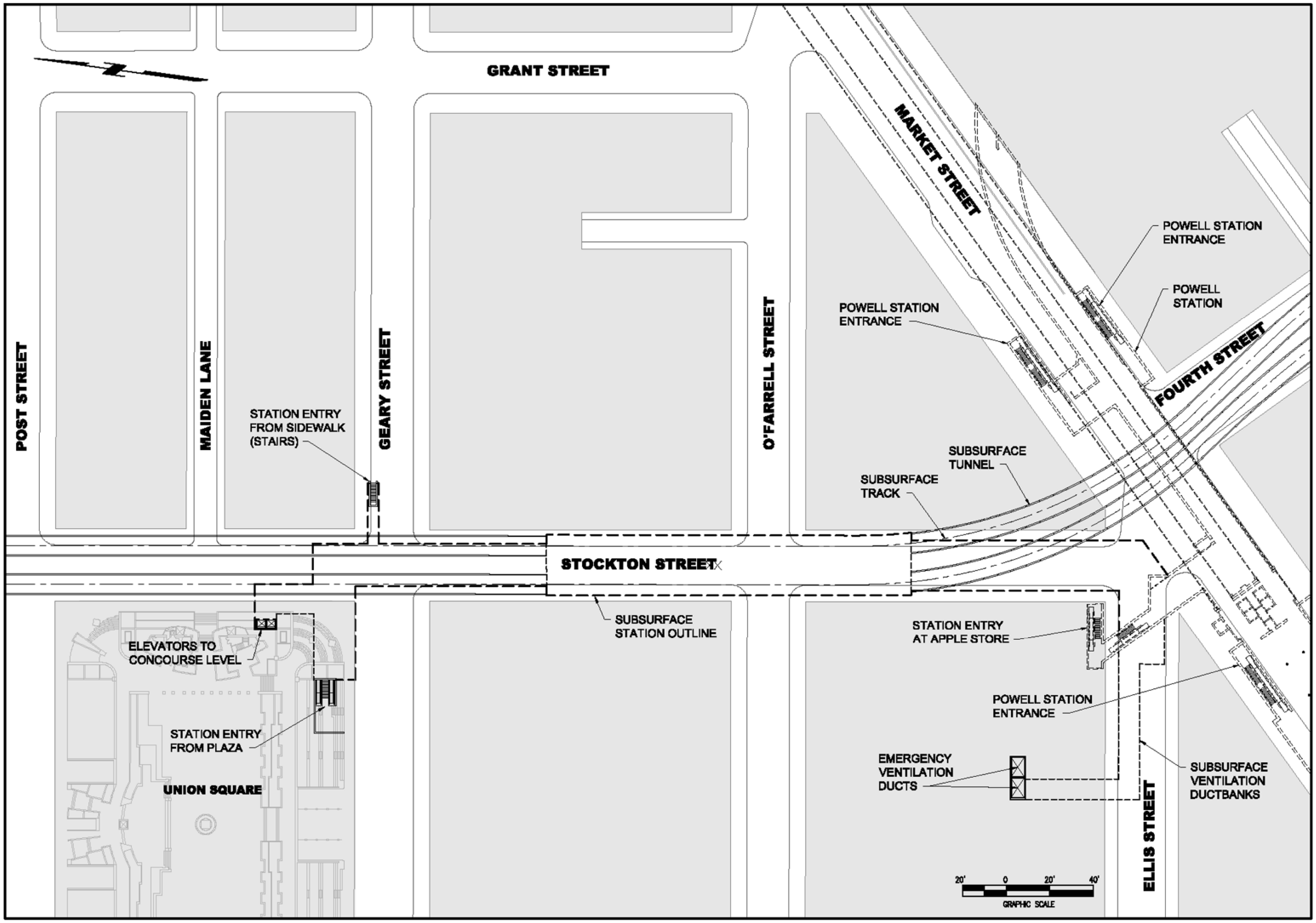
790-798 Market Street/2 Stockton Street (Assessor's Parcel's #0328-002 and 37052-001 to 004). Different from Alternative 3A above, Alternative 3B would have a combined Union Square/Market Street Station located on Stockton between Geary and Market Streets, with a platform centered on O'Farrell Street (see Figure 2-21). It would have a common

FIGURE 2-20: FOURTH/STOCKTON ALIGNMENT OPTION B - MOSCONE STATION



Source: PB Wong

FIGURE 2-21: FOURTH/STOCKTON ALIGNMENT OPTION B - UNION SQUARE/MARKET STREET STATION

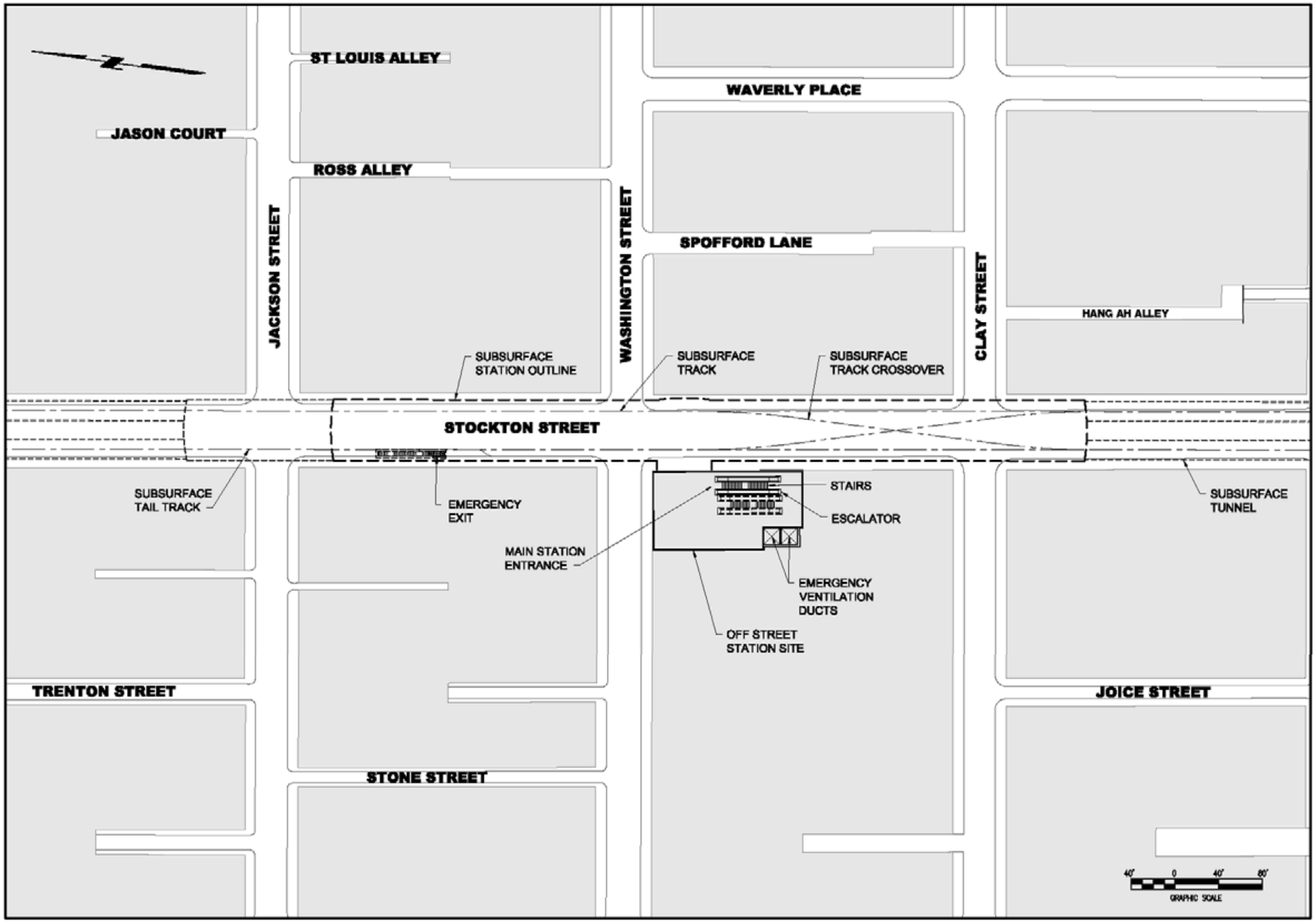


Source: PB Wong

mezzanine and ~~(~~concourse~~)~~ and one platform level that would serve both northbound and southbound trains. The south end of the Market Street/Union Square Station would connect to the BART/Muni Metro Market Street Subways at the Powell Street Station using existing pedestrian entrances on Market Street and at the northwest corner entrance on Stockton and Ellis Streets. At the north end of the station the main entrance would be located at the southeast corner of Union Square on Geary Street just west of Stockton Street. The entry would include escalators and stairs. A site for as many as two elevators would be located off Stockton Street in the terrace near the corner at Geary Street. The station entrances would displace about 34 parking spaces in the Union Square Garage. A second set of stairs would be located in the sidewalk on the north side of Geary Street, just east of Stockton Street, behind an existing Muni bus stop. Widening of the existing station access/egress on the north side of Ellis Street at One Stockton Street (the Apple Store) may require a bulb-out of the sidewalk, which would result in the elimination of three parking spaces and an existing street tree. Two emergency ventilation shafts would extend west of Stockton Street under Ellis Street, rising inside the air-well of the Ellis/O'Farrell Garage at 123 O'Farrell Street to a height of 26 feet above the garage roof. The emergency ventilation would be designed in cooperation with BART so as not to impact ventilation in the Powell Street Station. These vents would displace about 25 parking spaces out of a total of 950 spaces in the Ellis/O'Farrell Garage.

North of the Union Square station, the subway would continue in a bored tunnel under Stockton in a side-by-side configuration to the Chinatown terminus. This would permit the location of a station with a center platform, as well as a double crossover of tracks for train return in the opposite direction south of the platform. Twin storage tracks, capable of storing two two-car trains, would extend north of the station, about 60 feet beyond Jackson Street. Different from both Alternatives 2 and 3A, the Chinatown Station for Fourth/Stockton Alignment Option B would be located on Stockton Street between ~~Washington~~ Clay and Jackson Streets (see Figure 2-22). It would have a mezzanine and ~~(~~concourse~~)~~ and one platform level for north and southbound trains. The main pedestrian entrance would be in a building that Muni would construct on the west side of Stockton Street south of Washington Street (933~~-935~~949 Stockton Street, Assessor's Parcel #0211-001) to accommodate escalators, stairs, two elevators, and two emergency ventilation shafts. Construction of the station entrance would require acquisition of the parcel and one building, and relocation of 8 businesses and 17 residential units that occupy the building. The Muni facility would require only one story. However, for the purposes of this analysis it is assumed to be part of a 65-foot high building as permitted under existing zoning. The vent shafts would rise 26 feet above the development roofline on the southwest end of the parcel. Emergency stairs would be provided by a sidewalk hatch located in an existing bulb-out on west side of Stockton Street between Washington and Jackson Streets. The bulb-out would be extended slightly to an overall length of 38 feet, eliminating ~~about one~~ two parking spaces.

FIGURE 2-22: FOURTH/STOCKTON ALIGNMENT OPTION B - CHINATOWN STATION



Source: PB Wong

Station Locations – Alternative 3B

Fourth Street Alignment Option 3B would have three subway stations and one surface station, as listed in Table 2-5. The surface station would be located on Fourth Street north of Brannan Street to serve emerging development in the area. The surface station would be between 14 and 15 feet in width. The subway station platforms would be about 200 feet in length (225 feet at Union Square/Market Street), ~~(~~compared with 250 feet in Option 3A~~)~~, and 26 feet in width to accommodate two-car trains using high-floor LRVs. All subway station designs would accommodate fare gates and ticket vending machines (TVMs) per new Muni policy. All subway station platforms are single level with a mezzanine and concourse level above to permit a deep crossing of Market Street.

TABLE 2-5

CENTRAL SUBWAY FOURTH/STOCKTON ALIGNMENT OPTION B STATION LOCATIONS

Station	Type	Location
Brannan	Surface – Single Center Platform	Fourth Street between Brannan and Freelon Streets
Moscone	Underground – Single level center platform with a mezzanine and ~~(~~concourse~~)~~ level above platform level.	Fourth Street between Folsom and Howard Streets
Union Square/Market Street	Underground -Single level center platform with a mezzanine and ~~(~~concourse~~)~~ level above the platform level and a non-paid pedestrian level between Union Square and Market Street.	Stockton Street between Market and Geary Streets
Chinatown	Underground – Single level center platform and a mezzanine and ~~(~~concourse~~)~~ level above the platform level.	Stockton Street between Washington and Jackson Streets

North Beach Tunnel Construction Variant – Alternative 3B

This variant would be the same as described above for Alternative 3A.

Light Rail and Bus Operating Plan – Alternative 3B

For the Fourth/Stockton Alignment Option B, both the light rail and bus operating plans would be the same as for Alternative 3A and Alternative 2 as described in Section 2.1.2.

Operating Statistics – Alternative 3B

The operating statistics for the diesel and trolley bus fleet for Central Subway Fourth Street Alignment Option B would be the same as Option A and the Enhanced EIS/EIR Alignment as described in Section 2.1.2. Table 2-6 summarizes the operating statistics for the Fourth/Stockton Alignment Option B. Rail headways on the T-Third line would improve from the current nine minutes under existing conditions to seven minutes in the No Project/TSM Alternative and to ~~five~~ six minutes under the Fourth/Stockton Alignment Option B (same as Option A). Even though there would be an increase in LRV route miles and service frequencies associated with the new Central Subway service, the result ~~is~~ would be an annual

TABLE 2-6

ANNUAL OPERATING STATISTICS FOR

ALTERNATIVE 3 – FOURTH/STOCKTON ALIGNMENT OPTION B

Alternative	Peak Headways 9-X Line[2]	Diesel/Trolley Peak Demand (~~Systemwide~~ Fleet size)[1]	Total Annual Diesel/Trolley Bus Hours (Systemwide)[1]	Peak Headways T-Third[2]	LRV Fleet Peak Demand[3] (~~Systemwide~~ Fleet size) ~~1~~3	Total Annual LRV Car Hours T-Line (Systemwide)
Existing (2007) T-Third	5 minutes	377 (~~495~~ 473) diesel buses; 225 (~~333~~ 331) trolley buses	2,592,230	9 minutes	~~118~~ 119 (151) LRVs	~~84,800~~ 109,400 ~~(568,500)~~ (570,200)
No Project/TSM (2030)	5 minutes	377 (495) diesel buses; 230 (~~333~~ 336) trolley buses	2,622,030	7 minutes	~~129~~ 137 (171) LRVs	~~80,400~~ 117,000 ~~(609,500)~~ (602,700)
Fourth/Stockton Alignment Option B (2030)	5 minutes	377 (495) diesel buses; 219 (~~333~~ 336) trolley buses	2,545,630	~~5~~ 6 minutes	~~130~~ 140 (175) LRVs	~~86,400~~ 78,000 ~~(590,100)~~ [3] (615,900) [3]

Notes: [1] Source for 2007 bus equipment demand and bus hours is the Muni 2006-2025 Short Range Transit Plan, December 2005 and Dan Rosen, MTA, 2007. Revised Dan Rosen, January 2008.
[2] Headway refers to the time between transit vehicles on a given line.
[3] Assumes one-car trains operating in the peak for the Central Subway on both the long and short lines.

reduction of ~~6,000~~ 39,000 LRV car hours (compared with ~~2,400~~ 40,300 LRV car hours for Option A) on the ~~Central Subway Corridor~~ T-Third line and a systemwide annual ~~reduction~~ increase of ~~19,400~~ 13,200 car hours, compared to the No Project/TSM Alternative and the ~~27,800~~ 11,900 car hours for Option A, which has ~~a more direct alignment~~ one fewer stations and a faster travel time.

Transit Fleet Requirements – Alternative 3B

Fourth/Stockton Alignment Option B would require four additional LRVs (three peak LRVs and one spare) beyond the 2030 requirements for the No Project/TSM Alternative. Muni's total LRV fleet size, including spares, would be 175 LRVs and ~~130~~ 140 LRVs in the peak period, the same as Option A. The diesel bus fleet would ~~remain the same as~~ increase by 23 buses from the existing condition in 2030, but ~~and No Project/TSM fleets, with~~ the ~~same~~ peak demand would remain the same. The trolley bus fleet would ~~remain the same~~ increase by five buses, but peak demand would be reduced by six trolleys over existing conditions and by eleven trolleys over No Project/TSM.[6]

The light rail maintenance facility, traction power distribution system, signaling and communication system and fare collection system previously described for Alternative 2 in Section 2.1.2 would also apply to Alternative 3B.

[6] San Francisco Municipal Railway, *EIR Supplemental Final Revised Light Rail and Bus Transit Operating Plan*, August 6, 2006.

2.2 CAPITAL COSTS

2.2.1 CAPITAL COST SUMMARY

The capital cost estimates were prepared for Alternative 2, Enhanced EIS/EIR Alignment; Alternative 3, Fourth/Stockton Option A, LPA; and Alternative 3, Fourth/Stockton Option B, Modified LPA; and cover all components of the Project from the Initial Operating Segment (IOS) northerly terminus at King and Fourth Streets to Chinatown and for the LPA (Option 3A and 3B) North Beach Construction Variant extending non-operating tunnels beyond Chinatown Station to a construction shaft located on Columbus Avenue.

The estimate was developed using the Federal Transit Administration (FTA) Guidelines for Preparation of a Capital Cost Estimate for New Starts Projects and is structured to follow the FTA Standard Cost Categories (FTA Standard Cost Categories for Major Capital Projects, Rev. 9, February 2007). The standard cost categories are shown in Table 2-7. Table 2-7 compares base capital costs in 2007 dollars (without escalation or finance charges).

Cost estimates for various components of the Project have been developed based on a breakdown of labor, permanent materials, construction materials, plant and equipment required to construct or install a component of the project, indirect costs and margin plus any additional subcontract costs and contingency. Included in the unit prices are cost allocations for utility relocation, mobilization/demobilization, traffic control, other sitework and special conditions, such as demolition, site clearance and disposal of contaminated ground. The capital cost estimate also has an allowance for public art at each of the stations. Prevailing labor rates used in building up the cost estimate are based upon Department of Industrial Relations Schedule of Labor Rates for Craftsmen in Northern California. Where appropriate, unit costs for some elements of the trackwork and systems installation are developed using historical data from MTA projects, including the IOS and other light rail projects around the country and location factored to the San Francisco area. All unit prices have been estimated in 2007 dollars.

Right-of-way and easement costs were provided by the City based on recent appraisals. Professional Services have been determined on a percentage of construction cost basis, including all subconsultants and engineering and administration by MTA. A design/estimating contingency allowance is included to cover design development, uncertain market conditions at the time of bids, and recognizes the preliminary engineering level of the project. The costs for four additional LRVs (three plus one spare vehicle) are based on recent MTA procurement costs. In accordance with FTA guidelines an unallocated

TABLE 2-7

CAPITAL COST SUMMARY (IN $MILLIONS)

	2007 Alternative 2	**2007 Alternative 3A[1]**	**2007 Alternative 3B[1]**
Guideway & Track Elements	$364	$248	$244
Station, Stops, Terminals, Intermodals	$376	$376	$325
Support Facilities: Yards, Shops, Admin. Bldgs.	--	--	--
Site Work & Special Conditions	$94	$70	$47
Systems	$118	$110	$94
Construction Subtotal	**$952**	**$804**	**$710**
Row, Land, Existing Improvements	$15	$20	$20
Vehicles	$21	$21	$21
Professional Services	$229	$202	$188
Unallocated Contingency	$97	$84	$75
Subtotal	**$1,345**	**$1,131**	**$1,014**

[1] Costs for Alternatives 3A and 3B do not include the North Beach Construction Variant which is estimated to cost $54 million in YOE dollars.
Source: PB/Wong 2007

contingency is included in the capital costs to cover unexpected changes/additions in the work scope and unanticipated costs above and beyond the assumed normal rates that occur during construction.

The estimates are based on design/bid/ build delivery with contract packages as follows:

- Utility Relocations
- Tunnels including TBM Procurement
- Chinatown Station with Crossover and Tail Track
- Union Square/Market Street Station
- Moscone Station
- Surface Platform~~,~~ and Trackwork~~, and Overhead Contact System~~
- Systems (Train Control, Traction Power, Communications and Overhead Contact System)

Alternative 2 – Central Subway Enhanced EIS/EIR Alignment

The original capital cost estimate for Alternative 2 was based upon an estimate for the EIS/EIR prepared in 2004 with enhancements added to the cost estimate in 2005. The costs indicated in Table 2-7 for Alternative 2 represent the base year estimate escalated to 2007 dollars in accordance with construction industry published escalation rates for the period 2004 to 2007. Adjustments were also made to the original 2004 estimate to reflect further definition of the project and consistency of unit prices with the later Alternative 3 estimates.

Alternative 3A – Fourth/Stockton Alignment Option A (LPA)

The original capital cost estimate for Alternative 3A was based upon an estimate for the Project produced in 2005 and previously adjusted in 2006. The costs indicated in Table 2-7 for Alternative 3A represent the base year estimate escalated to 2007 dollars in accordance with construction industry published escalation rates for the period 2006 to 2007.

Alternative 3B – Fourth/Stockton Alignment Option B (Modified LPA)

The capital cost estimate for Alternative 3B was based upon an estimate for the project produced in 2007.

2.3 OPERATING AND MAINTENANCE (O&M) COSTS

2.3.1 O&M COST ESTIMATION METHODOLOGY

The O&M cost model was developed based on Muni's actual operating expenses for fiscal year 2005/2006. O&M cost calculations accounted for the level of Muni service provided for the No Project/TSM Alternative, the Enhanced EIS/EIR Alignment, and the Fourth/Stockton Alignment Options A and B. For each alternative, bus and light rail variables related to route miles, service frequencies, and travel times were derived from engineering and travel demand requirements. See Chapter 8.0 for detailed description of cost estimation methodology.

Operations inputs, such as revenue miles and hours per mode, were calculated independently using operating plans developed specifically for the Central Subway Project.

2.3.2 O&M COST SUMMARY

Table 2-8 summarizes the total operating and maintenance costs for the Muni system, broken out by vehicle type, for each alternative.

TABLE 2-8

OPEARATING AND MAINTENANCE COST SUMMARY

(MILLIONS $ / YEAR OF OPERATING EXPENSES)

	No Project	Alternative 2	Alternative 3A	Alternative 3B
2016	$707.9	$693.4	$693.0	$693.2
2030	$1,145.9	$1,122.3	$1,121.7	$1,122.1
Increment Over No Project/TSM				
2016	N/A	($14.3)	($14.9)	($14.7)
2030	N/A	($23.6)	($24.2)	($23.8)
Source: MTA, May 2007.				

2.4 PROJECT DEVELOPMENT HISTORY

Ten alternatives, encompassing diesel and electric buses and light rail vehicles with varied alignments and operating scenarios were considered during a multi-phase planning and screening process that preceded preparation of the Third Street Light Rail Project Final EIS/EIR. Through the initial screening process the alternatives evaluated in the 1998 EIS/EIR were reduced to No Project, No Build/TSM with enhanced bus service to meet demand, and a two-phased Light Rail Build Alternative that included a 5.4-mile Initial Operating Segment (IOS), now referred to as the T-Third Line, and a 1.7-mile Central Subway Project as shown in Figure 2-29. In 1998, the San Francisco Planning Commission certified the Final EIS/EIR and the San Francisco Public Transportation Commission (predecessor to the MTA) approved design and construction of the Third Street Light Rail Project in two phases. In 1999, the FTA issued a Record of Decision for the IOS, Phase 1 of the Project. The T-Third Line opened for full revenue service in April 2007. The Phase 2 Central Subway Project was put on hold by the Commission in 1999 pending development of a viable financial plan and incorporation into the RTP.

The Phase 2 Central Subway 1998 FEIS/FEIR Project (known as the Base Case) has been eliminated as an alternative because it is no longer a feasible project due to changes in City fire codes related to the vent shaft placement and Muni fare collection policy changes. It is defined here only as a point of reference.

The Base Case would have operated on both Third and Fourth Streets, south of Market Street. The line would have started at Fourth and King Streets, the terminus of the T-Third Light Rail Project. It would have operated as a surface line running northbound on Third Street and southbound on Fourth Street. There would have been a surface station on Third Street at King Street. The rail line would have transitioned from surface to subway operation at portals located between Brannan and Bryant Streets for both the Third Street and Fourth Street segments. Just north of Harrison Street, the Fourth Street rail line would have turned east to converge with the Third Street line and would have operated double-track from this point north. There would have been two subway stations in this Third Street segment, one between Folsom and Howard Streets and the other just south of Market Street. The rail line would have crossed Market Street in a shallow subway above the BART and Muni tunnels and connected to Geary Street via Kearny Street. The Market Street Station also included a pedestrian connection to the Montgomery Station.

The line would have followed Geary Street to Stockton Street where it would have turned north and continued on Stockton Street to a terminus at Jackson Streets. The two subway stations in the north of

FIGURE 2-29

THIRD STREET LIGHT RAIL

PHASE 1 INITIAL OPERATING SEGMENT AND PHASE 2 1998 FEIS/FEIR CENTRAL SUBWAY

Source: PB/Wong
Not to scale
Revised 1/08

Market segment would have been located on Stockton Street at Union Square near Post Street and in Chinatown near Clay Street. All subway station entrances would have been located in public sidewalks. Station designs assumed Proof-of-Payment (POP) fare collection, which eliminated the need for fare gates, like those used on the Market Street Metro, at the mezzanine/concourse level.

During preparation of the Third Street Light Rail Project EIS/EIR in 1997, there was a formal screening process to determine which options should be carried forward for evaluation in the EIS/EIR. Four key decisions were formulated in this process and summarized in the *Design Options Screening Report, Working Paper #2*:[7]

- Decision 1. Which alignment sub-options should be selected for: 1) Mission Bay (Third/King or 16th/I-280/King); 2) the Central Subway (Stockton/Geary or Kearny); and 3) the Downtown Surface Route (Market Street/Transbay Terminal or Washington Street/Chinatown)?
- Decision 2. Which Downtown alignment should be selected: Option 1 - Market Street Subway (integrated with Muni Metro); Option 2 - a New Central Subway through Downtown to Chinatown; or Option 3 - a Downtown Surface Route?
- Decision 3. Which Third Street configuration should be selected: two lanes, one/two flexible lanes, or one lane? Which LRV type (high floor or low floor); station platform height and configuration; and station locations should be selected?
- Decision 4. Which site should be selected for the new LRV maintenance and storage facility (Mission Bay, Cargo Way, or the former Western Pacific Rail Yard) and should the new LRV maintenance facility and the LRV acquisitions be phased?

The four key decisions were discussed at a series of about 120 meetings between October 1996 and July 1997. Based on the input from the community meetings as well as input from the Project's Technical Advisory Committee and Community Advisory Group and City Commissions (Planning, Redevelopment, Port, and Parking and Traffic), the Public Transportation Commission (PTC) narrowed the design options to be carried forward in the EIS/EIR on July 8, 1997. For the Light Rail Alternative, the PTC eliminated the 16th/I-280/King alignment through Mission Bay, the Central Subway alignment via Kearny Street, and the Downtown Surface Route via Market or Washington Streets.

The Final EIS/EIR was completed in 1998. On June 23, 1998, the San Francisco Public Transportation Commission selected the Third Street Light Rail project as the Locally Preferred Alternative including the Phase I Initial Operating Segment (now T-Third Line) and the Phase 2 Central Subway. On January 19, 1999, the San Francisco Public Transportation Commission approved the two-phased Third Street Light Rail Project. The PTC also approved two traffic lanes in each direction along Third Street, a new rail maintenance and storage facility at the former Western Pacific rail yard site and use of high platforms along the T-Third line, explicitly rejecting the use of low platforms or a hybrid version (low level with a high boarding area) that were not compatible with Muni's existing high floor light rail vehicles or did not address accessibility concerns about having equal access at all doors. FTA issued a Record of Decision (ROD) on March 16, 1999, for the Phase 1 portion of the Project. Though no New Starts federal funds were used for the T-Third project phase, the ROD did permit acquisition of limited right-of-way for the Phase 2 Central Subway that was identified in the 1998 FEIS/FEIR. The ROD deferred approval of Phase 2 until the Central Subway was incorporated into the RTP and Project funding was identified.

The Phase 1 Third Street Light Rail Project was initially included in the MTC RTP as a locally-funded project. The IOS was supported by over $300 million (1997 dollars) in Proposition B local sales tax revenues and other non-New Starts funds. In 2001, the Third Street Light Rail project, including the Phase 2 Central Subway, was incorporated into the RTP as a project eligible for federal funds. The funding plan included a combination of local, regional and federal funds for implementation of the two project phases and noted that an updated cost estimate would be provided for the Central Subway following selection of the Locally Preferred Alternative (LPA) by the MTA.

2.4.1 PHASE 2 CENTRAL SUBWAY CONCEPTUAL DESIGN

At the time the 1998 EIS/EIR alternative was conceived, a shallow excavation method was thought to be the most cost-effective construction approach for crossing Market Street, as there was sufficient room above the BART/Muni Metro Subway at Third and Market Streets to accommodate a shallow crossing. A shallow crossing at Fourth and Market Streets was not considered because of conflicts with the Powell Street Station structure. Because of a concern about the impact of surface construction and the circuitous alignment required for a shallow alignment, the Central Subway design team subsequently recommended consideration of a deep (rather than a shallow) tunnel crossing of Market Street at Third Street that would go below the existing Muni Metro and BART tunnels using Tunnel Boring Machines (TBMs).[8]

Studies were also performed to evaluate several alternative surface-to-subway portal locations in the South of Market area.[9] The findings from the station design, construction methodology, portal location, and other studies were discussed at seven public meetings and five Third Street Light Rail Community Advisory Group (CAG) meetings beginning in 2003. The portal options and project construction

[7] San Francisco Public Utilities Commission and Municipal Railway, *Design Options Screening Report Working Paper #2*, April 1997.
[8] San Francisco Municipal Railway, "Recommended Tunnel Construction Methods Report," March 16, 2004.
[9] San Francisco Municipal Railway, "Portal and Surface Station Locations Study," December 23, 2004

methods were presented to the public in an August 2004 meeting. The options included: (1) two portals, a single-track portal on Third Street between Townsend and Brannan Streets, one block south of the original location, with a single-track portal remaining on Fourth Street between Brannan and Bryant Streets or (2) a single double-track portal on Fourth Street between Townsend and Brannan Streets that used a two-track alignment via Harrison, Third, Kearny, Geary, and Stockton Streets. The prevailing public preference was for a single double-track portal on Fourth Street. Members of the public also suggested a Fourth Street alignment, which was possible using a deep crossing at Fourth and Market Streets. The meeting also discussed overall Project construction methods (TBM vs. Cut-and-cover/Special Excavation Method). The TBM concept was favorably received as an alternative to cut-and-cover since this approach reduces surface impacts such as noise, dust, and traffic effects and also reduces guideway construction time.

The "Special Alignment and Validation Studies," finalized in June 2005, evaluated a Fourth/Stockton Alignment with a double-track portal on Fourth Street between Townsend and Brannan Streets and a deep crossing below the BART/Muni Metro Market Street subway at Fourth Street.[10] It maintained the Chinatown Station on Stockton Street in the vicinity of Clay Street, combined the Union Square and Market Street Stations with northern entries in the vicinity of Union Square and southern entries using BART/Muni Metro Powell Street Station entrances; and relocated the Moscone Station to Fourth Street between Howard and Folsom Streets. The Fourth/Stockton Alignment had improvements in transit and vehicular travel time and localized traffic circulation, particularly on Third Street. This alignment, which used TBM construction, also reduced surface-related construction impacts (noise, dust, traffic) as compared to the shallow construction method proposed for the 1998 EIS/EIR Alignment.

Based on results from these studies, the MTA approved the designation of the Fourth/Stockton Alignment as the Locally Preferred Alternative (LPA) on June 7, 2005. This designation allowed the Fourth/Stockton Alignment, rather than the 1998 EIS/EIR Alignment, to be evaluated as the LPA in the FTA New Starts Program. On February 19, 2008, the MTA, subsequent to publication of the Draft SEIS/SEIR, endorsed Alternative 3B as the LPA.

[10] PB/Wong and San Francisco Municipal Railway, "Special Alignment and Validation Studies," June 30, 2005.

2.4.2 INITIATION OF SUPPLEMENTAL EIS/EIR

Preparation of an SEIS/SEIR was initiated in 2005 for the Phase 2 Central Subway refined alternatives. A Notice of Preparation (NOP) identifying alternatives to be evaluated in the SEIR was sent to the

Governor's Office of Planning and Research, responsible and trustee agencies, the Central Subway mailing list, and Corridor residents and occupants within a 300-foot band of the proposed alignments on June 3, 2005. Legal notice was also published in the San Francisco Chronicle, ads were placed in five Chinese daily newspapers, and flyers posted along the proposed alignments. In addition, the alternatives were presented for public comment at an EIR Scoping meeting conducted by MTA and the San Francisco Planning Department on June 21, 2005. A Notice of Intent was not required for the Central Subway SEIS.

2.4.3 MODIFICATIONS TO THE ALTERNATIVES

During the 2005 Central Subway Scoping Process, many comments regarding the proposed changes to the Phase 2 Central Subway were received. (See Section 11.0 Coordination.)

Subsequent to the Scoping Process, an updated Project construction cost estimate was prepared that exceeded the proposed budget for the Project. A panel of construction experts working with the Project design team undertook a cost reduction analysis to identify ways of reducing the cost of the Project without compromising its overall purpose and need. <u>Surface alternatives along Third, Fourth, and Stockton Streets and continuing north to Fisherman's Wharf were evaluated as part of this process, but were rejected from further evaluation in the Draft SEIS/SEIR because they had fewer benefits in terms of service reliability and greater impacts on parking and traffic. Though the capital costs were less for a surface alternative than for a subway alternative, the surface alternatives only minimally met the project purpose and need and resulted in higher operation and maintenance costs.[11]</u>

In response to public input during Scoping and recommendations from the cost reduction effort, a new option for the Fourth/Stockton Alignment design was identified. The original Fourth/Stockton Alignment was designated Option A (LPA) and a modified Fourth/Stockton Alignment, described below, was designated as Option B (Modified LPA). The changes incorporated into the Option B (Modified LPA) Alternative are summarized below.

- The portal was moved to a location under the I-80 Freeway on Fourth Street between Bryant and Harrison Streets;
- The number of southbound traffic lanes on Fourth Street between Harrison and Bryant Streets was reduced from four to three to accommodate the new portal location. In addition, the four southbound

[11] <u>PB/Wong for Muni, FINAL DRAFT, Task 1.72-01, Conceptual Alternative Downtown Rail Alignment Study Volume 1, Summary Report, Revision Oc, March 20,2006.</u>

- lanes in the segment between Bryant and ~~King~~ Townsend Streets were reconfigured to two northbound and two southbound lanes. Two sub-options for the northbound and southbound light rail tracks were identified: operation in mixed-flow lanes or semi-exclusive right-of-way in the inner two lanes;
- The relocation of the portal from between Townsend and Brannan Streets to between Bryant and Harrison Streets allowed for an additional surface station on Fourth Street between Brannan and Bryant Streets. This station would be a center platform configuration with access from the Fourth and Brannan Streets intersection;
- The underground station platform lengths were reduced from 250 to 200 feet, and the platform widths were standardized at 26 feet to address cost concerns;

- The size of the combined Union Square/Market Street Station was reduced and the northerly pedestrian entry was moved to the southeast corner of Union Square at Geary and Stockton Streets;
- The Chinatown Station underground platform was moved a block north to Washington Street, a more central location in Chinatown, which would also result in a shallower and more easily accessible station with reduced station costs;
- Construction methods and phasing were changed to include the use of two rather than one TBM and to limit Union Square/Market Street Station construction to cut-and-cover as opposed to a combination of cut-and-cover and sequential excavation; and
- A construction variant extending tunnels north of the Chinatown terminus to the vicinity of Washington Square Park in North Beach was proposed to facilitate removal of the TBM following construction.

Following the first NOP in June 2005, Muni discovered that the NOP had not been distributed to property owners. Accordingly, on September 20, 2006, a revised NOP that presented details of Option B (Modified LPA) suggested by the public during the 2005 Scoping Process was sent to owners and occupants within a 300-foot band of the proposed Central Subway Project alignments. In addition, the revised NOP was sent to the San Francisco Planning Department's standard EIR distribution list and the 2,500-name Central Subway Project mailing list. The key comments received in response to the second NOP are summarized in Chapter 11.0 Coordination.

2.4.4 SCREENING OF DESIGN OPTIONS/ALTERNATIVES NOT CARRIED FORWARD

Alignment and Portal Location

As mentioned in Section 2.4.1, the "Portal and Surface Station Locations Study" evaluated several surface-to-subway portal locations. The relocation of the single-track portal from between Bryant and Brannan Streets on Third Street to the block between Townsend and Brannan Streets, as well as having a double-track portal on Fourth Street between Townsend and Brannan Streets that would use an alignment via Harrison, Third, Kearny, and Geary Streets, and then transitioning back to Stockton Street were both eliminated from further consideration in the SEIS/SEIR because of traffic, parking and disruption to adjacent properties. A double-track portal on Fourth Street between Townsend and Brannan Streets was selected as a design to go forward with. These options were discussed at public meetings in the summer and fall of 2004. The double-track portal on Fourth Street between Townsend and Brannan is now a part of Alternative 3 - Fourth/Stockton Alignment Option A.

Tunnel Construction Methods

During conceptual engineering, a deep crossing of the BART/Muni Metro Market Street Subway at Third Street using a TBM to bore the northbound and southbound tunnels was considered for the Enhanced EIS/EIR Alignment. In this scheme the TBM would have been deployed between the single portals on Third and Fourth Streets and the intersection of Stockton and Geary Streets. This alignment would have passed under several properties between Third Street at Market Street and Stockton Street at Geary Street thus allowing for a straighter alignment compared to the surface construction alignment. From that point northward the Sequential Excavation Method (SEM) would have been used to reach the Chinatown terminus. The potential for incorporation of a deep Market Street crossing into the Enhanced EIS/EIR Alignment was evaluated in the “Special Alignment and Validation Studies.” The Third Street deep tunnel under Market Street was found to have a longer construction schedule and greater tunnel construction impacts to a sewer main, and higher costs, than a deep crossing on the Fourth/Stockton Alignment. These factors were discussed at public meetings in the summer and fall of 2004 and the deep crossing at Third and Market Streets was subsequently eliminated from further consideration in the Enhanced EIS/EIR Alignment when the Fourth/Stockton Alignment was selected as the LPA. A deep crossing of Market Street is proposed, as part of the Alternative 3 – Fourth/Stockton Alignment.

The use of a mega tunnel with a single large diameter bore for tunnels and stations was explored as an alternative to the twin tunnel construction method. Station access and ventilation shafts would be constructed via cut-and-cover techniques from the surface. The mega tunnel would require stacked stations that would push the platform levels to even greater depths. This tunneling concept was eliminated from further consideration because soil conditions are not optimal and settlement concerns would be greater with this approach, the larger TBM radii turns would impact more right-of-way requiring more costly right-of-way acquisition, and the platform depths would result in longer station access times for patrons. In addition, the deeper alignment under the BART/Muni Metro Market Street Subway would force the relocation of the Union Square/Market Street Station (UMS) for the Fourth/Stockton Alignment further north, creating a longer walk for passengers transferring to UMS from the BART/Muni Metro Powell Street Station.

Station Location

The station locations and the northern boundary of the Phase 2, Central Subway were initially established early in the Third Street Light Rail planning process as part of the *Bayshore Transit Study* completed in 1993 and incorporated into the *Four Corridor Study* prepared by the San Francisco Transportation Authority in 1995. The northern limit of the Third Street Light Rail Corridor was originally at California Street (*Four Corridor Plan*) and was later extended to Jackson Street, the northern project boundary analyzed in the 1998 EIS/EIR. The study limit of Jackson Street, established in the 1998 EIS/EIR, was important in distinguishing funding priorities for transportation corridors in the City and also for establishing the Project eligible for federal funding.

Under the 1998 EIS/EIR, all stations access points for the Project were provided in sidewalk areas within the public right-of-way. Early in the Phase 2 planning process for the Central Subway, station location and access studies were undertaken to evaluate the opportunities for locating station access points out of the public right-of-way to minimize disruption to the congested sidewalks and pedestrian traffic along the Project Corridor. At the same time, an alternative with a more direct alignment for the rail corridor, the Fourth/Stockton Alignment, was also being studied. When the NOP was issued in June 2005, off-street station locations had been incorporated in several locations into both the Enhanced EIS/EIR Alignment and the Fourth/Stockton Alignment. Further refinement of the station locations occurred between June of 2005 and summer of 2006 when the environmental process was reactivated. The northern boundary for the Project remained fixed at Jackson Street consistent with the 1998 EIS/EIR. Extending the Project boundaries northward would have required reinitiating the environmental process rather than preparation of a Supplemental EIS/EIR. The various station access points that were considered at each of the stations as part of this process are summarized below.

During conceptual engineering and public outreach discussed above, the San Francisco Planning Department and members of the public expressed concerns about the location of the Moscone Station on the Fourth/Stockton Alignment. Three locations for a Moscone Station were identified and discussed with the public at meetings in 2004 and 2005. The options included 1) Fourth Street between Howard and Folsom Streets, 2) Fourth Street between Folsom and Harrison Streets, and 3) Fourth Street between Howard and Folsom Streets with an additional subway station on Fourth Street south of Harrison Street. A member of the public and the cost reduction panel suggested a fourth option locating the station on Fourth Street between Mission and Howard Streets. The second and third options were developed in response to the Planning Department’s concern about serving the anticipated development on Fourth Street, south of Harrison Street and north of the Fourth/King station. The second Moscone Station location on Fourth Street between Folsom and Harrison Streets was eliminated from further consideration in this SEIS/SEIR because of potential safety conflicts between vehicles and pedestrians at the freeway ramps and a lack of public support expressed at meetings in the summer and fall of 2004.[12] The third option was eliminated due to the cost of an additional subway station on Fourth Street between Brannan and Bryant Streets. However, when Fourth/Stockton Alignment Option B (Modified LPA) was

[12] PB/Wong and San Francisco Municipal Railway, “Working Paper Task 1.60-11 Additional Station Location and Access Studies, Revision”, May 24, 2005.

developed a surface station was added at that location. The fourth option between Mission and Howard Streets was eliminated due to the conflict with an ~~major~~ eight-foot diameter sewer transport line on Fourth Street ~~in this area~~ between Howard and Mission Streets, and station spacing concerns given the proximity of the Moscone Station between Mission and Howard Streets and a Union Square/Market Street Station between Market and Geary Streets. The sewer transport line was recently relocated to this block of Fourth Street specifically to provide a connection to Moscone Center, so moving the major sewer line is not feasible due to its size and service connection to Moscone Center. The eight-foot diameter of the sewer line, which would penetrate a station at this location, would preclude simple design solutions. In addition, shifting the station north to Mission Street would cause greater overlap of the Union Square/Market Street Station service areas and would create a service gap between the Fourth and King Station and Mission Street, thereby serving a smaller population and employment base in South of Market.

In Union Square, merchants expressed concerns in meetings held during 2004 and 2005 about the narrowing of sidewalks in the busy retail core and the potential impacts on businesses adjacent to subway entrances. The redesigned Union Square Plaza was identified for potential access to the Union Square Station for the Enhanced EIS/EIR Alignment and was favorably received by the business community and civic organizations. This station access proposal was incorporated into the Fourth/Stockton Alignment Option A and later refinements to Union Square Station access were incorporated into Alternative 3B.[13],[14]

Early in the process of exploring off-street locations for the Chinatown Station, the project team did a site walk of Chinatown with community members. Four potential off-site locations were identified for locating an entrance to the station centered on Clay Street: 1) the southwest corner of Stockton and Sacramento Streets intersection (777 Stockton Street); 2) the east side of Stockton Street north of Sacramento Street (814-828 Stockton Street); 3) the north side of Clay Street, west of the Stockton Street

[13] Ibid.

[14] PB/Wong and San Francisco Municipal Railway, "Summary Report Task 1.60.4 Special Alignment and Validation Studies" Revision 0, June 30, 2005.

intersection (910-918 Clay Street); and 4) mid-block on the east side of Stockton Street between Jackson and Pacific Streets (site located in Ping Yuen Housing Complex at 799 Pacific). These sites were identified and evaluated based on factors such as building size and heights (one to two-story buildings were preferred to minimize neighborhood disruption), ability to accommodate station facilities and vent shafts (regulations governing vent shaft locations were updated to require off-sidewalk locations that discharge 10 feet above the adjacent surface), accessibility, constructability, business and residential displacement, development potential, possible environmental impacts, and consistency with Project boundaries established in the 1998 EIS/EIR. The 814-828 Stockton Street site emerged as the preferred site. The parking structure at 777 Stockton Street was eliminated from consideration because of its small size, which restricted the ability to accommodate the station entrance/exits and the vent shafts and to retain existing residential uses on the property. The 910-918 Clay Street site was eliminated from further consideration also because of its small size, which restricted the ability to accommodate the station facilities and the vent shaft, the community organizations located in the building that would be affected, and because of its accessibility to Stockton Street. The steep grades on Clay Street, in combination with the distance from Stockton Street, made this site less accessible to subway patrons than others under consideration. The Ping Yuen site was eliminated due to its location two blocks away from the station and beyond the established Study Area limit established for the Project in the 1998 EIS/EIR and the northern limit distinguishing the corridor for funding priority in the *Four Corridor Plan*. Further restrictions on this site included: a 12-foot drop from street level to the site, no access for construction and staging areas, displacement of an existing child care center on the site, and impacts to residents of the public housing occupying the site.

In community meetings that were held subsequent to the publication of the initial NOP in 2005, the meeting participants suggested that the Chinatown station site be moved closer to the heart of the Chinatown business district. Based on further assessments and screening, two additional access points were evaluated at that time in conjunction with a subway station site between Clay and Washington Streets: the southwest corner of the Stockton and Washington Streets intersection (933-949 Stockton Street) and the east side of Stockton Street, south of Washington Street (944-960 Stockton Street). The 944-960 Stockton Street site was eliminated from further consideration as it only afforded limited access through the basement of the existing Mandarin Towers building constraining the amount of space available for station entrances/exits and vent shafts. Thus only the 933-949 Stockton Street site was incorporated into the Fourth/Stockton Alignment, Option B. Both the two story building at 933-949 Stockton Street, near Washington Street, and the two story building at 814-828 Stockton Street near Sacramento Street are being carried forward for analysis in the SEIS/SEIR.

2.5 ROLE OF THE SEIS/SEIR

2.5.1 APPROVAL PROCESS

The purpose of the SEIS/SEIR is to examine alternative transit improvements in the Central Subway Corridor in terms of their potential environmental and social-economic impacts and to compare the alternatives based on the following Project goals: 1) improve travel and mobility for transit riders; 2) improve transit access to employment opportunities and to other areas of the City and region; 3) enhance physical environment while minimizing adverse environmental impacts; 4) ensure compatibility with transit-supportive policies; 5) implement a financially feasible project; and 6) gain community acceptance and support from City officials.

In addition to describing potential adverse impacts and mitigation measures associated with each alternative, the Draft SEIS/SEIR describes the trade-offs among the No Project/TSM and the Central Subway Alternatives according to these goals. The information will be used by local decision makers and the FTA to determine which alternative would have the least environmental effects and would be the most cost-effective and beneficial to the community, which would have the strongest local support, and which would be within the financial capacity of the local project sponsor, MTA, to implement.

A 45-day public comment period on the Draft SEIS/SEIR allows the public and interested agencies the opportunity to cite concerns about the environmental analysis and evaluation of alternatives. The public comment period also offers the opportunity for the public to provide input to the MTA on the Locally Preferred Alternative (LPA). Following the selection of the ~~Preferred Investment Strategy~~ LPA, the Final SEIS/SEIR will be completed. The Final SEIS/SEIR will incorporate and provide a summary of the comments and responses received during the public review process for the Draft SEIS/SEIR, and may provide additional information on the LPA.

FTA and the San Francisco Planning Commission will review the Final SEIS/SEIR to determine if all issues and/or comments received on the Draft SEIS/SEIR have been addressed and if the document meets the requirements of the National Environmental Policy Act and California Environmental Quality Act, respectively. In addition, FTA will determine if interagency agreements, developed as committed project mitigation measures, have been completed. The Planning Commission will be asked to certify the Final SEIR as complete and fulfilling the requirements of CEQA.

After FTA's review is completed, a Draft Record of Decision is prepared. The Final SEIS will be submitted to the U.S. Environmental Protection Agency, which places a notice of availability of the Final SEIS for public review in the *Federal Register*. Additionally, the Final SEIS is distributed to agencies that have previously commented on the Draft SEIS/SEIR. No less than thirty days after the notice of availability is published in the *Federal Register*, FTA may sign the Record of Decision. The San Francisco MTA can then request from FTA a "Letter of No Prejudice," which states that local funds used to construct Phase 1 of the Third Street Light Rail Project may serve as a local match for New Starts federal funding for the Phase 2 Central Subway Project.

2.5.2 REQUIRED PERMITS AND APPROVALS

Permits and approvals involving local, state, and federal agencies will be required prior to Project implementation. A list of these major approvals is provided in Table 2-9.

TABLE 2-9 -AGENCY APPROVALS

Agency	Approval or Permit
Department of Interior	Section 4(f) approval.
Advisory Council on Historic Preservation	Approval of Memorandum of Agreement (MOA) describing procedures for protection of and mitigation of impacts to historic and cultural resources pursuant to Section 106 of the National Historic Preservation Act and 36 CFR 800.
California State Historic Preservation Officer (SHPO)	Finding of Effect Determination.
California Public Utilities Commission (CPUC)	Permits required for all at-grade or grade-separated railroad, highway, and street crossings as well as pedestrian crossings of light rail and railroad tracks; public hearings before the CPUC may also be required; a formal application to conform with CPUC Rules of Practice and Procedure (CPUC Code Section 1200) is required; a formal application requesting permission to deviate from the established CPUC General Order (G.O.) standard (such as those regarding the height requirements for overhead wires) must be submitted and approved by the CPUC.
Caltrans	Access Control Properties Review. Permit to Encroach on Caltrans Right-of-Way.
Metropolitan Transportation Commission (MTC) and California Transportation Commission	Consistency with RTP and STIP.
Bay Area Rapid Transit (BART)	~~Amendment of~~ Consistency with the 1986 Muni/BART ~~j~~Joint ~~use~~ Station Maintenance ~~a~~Agreement, First Supplement ~~for Powell Street station entries~~, and execution of the 2008 Station Improvement Coordination Plan.
Regional Water Quality Control Board	General Construction Activity Stormwater Permit.
Bay Area Air Quality Management District (BAAQMD)	Conformity determination.
San Francisco Public Utilities Commission	Batch Industrial Wastewater Discharge Permit required for dewatering affluent discharge to the combined sewer system providing the quality of the effluent meets the NPDES General Permit discharge standards.
San Francisco Municipal Transportation Agency	Approve Project. Request from FTA a “Letter of No Prejudice” for New Starts federal funding. Approval required for surface street changes, traffic operation changes, traffic control measures, and on-street parking changes.
San Francisco Department of Public Health	Review and acceptance of site remediation plan in Maher Ordinance Area – Article 20.
San Francisco Planning Commission	General Plan Review/Referral for all aspects of project which occur in public rights-of-way, and amendments to appropriate portions of General Plan, Transportation Element, and Planning Code.
San Francisco Landmarks Preservation Advisory Board	Section 106 Review and Approval, review of SEIS/SEIR and Historical Architectural Report.
San Francisco Department of Public Works	Approval required for construction in streets and changes to sidewalk widths.
San Francisco Redevelopment Commission	Project review required for portions within existing Redevelopment Project Areas and, if adopted by the Board of Supervisors, within the proposed Redevelopment Areas. No approvals are needed for constructing light rail.
San Francisco Department of Recreation and Parks	Section 4(f) de minimis approval. Prop. K review and approval for shadow analysis. ~~Long-term encroachment permits for Union Square plaza.~~
San Francisco Arts Commission	Approval of the Public Arts Element and Civic Design.
San Francisco Board of Supervisors	Approval of General Plan and Planning Code amendments. Adoption of Redevelopment Plan amendments. Approval of property acquisitions, including eminent domain. Approvals required for use of City rights-of-way and Park property.
San Francisco County Transportation Authority	Review and inclusion of the project in the Countywide Transportation Plan and Capital Improvement Program of the Congestion Management Program for San Francisco funding.

3.0 TRANSPORTATION ANALYSIS

This chapter of the SEIS/SEIR describes the existing transportation conditions in the Study Area and evaluates the potential environmental operational and cumulative impacts of each of the four Central Subway alternatives as described in Chapter 2.0. Mitigation measures that would reduce or avoid operational environmental impacts are also described. See Chapters 4.0 and 5.0 for a description of existing conditions and impacts associated with all other environmental categories. All construction impacts and mitigation measures are summarized in Chapter 6.0, Construction. See Chapter 7.0 for the CEQA determinations of significance for all environmental categories.

Consistent with CEQA, the San Francisco Planning Department considers mitigation measures when necessary and feasible in order to reduce or eliminate potentially significant environmental effects. Improvement measures may be recommended to further minimize the affects of impacts that are less-than-significant. Under NEPA and FTA procedures, mitigation measures may be recommended to address project-related adverse effects even if impacts would not necessarily be considered significant.[1] This section identifies mitigation measures intended to reduce Project impacts to comply with both CEQA and NEPA requirements. For CEQA purposes, Chapter 7.0 provides further distinction between mitigation and improvement measures.

3.1 AFFECTED ENVIRONMENT

This section describes existing transit, traffic, freight, parking, non-motorized transportation, and emergency access conditions in the Central Subway Corridor (Corridor). For the purposes of transportation data collection and analysis, the Study Area is identified as the area generally within a two block radius of the Corridor, unless otherwise defined below. The Study Area would be bounded by the Mission Creek Channel to the south, Second and Montgomery Streets to the east, Columbus Avenue to the north, and Sixth and Taylor Streets to the west.

3.1.1 TRANSIT

This section provides a discussion of the existing local and regional transit systems serving the Central Subway.

[1] Council on Environmental Quality, Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Federal Register, 18026, 1981.

Existing Muni Transit System

Transit System

Muni provides 20-hour a day (5 a.m. to 1 a.m.), daily access to most locations within San Francisco with 24-hour a day daily service on 10 key trunk corridors. All of the 79 transit lines, except one which operates only weekends, operate seven days a week. Muni operates four modes of vehicles: diesel bus, trolley bus, rail (light rail vehicles/historic streetcars), and cable cars. Equipment demand by mode is shown in Table 3-1. In addition, Muni provides paratransit service by contract. The system carries approximately 216 million riders annually.

TABLE 3-1

2007 MUNI EQUIPMENT DEMAND BY MODE

	AM Peak Vehicle Demand	Revenue Vehicle Fleet[2]
Diesel Bus	377	495
Trolley Bus	225	333
Light Rail Vehicles (LRVs)	118	151
Historic Street Cars	17	26
Cable Cars[1]	26	40
Total	763	1,045

[1] Midday peak.

[2] Plus an addition 45 diesel buses that compose a reserve fleet.

Although the Muni route network is a modified grid that allows multi-destinational travel, approximately two-thirds of the 79 Muni routes are radial lines that travel from the neighborhoods to Downtown San Francisco. This includes 36 local and 16 express lines. In addition there are 13 cross-town lines that run north-south, east-west, or circumferential and 12 community service lines that fill in the gaps or serve areas of steep topography within the City. Also included are two special owl service routes (90, 91) that operate between the hours of 1 a.m. and 5 a.m. Late night service is also provided by eight regular routes on the L, N, 5, 14, 22, 24, 38, and 108 lines.

Transit service from the southern end of the Third Street Corridor to Downtown is provided by the new T-Third line. Including late night (Owl) bus service, transit along Third Street operates 24 hours a day. See Table 3-2 for a guide to hours of operation and frequency of transit service along the Third Street Light Rail Corridor. The new T-Third light rail line is an extension of the K-Ingleside line, which transitions from the K-Ingleside line to the T-Third line at the West Portal Station for inbound trains and

TABLE 3-2

GUIDE TO FREQUENCY OF SERVICE (AVERAGE TIME IN MINUTES)

	WEEKDAY						SATURDAY					SUNDAY				
ROUTE NAME[1]	**First**	**7-9 a.m.**	**9 a.m. - 4 p.m.**	**4-6 p.m.**	**Eve**	**Last**	**First**	**7-10 a.m.**	**10 a.m. - 6 p.m.**	**Eve**	**Last**	**First**	**7-10 a.m.**	**10 a.m. – 6 p.m.**	**Eve**	**Last**
T-Third[4] (LRT)	5:28	9	10	9	12-20	11:54 p.m.	5:28	10	10	12-20	11:54 p.m.	5:28	10	10	12-20	11:54 p.m.
J-Church (LRT)	5:09	8	10	12	20	12:30 a.m.	5:36 a.m.	12	12	15-20	12:16 a.m.	5:36 a.m.	15	15	20	12:16 a.m.
K-Ingleside (LRT)	5:09	10	12	10	12-20	12:30 a.m.	4:47 a.m.	12	12	15-20	12:16 a.m.	4:47 a.m.	15	15	20	12:16 a.m.
L-Taraval (LRT)	Owl	7	10	7	12-20	Owl	Owl	10	10	15-20	Owl	Owl	12	12	15-20	Owl
M-Oceanview (LRT)	5:42	9	12	9	12-20	12:30 a.m.	5:35 a.m.	12	12	15-20	12:11 a.m.	5:35 a.m.	15	15	20	12:11 a.m.
N-Judah (LRT)	Owl	7	10	7	12-20	Owl	Owl	10	10	15-20	Owl	Owl	10	10	15-20	Owl
1-California (trolley bus)	5:22	3	6	3	15	1:25 a.m.	5:25 a.m.	15	6	30	1:20 a.m.	5:25 a.m.	15	6	30	1:20 a.m.
2-Clement (diesel bus)	5:17	10	20	10	--	7:18 p.m.	5:07 a.m.	15	15	--	7:18 p.m.	5:07 a.m.	15	15	--	7:18 p.m.
3-Jackson (trolley bus)	7:06	10	20	10	20	1:05 a.m.	5:22 a.m.	15	15	20	1:22 a.m.	5:22 a.m.	15	15	20	1:22 a.m.
4-Sutter (trolley bus)	4:59	15	--	25	--	--	--	--	--	--	--	--	--	--	--	--
9-San Bruno (diesel bus)	5:35	10	10	8	15	12:18 a.m.	6:10 a.m.	12	12	20	11:55 a.m.	6:10 a.m.	12	12	20	11:55 a.m.
9X-Third Express[2] (diesel bus)	7:07 a.m.	5	10	5	15	5:55 p.m.	9:31 a.m.	--	15	--	6:15 a.m.	9:31 a.m.	--	10	15-20	6:15 a.m.
9AX Third ‘A’ Express[3] (diesel bus)	6:43 a.m.	10	--	10	--	--	--	--	--	--	---	--	--	--	--	---
9BX Third ‘B’ Express[4] (diesel bus)	6:41 a.m.	10	--	10	--	--	--	--	--	--	--	--	--	--	--	---
10-Townsend (diesel bus)	5:47	10	20	10	30	7:02 p.m.	--	--	--	--	--	--	--	--	--	--
12-Folsom/Pacific	5:54	10	10	10	30	12:30 a.m.	6:00 a.m.	20	20	30	12:19 a.m.	6:00 a.m.	20	20	30	12:19 a.m.
20-Columbus	7:05	10-12	15	--	--	4:07 p.m.	--	--	--	--	--	--	--	--	--	--
30-Stockton long line[4] (trolley bus)	5:30 a.m.	9	9	9	12	1:06 a.m.	6:00 a.m.	10	6	12	1:06 a.m.	6:00	10	6	12	1:06

TABLE 3-2

GUIDE TO FREQUENCY OF SERVICE (AVERAGE TIME IN MINUTES)

	WEEKDAY						SATURDAY					SUNDAY				
ROUTE NAME[1]	**First**	**7-9 a.m.**	**9 a.m. - 4 p.m.**	**4-6 p.m.**	**Eve**	**Last**	**First**	**7-10 a.m.**	**10 a.m. - 6 p.m.**	**Eve**	**Last**	**First**	**7-10 a.m.**	**10 a.m. – 6 p.m.**	**Eve**	**Last**
30-Stockton short line[4] (trolley bus)	Owl	9	4-5	4-5	12	Owl	Owl	10	3-6	12	Owl	Owl	20	4-8	12	Owl
38-Geary (diesel bus)	5:14 a.m.	15	15	15	20	12:07 a.m.	5:14 a.m.	15	14	15	12:44 a.m.	5:14 a.m.	15	14	15	12:44 a.m.
38L-Geary Limited (diesel bus)	6:00 a.m.	7	7	7	--	5:52 p.m.	8:40 a.m.	7	7	--	5:39 p.m.	--	--	--	--	--
45 Union/Stockton (trolley bus)	6:10 a.m.	9	9	9	15	1:02 a.m.	6:10 a.m.	15	12	15	1:30 a.m.	6:10	20	12	12	1:30
47-Van Ness (trolley bus)	6:00 a.m.	8	9	8	20	1:06 a.m.	6:14 a.m.	9	9	20	1:19 a.m.	6:14 a.m.	9	9	20	1:19 a.m.
91-Owl[4] (diesel bus)	12:15 a.m.	--	--	--	30	4:15 a.m.	12:15 a.m.	--	--	30	4:15 a.m.	--	--	--	--	

1 All bus lines operate fully accessible vehicles. All light rail vehicles (LRVs) are fully accessible; but the T-Third is the only fully accessible rail line because it has high level platforms on the surface. The other light rail lines are fully accessible in the Market Street Subway but are accessible only at key stops on the surface.

2 Reverse-peak direction service.

3 Service operates peak-hour, peak-direction only.

4 Late night service provided by the 91-Owl.

Source: San Francisco Municipal Railway

transitions from the T-Third line to the K-Ingleside line at Ferry Plaza for outbound trains. It has been extended to operate as the T-Third via The Embarcadero, King, Fourth, Owens, and Third Streets and Bayshore Boulevard to a temporary terminal in the middle of Bayshore Boulevard, just south of Sunnydale Avenue. It will eventually connect directly to the Caltrain Bayshore Station that straddles the county line between the cities of San Francisco and Brisbane. Most of the operation is in semi-exclusive right-of-way. The exception is the nine-block section in the Bayview Commercial Core, which operates in a mixed-flow configuration to retain parking in support of business revitalization. There are 18 light rail surface stations, with 8 center and 10 side platforms. All platforms are high level and most extend the length of a block between two intersections. The T-Third line operates between 5 a.m. and 1 a.m. with daytime service frequencies of 9 minutes during peak periods.

Bus System

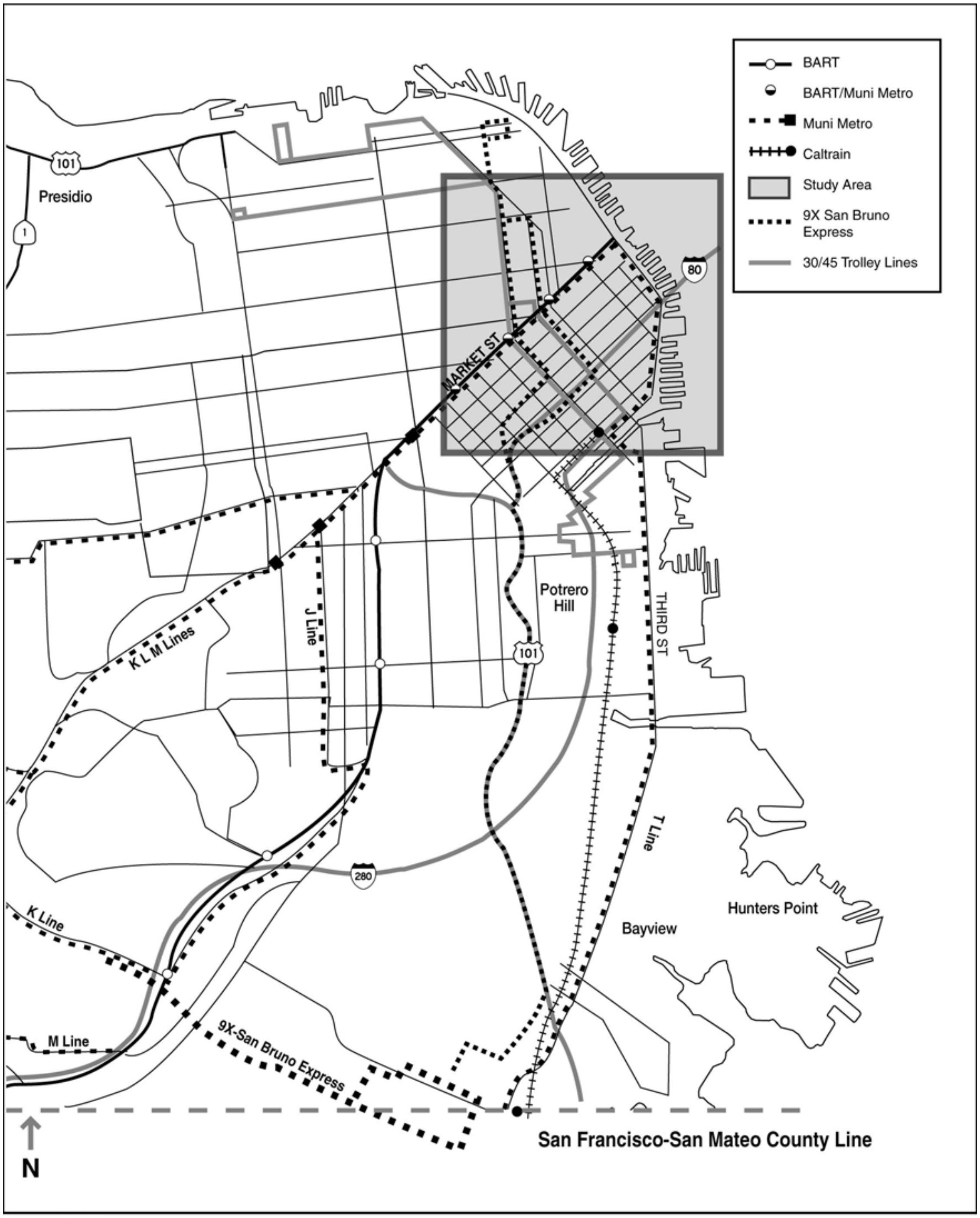
A detailed description of the Corridor's six primary bus routes and their current available capacity is provided below (see Figure 3-1). Vehicle design capacities are derived from the size of the vehicle and include the number of sitting and standing passengers. According to Muni, for both standard electric trolley coaches and diesel motor coaches, the design capacity for planning purposes is 63 passengers per vehicle; for articulated buses, the design capacity is 94 passengers per vehicle; and for light rail vehicles, the design capacity is 119 passengers. In order to determine the amount of bus capacity used at the maximum load point (the point where passenger demand is the highest) for each line, the number of peak hour passengers at the maximum load point was divided by the bus capacity (the number of vehicles x the design capacity per vehicle) during the peak hours.[2]

9X-San Bruno Express. This line operates 20-hours per day on weekday and weekends. It connects Fisherman's Wharf, North Beach and Chinatown districts (Broadway and Kearny/Stockton Streets) to Visitacion Valley, the Excelsior district, and City College (Phelan Loop) via North Point and Powell Streets, Columbus Avenue, Stockton and Kearny Streets, Third and Fourth Streets, Highway 101, San Bruno Avenue, Bayshore Boulevard, Geneva Avenue, and Ocean Avenue to Phelan Avenue. This line provides service to the Powell and Montgomery BART/Muni Metro stations. During the a.m. peak hour, the maximum load point occurs at Stockton and Sutter Streets in the southbound (outbound) direction, with about 55 percent of the available capacity used. During the p.m. peak hour, the maximum load point occurs at the same location in the southbound (outbound) direction, with the bus line operating at over 58 percent of capacity. About 63 percent of the route's 8,100 daily boardings occur north of Highway 101.

[2] Passenger and number of vehicle information were based on Muni bus monitoring data for FY 05/06. Ridership data has not yet been collected for the service changes implemented in April 2007.

FIGURE 3-1

EXISTING MUNI ROUTES SERVING THE STUDY AREA



Source: PB Wong
Not to scale

9AX-San Bruno 'A' Express. This line operates 20-hours per day weekdays and weekends. It connects the North Beach and Chinatown districts (Broadway and Stockton Street) to the Excelsior district (Geneva/Mission Streets) and City College (Phelan Loop) via Stockton and Kearny Streets, Third and Fourth Streets, Highway 101, San Bruno Avenue, Bayshore Boulevard, Geneva Avenue, and Ocean Avenue to Phelan Avenue. Like the 9X-San Bruno, this line provides service to the Powell and Montgomery BART/Muni Metro stations. During the a.m. peak hour, the maximum load point occurs at Bayshore Boulevard and Carroll Avenue, with the bus line operating at almost 117 percent of capacity. During the p.m. peak hour, the maximum load point occurs at Stockton and Sutter Streets, with the bus line operating at about 108 percent of capacity. About 57 percent of the route's 2,800 daily boardings occur north of Highway 101.

9BX-San Bruno 'B' Express. This line operates on the same weekday schedule (no weekend service) as the 9X and 9AX and operates along the same route as the 9X. During the a.m. peak hour, the maximum load point occurs at Bayshore Boulevard and Arleta Avenue, with the bus line operating at about 83 percent of capacity. It also operates at about 98 percent of capacity during the p.m. peak hour, when the maximum load point occurs at Stockton and Sutter Streets. About 62 percent of the route's 2,100 daily boardings occur north of Highway 101.

30-Stockton. This line connects the Marina district (Beach/Broderick Streets) to the Caltrain Terminal (Fourth/Townsend Streets) via Chestnut Street, North Point Street, Columbus Avenue, Stockton Street, and Fourth Street to Townsend Street. It provides service to the Montgomery and Powell BART/Muni Metro stations. During the a.m. peak hour, the maximum load point occurs at Stockton and Sutter Streets in the northbound (inbound) direction, with approximately 83 percent of the available capacity used. During the p.m. peak hour, the maximum load point occurs at the same location in the southbound (outbound) direction, with about 71 percent of the available capacity used. Daily boardings average about 27,100.

45-Union/Stockton. This line connects the Presidio (Lyon/Greenwich Streets) to the Caltrain Terminal (Fourth/Townsend Streets) via Union Street, Stockton Street, Fourth Street to Townsend Street. It provides service to the Montgomery and Powell BART/Muni Metro stations. During the a.m. peak hour, the maximum load point occurs at Stockton and Sutter Streets in the southbound (outbound) direction, with about 91 percent of the available capacity used. During the p.m. peak hour, the maximum load point also occurs at this location in the southbound (outbound) direction, with about 73 percent of the available capacity used. Daily boardings average about 12,700.

Other Muni routes serving the Study Area are summarized below. At the Caltrain Terminal, the 10-Townsend diesel bus line provides service east along Townsend Street to the Transbay Terminal and then north through the Financial District on Battery and Sansome Streets, continuing along The Embarcadero and North Point Street to a terminus at Van Ness Avenue. The 47-Van Ness trolley bus line connects the Caltrain Terminal to the west of Downtown along the Van Ness Avenue corridor, terminating at Van Ness Avenue and North Point Street near the 10-Townsend bus line terminus. The 12-Folsom/Pacific diesel bus line operates inbound on Folsom Street and outbound on Harrison Street to The Embarcadero, and then west to Pacific Heights via Broadway and Pacific and Jackson Streets. The 9-San Bruno operates on lower Market Street. The Market Street lines generally serve all of the BART/Muni Metro stations.

There are extensive Downtown connections to Muni surface bus operations and Muni Metro, and BART rail service. The 14-Mission and 14L–Mission Limited trolley bus lines and 14X–Mission Express diesel bus line operate along Mission Street. At Market Street there are nearly a dozen Muni bus lines that operate past Third and Fourth Streets, including the 2, 3, 4, 5, 6, 7, 16AX, 16BX, 21, 38, 71, and 71L lines. The F-Market provides surface rail connections between the Castro district and Downtown along Market Street. The BART/Muni Metro Montgomery and Powell Street Stations serve riders on the Market Street Subway near Third and Fourth Streets.

Union Square is served by the 38-Geary and 38L-Geary Limited diesel bus lines crossing Stockton Street inbound on O’Farrell to the Transbay Terminal and outbound on Geary Boulevard to the Richmond district. The 3-Jackson and 4-Sutter trolley bus lines and the 2-Clement diesel bus line cross Stockton Street inbound on Post Street and outbound on Sutter Street. The 2-Clement line continues to the Ferry Building. The 3-Jackson and 4-Sutter lines terminate near Market and Sansome Streets.

In Chinatown, the 1-California trolley bus line operates inbound to Market Street via Clay Street, and outbound to the Richmond district via Sacramento Street. As mentioned above, the 12-Folsom/Pacific line operates between South of Market, The Embarcadero and Chinatown via Broadway (inbound) and Pacific Street (outbound).

Light Rail System

Muni also operates the Muni Metro light rail system (refer to Figure 3-1). The light rail service has various types of operations: on-street in mixed traffic conditions, surface operations in semi-exclusive right-of-way, and exclusive subway. Most of the system operates on-street in mixed-flow conditions. The Metro system currently has five operating lines, all serving downtown San Francisco: the J-Church (from Balboa Park via Church Street), K-Ingleside (from Balboa Park via Ocean Avenue and West Portal

Avenue), L-Taraval (from San Francisco Zoo via Taraval Street), M-Ocean View (from Ocean View via 19th Avenue and West Portal Avenue), and N-Judah (from Great Highway via Judah Street). In addition, the Castro Shuttle operates in the subway between The Embarcadero and Castro stations during peak hours on 10-minute headways.

Muni started operation of an historic trolley line on Market Street in September 1995 and extended it in 1998. The F-Market historic streetcar line runs on the surface of Market Street, between Castro Street and Fisherman's Wharf, and operates using rehabilitated vintage PCC (President's Conference Committee) cars designed in the 1930s and historic street cars from systems around the world.

Muni Metro light rail lines provide weekday service generally between 5 a.m. and 1 a.m., 6 a.m. and 1 a.m. on Saturday and 8 a.m. and 1 a.m. on Sunday. Metro owl service (late-night surface bus operation) is offered for the L-Taraval and N-Judah lines. The J-Church route area is generally served by the 24-Divisadero and the surface portion of the K-Ingleside line is covered by the 91-Owl bus during the late-night hours when Muni Metro is not in operation.

The weekday Muni Metro and street car daily ridership for the 6 lines is about 128,100 boardings, including 16,100 for the F-Market, 18,700 for the J-Church, 15,300 for the K-Ingleside, 23,300 for the L-Taraval, 23,300 for the M-Ocean View, 31,400 for the N-Judah, and 24,000 for the T-Third line.[3]

Future Bus Service Changes

Muni's SRTP 2006-2025 lists three transit-related improvements that are planned for implementation in and near the Study Area. These include:

- Bus Rapid Transit (BRT) - The Geary Corridor is one of the identified areas for BRT implementation and initial planning work is underway.
- Transit Preferential Streets (TPS) Improvements - Areas identified for TPS are Stockton Street/Columbus Avenue and Market Street.
- Islais Creek Bus Maintenance and Storage Facility - the new bus maintenance facility at Indiana and Tulare Streets will replace the Kirkland Division.

[3] Muni Draft Short Range Transit Plan, 2008-2027, Ridershp for Fiscal Year 2006 and Muni estimates from July 2007 for the T-Third line.

Mission Bay

Muni is planning to extend trolley coach service to accommodate new ridership in Mission Bay as employment and residential development increase in that area (see Figure 3-2). The expected changes include:

- Reroute the 22-Fillmore, which currently serves the Potrero Hill and Dogpatch neighborhoods, onto 16th Street, east of Kansas Street, to a terminal on Third Street in Mission Bay. As an interim measure, this extension to Third Street may be served by the 33-Stanyan. This service change requires overhead wires to be constructed on 16th Street between Kansas and Third Streets, and a terminal loop at Third Street. There are a number of safety concerns about the Caltrain grade crossing at 16th and Seventh Streets that must be resolved, before construction proceeds.

- Extend either the 30-Stockton or 45-Union/Stockton trolley coach line from its existing terminal at Fourth and Townsend Streets, through Mission Bay, and over a portion of the current 22-line on Potrero Hill to the existing 22-line terminal at Third and 20th Street. This service requires new street construction and identification of funding for overhead wires relocation and acquisition of additional vehicles in Mission Bay before it can be implemented.

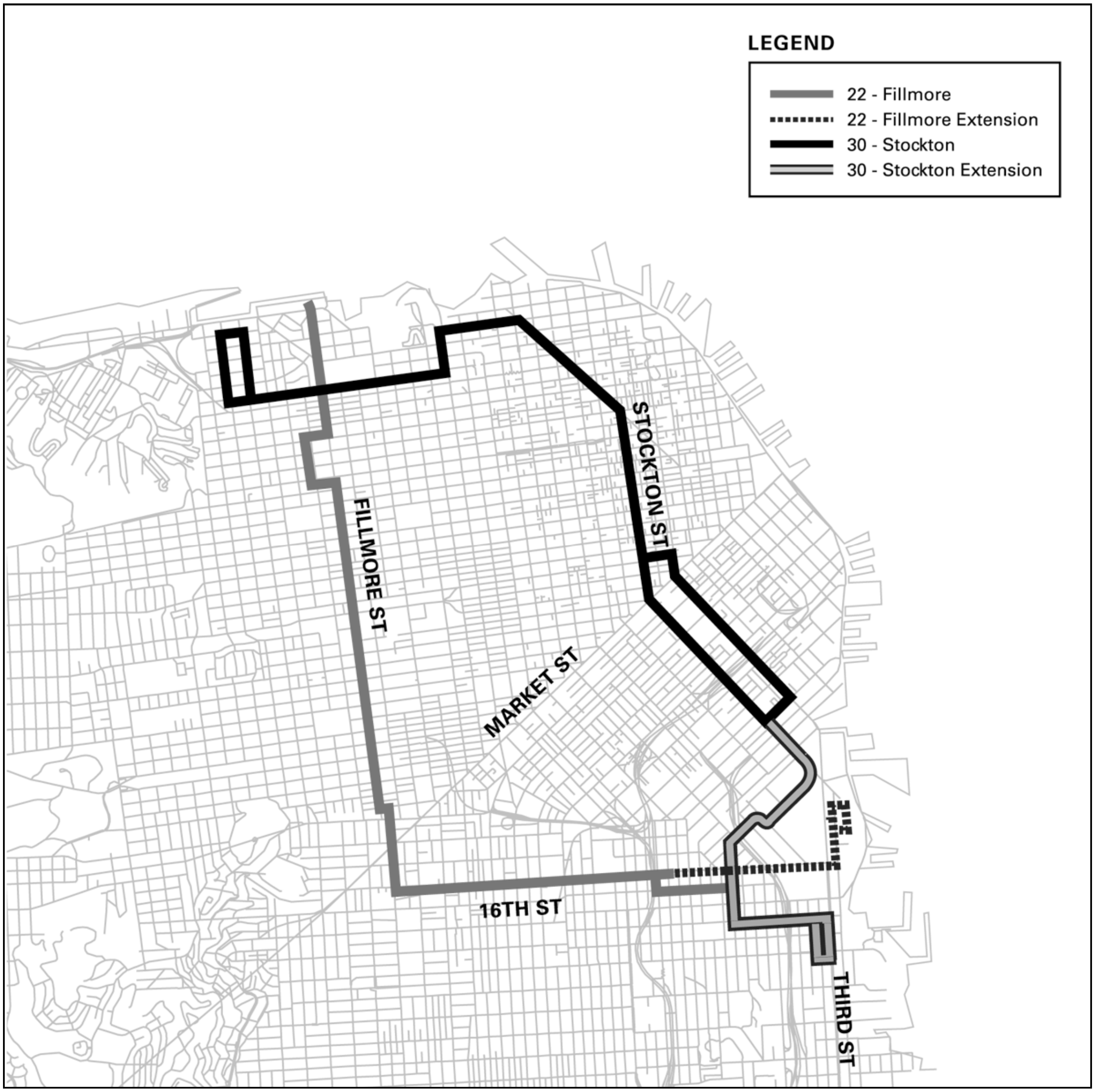
Origin-Destination Analysis

In February and March of 2004, a transit on-board survey was performed to support the transit planning efforts of Muni and the San Francisco County Transportation Authority. Prior to the development of this survey, a 1976 citywide survey of Muni passenger characteristics and travel patterns and a 1996 survey of transit riders in the Third Street Corridor were used to support the initial estimates of Third Street Light Rail ridership. A primary goal of the survey was to more precisely understand the origins and destinations of Muni passengers systemwide.

The origins and destinations of riders of the 15-Third bus line were primarily located in the Bayview-Hunters Point neighborhood (23 percent), Chinatown/North Beach (18 percent), Crocker-Amazon/ Visitacion Valley (15 percent), and South of Market (14 percent) (see Figure 3-3). The combined origins and destinations of riders all corridor routes, including the former 15-Third, 9AX/9BX-San Bruno Expresses, 30-Stockton, and 45-Union/Stockton indicate the greatest travel shares in Chinatown (26 percent), South of Market (16 percent), the Geary corridor (15 percent), and Crocker-Amazon/Visitacion Valley (12 percent). Only 11 percent of the origins and destinations were in the Financial District/Civic Center areas

FIGURE 3-2

PROPOSED MISSION BAY ROUTE CHANGES



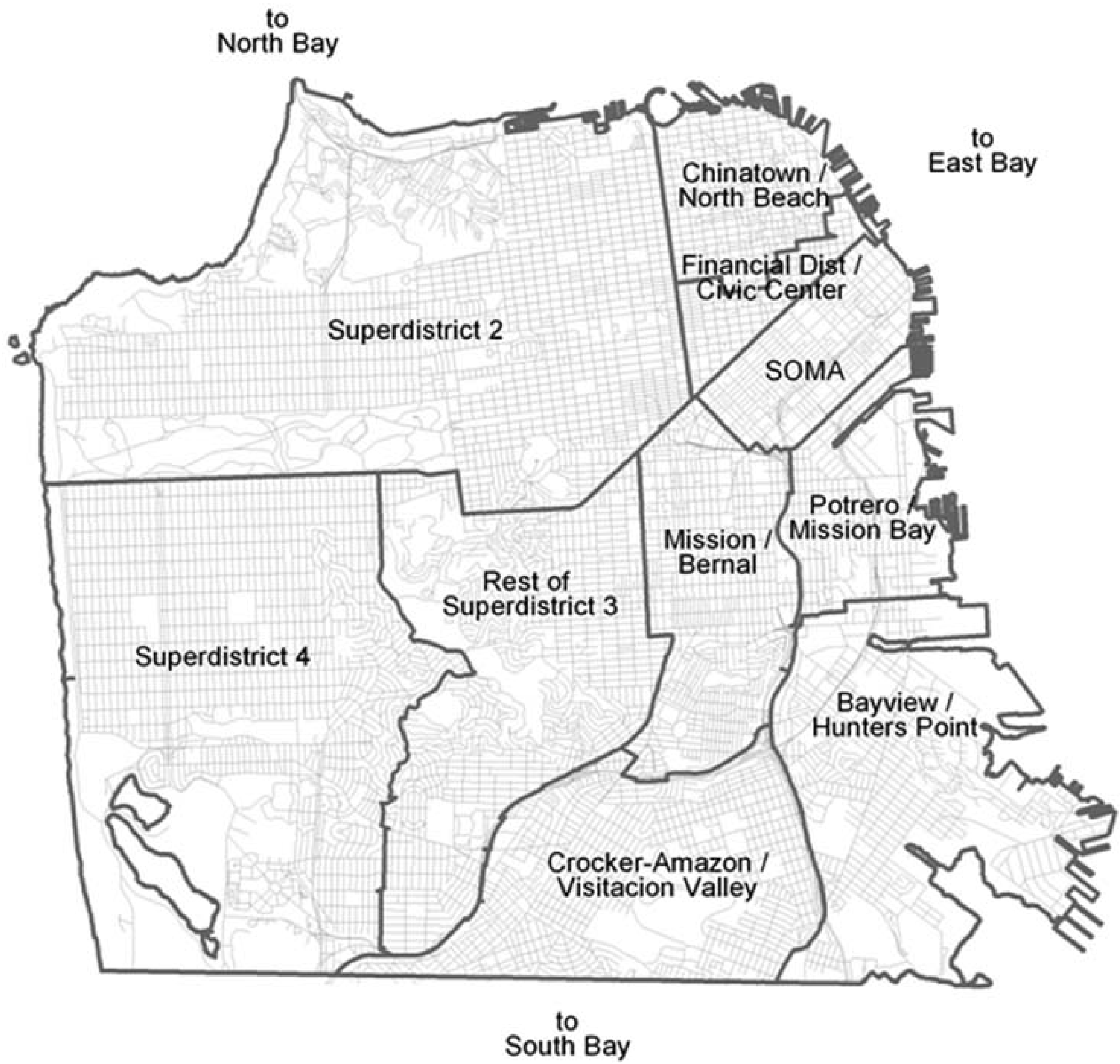
Source: MTA
Not to Scale

Transit Travel Times

Travel times are a significant influence on the attractiveness of transit for any given trip. Transit travel times relative to walking and driving are key inputs and outputs of the travel demand forecast model used

FIGURE 3-3

ORIGIN - DESTINATION DISTRICTS



Source: PB/Wong
Not to Scale
Revised 1/08

to estimate the future transit ridership of the Central Subway. In addition to other factors such as service frequency and stop location, the transit travel times are used in the model to predict the origins, destinations, timing, and purposes of transit trips. Average travel times by transit for select corridor origins and destinations illustrate transit service currently experienced by Third Street Corridor riders.

For the T-Third line, the travel time between the endpoints of the line is approximately 47 minutes during the a.m. peak period. Between Sunnydale Avenue/Bayshore Boulevard and Fourth/King Streets the in-vehicle travel time is 24 minutes.

For the existing 9X/9AX/9BX-San Bruno Express buses, the in-vehicle travel time between Arleta Avenue/Bayshore Boulevard and Kearny/Pacific Streets is approximately 34 minutes. In addition, the in-vehicle travel time between Arleta Avenue/Bayshore Boulevard and Kearny/Sutter Streets is 28 minutes. For both the 15-Third bus line and the 9X/9AX/9BX-San Bruno Expresses, p.m. peak service would be slightly longer due to generally more congested roadway conditions.[4]

Regional Transit Services

Several regional transit providers serve the Study Area. These include Caltrain, BART, AC Transit, Golden Gate Transit, and SamTrans.

<u>Caltrain</u>

Caltrain provides commuter rail service between Santa Clara and San Francisco Counties. A total of 86 trains, including 10 express trains, run along the San Francisco Bay Peninsula each weekday and almost 32,000 people take Caltrain each day.[5] Caltrain’s San Francisco Terminal is located at Fourth and Townsend Streets, approximately one and one-half mile from the core of Downtown. Several Muni local and express buses and one Metro line serve this station. Caltrain passengers who purchase a Peninsula Pass are able to transfer to any Muni bus or the light rail train at no charge. Approximately 7,150 daily passengers currently board at this station.[6]

<u>Bay Area Rapid Transit (BART)</u>

BART provides regional transit services, connecting San Francisco with Millbrae in the Peninsula and Pittsburg, Richmond, Fremont, and Dublin in the East Bay. In FY 06, the average weekday ridership was approximately 323,000 throughout the entire system.[7] Connections to the Corridor and Chinatown can be made via the Embarcadero, Montgomery, and Powell BART/Muni Metro Stations along Market Street.

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4 Travel times derived from the June 2006, Muni rotation sheets.
5 Caltrain Short Range Transit Plan, FY 2004/2013.
6 Caltrain Station Rank (Average Weekday 2006)
7 BART Fourth Quarter FY2006, Summary Chart, Performance Indicators, BART Website, June 2007.

Alameda-Contra Costa Transit District (AC Transit)

AC Transit is the primary bus transit operator for the East Bay counties of Alameda and Contra Costa. AC Transit operates 27 routes from the East Bay into the San Francisco Transbay Terminal. The Transbay Terminal is located two blocks east of Third Street between First and Fremont Streets and south of Mission Street. Most of the transbay service is designed for commuters and operates during peak periods only. In FY 06, the total average weekday ridership on the transbay routes was approximately 11,300 passengers.[8]

Golden Gate Transit

Serving riders from Marin and Sonoma Counties, Golden Gate Transit brings nearly 5,000 riders to San Francisco each weekday over a system of 18 commute express and 3 all-day basic bus routes. Most routes serve either the Civic Center area via the Van Ness Corridor or the Financial District via Battery/Sansome Streets. Transfers to other regional operators can be made along Mission Street and at the Transbay Terminal (two blocks east of the Corridor). Basic routes provide evening and late night service to San Francisco.

San Mateo County Transit District (SamTrans)

SamTrans is the primary public transit operator for San Mateo County, with 57 public transit routes. The service area stretches from northern Santa Clara County to Downtown San Francisco, with many routes terminating at the Transbay Terminal (two blocks east of the Corridor). SamTrans operates 11 routes that serve Downtown. Total average weekday ridership on the 11 routes serving downtown San Francisco is approximately 11,300 passengers.[9]

Bay Area Ferries

Ferry service is provided between San Francisco and Vallejo, Alameda, Oakland, and Tiburon by the Blue and Gold Fleet. Golden Gate Transit operates ferry service between San Francisco and Larkspur and Sausalito. All ferries serve the Ferry Terminal, located on The Embarcadero at the foot of Market Street.

8 Alameda-Contra Costa Transit District (AC Transit) GM Memo No. 7-036, Annual Transbay Service Performance Analysis.
9 San Mateo Transit District (SamTrans) Short Range Transit Plan, Interim–2004-2013.

Planned Regional Improvements

There are three major regional transit improvements that are identified in the current Regional Transportation Plan (RTP) and that have been included in the San Francisco travel demand model assumptions.[10]

- BART System – This project would improve station access, expand station capacity, and introduce new vehicles to the BART core system to reduce existing system constraints.
- Ferry Terminal – The RTP calls for improvements to the Downtown Ferry Terminal and to increasing the number of spare ferry vessels.
- Transbay Terminal – Phase 1 improvements including replacement of the existing Transbay Terminal with an upgraded facility with additional transit capacity are included in the financially constrained element of the RTP. The extension of Caltrain service from the Terminal at Fourth and Townsend Streets to the Transbay Terminal is not included in the financially constrained element of the RTP and therefore for modeling purposes is not assumed to be in place by 2030.

3.1.2 TRAFFIC

Existing Roadway Network

The Study Area contains major north-south roadways that link the southeastern quadrant of San Francisco with Downtown and provide regional connections to the Peninsula, East Bay, and Marin County. It also contains principal thoroughfares that distribute traffic in the South of Market, Union Square, Downtown, Chinatown and North Beach districts (refer to Figure 3-3). The major roadways in the Study Area are described below, including the average daily traffic volumes of 2005.[11]

<u>Highway 101</u>

This principal north-south highway links San Francisco with the Peninsula to the south and with Marin County to the north. Between Interstate 80 and Interstate 280, the limited access highway 101 has ten traffic lanes. Between I-80 and the Golden Gate Bridge, Highway 101 is a six-lane surface street along South Van Ness Avenue, Van Ness Avenue, Lombard Street, Richardson Avenue, and Doyle Drive. Highway 101 at Cesar Chavez Street carries over 246,000 vehicles per day.

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[10] Metropolitan Transportation Commission, *Transportation 2030 Plan for the San Francisco Bay Area*, Final February 2005.
[11] Caltrans 2005 Traffic Counts.

Interstate 280

Interstate 280 (I-280) is a ten-lane freeway connecting the Peninsula with the southwestern quadrant of the City. For southbound traffic, I-280 provides a direct connection around the east side of Potrero Hill to Highway 101. Northbound traffic can use I-280 to access Potrero Hill and Mission Bay neighborhoods. I-280's northern terminus consists of a pair of on and off-ramps in the South of Market area, at Sixth and Brannan Streets and at Fifth and King Streets. I-280 at Mariposa Street (south of the on and off-ramps) carries over 106,000 vehicles per day.

Interstate 80

Interstate 80 (I-80) provides the primary access to and from the San Francisco Oakland Bay Bridge (Bay Bridge) which connects to the East Bay and it also connects directly with Highway 101, west of Ninth Street. In the vicinity of Third and Fourth Streets, I-80 has three through lanes in each direction. I-80 provides access to the Bay Bridge, which carries up to 294,000 vehicles a day. A set of on-and-off ramps is located at Fifth Street and Fourth Street for eastbound and westbound I-80 traffic, respectively.

Third Street

Third Street serves as a principal north-south arterial, extending north from its interchange with Highway 101 and Bayshore Boulevard to Market Street in the Financial District. Third Street serves as a through street and as a connection between the commercial and industrial areas located along the length of Third Street and the Highway 101 and I-80/Bay Bridge regional freeway facilities. The San Francisco *General Plan* identifies Third Street as a Major Arterial and a Transit Important Street. It is also part of the Congestion Management Plan (CMP) network and Metropolitan Transportation System (MTS).

In the SOMA area, Third Street serves as the principal northbound arterial into the Financial District from Mission Bay and the City's growing eastern waterfront. Third Street is a one-way, northbound arterial (with one-way southbound Fourth Street) between King Street and Market Street. Third Street is typically 62.5 feet wide with 10-foot wide sidewalks on both sides. In this section of Third Street, there are three 10-foot northbound through lanes. The configuration of the outside lanes varies by time of day and block. There is a dedicated northbound bus lane on the east side of the street that starts 200 feet south of Brannan Street and continues north to Market Street. Peak hour parking restrictions allow the use of the curb lane as a dedicated turn lane for Brannan, Bryant, and Mission Streets. Metered parking on both sides of Third Street exists between Market and King Streets, with the exception of the block between Howard and Folsom Streets, where parking is restricted all day long.

Fourth Street

Fourth Street, between King and Market Streets, is designated as a Major Arterial in the *General Plan*. With a 62.5 feet curb-to-curb width and two 10-foot wide sidewalks, Fourth Street is a key roadway connection between the Financial District and southbound I-80 and I-280. Fourth Street also provides the most direct pedestrian connection between the Financial District and Union Square and the new commercial and residential developments in the vicinity of the Caltrain Terminal at Townsend Street.

From its northern terminus at Market Street, Fourth Street draws traffic from southbound Stockton Street and eastbound O'Farrell Street. The number of traffic lanes on Fourth Street between Market and Townsend Streets varies between two and four through lanes. The configuration of the parking lanes varies by time of day and block. Multiple left-turn and right turn lanes exist at Mission, Folsom, and Harrison Streets. Between Harrison and Townsend Streets, a dedicated bus-only lane with a raised boarding island at Townsend Street, is located on the east side of the roadway. At Townsend Street, a dedicated left-turn lane separates the bus lane from the curb. Fourth Street, south of Townsend Street where it fronts the Caltrain Terminal, becomes a two-way street with two lanes in each direction. At Fourth and King Streets, the T-Third line intersects with the Muni Metro Extension (MMX) line from Market Street to Fourth Street, then continues south crossing over Mission Creek to Mission Bay via the Fourth Street Bridge. Existing metered parking can be found on both sides of Fourth Street between Market and Townsend Streets, except for the block between Mission and Howard Street, where a 24-hour parking restriction is in effect. As with other streets in the South of Market Area, Fourth Street has a combination of full-time and part-time tow-away restrictions of several block faces to increase traffic capacity during the peak travel hours.

Fifth Street

Fifth Street runs north and south between Market Street to the north and Townsend Street to the south, where it ends at the Caltrain Rail Yard. Fifth Street is a two-way street with two traffic lanes in each direction. The curb-to-curb width is generally 62.5 feet throughout the Study Area. There are 10-foot wide sidewalks and on-street parking along both sides of the street. The San Francisco *General Plan* identifies Fifth Street as a Major Arterial between Market and Bryant Streets and a Citywide Bicycle Route between Market and Townsend Streets. Metered parking is established on both sides of Fifth Street from Market to Bluxome Streets, except the block between Harrison and Bryant Streets, where there are tow-away restrictions in place, and the block between Bryant and Brannan Streets, where there is an existing one-hour parking regulation from 7 a.m. to 6 p.m., Monday through Saturday.

Sixth Street

Sixth Street provides a direct connection to the I-280 freeway in the South of Market Area at Townsend Street. Sixth Street is a two-way, north-south arterial with four traffic lanes and a curb-to-curb width of 62.5 feet throughout the Study Area. There are 10-foot wide sidewalks on both sides of the street. An additional traffic lane is provided in the southbound direction on Sixth Street between Howard and Harrison Streets during the p.m. peak period, due to on-street parking restrictions. Metered parking is provided along both sides of the street between Market and Folsom Streets.

King Street

King Street is a wide, landscaped boulevard providing a direct east-west connection between The Embarcadero and the I-280 on and off-ramps at Fifth Street. With a 126-foot curb-to-curb width and 20-foot wide sidewalks in the vicinity of Third and Fourth Streets, King Street has unique and varied geometries designed to safely accommodate high pedestrian, light rail, and vehicle flows. It is a four-lane, two-way street with Muni Metro tracks in a center median. In general, parking is not permitted on King Street, except on the north side between The Embarcadero and Third Street. King Street has an average daily traffic volume (ADT) of 21,580 east of Third Street.[12] It is designated as a Major Arterial, Primary Transit Street, a Neighborhood Network Connection Street, and Bicycle Route east of Third Street in the *General Plan*.

The Embarcadero

The Embarcadero, along the eastern edge of the Study Area, has three traffic lanes in each direction between Howard and Broadway Streets, and two traffic lanes in each direction south of Howard Street. An ADT of 47,700 was recorded at Washington Street, north of the Study Area. With a curb-to-curb width exceeding 120 feet in many locations, The Embarcadero readily accommodates Muni's semi-exclusive median rail right-of-way between South Beach Park and Fisherman's Wharf. The F-Line's Fisherman's Wharf extension operates in a semi-exclusive median right-of-way from Broadway Street to Kearny Street.

The *General Plan* designates The Embarcadero as a Major Arterial, a Primary Transit Street, a Neighborhood Commercial Street, a Citywide Bicycle Route with marked bike lanes, as well as a freight traffic route. Metered parking along The Embarcadero is managed by the Port of San Francisco. The walkway or promenade on the east side of The Embarcadero also serves as a key recreational trail for tourists, walkers, joggers and skaters.

Market Street

[12] DPT count, 10/7/2004

Market Street is the central spine of San Francisco's Downtown and South of Market districts, serving as the axis from which the two street grid systems diverge. It is a two-way, four-lane street with a 120-foot right-of-way and sidewalks that range from 26 feet to 35 feet wide, with restricted transit lanes, boarding islands and marked bicycle lanes in the vicinity of the Project. Market Street primarily serves the City as a transit corridor, providing rail and bus transit service on the surface and two underground levels of rail service, Muni Metro and BART. Market Street is designated as a Primary Transit Street, a Neighborhood Commercial Street, and a Citywide Bicycle Route. Parking on Market Street is restricted to commercial loading and unloading use.

Geary Street

Geary Street is an east-west street providing a connection from the Union Square area to the Richmond District. In the vicinity of Union Square, the street is typically 38 feet wide with 15-foot sidewalks. In the Union Square area, it is one-way in the westbound direction and has two-mixed traffic lanes and a transit lane. Geary Street is designated in the *General Plan* as a Major Arterial, a Primary Transit Street, and a Neighborhood Commercial Street. Metered parking is available on both sides of Geary Street, except for the north side between Stockton and Powell Streets, which directly fronts the Union Square garage entrance.

Stockton Street

Stockton Street is a three-lane street that extends north from Market Street, past Union Square, Chinatown, and North Beach to Beach Street in the vicinity of Fisherman's Wharf. It is one-way in the southbound direction between Market and Sutter Streets, with two travel lanes and a transit lane. North of Sutter Street, it is two-way with one northbound lane and two southbound lanes. It traverses through a tunnel under Nob Hill between Sutter and Sacramento Streets. Within the tunnel, there is a single northbound bicycle climbing lane. Stockton Street is designated as a Primary Transit Street, a Neighborhood Commercial Street, and a Citywide Bicycle Route. In the Union Square area, Stockton Street has full-time tow-away restrictions on several blocks to increase capacity during the peak travel hours, with metered parking allowed in spot locations. In Chinatown, most of the metered parking spaces are established for commercial loading and unloading for the various businesses along Stockton Street.

Kearny Street

Kearny Street has a 46-foot wide curb-to-curb width and two 14-foot wide sidewalks. Kearny Street is designated as a major arterial in the San Francisco *General Plan.* It is also a designated Primary Transit Street between Broadway and Market Street and a Neighborhood Commercial Street between Market Street and Columbus Avenue. Typically four lanes wide, Kearny Street has peak hour parking restrictions that allow a second left-turn lane at Sutter and Pine Streets and a second right turn lane at Post, Bush and California Streets. Metered parking is established on the west side of Kearny Street between Geary and Bush Streets and a daytime tow-away restriction (7 a.m. to 6 p.m.) on the east side of the street.

Columbus Avenue

Columbus Avenue, designated as a Major Arterial in the *General Plan*, provides a direct connection between the Financial District and Fisherman's Wharf. It is also a designated Primary Transit Important Street and Neighborhood Commercial Street between Kearny and North Point Streets. Columbus Avenue has a curb-to-curb width of 60 feet with 10-foot sidewalks. This width allows for two traffic lanes in each direction, and includes painted medians and turn pockets where required. Metered parking exists on both sides of Columbus Avenue, except where the bus zones serve the 15-Third, 30-Stockton, 41-Union, and the 45-Union-Stockton lines. A tree-planted median in the middle of Columbus Avenue exists between Union and Filbert Streets.

Planned Roadway Improvements

Roadway improvements planned for implementation in the Study Area or in the immediate vicinity include: the Bay Bridge approach and Terminal Separator ramps and roadway changes related to improvements at the Transbay Terminal. These roadway improvement projects are discussed in Section 2.1.1.

Traffic Volumes

Table 3-3 lists existing average weekday and peak hour traffic volumes on several roadways in the Corridor. The total two-way volume of a.m. and p.m. peak period traffic along most of the Corridor is generally similar. However, during the morning peak period, almost two-thirds of the traffic on Third Street's two-way segments is northbound toward the Downtown. During the p.m. peak period, traffic flows are closely balanced in the northbound and southbound directions.

Traffic counts conducted along Corridor area roadways indicate that the heaviest traffic volume periods occur on weekdays between 7 a.m. and 9 a.m. and between 4 p.m. and 6 p.m. Therefore, this study assesses the potential impacts the proposed project alternatives could cause to the transportation network during these typical weekday periods.

TABLE 3-3

EXISTING WEEKDAY TRAFFIC VOLUMES IN THE CORRIDOR

Count Location		Traffic Volumes		
Roadway	**Location**	**Daily (Approx.)**	**A.M. Peak Hour**	**P.M. Peak Hour**
Interstate 280	Between 18th & Sixth Streets	95,000	11,440	11,340
	Between Sixth & Fifth Streets	52,000	2,490	2,470
Interstate 80	Between Fourth & Second Streets	201,000	13,740	11,560
Third Street	NB Between King & Townsend Streets	23,800	1,050	1,720
	NB Between Harrison & Folsom Streets	28,500	2,060	1,770
Fourth Street	SB Between King & Townsend Streets	11,300	780	1,160
	SB Between Harrison & Folsom Streets	29,000	1,450	1,770
King Street	Between Fourth & Third Streets	24,900	2,730	3,370
	Between Third & Second Streets	18,500	2,590	3,380
Geary Street	WB Between Powell & Stockton Streets	11,500	1,190	1,640
Stockton Street	SB Between Market & O'Farrell Streets	18,200	980	1,120
	SB Between Geary & Post Streets	18,000	1,410	1,750

Notes: All volumes are two-way volumes unless otherwise noted.
NA – Not Available

Source: San Francisco Department of Parking and Traffic and San Francisco Model, 2007.

Intersection Levels of Service

This SEIS/SEIR evaluates the weekday peak hour operations of five key signalized intersections along the Third, Fourth, and Sixth Street corridors that could be affected by the proposed alternatives. Other intersections along these street corridors may also be effected by Project alternatives, therefore the five intersections designated for analysis are representative of traffic conditions in the vicinity. In 2006, traffic conditions were assessed by DPT based on a.m. and p.m. peak hour turning movement counts at each of the Study Area intersections to assist in determining current traffic levels.

LOS is used to describe how efficiently an intersection operates. The method used for signalized intersection analysis generally defines LOS in terms of delay, which is the average amount of time a vehicle must wait before being able to pass through the intersection. The delay is expressed by letter designation from LOS A, which signifies very low delays (under 10.0 seconds per vehicle), to LOS F, which signifies substantial delays (over 80 seconds per vehicle) and congestion. In urban settings, LOS E (over 55 seconds to 80 seconds of delay per vehicle) and LOS F (80 seconds or greater delay) are considered unacceptable levels of service. (LOS criteria for signalized intersections are defined in detail in Table E-5 in Appendix E.)

Existing peak hour service levels at each of the signalized intersections are presented in Table 3-4. During the a.m. peak hour the Third Street/King Street intersection performs at LOS D and the Fourth Street/Harrison Street and Fourth Street/Bryant Street intersections operate at LOS B. The other two Study Area intersections (Fourth/King and Sixth/Brannan) perform at LOS E and F, respectively, in the a.m. peak hour, when the traffic flows from the I-280 off-ramps are the heaviest. During the p.m. peak hour, two of the Study Area intersections operate at LOS ~~C, or better~~ B, with the other three operating at LOS E or F conditions as outbound traffic peaks towards the I-280 freeway on-ramps. During the afternoon peak, traffic may queue back several blocks on City streets on approaches to the freeway ramps in the South of Market area. Congestion occurs not only at the intersections noted in Table 3-4, but also at other intersections along these streets.

TABLE 3-4

EXISTING INTERSECTIONS

LEVEL OF SERVICE CONDITIONS

INTERSECTION	A.M. PEAK HOUR (LOS/ave. sec. delay)	P.M. PEAK HOUR (LOS/ave. sec. delay)
Third Street / King Street	~~D/ 36.1~~ D/ 35.8	F/ >80.0
Fourth Street / King Street	E/ 55.9	F/ >80.0
Fourth Street / Harrison Street	~~B/ 13.2~~ B/ 13.5	~~B/ 19.5~~ B/ 18.5
Sixth Street / Brannan Street	F/ >80.0	F/ >80.0
Fourth Street / Bryant Street	~~B/ 11.8~~ B/ 18.9	~~C/ 20.7~~ B/ 19.6

Source: San Francisco Department of Parking and Traffic, November 2006 and February 2007. Revised February 2008

Traffic Travel Speeds

Average vehicle travel speeds were determined along the Fourth Street Corridor. Existing average travel speeds, which account for delays at intersections and congested conditions, are summarized in Table 3-5. On Fourth Street, peak period speeds average between 7 and 23 miles per hour.

TABLE 3-5

EXISTING TRAFFIC TRAVEL SPEEDS

ROUTE	PEAK PERIOD	AVG. SPEED LOS/(mph)
Fourth Street:		
King to Brannan Streets	P.M.	E/ 7.2
Brannan to Bryant Streets	P.M.	D/12.1
Bryant to Harrison Streets	P.M.	B/22.6
Source: Department of Parking and Traffic, February 2007, and Transportation Research Board, Highway Capacity Manual 2000, Exhibit 15-2, 2000.		

The San Francisco County Transportation Authority, as Congestion Management Agency for San Francisco, periodically monitors average travel speeds along key segments of the designated Congestion Management Program (CMP) network in the City, including arterials and freeways. The CMP network includes all of the principal arterials within the City, including Fourth Street. Travel speeds have been monitored since 1991 and were last measured for CMP purposes in 2004. On Fourth Street, the CMP p.m. speeds were about seven miles per hour slower when compared to the current speeds. The speed increases are primarily due to recent adjustments to the cycle lengths, offsets, and splits in regards to the signal timing sequences to improve traffic progression. The performance of the CMP roadway network is measured against LOS standards for arterial roadways. If roadway performance falls below the standard (i.e., congestion worsens), actions must be undertaken to restore or improve the service level. The San Francisco CMP sets a standard of LOS E for the designated CMP network (LOS criteria for arterial roadways are defined in detail in Table E-6 in Appendix E). Currently, average travel speeds on Fourth Street are in the LOS B to E range during the p.m. peak period.

3.1.3 FREIGHT AND LOADING

While not officially designated as truck routes, Third Street and Fourth Street are called out in the San Francisco *General Plan* as routes with significant levels of truck traffic. Because of recurring peak hour congestion levels and relatively narrow lanes, Third and Fourth Streets are not preferred truck routes for non-local through trips. Truck drivers with large vehicles and a familiarity with the City would likely opt to avoid the Financial District and select a longer route along The Embarcadero or along other City arterials like Van Ness Avenue.

In order to adequately serve the many commercial businesses on Third and Fourth Streets and accommodate the occasional service needs of residents, the City has designated yellow metered loading areas along the corridor. On Fourth Street between Folsom and Townsend Streets there are ten metered yellow loading zones. On Third Street between Bryant and King Streets, there are 18 metered yellow loading zones during the daytime non-peak hour times. Currently, the yellow zones are located on both sides of these streets and can only be accessed from one direction since Third and Fourth Streets are one-way streets. A review of the existing commercial businesses on Third and Fourth Streets between Harrison and Townsend Streets revealed that most, if not all, of the commercial loading/unloading activities occur on-street at the yellow zones since there are very few off-street truck loading facilities or docks available.

Because Third and Fourth Streets are currently both multi-lane, one-way streets, the accommodation for truck turning movements is adequate since trucks can straddle more than one traffic lane, when necessary, on approaches to intersections in preparation for making wide turns. In addition, side streets are generally wide enough to accept the truck turn movements from Third and from Fourth Streets; except on Perry and Stillman Streets.

Stockton Street is a mix of on-street metered parking, on-street loading zones, and bus zones. In some blocks, between Market and Sutter Street, on-street parking and loading has been removed completely to accommodate the flow of traffic, access to the public parking garages, and bus stops. The on-street loading spaces in both Union Square and Chinatown are important to servicing the adjacent retailers as off-street loading docks are limited.

On Columbus Avenue, between Union and Powell Streets, there are no off-street loading spaces.

3.1.4 PARKING

On-Street Parking

Parking conditions along the Central Subway Corridor were surveyed during a mid-morning and two mid-afternoon weekday afternoon periods in September, 2006, south of Market Street and mid-afternoon weekday north of Market Street in May 2007. In each survey, block-by-block on-street parking occupancy counts and parking capacity measurements (excluding driveways and illegal parking zones, e.g., red zones for bus stops and fire hydrants, etc., but including yellow and white loading zones) were conducted. To conservatively assess potential parking impacts resulting from the Project alternatives, the following discussion presents the average parking occupancy counts, by block, of the surveys. Existing parking conditions are summarized in Table 3-6.

Parallel parking is allowed on both sides of Third Street between King and Bryant Streets and along both sides of Fourth Street between Bluxome and Harrison Streets. Many of these on-street parking spaces are regulated with 15-minute, 30-minute, 1-hour, or 2-hour parking meters or time limits. In this area, metered parking spaces, many with short time limits, have been established to discourage long-term parking and encourage parking turnover. The abutting land uses consist of industrial, commercial and residential developments. On those segments of Third and Fourth Streets that will be impacted by the Project, there are currently ~~172~~192 on-street parking spaces (~~201~~221 including the spaces removed for construction on Fourth Street between Bryant and Harrison Streets).

TABLE 3-6

EXISTING ON-STREET PARKING CONDITIONS IN CORRIDOR

SEGMENT	APPROXIMATE NUMBER OF ON-STREET PARKING SPACES			NUMBER AND PERCENTAGE OF SPACES OCCUPIED	
	WEST	EAST	TOTAL	NO.	Percent
Third Street					
King to Townsend Streets	13 (All metered)	10 (All metered)	23	20	87%
Townsend to Brannan Streets	19 (All metered)	16 (Tow-away east side 7-9 a.m. & 4-7 p.m.)	35	20	57%
Brannan to Bryant Streets	21 (All metered)	13 (Tow-away east side 7-9 a.m. & 4-7 p.m.)	34	25	74%
Subtotal	**53**	**39**	**92**	**65**	**71%**
Fourth Street					
Townsend to King Streets	0	0	0	0	0%
Townsend to Brannan Streets	5 (All metered)	15 (All metered)	20	14	70%
Brannan to Bryant Streets	20 (All metered)	16 (10 metered, Tow-away east side 7 am-7 pm between Freelon and Brannan – affects 6 sp)	36	30	83%
Bryant to Harrison Streets[1]	17 (all metered)	12 (all metered)	29	N/A	N/A
Subtotal[2]	**25+**	**31+**	**56**	**44**	**79%**
Stockton Street					
Geary to Post Streets	0	10	10	4	40%
Clay to Washington Streets	11 (All metered)	3 (All metered)	14	11	79%
Washington to Jackson Streets	8 (All metered)	12 (All metered)	20	18	90%
Subtotal[3]	~~11~~19	~~13~~25	**~~24~~44**	~~15~~33	~~63%~~ 75%
TOTAL	**~~89+~~97+**	**~~83+~~95+**	**~~172+~~ 192+**	**~~124~~ 142**	**~~72%~~ 74%**

[1] This segment of Fourth Street was under construction during the recent counts. Therefore, no parking occupancy data was available.

[2] Occupancy counts do not include the segment between Bryant and Harrison, so the 29 parking spaces between Bryant and Harrison Streets ~~numbers~~ are not included in the subtotal.

[3] Average occupancy was not calculated for the Stockton Street blocks because the two blocks are located in different districts and an average occupancy would not give an accurate assessment of occupancies in each area.

Source: San Francisco Department of Parking and Traffic, Sept. 27 and 28, 2006, ~~and~~ May 7 and 8, 2007, and January 2008.

Parking occupancy surveys were not conducted north of Bryant Street on Fourth Street and north of Bryant Street on Third Street because Caltrans' construction staging activities for the Bay Bridge West Approach Retrofit Project have temporarily removed parking in the area. In general, on-street parking is usually fully occupied on Third and Fourth Streets north of Bryant Street.

On Stockton Street, parking counts were conducted on the blocks potentially affected by the proposed stations and/or vent shafts where parking removal was anticipated. There are 10 parking spaces on the block between Geary and Post Streets, ~~and~~ 14 spaces on the block between Clay and Washington Streets, and 20 spaces on the block between Washington and Jackson Streets (including truck and passenger loading zones). The average occupancy is ~~63~~75 percent for these ~~two~~ three blocks of Stockton Street.

On the block between Geary and Post Streets, all of the parking is located on the east side of the street and consists of 10 metered yellow loading zones. Observed mid-day weekday occupancy was only 40 percent, but occupancy would be expected to vary throughout the day as deliveries are made. On the blocks between Clay and ~~Washington~~ Jackson Streets, there are a total of ~~14~~34 metered spaces, composed of a mix of standard parking spaces and white and yellow zones. The average weekday occupancy in ~~this~~ these two blocks is ~~79~~ 85 percent.

Parking Summary

Table 3-6 also summarizes the current corridor-wide parking occupancies. On Third Street between King Street and Bryant Street, there are 92 spaces. On Fourth Street between King Street and Bryant Street, 56 on-street parking spaces exist and on the ~~two~~ three blocks of Stockton Street evaluated, there are ~~24~~ 44 parking spaces. Existing parking occupancy is approximately ~~72~~ 74 percent on a combined corridor-wide basis.[13]

3.1.5 PEDESTRIANS

Pedestrian Streets

Third Street, between King and Market Streets, is designated as a Neighborhood Commercial Street in the *General Plan*.[14] Other streets in the Study Area with the same designation include Berry Street (from

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[13] Because of Caltrans construction on the Bay Bridge West Approach, the portion of Fourth Street between Harrison and Bryant has been excluded from this occupancy survey

[14] San Francisco Planning Department, San Francisco *General Plan*, Transportation Element, adopted June 1978, amended in February 2005. A Neighborhood Commercial Street is a street in a Neighborhood Commercial District as identified in the *General Plan* with predominantly commercial use and parking and loading conflicts. Design goals are to maintain at least four feet of unobstructed width for pedestrian passage, encourage pedestrian-oriented uses, maintain a buffer (trees and parking) between pedestrian and vehicular circulation, meet minimum crosswalk requirements, and restrict turning movements and curb cuts. Pedestrian improvements which reflect the neighborhood character should be a priority.

Fourth Street to The Embarcadero), The Embarcadero, Market Street, Stockton Street, and Geary Street.

This designation indicates that the street is locally significant for pedestrian circulation. Third and Fourth Streets, between Folsom and Market Streets, and Market Street from Steuart Street westward, are designated as Citywide Pedestrian Network Streets in the *General Plan*.[15] This designation is reservedfor streets of citywide significance, used for walking between neighborhoods and connecting major institutions and transit facilities.

The sidewalk on the east side of Third Street, between Clementina and Howard Streets, in the vicinity of the proposed Moscone Station entrance, is just over 10 feet wide. Building columns supporting upper floors are situated east of the sidewalk, and between the columns and the first floor building facade an 8- to 13.5-foot wide private sidewalk arcade exists. On the west side of the street, the sidewalk is situated behind the driveway entrance to the Moscone Center garage. On both sides of Third Street between Mission and Market Streets, the sidewalks are about 14 feet wide.

The sidewalks on Fourth Street in the Study Area are generally 10 feet wide. On the block between Howard and Folsom Street, the sidewalk on the west side is 16 feet wide. Moscone Center South fronts the east side of this block. On the east side, the pedestrian walkway is located within the Moscone Center property rather than on the public sidewalk to accommodate the entrance to the Moscone Center underground loading docks. All intersections of Fourth Street are signalized with pedestrian crosswalks. The land uses in this section are a mix of commercial, industrial, and public. The greatest concentration of pedestrian activity occurs adjacent to the Caltrain Terminal (at Fourth and Townsend Streets) as passengers walk to and from the station or transfer between Muni LRVs, buses, and the commuter trains. The pedestrian LOS near the Caltrain Terminal is LOS D.[16] The City plans to install an audible pedestrian signal at this location to facilitate pedestrian movement.

On the east side of Stockton Street, both north and south of Post Street, the sidewalks are 15 feet wide. On the west side of Stockton Street, south of Post Street, the sidewalk abutting Union Square Park is 10 feet wide. On the north side of Post Street, the sidewalk is 15 feet wide within the public right-of-way. Near Clay Street, Stockton Street’s eastside sidewalks are about 11 feet wide. North of Clay Street, Stockton’s western sidewalk is 10.5 feet wide, and to the south of Clay Street, the sidewalk is 29.5 feet wide. Stockton Street has some of the heaviest pedestrian volumes in the City, with people frequently walking in the street to avoid sidewalk queues. Physical pedestrian improvements, such as corner bulb-outs, delineated pedestrian walkway with colored concrete, standardized diagonal crossing striping, and

[15] Ibid. Citywide Pedestrian Network Streets are of “citywide significance,” providing inter-neighborhood connection and including both exclusive pedestrian and pedestrian-oriented vehicular streets. These streets are intended to connect major institutions and transit facilities and to be used by commuters, tourists, general public, and recreational users.

bi-lingual pedestrian crossing signs are proposed as part of the Stockton Street Enhancement Project, but are not yet funded.[17]

Bay Trail

A portion of the regional Bay Trail runs through the Study Area (see Figure 3-4 for the route along the eastern waterfront). The Bay Trail is intended to provide continuous access to the San Francisco Bay's waters edge. It connects in the north from the recently completed pedestrian promenade along The Embarcadero to Fourth Street via King Street. It crosses the Fourth Street bridge and swings eastward into the China Basin Park around McCovey cove and connects with bike lanes on Terry A. Francois Boulevard and an existing bike route on Illinois Street to access the City's southeastern waterfront.

Pedestrian Levels of Service

Table 3-7 summarizes the existing pedestrian level of service at the proposed station entrances in the Project Corridor. Pedestrian counts were collected at specific locations along the Corridor at each of the proposed stations that could potentially be impacted by the placement of station entrances as part of the Central Subway Project. The Highway Capacity Manual (HCM) methodology (Chapter 18) was used to calculate the pedestrian level of service on sidewalks at these locations. According to the results from the pedestrian counts, the existing pedestrian levels of service at all proposed station entrances operate at LOS A.

3.1.6 BICYCLES

The San Francisco General Plan designates an Official Bicycle Route Network (refer to Figure 3-4). The Official Bicycle Route Network does not include designated bicycle routes on Third or Fourth Streets in the South of Market Area, except for a three block segment on Third Street between Townsend Street and Terry A. Francois Boulevard (Route #536 traverses Third Street between Townsend Street and King Street, and Route #5 traverses Third Street between King Street and Terry Francois Boulevard).

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[16] U.S. Department of Transportation Federal Transit Administration and the City and County of San Francisco, Peninsula Joint Powers Board, and San Francisco Redevelopment Agency, Transbay Terminal Downtown Extension/Redevelopment Project FEIS/FEIR/Section 4(f) Evaluation, March 18, 2004.

[17] City and County of San Francisco, Department of Parking and Traffic in cooperation with the Chinatown Development Center, Stockton Street Enhancement Project, June 30, 2003.

FIGURE 3-4

BICYCLE ROUTES AND BAY TRAIL IN THE THIRD STREET CORRIDOR

Source: PB/Wong
Not to scale

TABLE 3-7

EXISTING PEDESTRIAN LEVEL OF SERVICE

AT PROPOSED STATION ENTRANCES

Intersection	Corner	Street	15-minute count [1]	Effective Walkway Width (ft)	Ped Unit Flow Rate (ped/min/ft)	LOS
Market Street Station						
Third/Market	SW	Market	431	27.5	1.04	**A**
Third/Market	SE	Market	523	25.0	1.39	**A**
Moscone Station						
Fourth/Howard [2]	NE	Fourth	121	11.0	0.73	**A**
Fourth/Howard	NW	Fourth	96	12.0	0.38	**A**
Fourth/Howard	NW	Howard	72	18.0	0.27	**A**
Union Square and Union Square/Market Street Station						
Stockton/Geary	NE	Geary	238	19.5	0.84	**A**
Stockton/Maiden Lane	NE	Stockton	262	7.00	2.49	**A**
Stockton/Maiden Lane	SE	Stockton	261	9.00	1.93	**A**
Chinatown Station						
Stockton Between Sacramento and Clay	Mid	Stockton	179	7.0	1.70	**A**
Stockton/Washington	SW	Stockton	193	6.5	1.98	**A**
Hang Ah Alley (South of Clay)	Mid	Hang Ah	27	11.0	0.16	**A**

[1] Counts conducted April and June 2007 p.m. peak period.

[2] Proposed station elevator location.

However, there are two bicycle routes that run parallel to the Third and Fourth Street corridors in the South of Market Area. Route #11 is a designated bicycle route on Second Street between Market and King Streets to the east of the Project Corridor, and Route #19 is a designated bicycle route on Fifth Street between Market and Townsend Streets to the west of the Project Corridor. Additionally, Route #36 is a designated bicycle route on Townsend Street between Eighth Street and The Embarcadero. Second Street, Fifth Street, and Townsend Street were all identified as “Priority Projects” for bicycle improvements in the San Francisco Bicycle Program’s May 2005 Proposition K 5-Year Prioritization Program.[18] North of Market Street, Route #17 traverses Stockton Street between Broadway and Post Street.

[18] San Francisco County Transportation Authority, San Francisco Bicycle Program, Proposition K 5-Year Prioritization Program, May 2005. The Bicycle Improvement Program is currently undergoing separate environmental review.

Bicycle Routes

Route #5 (The Embarcadero/Third Street Corridor)

Route #5 follows Third Street, King Street, and The Embarcadero near the Project Corridor, with existing bicycle lanes provided in both directions on King Street and The Embarcadero. The Third Street portion connects with the Mission Bay development via a bridge that crosses the China Basin channel.

Route #11 (Second Street)

Route #11 follows Second Street between Market and King Streets. The San Francisco Bicycle Program's May 2005 Proposition K 5-Year Prioritization Program identified the portion of Route #11 on Second Street, between Market and King Streets, as a "Priority Project" and several conceptual improvement options were developed and received public input and feedback.

Route #17 (Stockton Street)

Route #17 follows Stockton Street between Broadway and Post Street. A northbound bicycle lane exists on Stockton Street between Bush and Sacramento Streets, which provides cyclists a dedicated lane as they climb upgrade towards Chinatown. The San Francisco Bicycle Program's May 2005 Proposition K 5-Year Prioritization Program recommends exploring adding bicycle lanes along the entire length of Stockton Street between Broadway and Market Street by removing one of the two southbound travel lanes in the Stockton tunnel to enable striping a southbound bicycle lane and by creation of a contraflow bicycle lane on the one-way southbound portion of Stockton Street between Sutter and Post Streets.

Route #19 (Fifth Street and Fourth Street)

Route #19 follows Fourth Street between Third Street (Route #5) and Townsend Street (Route #36), Townsend Street to Fifth Street, and Fifth Street to Market Street. The San Francisco Bicycle Program's May 2005 Proposition K 5-Year Prioritization Program identified the portion of Route #19 on Fifth Street between Market and Townsend Streets as a "Priority Project" and several conceptual improvement options were developed and received public input and feedback – the document notes that the Central Subway's proposed alignment on Fourth Street could adversely increase traffic volumes on Fifth Street and that Muni's associated environmental documents for the Central Subway should address this impact to Fifth Street.[19,20]

Route #36 (Townsend Street)

19 Ibid, Category: C.iv.b Bicycle Circulation/Safety, May 2005.
20 City and County of San Francisco, San Francisco County Transportation Authority, San Francisco Bicycle Plan: Policy Framework, May 2005.

Route #36 follows Townsend Street between Eighth Street (Route #23) and The Embarcadero (Route #5). The San Francisco Bicycle Program's May 2005 Proposition K 5-Year Prioritization Program identified portions of Townsend Street as a "Priority Project" and several conceptual improvement options were developed and received public input and feedback.

3.1.7 EMERGENCY VEHICLE ACCESS

Arterial Street Access

The San Francisco Fire Department's Fire Station #8 is located at 36 Bluxome Street, just west of Fourth Street. This station is one of the City's five busiest stations. Emergency vehicles responding from this station are often challenged by traffic congestion and interference on Fourth and Fifth Streets. The major streets commonly used by emergency vehicles from this fire station are: Fourth Street, Fifth Street, Brannan Street, Townsend Street, and Bluxome Street.

Fire Station #1 is located at 676 Howard Street, just east of Third Street. As with Fire Station #8, Fire Station #1 is located in the South of Market Area, where traffic congestion creates difficulties for emergency vehicles to navigate. The major streets commonly used by emergency vehicles from this fire station are: Third Street, Fourth Street, Howard Street, Mission Street, Geary Street and Kearny Street.

Fourth Street Emergency Vehicle Contraflow

Depending on their destination, emergency vehicles from Fire Station #85 may exit Bluxome Street from Fourth or Fifth Streets. When Fourth Street is congested, emergency vehicles exiting Bluxome Street make a left turn and travel "contraflow" north on Fourth Street to Brannan Street. This kind of contraflow maneuver for emergency vehicle access is typical at other fire stations located near one-way streets.

Emergency Vehicle Staging Requirements

In addition to the Bluxome Street access issue at Fire Station #8, the San Francisco Fire Department has insisted that if any portal structure is located in a roadway, consideration should strongly be given to the needs of the Fire Department vehicles to safely stage rescue vehicles on the east side of Fourth Street.

Proposed Fire Station Signal Pre-Emption System

Because existing traffic flows on Fourth Street are currently a problem, the City has been investigating the potential application of a special pre-empt signal phase to clear the vehicle queues on Fourth Street between Brannan and Townsend Streets and give the emergency vehicles greater flexibility in selecting the quickest response route. Other signalized intersections in the South of Market area near the Corridor have also been identified to be upgraded with emergency pre-emption capabilities.

3.2 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

This section identifies and evaluates the potential environmental consequences for the operation and cumulative conditions of each of the Central Subway alternatives in the areas of transit, traffic, freight, parking, non-motorized transportation, and emergency vehicle access. Mitigation measures that would reduce or avoid significant impacts are described. Construction impacts and mitigations of the transportation areas are detailed in Chapter 6.0 with all other construction impacts and mitigations. See Chapter 7.0 for CEQA determinations of significance.

3.2.1 TRANSIT

A project would have a significant effect on the environment if it would cause a substantial increase in transit demand that could not be accommodated by adjacent transit capacity, resulting in unacceptable levels of transit service; or cause a substantial increase in delays or operating costs such that significant adverse impacts in transit service levels could result.[21]

Future Transit Conditions

The purpose of this section is to describe the methodology used to forecast future year (2030) transit ridership for the No Project/TSM, Enhanced EIS/EIR Alignment, Fourth/Stockton Alignment Option A (LPA), and Fourth/Stockton Alignment Option B (Modified LPA) Alternatives. The forecasts were based on outputs from the San Francisco Travel Demand Forecast Model. The analysis was conducted using the San Francisco Tour-Based Microsimulation Model (San Francisco Model), a state-of-the-art travel demand forecasting model developed for the San Francisco County Transportation Authority (SFCTA) in the late 1990's to support transportation planning and coordination activities in San Francisco. This model has been used in long-range county-wide planning, development impact analysis, and to support the analysis of transportation impacts of major investments. The San Francisco Model is a multi-modal tool, addressing all modes of travel, including transit, auto, bike, and walk. The model can provide estimates of a wide range of travel-related measures. For transit, these measures include estimates of system ridership, route ridership, station ridership, and user benefits.

Relationship to 1998 EIS/EIR Analysis

The travel demand analysis conducted for each of the alternative Central Subway segments of the Third Street Light Rail Project is significantly different than that conducted for the 1998 EIS/EIR. In the earlier study, a growth-factor method was used to produce ridership estimates. The Draft EIS/EIR relied on data from the regional travel demand forecast model maintained by MTC (including land-use projections and transportation networks), observed transit boarding data, and an assumed relationship between travel time and demand (elasticity) to produce demand forecasts for the Third Street Light Rail Project. The ridership forecasts for the 1998 EIS/EIR were not based on runs of a travel demand forecast model for each alternative. At the time of the earlier analysis, the San Francisco Model had not yet been developed.

In contrast, travel demand forecasts for the Central Subway Project SEIS/SEIR are based on outputs from the San Francisco Model. The model was run separately for each alternative described. Differences in model outputs are the result of the different methodologies employed and the internalization of critical travel demand assumptions in the model that would potentially impact ridership. Such differences are noted where appropriate in this document.

The San Francisco Model

The San Francisco Model uses the "full day pattern" activity modeling approach. This approach simultaneously predicts the main components of all of a person's travel across the entire day. A simulation of San Francisco resident population is created, and input to the component models of vehicle availability, day pattern choice (tour and trip generation), tour and trip time of day choice, destination choice and mode choice. Destination and mode choice are also predicted at both the tour and the trip level. Simulated tours and trips are aggregated to represent flows between traffic analysis zones before traffic assignment. The model system predicts the choices for a full, representative sample of residents of San Francisco County, almost 800,000 simulated individual person-days of travel. It was created based on the observed behavior of San Francisco residents as revealed in 1990 and 1996 travel surveys conducted by the MTC. The San Francisco Model predicts demand for San Francisco County residents

[21] Transit/Service levels are unacceptable if the demand exceeds the capacity (seats plus standees) as defined by the transit provider.

only. This San Francisco-specific travel demand is then integrated with estimates of regional travel demand produced by Baycast, the regional travel demand model developed and maintained by the MTC.

In order to estimate future travel demand, the model requires information on the location of future year employment, population, and configuration and performance of transportation networks. In addition to considering where people live, work, and shop, the model also considers the socioeconomic characteristics of Bay Area residents, and is sensitive to levels of congestion, fares, and other monetary costs. Many of these future year assumptions are based on information developed by the MTC, in order to ensure consistency with regional transportation planning efforts. An important aspect of the San Francisco Model is that it captures the effects of transit and other service quality improvements, not only in terms of new passengers attracted, but also in terms of how these improvements affect the choices of existing transit users.

The forecasts prepared as part of this effort were developed for the horizon year of 2030, consistent with the most recent Regional Transportation Plan (RTP). This forecasting effort assumed the same employment, population, and transportation network assumptions used in the RTP, with additional spatial detail added within San Francisco. Finally, the forecasting methodology used is consistent with the guidelines established for the Federal Transit Administration's (FTA's) evaluation of federal New Starts projects.

Analysis of all of the alternatives, including the No Project/TSM Alternative, assume a fixed trip distribution. This constraint is imposed by FTA to facilitate the comparison of alternatives. Some distribution models may be unreasonably sensitive to travel times and other measures of impedance, which makes alternative-to-alternative comparisons within a project difficult, and also makes comparing projects from one region to another difficult. As a result of this constraint, the assumed origin-destination patterns of travelers is assumed to be the same across all alternatives, though the transit network is different for each alternative, resulting in different estimates of transit ridership.

Base Year Validation

Prior to using the San Francisco Model for developing travel demand forecasts, the model was calibrated and validated against a base year of 2000 (before the implementation of T-Third service and the associated bus route changes). The ability of the model to match, within a reasonable tolerance, observed base-year transit ridership in the corridor is critical. Base year estimated ridership is compared to observed ridership estimates provided by Muni for selected bus and LRV routes in the Third Street/Central Subway Corridor. This analysis indicated a reasonable match to observed boardings, within two percent of observed total ridership across all routes.

Ridership Projections

Table 3-8 presents the estimated typical weekday daily ridership projections for the Project alternatives (weekday a.m. peak hour and p.m. peak hour ridership projections are provided in Tables E-1 and E-2 in Appendix E). Projections are provided for the Third Street Corridor's primary bus lines, including the 9X/AX/BX-San Bruno Expresses, 30-Stockton, and 45-Union/Stockton (the projected ridership shown for the 30-Stockton and 45-Union/Stockton lines represent only those trips on the portion of the routes between Filbert and Townsend Streets as this segment would be most directly affected by the Central Subway Project). Projections are also provided for the proposed light rail line, where applicable. All of the projections account for existing transit trips and trips generated by expected growth along the Corridor, including the development of the proposed Mission Bay project.

The daily trips projected at each of the proposed Central Subway stations or stops for each alternative are summarized in Table 3-9.

Under all Build Alternatives, the greatest amount of passenger activity would occur at the Central Subway Market Street Station (or Union Square/Market Street Station); ~~45~~ 47 percent of system boardings for Alternative 2 and ~~50~~ 49 and 48 percent of system boardings for Alternatives 3A and 3B, respectively. At the Powell Street Station on Market Street, the passenger activity is associated with the high level of transfers that would occur between the BART system and the Muni Metro system. It is estimated that approximately ~~38~~ 49 percent of the passengers boarding the Central Subway system at Powell Street would be transfers from BART. Much of this transfer activity is presently occurring as passengers use Powell Street as a point of transfer to other Muni routes and services, some of which would be replaced by the Central Subway light rail line. By 2030, it is projected that 4,200 additional daily riders would exit and 13,000 would enter BART at the Powell Street Station.[22] Additional passengers would use the concourse level of the station, however, passengers entries/exists from/to the street level is expected to decline. The 2008 study also shows fewer patrons using the station stairways and escalators between the street and concourse levels, because transfers to and from BART/Muni Metro

[22] SFMTA analysis of SFCTA's 11/07 ridership projections as cited in Arup Americas, Inc. Powell Station Central subway Impacts Study, May 2008.

and the Central Subway on the concourse would replace transfers to and from the systems at the street surface level.

The Fourth and King Station, serving the T-Third Line also has a high level of passenger activity ranging from ~~25~~ 29 percent (Alternative 3B) to 32 percent (Alternative 3A) of system ridership. The passenger activity at the King Street station relates to the high level of passenger transfers between Caltrain and the Muni system at this point. Caltrain boardings are projected to be about ~~89~~ 67 percent of total ridership at this station in 2030. This transfer activity currently exists as passengers from the Caltrain terminal board Muni buses or the T-Third rail line to get to their destinations throughout the downtown and other parts

TABLE 3-8

ESTIMATED WEEKDAY TRANSIT RIDERSHIP

EXISTING AND 2030 CONDITIONS

LRT/BUS LINE	2000	2030 NO PROJECT/TSM	2030 ENHANCED EIS/EIR ALIGNMENT	2030 FOURTH / STOCKTON ALIGNMENT OPTION A (LPA)	2030 FOURTH / STOCKTON ALIGNMENT OPTION B (MODIFIED LPA)
CORRIDOR BOARDINGS					
RAIL					
T-Third Long Line[1]	N/A	~~60,030~~ 24,600[4]	~~59,710~~ 44,500	~~60,670~~ 45,800	~~65,830~~ 44,900
T-Third Short L~~l~~ine	N/A	N/A	~~30,080~~ 18,900	~~28,170~~ 19,000	~~33,400~~ 18,900
T-Third Very Short Line	N/A	N/A	12,900	12,800	12,800
Subtotal		**~~60,030~~** 24,600	**~~89,790~~** 76,300	**~~88,840~~** 77,600	**~~99,230~~** 76,600
BUS					
Line 15[2]	~~31,130~~ 28,300	~~n/a~~ N/A	~~n/a~~ N/A	~~n/a~~ N/A	~~n/a~~ N/A
Lines 9X, 9AX, 9BX	~~9,320~~ 10,600	~~29,560~~ 23,000	~~30,790~~ 22,300	~~30,760~~ 20,800	~~24,770~~ 21,200
Lines 30, 45 [3]	~~52,420~~ 54,400	~~57,860~~ 76,600	~~42,030~~ 46,600	~~42,510~~ 44,800	~~38,290~~ 44,800
Subtotal	**~~92,870~~ 93,300**	**~~87,420~~ 99,600**	**~~72,820~~ 68,900**	**~~73,270~~ 65,600**	**~~63,060~~ 66,000**
TOTAL IN CORRIDOR:	**~~92,870~~ 93,300**	**~~147,450~~ 124,200**	**~~162,610~~ 145,200**	**~~162,110~~ 143,200**	**~~162,290~~ 142,600**
Increase Over Existing:	0	~~54,580~~ 30,900	~~69,740~~ 51,900	~~69,240~~ 49,900	~~69,420~~ 49,300
Increase Over No Project/TSM:	0	0	~~15,160~~ 21,000	~~14,660~~ 19,000	~~14,840~~ 18,400
SYSTEM BOARDINGS					
RAIL	~~209,510~~ 185,700	~~280,550~~ 238,900	~~303,190~~ 287,900	~~311,730~~ 300,700	~~320,630~~ 299,500
BUS	~~543,240~~ 547,000	~~585,470~~ 609,000	~~590,450~~ 567,800	~~575,760~~ 566,700	~~566,290~~ 566,800
TOTAL SYSTEM:	~~752,750~~ 732,800	~~866,020~~ 848,800	~~893,640~~ 855,700	~~887,490~~ 867,400	~~886,910~~ 866,300
Increase Over Existing:	0	~~113,270~~ 116,050	~~140,890~~ 122,900	~~134,740~~ 134,600	~~134,160~~ 133,500
Increase Over No Project/TSM:	0	0	~~27,620~~ 6,900	~~21,470~~ 18,600	~~20,890~~ 17,500

Notes:
[1] Central Subways T-Third long-line to Visitacion Valley, ~~and~~ T-Third short-line to 18th and Third Streets, and T-Third very short line to the Caltrain Station at Fourth and King Streets.
[2] 15-Third Line shifts to 9X-San Bruno or to the T-Third line.
[3] 45 Union/Stockton extended into Mission Bay
[4] Rail ridership on the K between The Embarcadero and the county line and on the N to The Embarcadero.
N/A Not Applicable
Ridership is defined as the number of passengers boarding.

Source: San Francisco Model, January 2007. Revised January 2008.

TABLE 3-9

ESTIMATED WEEKDAY RIDERSHIP

BY CENTRAL SUBWAY STATION

2030 CONDITIONS

STATION	2030 NO PROJECT /TSM	2030 ENHANCED EIS/EIR ALIGNMENT	2030 FOURTH / STOCKTON ALIGNMENT OPTION A (LPA)	2030 FOURTH / STOCKTON ALIGNMENT OPTION B (MODIFIED LPA)
Fourth and King	---	~~20,250~~ 15,700	~~20,670~~ 19,100	~~19,520~~ 17,400
Fourth and Brannan	---	~~---~~	~~---~~	~~6,670~~ 3,000
Third (between King and Townsend)	---	~~2,990~~ 4,000	~~---~~	~~---~~
Moscone	---	~~4,290~~ 3,800	~~3,860~~ 3,500	~~3,520~~ 2,800
Market Street	---	~~30,540~~ 28,300	~~32,620~~ 29,400	~~38,510~~ 28,600
Union Square	---	~~2,640~~ 1,600		
Chinatown	---	~~6,570~~ 6,200	~~8,190~~8,300	~~8,050~~ 8,000
TOTAL IN CORRIDOR:	**---**	**~~67,280~~ 59,600**	**~~65,340~~ 60,300**	**~~76,270~~ 59,800**
TOTAL IN CENTRAL SUBWAY	**---**	**43,900**	**41,200**	**42,400**

Note: An estimated ~~89~~67 percent of passenger activity at the Fourth and King Station is related to transfers from Caltrain and about ~~25 to 32~~ 49 percent of passenger activity at the Market Street or Union Square/Market Street Stations is related to transfers from BART to Muni at Powell Street Station.
Ridership is defined as the number of passengers boarding.
Central Subway total excludes the Fourth and King Station which is part of the T-third line.
Source: San Francisco Model, January 2007. Revised January 2008.

of San Francisco. If in the future, the Caltrain line is extended to the Transbay Terminal as proposed in Phase 2 (Downtown Extension) of the Transbay Terminal Improvements, ridership on the Central Subway line would likely be reduced by some portion of the ~~89~~ 67 percent. However, because the Downtown Extension is not included as part of the Regional Transportation Plan and currently has an estimated $2 billion shortfall for implementation, the extension of Caltrain has not been assumed to be part of the transportation network by 2030 and a detailed analysis of the ridership impacts was not conducted (refer to Section 3.1.1 for the transportation improvements that are projected to be in place by 2030). The p.m. peak period ridership ~~at each of the Central Subway stations~~ on the key transit routes in the T-Third corridor is presented in Table 3-10.

Transit Travel Times

Table 3-11 presents in-vehicle travel time comparisons for selected trips using the 15-Third bus service (from 2000 before operation of the T-Third began) and travel times for selected trips under each of the alternatives. The total travel times include walk, wait, and ride (in-vehicle and out-of-vehicle) times.

Out-of-vehicle travel times are influenced by such factors as service headways, location of station access points, and depth of station. These out-of-vehicle travel times are accounted for in the model and the projected transit ridership."

TABLE 3-10

2030 ESTIMATED P.M. PEAK PERIOD RIDERSHIP

FOR SELECTED ROUTES IN CORRIDOR

VOLUME	2000 BASE	2030 NO PROJECT / TSM ALIGNMENT	2030 ENHANCED EIS/EIR ALIGNMENT	2030 FOURTH / STOCKTON ALIGNMENT OPTION A (LPA)	2030 FOURTH / STOCKTON ALIGNMENT OPTION B (MODIFIED LPA)
T-Third Lines ~~Central Subway/30~~	~~1,260~~ ---	~~1,950~~ 11,590	~~19,020~~ 26,990	~~16,710~~ 27,110	~~19,720~~ 26,820
9AX	~~1,680~~ 1,490	~~710~~ 1,810	~~610~~ 1,670	~~610~~ 1,610	~~610~~ 1,620
9BX	~~720~~ 940	~~1,080~~ 1,900	~~1,000~~ 1,570	~~970~~ 1,550	~~970~~ 1,570
9X	~~570~~ 750	~~5,120~~ 1,630	~~6,210~~ 1,690	~~5,270~~ 1,520	~~2,730~~ 1,580
30	8,370	13,900	4,150	4,140	4,120
45	4,600	8,530	5,620	5,510	5,480

Note: The p.m. peak period is three-hour ridership.
Ridership is defined as the number of passengers boarding.
Source: San Francisco Model, January 2007. Revised January 2008.

TABLE 3-11

IN-VEHICLE TRAVEL TIMES FOR SELECTED TRANSIT TRIPS

EXISTING AND 2030 CONDITIONS

TRANSIT TRAVEL TIME (minutes)					
ORIGIN-DESTINATION	**2000**	**2030 NO PROJECT / TSM ALIGNMENT**	**2030 ENHANCED EIS/EIR ALIGNMENT**	**2030 FOURTH / STOCKTON ALIGNMENT OPTION A (LPA)**	**2030 FOURTH / STOCKTON ALIGNMENT OPTION B (MODIFIED LPA)**
Fourth/King – Market Street	8.1	10.5	~~4.4~~ 4.7	~~3.2~~ 3.5	~~4.5~~ 4.9
Market Street to Chinatown Station[2]	3.7	6.5	2.3	1.1	1.4
Fourth/King – Chinatown Station[1]	11.8	17.0	7.0	4.6	6.3

Notes: [1] The Chinatown Station is at Stockton/Clay for the Enhanced EIS/EIR and Fourth/Stockton Alignment Option A (LPA) Alternatives, and at Stockton/Washington for the Fourth/Stockton Option B (Modified LPA) Alternative.
[2] Market Street is the Market Street Station under Alternative 2 and the Union Square/Market Street Station under Alternatives 3A and 3B
Source: PB/Wong, April 2007. Revised October 2007.

Alternative 1 – No Project/TSM

Operations and Cumulative Impacts

By 2030, the No Project/TSM Alternative transit ridership demand in the Corridor is expected to grow by nearly ~~60~~ 33 percent over existing conditions, due to employment and population growth in the South of

Market, Mission Bay, Bayview-Hunters Point, and the Financial districts (refer to Table 3-8). In the base year 2000, the San Francisco Model inputs indicate an estimated population of ~~58,000~~ 52,120 and estimated employment of ~~142,000~~ 280,700 jobs ~~within ¼ mile of~~ in the Central Subway Corridor (refer to Table 1-1). According to the San Francisco

Planning Department, SFCTA, and Association of Bay Area Government (ABAG) forecasts, the population is expected to grow to by approximately ~~83,000~~ 96,040 persons (plus ~~41~~ 84 percent) and the employment is expected to grow to ~~177,000~~ 335,030 jobs (plus ~~24~~ 19 percent) in the Central Subway Corridor. This growth can be compared to a county-wide projected population growth of approximately ~~18~~ 20 percent and employment growth of about ~~29~~ 28 percent.~~, demonstrating that the~~ The rate of population growth in the project corridor exceeds the rate of growth citywide, though the employment growth is lower. This growth could increase travel demand and result in increased congestion on surface streets. The travel time of a transit trip between Fourth and King Streets and Chinatown would increase by 5.2 minutes when compared to existing conditions.

Corridor transit ridership demand would increase by about ~~54,580~~ 30,900 daily trips between 2000 and 2030 under the No Project/TSM Alternative. The daily rail ridership would increase by approximately ~~60,030~~ 24,600 trips over existing conditions~~, but this would be offset by a reduction of~~ and the daily bus ridership would increase by approximately ~~5,450~~ 6,300 trips (refer to Table 3-8). This reduction in bus increase in transit ridership would occur as a result of service changes that were implemented for the T-Third line, as well as growth in population and employment. Changes to transit services in the Corridor between the base year 2000 and the year 2030 TSM included:

- Implementation of Phase 1 of Third Street Light Rail Project. The Initial Operating Segment, which has been accepted by FTA as the TSM alternative for Central Subway analyses, provides at-grade rail transit service from the terminus at Sunnydale and Bayshore Boulevards at the San Francisco County line north to Fourth and Townsend Streets along Third Street. The T-Third line operates as an extension of the Castro shuttle with 7-minute frequencies in the a.m. and p.m. peak periods, 10-minute frequencies in the midday, and 12-minute frequencies in the evening.
- Elimination of the 15-Third line. The 15-Third line was replaced by the T-Third light rail line and expanded service on the 9X-San Bruno Express, the 30-Stockton, and the 45-Union/Stockton.
- Extension of the 9X/9AX/9BX-San Bruno Expresses: These routes were extended from Broadway north to the Kearny/North Point intersection and extended to the south from Mission Street to the Phelan Loop, to cover the portion of the 15-Third line that was eliminated and not replaced by T-Third service. The 9AX-San Bruno A Express and 9BX-San Bruno B Express provide peak hour, peak direction service only, operating at 10-minute headways. During the peak, the 9X-San Bruno Express provides reverse peak direction service with 12-minute headways and bi-directional service during the midday and evening at 12 and 15-minute headways, respectively.

- Extension of the 45-Union/Stockton: This route was extended from the 2006 (pre-T-Third) route to provide service to Mission Bay. It has 8-minute frequencies during the peak periods, 6-minute frequencies in the midday, and 20-minute frequencies in the evening.

In the No Project/TSM Alternative, service between the Caltrain station at Fourth and Townsend and Chinatown is provided by the 30-Stockton and 30-Stockton short line buses. This service is replaced by the Central Subway operations in the Build Alternative. An analysis of expected volumes and capacities on the 30-Stockton and 30-Stockton short line indicates that capacities would not be exceeded on this segment. However, capacities of the light rail vehicles operating along the Muni Metro Extension, which connects service between the Market Street subway and the T-Third line, may experience capacity issues for limited durations during the peak period due to capacity constraints on the segment between the Embarcadero Station and the Folsom/Embarcadero stop. The Muni 9~~A~~X/9BX-San Bruno Expresses are not expected to experience capacity issues, but capacity issues would arise on the 9AX-San Bruno Express.~~, with r~~Ridership on ~~this~~ the 9X-San Bruno Express routes is forecast to increase from approximately ~~9,320~~ 10,600 daily boardings to approximately ~~29,560~~ 23,000 daily boardings between 2000 and 2030. Table 3-10 indicates a peak period demand of about ~~5,120~~ 4,930 passengers ~~(at Fourth and Mission Streets)~~ on the 9X-San Bruno Express lines, which is a substantial increase over the 2000 ridership demand of approximately ~~570~~ 3,180 passengers.

Mitigation Measures

To accommodate this projected demand for transit service, additional buses and increases in service levels for the 9X may be required. The 2030-ridership projections from the San Francisco model are “unconstrained” assuming full build out of Mission Bay and termination of Caltrain at Fourth and Townsend Streets. Actual ridership may vary from these projections if growth does not materialize or if the Caltrain is extended to the Transbay Terminal at some point in the future. Riderhsip patterns on the light rail and bus lines will be monitored following the implementation of the T-Third service and associated bus changes. When warranted by passenger demand, Muni will modify their service plans to allow an increase in transit capacity.

Alternative 2 – Enhanced EIS/EIR Alignment

Operations and Cumulative Impacts

Travel times between Fourth and King Streets and the Market Street Station would be ~~6.1~~ 5.8 minutes faster and travel times between Fourth and King Streets and the Chinatown Station would be 10.0

faster in the Enhanced EIS/EIR Alternative than in the No Project/TSM Alternative due to the replacement of buses traveling in mixed-flow with trains traveling in a semi-exclusive or dedicated right-of-way (refer to Table 3-11). When compared to the existing conditions the travel time between Fourth and King Streets and the Market Street Station would be ~~4.1~~ 3.4 minutes faster and ~~3.7~~ 4.8 minutes faster for the trip between Fourth and King Streets and the Chinatown Station.

As shown in Table 3-8, the proposed light rail line is expected to serve approximately ~~89,790~~ 76,300 trips per weekday in 2030, or ~~29,760~~ 51,700 more daily riders than served by the T-Third line in the No Project/TSM Alternative, primarily due to the more direct alignment providing connections to the Union Square and Market Street Stations and also due to travel time savings gained in the proposed tunnel. A large share of these travelers are persons with origins likely outside San Francisco who board the Central Subway at Fourth and King near the Caltrain Terminal ~~and alight along~~ or board at Market Street connecting from the BART system, as shown in Table 3-9. Overall boardings on routes serving the Third Street Corridor are expected to increase by approximately ~~15,160~~ 21,000 over the No Project/TSM Alternative or ~~69,740~~ 51,900 over existing conditions. The increase of ~~29,760~~ 51,700 rail boardings over the No Project/TSM Alternative would be offset ~~somewhat~~ by a decline in bus boardings in the corridor of approximately ~~14,600~~ 30,700.

The large numbers of travelers using the Enhanced EIS/EIR Alignment could exceed the capacity at some point in the future. The combined peak load on the T-Third long, T-Third short, and T-Third very short lines is predicted to be ~~19,020~~ 26,990 riders by 2030, assuming ~~5~~6-minute headways (refer to Table 3-11). The service provided by two-car trains on the T-Third very short line and one-car trains on the T-Third long and short lines may need to be supplemented in the future as growth occurs to meet Muni planning capacity standards. These capacity issues may be substantially alleviated if the Caltrain Downtown Extension were implemented (the Caltrain Extension was not included in the networks because it was not part of the fiscally constrained RTP). As was the case with the No Project/TSM Alternative, demand projected for 9AX-San Bruno Express line may exceed capacity by 2030. Ridership on ~~this~~ the 9X-San Bruno Express routes is forecast to increase to ~~6,210~~ 4,930 passengers ~~(at Fourth and Mission Streets)~~.

Mitigation Measures

In 2030, passenger demand could slightly exceed the capacity of proposed light rail vehicle and bus services during certain peak hours. The 2030-ridership projections from the San Francisco model are “unconstrained” assuming full build-out of Mission Bay and termination of Caltrain at Fourth and Townsend Streets. As noted in the Mitigation Measures for the No Project/TSM Alternative, actual ridership may vary from these projections if growth does not materialize or if the Caltrain is extended to the Transbay Terminal at some point in the future. Riderhsip patterns on the light rail line will be monitored following the implementation of the service. When warranted by passenger demand, Muni will increase the number, frequency, and/or size of trains and buses through modification of the operating plan to allow an increase in capacity.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

Operations and Cumulative Impacts

Travel times between Fourth and King Street Station and the Union Square/Market Street Station are assumed to be 1.2 minutes faster in Fourth/Stockton Alignment Option A than in the Enhanced EIS/EIR Alignment and 2.4 minutes faster between Fourth and King Streets and the Chinatown station due to the straightening out of the route and a reduction in the number of stops. ~~and~~ The travel time between the Fourth and King Street Station and the Chinatown Station would be 12.4 minutes faster than under the No Project/TSM Alternative (refer to Table 3-11). When compared to existing conditions, travel times from Fourth and King Streets would be ~~4.9~~ 4.6 minutes faster to Market Street and 7.2 minutes faster to Chinatown Station.

As shown in Table 3-8, when compared to the No Project/TSM Alternative, the Fourth/Stockton Alignment Option A is projected to serve about ~~88,840~~ 77,600 trips per weekday in 2030, or ~~28,810~~ 53,000 more daily riders than served by the T-Third line operating along The Embarcadero. This is primarily due to the more direct alignment providing connections to the Union Square/Market Street Station and also due to the travel time savings gained in the proposed tunnel. This ~~is slightly fewer passengers than~~ serve~~d~~s 1,300 more passengers than ~~by~~ the Enhanced EIS/EIR Alternative~~.~~, as ~~Though~~ Option A provides slightly faster travel times~~,~~ with the reduction in the number of stops ~~increases the walk time to stations~~ and a more direct alignment. ~~This out-of-vehicle time is often perceived by travelers to be more onerous than time spent riding in vehicles.~~ As was the case with the Enhanced EIS/EIR Alternative, a large share of the users of the Central Subway ~~are likely~~ have trip origins outside San Francisco; boarding the Central Subway at the Fourth and King Station after getting off Caltrain and ~~alighting at~~ or Market Street transferring from the BART system (refer to Table 3-9). When compared to the No Project/TSM Alternative, overall boardings on routes serving the Third Street Corridor are expected to increase by approximately ~~14,660~~ 19,000 over the No Project/TSM Alternative or ~~69,240~~ 49,700 over the existing conditions. The increase of ~~28,810~~ 53,000 rail boardings over the No Project/TSM Alternative would be offset by a decline in bus boardings of approximately ~~14,150~~ 34,000.

As observed in the Enhanced ~~ESI~~EIS/EIR Alternative, the large numbers of travelers using the Fourth/Stockton Alignment Option A could exceed the capacity by 2030. The combined peak load on the T-Third long, T-Third short, and T-Third very short lines is predicted to be ~~16,710~~ 27,110 riders (refer to Table 3-10). To meet the Muni planning capacity standards, additional service may be required as development occurs. As previously noted, these capacity issues would be substantially alleviated if the Caltrain Downtown

Extension were implemented. Once again, capacity issues may arise on the 9AX-San Bruno Express. Table 3-10 indicates a peak load of about ~~5,270~~ 4,680 passengers on the 9X-San Bruno Express lines ~~(at Fourth and Mission Streets)~~. The Powell Street Station may also experience capacity issues at the concourse level due to increased passenger activity at the northeast end of the station.

Mitigation Measures

Mitigation measures would be the same as those outlined under Alternative 2, except as noted below.

SFMTA and BART will prepare and enter into a Station Improvement Coordination Plan for the Powell Street Station that will provide for, at a minimum, implementation of and allocation of cost for any station infrastructure improvements necessary to maintain pedestrian safety and a pedestrian level of service of D or better at the Powell Street Station as a result of the Central Subway Project.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Operations and Cumulative Impacts

For the Fourth/Stockton Alignment Option B, travel time between the Fourth and King Station and the Union Square/Market Street Station is estimated to be ~~1.3~~ 1.4 minutes slower and travel time between Fourth and King Streets and the Chinatown Station would be 1.7 minutes slower than in Fourth/Stockton Alignment Option A due to the presence of an additional stop in SOMA, but travel times between Fourth and King Streets and Chinatown 10.7 minutes faster than under the No Project/TSM Alternative (refer to Table 3-11). When compared to existing conditions, travel times from Fourth and King Streets would be ~~3.6~~ 3.2 minutes faster to Market Street and 5.5 minutes faster to Chinatown Station.

The light rail line in the Fourth/Stockton Alignment Option B is expected to serve approximately ~~99,230~~ 76,600 trips per weekday in 2030, or ~~39,200~~ 52,000 more daily riders when compared to the No Project/TSM Alternative (refer to Table 3-8). It serves ~~10,390 more~~ 1,000 fewer passengers or one percent less than served by the light rail train in the Fourth/Stockton Alignment, Option A Alternative, primarily due to the ~~additional access provided by~~ slightly slower travel times resulting from the proposed surface station on Fourth Street. The bus ridership is projected to decline on lines serving the Corridor, such as the 9X/9AX/9BX- San Bruno Expresses, 30-Stockton, and 45-Union/Stockton, as well as other lines serving Downtown San Francisco and SOMA as a result of the Central Subway Project implementation. As was the case with the Enhanced EIS/EIR Alternative and Fourth/Stockton Alignment Option A, a large share of the users of the Central Subway are expected to have trip origins outside San Francisco, transferring to the Central Subway at Fourth and King Station (from Caltrain) ~~and alighting~~ or at Market Street transferring from the BART system (refer to Table 3-9**)**. When compared to the No Project/TSM Alternative, overall transit boardings on routes serving the Third Street Corridor are expected to increase by approximately ~~14,840~~ 18,400 over the No Project/TSM Alternative or ~~69,420~~ 49,300 over existing conditions. The increase of ~~39,200~~ 52,000 rail boardings over the No Project/TSM Alternative would be offset by a decline of ~~24,360~~ 33,600 bus boardings.

~~The Fourth/Stockton Alignment Option B has the highest Central Subway ridership of the four alternatives evaluated and b~~By 2030 the large numbers of travelers using the Central Subway could exceed the capacity during the peak hours under the Fourth/Stockton Alignment Option B (refer to Tables 3-9 and 3-10). Table 3-10 indicates that the peak load on the combined T-Third light rail lines, is projected to be ~~19,720~~ 26,820 by 2030. Assuming the use of Muni planning capacity standards, additional rail service may be required to meet demand as development along the Corridor and to the south of San Francisco occurs. For the Fourth/Stockton Alignment Option B, the 9X-San Bruno Express demand would be less than under ~~all other a~~Alternative~~s~~ 2. This is due to a shift in passengers disembarking at the Fourth and Harrison Streets and Fifth and Harrison Street stops, from the 9X-San Bruno Express and other lines, to the T-Third light rail line stop at Fourth and Brannan Streets. The 9AX-San Bruno Express line could experience capacity issues. The Powell Street Station may also experience capacity issues at the concourse level due to increased passenger activity at the northeast end of the station.

Mitigation Measures

Mitigation measures would be the same as those outlined under Alternative ~~2~~ 3A.

3.2.2 TRAFFIC

A project is considered to have a significant traffic impact when project-related traffic causes the intersection level of service to deteriorate from LOS D or better to LOS E or F, or from LOS E to LOS F or if the project substantially contributes to increased delays at intersections already operating at LOS E or F. A project would also have a significant impact if it would cause major traffic hazards or contribute considerably to cumulative traffic increase that would cause deterioration in levels of service to unacceptable levels.

Future Traffic Conditions

This section discusses the methodology used to develop future year (2030) traffic projections and vehicle travel times for the Central Subway Alternatives.

Growth in Vehicular Traffic Trips

The development of 2030 background traffic conditions was based on the San Francisco County Transportation Authority's (SFCTA's) travel demand model (San Francisco Model). The San Francisco Model is typically used to obtain estimates of travel volumes and patterns within San Francisco. The activity-based model simulating trip tours is able to quantify shifts in travel patterns and modal splits due to changes in conditions such as: roadway configurations, land uses, travel times, transit accessibility, traffic congestion, and parking costs.

The San Francisco Model forecasts traffic volumes for street segments or links, but not for intersections. The forecasted traffic growth for each street segment in the Study Area (based on 2000 and 2030 model runs) was added to existing traffic volumes to obtain 2030 No Project /TSM traffic projections. Then, based on existing travel patterns and proposed development access points, manual adjustments were made to develop 2030 peak hour turning movement projections for the Study Area's five intersections.

Table 3-12 summarizes the expected 2030 traffic volumes along the I-80 and I-280 Freeway Corridors, Geary and Stockton Streets, and Third and Fourth Streets, between Mission Creek and Market Street. Traffic volumes are expected to increase on all key street segments in the Study Area in the future with the exception of Third Street between King and Townsend Streets in the a.m. peak hour. This reduction is expected to result from increased use of the Sixth and Brannan Streets off-ramp from I-280 by northbound traffic.

TABLE 3-12
PROJECTED 2030 WEEKDAY TRAFFIC INCREASES
UNDER THE NO PROJECT/TSM ALTERNATIVE

	A.M. PEAK HOUR			P.M. PEAK HOUR		
LOCATION	**EXISTING**	**2030**	**INCREASE**	**EXISTING**	**2030**	**INCREASE**
Interstate 280:						
Between 18th & Sixth Streets	11,440	12,500	+1,060	11,340	12,150	+810
Between Sixth & Fifth Streets	2,490	3,280	+790	2,470	4,510	+2,040
Interstate 80:						
Between Fourth & Second Streets	13,740	18,660	+4,920	11,560	14,860	+3,300
Third Street:						
Between King & Townsend Streets	1,050	850	-200	1,720	2,830	+1,110
Between Harrison & Folsom Streets	2,060	N/A	N/A	1,770	2,120	+350
Fourth Street:						
Between King & Townsend Streets	780	1,780	+1,000	1,160	1,640	+480
Between Harrison & Folsom Streets	1,450	1,770	+320	1,770	2,390	+620
King Street:						
Between Fourth & Third Streets	2,730	3,210	+480	3,510	3,830	+460
Between Third & Second Streets	2,410	3,380	+970	2,590	3,410	+820
Geary Street:						
Between Powell & Stockton Streets	1,190	1,570	+380	1,640	2,340	+710
Stockton Street:						
Between Market/Ellis & O'Farrell Streets	980	2,030	+1,050	1,120	2,240	+1,120
Between Geary & Post Streets (Union Square)	1,410	1,710	+300	1,750	2,020	+270

N/A = Not Available

Source: San Francisco, Department of Parking and Traffic and San Francisco Model, 2007.

Intersection Levels of Service and Traffic Travel Speeds

The future peak hour service levels were estimated for each study intersection. The service level calculations considered each alternative's future turning volumes; number, type and width of approaching lanes; travel speeds; and signal phasing, including consideration of special phases used for light rail vehicles. Tables 3-13 and 3-14 summarize the projected levels of service for each alternative for key intersections in the Study Area. The projected levels of service were generated from the TRAFFIX model using input for traffic volumes, signal timing, and lane configurations at each intersection. A significant impact would occur if a project or cumulative development to which the project contributes causes an intersection operating at LOS A, B, C or D to deteriorate to LOS E or F conditions. Intersection delays associated with LOS F are represented in the tables as greater than 80 seconds. Tables E-12 and E-13 in Appendix E include the percent contributions of the No Project/TSM and the Build Alternatives' Project-related traffic as a percent of total 2030 Cumulative traffic volumes, and the project-related traffic as a percent of only the increase in traffic volumes between Existing and2030 Cumulative conditions. This calculation is presented only for the intersections that would operate at LOS E or LOS F under 2030 Cumulative conditions.

TABLE 3-13

2030 A.M. INTERSECTION LOS / AVERAGE SECONDS OF DELAY

INTERSECTION	EXISTING	NO PROJECT / TSM ALTERNATIVE	ENHANCED EIS/EIR ALTERNATIVE	FOURTH / STOCKTON ALTERNATIVE OPTION A (LPA)	FOURTH / STOCKTON ALTERNATIVE OPTION B (MODIFIED LPA)
Third Street / King Street	~~D/ 36.1~~ D/ 35.8	~~D/ 47.1~~ E/61.0	**F/>80.0**	**F/>80.0**	**F/>80.0**
Fourth Street / King Street	E/ 55.9	E/ 69.5	~~D/ 40.0~~ E/ 62.6	~~E/ 64.6~~ E/64.1	~~E/ 58.6~~[1] E/64.1[1]
Fourth Street / Harrison Street	~~B/ 13.2~~ B/ 13.5	~~E/ 66.5~~ C/28.0	~~C/ 31.5~~ C/34.8	~~C/ 31.2~~ C/34.8	~~F/ 75.7~~ C/34.1
Sixth Street / Brannan Street	F/>80.0	F/>80.0	F/>80.0	F/>80.0	F/>80.0
Fourth Street / Bryant Street	~~B/ 11.8~~ B/ 18.9	~~B/ 11.8~~ B/ 19.0	~~C/ 23.8~~ C/ 23.4	~~C/ 28.2~~ C/ 27.7	~~D/ 52.5~~ D/51.7

Bold shows Project related impact.

[1] The level of service presented here is for the semi-exclusive flow option. The level of service under the mixed-flow option would be LOS D.

Source: San Francisco Department of Parking and Traffic, November 2006, February 2007, and March 2007. Revised February 2008.

TABLE 3-14

2030 P.M. INTERSECTION LOS

INTERSECTION	EXISTING	NO PROJECT / TSM ALTERNATIVE	ENHANCED EIS/EIR ALTERNATIVE	FOURTH / STOCKTON ALTERNATIVE OPTION A (LPA)	FOURTH / STOCKTON ALTERNATIVE OPTION B (MODIFIED LPA)
Third Street / King Street	F/>80.0	F/>80.0	F/>80.0	F/>80.0	F/>80.0
Fourth Street / King Street	F/>80.0	F/>80.0	F/>80.0	F/>80.0	F/>80.0[1]
Fourth Street / Harrison Street	~~B/ 19.5~~ B/ 18.5	~~C/ 27.6~~ C/ 27.0	~~D/ 35.8~~ D/35.3	**~~E/ 65.2~~ E/64.6**	**F/>80.0**[2]
Sixth Street / Brannan Street	F/>80.0	F/>80.0	F/>80.0	F/>80.0	F/>80.0
Fourth Street / Bryant Street	~~C/ 20.7~~ B/19.6	~~C/ 30.9~~ C/30.4	~~B/ 18.5~~ B/ 18.2	~~D/ 39.5~~ C/ 24.4	~~D/ 37.3~~ D/ 36.9

Bold shows Project related impact.
1 The level of service presented here is for the mixed-flow and semi-exclusive option.
2 The level of service presented here is for the semi-exclusive option. The level of service for the mixed-flow option would be LOS E.
Source: San Francisco Department of Parking and Traffic, November 2006, February 2007, and March 2007. Revised February 2008.

Table 3-15 summarizes existing average travel speeds and 2030 travel speeds for the Project Alternatives. The travel speeds for existing conditions were collected using the average car method as recommended in the Manual of Transportation Engineering Studies, a publication of the Institute of Transportation Engineers (ITE). Each arterial segment was surveyed three times per segment in both the a.m. and p.m. peak periods. Upon completion of the three surveys for each segment, the average speed of each run conducted was calculated. To conform to recommended procedures established by ITE, the calculated average speed data was used to verify that the minimum sample size was satisfied. If these surveys were found to be insufficient, additional travel time runs on specific segments were completed to conform to the ITE procedure. Travel speeds for the build alternatives were generated from the TRAFFIX model using the urban streets methodology from the HCM (Chapter 15, HCM 2000).

Alternative 1 – No Project/TSM

Operations and Cumulative Impacts

Under the No Project/TSM Alternative, the roadway network in 2030 would be similar to existing conditions, with the exception of the roadway changes within the proposed Mission Bay development. Two of t~~T~~he intersections, ~~Third/King~~ Fourth/Harrison and Fourth/Bryant, ~~intersections~~ would operate at

TABLE 3-15

TRAFFIC P.M. PEAK PERIOD TRAVEL SPEED COMPARISON

LOS / AVERAGE SPEED (mph)					
ROUTE	**EXISTING**	**2030 NO PROJECT / TSM ALTERNATIVE**	**2030 ENHANCED EIS/EIR ALTERNATIVE**	**2030 FOURTH/ STOCKTON ALTERNATIVE OPTION A (LPA)**	**2030 FOURTH/ STOCKTON ALTERNATIVE OPTION B (MODIFIED LPA)**
Fourth Street:					
King to Brannan Streets	E/ 7.2	F/ 5.8	F/ 3.1	F/ 4.5	F/ 7.0
Brannan to Bryant Streets	D/ 12.1	D/ 9.1	E/ 9.0	F/ 6.0	D/ 9.3
Bryant to Harrison Streets	B/ 22.6	E/ 8.2	D/ 10.0	F/ 6.9	F/ 4.8
Source: Department of Parking and Traffic, February 2007, and Transportation Research Board, *Highway Capacity Manual 2000*, Exhibit 15-2, 2000.					

acceptable levels of service, LOS ~~D~~ C and B, respectively, in the a.m. peak hour and both the ~~Bryant and Harrison Street~~ intersections ~~with Fourth Street~~ would operate at LOS C during the p.m. peak hour. ~~As under existing conditions, many~~ Three of the Study Area intersections would operate at LOS E, or worse, conditions during the a.m. and p.m. peak period. LOS E or F conditions would occur at the following intersections under the No Project/TSM Alternative (refer to Tables 3-13 and 3-14):

- Third Street/King Street would degrade from LOS D to LOS E during the a.m. peak hour and continue to operate at LOS F during the p.m. peak hour with increased delays due to increases in traffic volumes on all approaches,
- Fourth Street/King Street would remain at LOS E during the a.m. peak hour and LOS F during the p.m. peak hour with increases in traffic volumes on all approaches, except on the eastbound through movement in the a.m. peak hour, where congestion would limit the traffic flows, and
- ~~Fourth Street/Harrison Street would degrade from LOS B to LOS E during the a.m. peak hour with significant increase in traffic volume to the I-80 on-ramp, and~~
- Sixth Street/Brannan Street would continue to operate at LOS F during a.m. and p.m. peak hours but would experience increased delays in the p.m. peak hour.

Mitigation Measures

Given the constrained roadway space available and limited opportunities for roadway restriping or signal enhancements, none of the LOS E and F intersections, ~~except for the Fourth and Harrison Streets~~

~~intersection~~ Third/King, Fourth/King and Sixth Brannan Streets, could be reasonably mitigated and are therefore considered cumulative, unavoidable adverse impacts. ~~At the Fourth/Harrison Streets intersection, the following mitigation measure is recommended:~~

- ~~Fourth Street/Harrison Street: In 2030, the Fourth/Harrison Street intersection would degrade to LOS E conditions during the a.m. peak hour; however, the intersection's performance could be improved to LOS B conditions by adding, via striping changes, a shared through and right-turn lane from Fourth Street to Harrison Street. This improvement would require parking removal on the east side of Fourth Street, from Harrison Street to a point about 200 feet to the north for lane transition purposes. Signal timing changes would also help improve the operating conditions by allocating the appropriate amount of green time to all approaches.~~"

Alternative 2 – Enhanced EIS/EIR Alignment

Operations and Cumulative Impacts

For the Enhanced EIS/EIR Alignment, Third and Fourth Streets between King and Bryant Streets would be reconfigured to accommodate the light rail tracks, station platforms, and subway portals.

On Third Street, between King and Townsend Streets, three through (one-way northbound) and one right-turn only traffic lanes on the approach to Townsend Street would be situated on the east side of the street and the exclusive lane for the light rail tracks and a curbside station would be located on the west side. Between Townsend and Brannan Streets, the light rail tracks transition toward the middle of the street en route to the subway portal as part of a mixed-flow vehicle and track lane, and the western most through traffic lane would transition further west, crossing the light rail tracks, so that from just south of Brannan Street to the portal, two traffic lanes would exist on the east side of the tracks and one traffic lane on the west side. The middle through traffic lane would transition into the mixed-flow vehicle and track lane. No existing turning movements would be prohibited. With the inclusion of light rail, this segment of Third Street would provide three traffic lanes at all times (note that it currently provides a fourth lane during the a.m. peak hour for the right-turn only lane). Northbound traffic on this block of Third Street can access either side of the street by crossing the mixed-flow vehicle and track lane. On Third Street between Brannan and Bryant Street, the mixed-flow vehicle and track lane would transition into a portal in the middle of the street, with two northbound traffic lanes on the east side of the portal and two northbound traffic lanes on the west side of the portal. On this block of Third Street, the properties on the east side of Third Street would be accessed from the two northbound traffic lanes on the east side of the portal, and the properties on the west side of Third Street would be accessed from the two northbound traffic lanes on the west side of the tracks.

Under this alternative, Fourth Street would remain one-way southbound between Bryant and Townsend Streets, with a portal in the center of the street between Bryant and Brannan Streets. Between Bryant and Brannan Streets, the buildings on the east side of Fourth Street would be accessed from the two southbound traffic lanes on the east side of the portal, and the buildings on the west side of Fourth Street would be accessed from the two southbound traffic lanes on the west side of the portal. On Fourth Street between Brannan and Townsend Streets, two southbound traffic lanes would exist on both sides of the light rail tracks with the track from the portal transitioning into a mixed-flow vehicle and track lane. In addition, southbound traffic can access either side of the street by crossing the mixed-flow vehicle and track lane. At Townsend Street, the eastern two lanes would be diverted onto Townsend to establish an eastbound one-way bus lane and loading zone on the west side of Fourth Street in front of the Caltrain Terminal. On Fourth Street between Townsend and King Streets, there would be three traffic lanes in the southbound direction, including a left turn only lane shared with the tracks, and one northbound traffic lane with a right-turn only regulation at Townsend Street.

Properties along Fourth Street between Bryant and Townsend Streets would have direct access from the eastbound Interstate 80 off-ramp at Fourth and Bryant Streets and access to the Interstate 280 on-ramp via the intersection at Fifth Street/King Street.

On Fourth Streets, the light rail would travel in a mixed-flow traffic lane, except along the track lane on the west side of Third Street between Townsend and King Streets, where the platform stop is located. All intersections would be re-graded to conform to the trackway.

Under Alternative 2, the Third and King Streets intersection would degrade from LOS ~~D~~ E to LOS F and the Fourth and Bryant Streets intersection would degrade from LOS B to LOS C in the a.m. peak hour with the implementation of the Project. This would result in a significant project impact for the Third/King Streets intersection, The LOS operating conditions for the other three intersections would remain the same, with the Fourth/King Streets intersection experiencing slightly fewer delays than under the No Project/TSM Alternative and the Fourth/Harrison and Sixth/Brannan Streets intersections experiencing slightly higher delays. Cumulative unavoidable adverse impacts are expected to occur at Third Street/King Street intersection in the a.m. peak hour.~~, Fourth Street/King Street (p.m. peak hour only), and Sixth Street/Brannan Street under the No Project/TSM Alternative as these intersections are expected to perform at LOS E or F conditions during the a.m. and/or p.m. peak hours.~~

Implementation of the Enhanced EIS/EIR Alignment would result in a degradation of level of service from LOS C to LOS D at the Fourth Street/Harrison Street intersection and exacerbate the congested

LOS F operations during the p.m. peak hours at Third Street/King Street~~, Fourth Street/King Street,~~ and Sixth Street/Brannan Street intersections.~~, but~~ At the Fourth/Bryant Streets intersection, the level of service would improve from LOS C to LOS B with Alternative 2. Alternative 2 would make a considerable contribution to the cumulative congestion only at the Sixth/Brannan Streets intersection. At the Sixth Street/Brannan Street intersection, Alternative 2 would increase delays for vehicles accessing the I-280 on- and off-ramps. The Project would not make a considerable contribution to the cumulative adverse impacts at the other two intersections. At the Third Street/King Street intersection, the increase in the northbound left turns ~~that~~ would cause greater delays than under the No Project/TSM Alternative. At Fourth Street/King Street, the overall traffic volume and delays are ~~is~~ slightly less than the

No Project/TSM Alternative~~, but the increase in eastbound left turns could cause delays to increase. During the a.m. peak hours, the LOS operating conditions for two of the intersections remain the same, but would experience slightly fewer delays than under the No Project/TSM Alternative.~~ The Fourth Street/King Street intersection would operate as a constraint to traffic traveling southbound on Fourth Street.

No long-term traffic impacts would be anticipated north of the subway portals since the project would not change traffic lane configurations or increase traffic levels north of Bryant Street.

<u>Mitigation Measures</u>

Project-related unavoidable adverse impacts are expected to occur at the Third/King Streets intersection. Cumulative unavoidable adverse impacts, which cannot be reasonably mitigated are expected to occur by 2030, with or without the Project, at Third Street/King Street, Fourth Street/King Street, and Sixth Street/Brannan Street intersections. Alternative 2 would make a considerable contribution to the cumulative impacts at the Sixth/Brannan Streets intersection in the p.m. peak hour.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

<u>Operations and Cumulative Impacts</u>

For the Fourth/Stockton Alignment Option A (LPA), Fourth Street between King and Brannan Streets would be reconfigured to accommodate the light rail tracks and subway portal.

Under this alternative, Fourth Street would remain one-way southbound between Bryant and Townsend Streets. On Fourth Street between Brannan and Townsend Streets, two southbound traffic lanes would exist on the west side of the light rail tracks and one southbound traffic lane on the east side. At Townsend Street, the eastern southbound lane would be diverted onto Townsend Street to establish a northbound one-way bus lane and loading zone on the east side of Fourth Street in front of the Caltrain Terminal, between Townsend and King Streets.

On Fourth Street, the light rail would travel in a semi-exclusive four- to six-inch raised right-of-way between Townsend and King Streets for both northbound and southbound directions, It would then transition to a portal between Townsend and Brannan Streets. All intersections would be re-graded to conform to the raised trackway.

Access to the Interstate 280 on-ramp from the properties on the east side of Fourth Street between Brannan and Townsend Streets would be restricted. Southbound traffic originating from these properties would have to turn left onto eastbound Townsend Street, right onto southbound Second Street, right onto westbound King Street, then to the on-ramp at Fifth and King Streets.

Under Alternative 3A, the Third Street/King Street intersection would degrade from LOS ~~D~~ E to LOS F in the a.m. peak hour and the Fourth Street/Harrison Street intersection would degrade from LOS C to LOS E in the p.m. peak hour with the implementation of the Project, resulting in a significant project impact. The Fourth Street/Bryant Street intersection would degrade from LOS B to LOS C in the a.m. peak hour and would remain at LOS C in the p.m. peak hour, but would still operate at an acceptable level of service. Third/King, Fourth/King, and Sixth/Brannan streets intersections are expected to continue to operate at LOS E or F in the a.m. and p.m. peak hours. Cumulative unavoidable adverse traffic impacts are expected to occur at Third Street/King Street (a.m. peak hour), Fourth Street/King Street (a.m. and p.m. peak hour), and Fourth Street/Harrison Street (a.m. and p.m. peak hour). These intersections are expected to perform at LOS E or F conditions during the a.m. and/or p.m. peak hours with or without the Fourth/Stockton Alignment Option A (LPA), but Alternative 3A would have a considerable contribution to the cumulative impacts at these intersect~~6~~ions in the p.m. peak hour. Implementation of light rail would exacerbate the congested operations at the Fourth Street/King Street intersection during the p.m. peak hours with increases in the eastbound through volumes contributing to the increase in delays. At Third Street/King Street, the increases in eastbound left turn movements would contribute to the increased delays at the intersection and at the Fourth Street/Harrison Street intersection, the increase in southbound right turn movements resulting from Alternative 3A would contribute to the increased congestion. At the Sixth Street/Brannan Street intersection, the LOS operating conditions would remain at LOS F during the a.m. and p.m. peak hours, but would experience slightly ~~fewer~~ higher delays ~~than under the No Project/TSM Alternative~~ with the reduction in southbound lanes.

No long-term traffic impacts would be anticipated north of the subway portals since the Project would not change traffic lane configurations or increase traffic levels north of Brannan Street, except for the Fourth Street/Harrison Street intersection.

Mitigation Measures

To mitigate intersection operation impacts under the Fourth/Stockton Alignment Option A (LPA), the following mitigation measure is recommended:

- Fourth Street/Harrison Street: With the Fourth/Stockton Alignment Option A (LPA), the Fourth/Harrison Street intersection would degrade to LOS E conditions during the p.m. peak hour due to heavy right turns from Fourth Street to Harrison Street. However, the intersection’s p.m. peak hour performance could be improved to LOS B conditions by adding, via striping changes, a shared through and right-turn lane from Fourth Street to Harrison Street. This improvement would require parking removal on the east side of Fourth Street, from Harrison Street to a point about 200 feet to the north for lane transition purposes. Signal timing changes would also help improve the operating conditions by allocating the appropriate amount of green time to all approaches.

Project-related unavoidable adverse impacts are expected to occur at the Fourth/Harrison Streets and Third/King Streets intersections. Cumulative unavoidable adverse traffic impacts, which cannot be reasonably mitigated are expected to occur by 2030, with and without the light rail project, at Third Street/King Street~~,~~ and Fourth Street/King Street~~, and Fourth Street/Harrison Street~~. Alternative 3A would have a considerable contribution to these cumulative impacts in the p.m. peak hour.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Operations and Cumulative Impacts

For the Fourth/Stockton Alignment Option B (Modified LPA), Fourth Street between King and Harrison Streets would be reconfigured to accommodate the light rail tracks, station platform, and subway portal.

Under this alternative, Fourth Street between Townsend and Bryant Streets would be converted from one-way southbound to two-way operation, with a portal in the center of the street underneath the Interstate 80 overpass between Harrison and Bryant Streets. This alternative will include one surface station between Brannan and Bryant Streets. On Fourth Street between Bryant and King Streets, two southbound traffic lanes would exist on the west side of the light rail tracks and one northbound traffic lane on the east side. The northbound lane would be diverted eastbound at Bryant Street with a right-turn only restriction.

There are two suboptions for lane configurations on Fourth Street under the Fourth/Stockton Alignment Option 3B. The semi-exclusive suboption would have light rail on Fourth Street in a semi-exclusive four- to six-inch raised right-of-way, or curbs along the trackway, between Brannan and King Streets for both northbound and southbound directions. On Fourth Street between Brannan and Bryant Streets, the track right-of-way would be semi-exclusive in the northbound direction and mixed-flow in the southbound direction. The trackway would then transition to a portal between Harrison and Bryant Streets underneath the Interstate 80 freeway overpass. All intersections would be re-graded to conform to the trackway.

The mixed-flow suboption would have light rail on Fourth Street in mixed-flow lanes between Bryant and King Streets for both northbound and southbound directions, providing for one additional lane of travel for northbound traffic. As with the semi-exclusive track lane option, the trackway would transition to a portal between Harrison and Bryant Streets underneath the Interstate 80 freeway overpass, and all intersections would be re-graded to conform to the trackway.

Alternative 3B provides direct access from Interstate 280 to properties on the west side of Fourth Street between Townsend and Bryant Streets. In order to access Interstate 280 from the properties on the east side of Fourth Street, traffic must make a right turn onto eastbound Bryant or Brannan, right onto southbound Second Street, right onto King Street, then to the Interstate 280 on-ramp at Fifth and King Streets. Left turns from Fourth Street at intersections and at mid-block locations for both northbound and southbound would be prohibited.

Access to the proposed Transbay Terminal bus storage facilities underneath the Interstate 80 freeway on the blocks bounded by Second, Third, Fourth, Stillman, and Perry Streets would be provided through Second, Third, and Fourth Streets. ~~Because of the location of t~~The portal on Fourth Street at Perry Street, under the Interstate 80 freeway, has been located to accommodate the bus access from southbound Fourth Street to the bus storage facility~~ may be restricted due to the tight turning radius~~. The portal may ~~also~~ ,however, restrict turn movements of larger trucks (40-foot or greater wheelbase) to Stillman Street~~ for the same reasons~~.

For Alternative 3B, when compared to the No Project/TSM Alternative, the LOS at the Third Street/King Street intersection would degrade from LOS ~~D~~ E to LOS F in the a.m. peak hour and the operation of the Fourth Street/Harrison Street intersection would degrade from ~~LOS E to LOS F in the a.m. peak hour and from~~ LOS C to LOS F in the p.m. peak hour as a result of the Project implementation. The intersection of Fourth/Bryant Streets would degrade from LOS B to LOS D in the a.m. peak hour and from LOS C to LOS D in the p.m. peak hour, but would continue to operate at acceptable levels of service. The intersections of Third/King (a.m. peak hour changes from LOS E to LOS F), Fourth/King, and Sixth Brannan would continue to operate at LOS E or LOS F in the peak hours. Cumulative unavoidable adverse impacts are expected to occur at Third Street/King Street (a.m. and p.m. peak hour), Fourth Street/Harrison Street (p.m. peak hour only), and Fourth Street/King Street (p.m. peak hour only) intersections. Implementation of light rail would exacerbate the~~ir~~ congested operations at these locations during the p.m. peak hours with either ~~of~~ the semi-exclusive or mixed-flow street configurations. These locations would experience greater delays in this alternative than in the No Project/TSM Alternative due to overall increases in traffic volumes~~, as noted under Alternative 3A,~~ resulting in a considerable contribution to the cumulative impacts.

The LOS operating conditions at the critical intersections remain the same or degrade one level of service during the a.m. peak hour~~s~~, and would also experience moderately longer delays than under the No Project/TSM Alternative, except at Fourth Street/King Street intersection where overall traffic volumes are less than those under the No Project/TSM Alternative. The increased traffic at the Third/King Streets intersection resulting from Alternative 3B will also result in a considerable contribution to the cumulative impacts.

The only differences in the level of service between the semi-exclusive and mixed-flow track lane options are at Fourth/King Streets and Fourth/Harrison Streets. In the a.m. peak, Fourth/King Streets performs at LOS E for the semi-exclusive track option, while it operates at LOS D in the mixed-flow option. <u>In the p.m. peak, Fourth/Harrison Streets intersection performs at LOS F for the semi-exclusive option and LOS E for the mixed-flow option.</u> The improvement in the level of service for the mixed-flow option could be attributed to the added capacity of the mixed-flow lane, which would be used by both the LRVs and automobile traffic.

No long-term traffic impacts would be anticipated north of the subway portals, except for Fourth Street/Harrison Street, since the project would not change traffic lane configurations or increase traffic levels north of Harrison Street.

Mitigation Measures

Mitigation measures would be the same as those described under Alternative 3A except as noted below. To address the tight turn radius issues at ~~Perry~~ Stillman Street, MTA is currently investigating ~~reducing the portal length and shifting its location southward to allow buses and~~ with Caltrans, the TJPA and Golden Gate Transit the possibility of allowing trucks to enter ~~Perry~~ Stillman Street from Fourth Street under the Caltans I-80 structure via the bus storage facility. ~~Other possible options evaluated were to locate the subway portal opening at the immediate3 north side of the Fourth Street/Bryant Street intersection and to design the incline of the tracks in the portal with a steeper grade or to shift the portal westerly by 13 feet, which would also include shifting of the two westerly traffic lanes and the west sidewalk further west. The relocation of the west sidewalk would encroach into the Caltrans right-of-way. All of these options would provide adequate space on the east side of Fourth Street to allow buses and trucks to access Perry and Stillman Streets.~~ Other possible options not yet identified may also be considered as part of the coordination process with the Transbay Terminal project team. When the preferred option is selected, it would be included into the design ~~of the portal~~ for this Project.

3.2.3 FREIGHT AND LOADING

This section discusses the potential environmental consequences to truck movement under each of the alternatives. A project would have a significant effect on the environment if it would result in a loading demand during the peak hour of loading activities that could not be accommodated within proposed on-site loading facilities or within convenient on-street loading zones, and created potentially hazardous conditions or significant delays affecting traffic, transit, bicycles or pedestrians.

Alternative 1 – No Project/TSM

Operations and Cumulative Impacts

By 2030, traffic is expected to increase on all major streets throughout the Corridor except Third Street, immediately north of the I-280 off-ramp in the a.m. peak hour (refer to Table 3-11). The increased congestion would impact all traffic flows, including private autos, trucks, and buses.

The No Project/TSM Alternative would not disproportionately affect truck freight movements. Trucks would be subject to the same amount of increase in delays at intersections and in overall travel times as automobiles.

Mitigation Measures

No mitigation measures would be required.

Alternative 2 – Enhanced EIS/EIR Alignment

Operations and Cumulative Impacts

The light rail station platform on Third Street at King Street, the surface alignment along Third and Fourth Streets, and the subway portals would displace some on-street parking, including loading zones between King and Bryant Streets. The removal of existing on-street loading zones (3 on Third Street, 2 on Fourth Street) would require re-establishment of loading zones in areas where parking would be allowed on Third and Fourth Streets and/or on nearby side streets. If no convenient spaces were available, double-parking of trucks may occur. At the Union Square Station, sidewalk bulb-outs would be constructed on Stockton Street, north and south of Maiden Lane, to provide stair and escalator entries eliminating five or six truck parking spaces. The loss of existing loading zone spaces on Stockton Street at the Union Square and Chinatown Stations would not be re-established since there are already nearby loading zones at these locations.

Mitigation Measures

During final design of the Enhanced EIS/EIR Alignment, areas for new, permanent, on-street loading zones may be identified along Third and Fourth Streets (between King and Bryant Streets) and appropriate side streets. Some of the new loading zones may need to displace existing parking spaces.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

Operations and Cumulative Impacts

The surface alignment along Fourth Street and the location of the subway portal would displace some on-street parking, including loading zones between King and Brannan Streets. The removal of existing on-street loading zones would require re-establishment of loading zones in areas where parking would be allowed on Fourth Street and/or on nearby side streets. If no convenient spaces were available, double-parking of trucks may occur. The placement of vent shafts for the Union Square/Market Street Station would result in the loss of two to three loading zones on Stockton Street, south of Maiden Lane, and the bulb-out for stairway access to the station would displace three loading zones on Stockton Street, south of Maiden Lane. Two loading zone spaces would also be lost on the east side of Stockton Street between Clay and Washington Streets to provide room for the emergency access hatch at the Chinatown Station.

Mitigation Measures

Mitigation measures would be the same as those described above under Alternative 2, except as noted below.

The proposed location of the combined northbound and southbound portals on Fourth Street on the block between Brannan and Townsend Streets would require the relocation of the existing 45-foot long white loading zone and the adjacent two 22-foot long yellow metered loading zones located on the east side of Fourth Street approximately 39-feet south of Brannan Street. These loading zones currently serve the multi-story commercial building at 601 Fourth Street (The Lofts) on the southeast corner of Fourth and Brannan Streets. This building's loading zone should be relocated to a location around the corner on the south side of Brannan Street just east of Fourth Street. These improvements should be considered during the development of the Project's final plans.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Operations and Cumulative Impacts

Provision of the light rail station platform on Fourth Street at Brannan Street, the surface alignment along Fourth Streets, and the location of the subway portal would displace some on-street parking, including loading zones between King and Harrison Streets. The removal of existing on-street loading zones would require re-establishment of loading zones in areas where parking would be allowed on Third and Fourth Streets and/or on nearby side streets. Approximately four loading zones spaces would be removed on the west side of Stockton Street between Washington and Jackson Streets at the Chinatown Station to provide space for the emergency access hatch. If no convenient spaces are available, double-parking of trucks may occur. The access to Stillman Street for larger trucks (40-foot wheelbase and above) would be restricted under this alternative due to the location of the portal.

Mitigation Measures

Mitigation measures would be the same as those described above under Alternative 2, except as noted below. To address the tight turn radius issues at Stillman Street, MTA is currently investigating with Caltrans, the TJPA and Golden Gate Transit the possibility of allowing trucks to enter Stillman Street from Fourth Street under the Caltrans I-80 structure via the bus storage facility. Other possible options not yet identified may also be considered as part of the coordination process with the Transbay Terminal project team. When the preferred option is selected, it would be included into the design for this Project.

3.2.4 PARKING

San Francisco does not consider parking supply as part of the permanent physical environment. Parking conditions are not static, as parking supply and demand varies from day to day, from day to night, from month to month, etc. Hence, the availability of parking spaces (or lack thereof) is not a permanent physical condition, but changes over time as people change their modes and patterns of travel.

In San Francisco, parking deficits are considered to be social effects, rather than impacts on the physical environment as defined by CEQA. Under CEQA, a project's social impacts need not be treated as significant impacts on the environment. Environmental documents should, however, address the secondary physical impacts that could be triggered by a social impact. (CEQA Guidelines § 15131(a).) The social inconvenience of parking deficits, such as having to hunt for scarce parking spaces, is not an environmental impact, but there may be secondary physical environmental impacts, such as increased traffic congestion at intersections, air quality impacts, safety impacts, or noise impacts caused by congestion. In the experience of San Francisco transportation planners, however, the absence of a ready supply of parking spaces, combined with available alternatives to auto travel (e.g., transit service, taxis, bicycles or travel by foot) and a relatively dense pattern of urban development, induces many drivers to seek and find alternative parking facilities, shift to other modes of travel, or change their overall travel habits. Any such resulting shifts to transit service in particular, would be in keeping with the City's "Transit First" policy. The City's Transit First Policy, established in the City's Charter Section 16.102 provides parking policies for areas well served by public transit.

The transportation analysis accounts for potential secondary effects, such as cars circling and looking for a parking space in areas of limited parking supply, by assuming that all drivers would attempt to find parking at or near the project site and then seek parking farther away if convenient parking is unavailable. The secondary effects of drivers searching for parking is typically offset by a reduction in vehicle trips due to others who are aware of constrained parking conditions in a given area. Hence, any secondary environmental impacts which may result from a shortfall in parking in the vicinity of the proposed project would be minor, and the traffic assignments used in the transportation analysis, as well as in the associated air quality, noise and pedestrian safety analyses, reasonably addresses potential secondary effects.

Future Parking Conditions

The following assessment is based on current parking demands and supplies in the Corridor and considers parking that would result from implementation of the alternatives. It does not forecast parking demands or evaluate parking impacts associated with other future developments; only those attributable to the Project. However, the assessment provides estimates of surplus parking throughout the Corridor.

Table 3-16 quantitatively summarizes the parking impacts on a segment-by-segment basis (Table E-10 in Appendix E provides quantified parking information on a block-by-block basis). Although individual

TABLE 3-16

2030 PARKING CONDITIONS IN CORRIDOR

APPROXIMATE NUMBER OF ON-STREET PARKING SPACES								
SEGMENT	**NO PROJECT / TSM ALTERNATIVE**		**ENHANCED EIS/EIR ALTERNATIVE**		**FOURTH / STOCKTON ALTERNATIVE OPTION A (LPA)**		**FOURTH / STOCKTON ALTERNATIVE OPTION B (MODIFIED LPA)**	
Third Street - Total 92 Spaces								
	Spaces Remaining	Spaces Lost	Spaces Remaining	Spaces Lost	Spaces Remaining	Spaces Lost	Spaces Remaining	Spaces Lost
King to Townsend Streets	23	0	0	-23	23	0	23	-0
Townsend to Brannan Streets	35	0	35	0	35	0	35	-0
Brannan to Bryant Streets	34	0	0	-34	34	0	34	-0
Fourth Street - Total 85 Spaces								
King to Townsend Streets	0	0	0	0	0	0	0	-0
Townsend to Brannan Streets	20	0	20	0	2 NB/SB Portal	-18	Semi-Exclusive ~~0~~ 2 Mixed-Flow 5	Semi-Exclusive ~~-20~~ 18 Mixed-Flow -15
Brannan to Bryant Streets	36	0	0	-36	36	0	Semi-Exclusive 7 Mixed-Flow ~~3~~ 7	Semi-Exclusive -29 Mixed-Flow ~~-33~~ -29
Bryant to Harrison Streets	29	0	29	0	29	0	Both 0	Both -29
Stockton Street – Total 26 Spaces								
Geary to Post Streets	10	0	2	-8	5	-5	10	-0
Clay to Washington Streets	14	0	4	-10	8	-6	10	-4
Washington to Jackson Streets	20	0	20	0	20	0	18	-2
TOTAL CORRIDOR	~~201~~221	0	~~90~~110	-111	~~172~~192	-29	Semi-Exclusive ~~119~~139 Mixed-Flow ~~120~~142	Semi-Exclusive -82 Mixed-Flow ~~-81~~79

Source: San Francisco Department of Parking and Traffic, May 2007 and January 2008.

NOTE: Under Alternative 3B up to three parking spaces would potentially be removed on the north side of Ellis Street to accommodate the expansion of One Stockton Street (the Apple Store) access/egress into the public sidewalk area.

parking spaces are not delineated along much of the Corridor, estimates were made of overall parking capacities based on field measurements and observations.

Alternative 1 – No Project/TSM

Operations and Cumulative Impacts

The No Project/TSM Alternative would not displace any additional parking spaces. Although additional bus service would be proposed under the No Project/TSM Alternative, none of Muni's bus zones along the Corridor would need to be extended (thereby displacing on-street parking spaces) to accommodate the increased bus service.

Mitigation Measures

This alternative would not result in any significant impacts, therefore no mitigation is required.

Alternative 2 – Enhanced EIS/EIR Alignment

Operations and Cumulative Impacts

The Enhanced EIS/EIR Alignment would impact on-street parking along Third and Fourth Streets between King Street and the proposed subway portals, in the Hearst and Union Square parking garages, as well as near the proposed Chinatown station entrances.

The proposed location of the light rail tracks, platforms, and subway portal on Third Street would remove 57 of the existing 92 on-street parking spaces between King and Bryant Streets (refer to Table 3-16). On Fourth Street, all 36 spaces would be eliminated between Brannan and Bryant Streets to accommodate the light rail facilities. Parking would be retained on the blocks between Brannan and Townsend Streets and between Bryant and Harrison Streets.

On Stockton Street between Geary and Post Streets at the Union Square Station, 8 out of 10 parking spaces would be lost due the space occupied by the station portals. At the Chinatown Station on Stockton Street between Clay and Washington Streets, 10 of the 14 parking spaces would be lost due to the new emergency access hatch located on the northwest corner of Clay and Stockton Streets and station access as described below.

Overall, the Enhanced EIS/EIR Alignment would displace 111 parking spaces. Since on-street parking spaces along the Corridor and along nearby streets are usually at or near full occupancy during the day, it is unlikely that many of the displaced spaces could be reclaimed by relocation to another nearby location.

The Enhanced EIS/EIR Alignment would have four subway stations: Moscone Center, Market Street, Union Square, and Chinatown. The escalators, elevators and stairs serving the Moscone Center and Market Street stations are proposed to be located in off-sidewalk areas where feasible, in property to be acquired by Muni, so parking would not be affected. However, due to the narrow right-of-way of Stockton Street in Chinatown and at Union Square, a portion of the curbs and sidewalks would need to be extended to accommodate the station's entries. Eight on-street parking spaces, a passenger loading zone, and a freight loading area would be eliminated due to the extensions at the Chinatown Station and another eight parking spaces at the Union Square Station. Most of these parking spaces are metered and used for truck loading. One of the spaces is located in front of the Post Office at the corner of Stockton and Clay Streets and is reserved for government vehicles. Parking in these areas is often at full-occupancy. In addition, 30 parking spaces in the Hearst Garage at 45 Third Street and 29 out of 985 parking spaces in the Union Square parking garage would be eliminated to accommodate the vent shafts and station access points.

Mitigation Measures

San Francisco has a "transit first" policy, and the displacement of existing automobile parking spaces is not considered a substantial impact requiring mitigation. However, the impacts could be alleviated or reduced with the following mitigation measures.

To improve the accessibility to businesses in the Corridor, it is recommended that retained and added (where applicable) parking spaces be designated for short-term parking and loading, especially in commercial districts. Near commercial establishments, parking turn-over should be encouraged through the use of time limits (e.g., parking meters, signed restrictions, etc.). These improvements would be incorporated into the development of the project's final plans.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

Operation and Cumulative Impacts

The Fourth/Stockton Alignment Option A (LPA) would impact on-street parking along Fourth Street between King Street and the proposed subway portals near Brannan Street, at the Union Square Station, as well as the proposed Chinatown station entrance on Stockton Street.

The proposed location of the light rail tracks and subway portal on Fourth Street would remove 18 of the 20 existing on-street parking spaces between Townsend and Brannan Streets (refer to Table 3-16).

On Stockton Street between Geary and Post Streets at the Union Square Station, 5 out of 10 parking spaces would be lost due the space occupied by the station entrances. At the Chinatown Station on Stockton Street between Clay and Washington Streets, 6 of the ~~16~~ 14 parking spaces would be lost due to the new emergency access hatch located on the west side of the street and the station emergency stairs.

Overall, the Fourth/Stockton Alignment Option A (LPA) would displace 29 on-street parking spaces. Since on-street parking spaces along the Corridor and along nearby streets are usually at or near full occupancy during the day, it is unlikely that many of the displaced spaces could be reclaimed on other close-in streets.

The Fourth/Stockton Alignment Option A (LPA) would have three subway stations: Moscone, a combined Union Square/Market Street Station, and Chinatown Station. The escalators, elevators and stairs serving the stations are proposed to be located in off-sidewalk areas where feasible in property to be acquired by Muni, so parking would not be affected. However, due to the narrow right-of-way of Stockton Street in Chinatown, a portion of the curbs and sidewalks would need to be extended to accommodate the station's primary entrance. Four on-street parking spaces would be eliminated due to the sidewalk extensions. All of these parking spaces are metered. Parking in this area is often at full-occupancy. In addition to on-street parking loss, the Fourth/Stockton Alignment Option A would result in the loss of 29 off-street spaces out of 985 spaces at the Union Square garage to accommodate vent shafts and station access.

Mitigation Measures

The mitigation measures would be the same as those described for Alternative 2.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Operations and Cumulative Impacts

The Fourth/Stockton Alignment Option B (Modified LPA) alignment would impact on-street parking along Fourth Street between King Street and the proposed subway portals, just south of Harrison Street beneath I-80, in the Union Square Station area, and near the proposed Chinatown Station entrances.

The Fourth/Stockton Alignment Option B (Modified LPA) alignment also involves the modification of Fourth Street from a one-way street to a two-way street between Townsend and Bryant Streets. In addition, this alternative also includes a new center-platform surface-level station between Bryant and Brannan Streets.

The proposed location of the light rail tracks, platforms, and subway portal on Fourth Street would remove ~~82~~ 76 of the 85 existing on-street parking spaces (east side and west side) under the semi-exclusive option and ~~81~~ 73 spaces under the mixed-flow option between Townsend and Harrison Streets (refer to Table 3-16).

There would be a loss of three parking spaces on the north side of Ellis Street, west of Stockton Street, to accommodate the potential widening of the existing station access/egress at One Stockton Street (the Apple Store) and ~~four~~ six parking spaces near the Chinatown Station to accommodate emergency access to the station.

Overall, the Fourth/Stockton Alignment Option B (Modified LPA) would displace ~~82~~ 79 parking spaces on Fourth and Stockton Streets and an additional three spaces on Ellis Street. Since on-street parking spaces along the Corridor and along nearby streets are usually at or near full occupancy during the day, it is unlikely that many of the displaced spaces could be relocated to other nearby streets.

The Fourth/Stockton Alignment Option B (Modified LPA) would have one surface platform stop and three subway stations: 1) the surface platform stop between Brannan and Bryant Streets (500 block of Fourth Street), 2) Moscone Center, 3) the combined station serving Market Street and Union Square, and 4) Chinatown.

The escalators, elevators and stairs serving the Moscone, Union Square/Market Street, and Chinatown stations are proposed to be located off-sidewalk, where feasible, on property that would be acquired by Muni or through the use of encroachment permits, so parking would not be affected. However, due to the narrow right-of-way of Stockton Street in Chinatown, a portion of the curbs and sidewalks would need to be extended to accommodate the station's primary entrance and the emergency stairway access. Four on-street parking spaces would be eliminated due to the extensions. All of these parking spaces are metered. Parking in this area is often at full-occupancy. In addition, 25 parking spaces out of 950 would be eliminated from the Ellis/O'Farrell garage and 34 out of 985 off-street parking spaces would be eliminated in the Union Square parking garage due to placement of vent shafts (Ellis/O'Farrell) and station elevators and escalator access (Union Square).

Mitigation Measures

Mitigation measures would be the same as described for Alternative 2.

3.2.5 PEDESTRIANS

This section describes the potential environmental consequences to pedestrian circulation under each of the alternatives. A project would have an effect on the environment if it would result in substantial overcrowding on public sidewalks, create potentially hazardous conditions for pedestrians, or otherwise interfere with pedestrian accessibility to the site and adjoining areas.

To project the future pedestrian volumes at the critical station entrance location a three-step process was undertaken. First, existing three-hour peak period pedestrian counts were factored with a growth factor (originating from the San Francisco Model) to account for the projected increases in pedestrian trips to and from the Study Area at each of the proposed subway station locations. Second, future pedestrian volumes were added to the projected station ridership at each proposed entrance to give a projected total pedestrian volume at that location. Third, the total volume was converted into an equivalent 15-minute count to be used in the Highway Capacity Manual (HCM) methodology (Chapter 18) to calculate the pedestrian level of service on sidewalks. According to the results from the pedestrian counts, the existing pedestrian levels of service at all proposed station entrances, which currently operate at LOS A, would continue to operate at LOS A except on Stockton Street at Maiden Lane at the Union Square Station for Alternative 3A and along Stockton Street at the proposed Chinatown Station for Alternative 3B where sidewalks would operate at LOS B (see Table 3-17).

Alternative 1 – No Project/TSM

Operations and Cumulative Impacts

Under the No Project/TSM Alternative, the sidewalks along the Corridor would not be changed. No sidewalk improvements would be undertaken along the Central Subway Corridor nor would sidewalk narrowing occur.

Mitigation Measures

These alternatives would not result in any significant impacts, therefore no mitigation is required.

Alternative 2 – Enhanced EIS/EIR Alignment

Operations and Cumulative Impacts

Under the Enhanced EIS/EIR Alignment, the sidewalk widths on Third and Fourth Streets between Townsend and Brannan Streets would remain the same at 10 feet, and at two of the four proposed subway station locations, the effective walkway widths along the sidewalks (i.e., portion of sidewalk that can be effectively used for pedestrian movements) would be reduced to provide access stairways, escalators, and elevators.

Each of the proposed subway stations would be accessed via stairways, escalators, and elevators descending from the sidewalk area to the subway's mezzanine and platform levels. When provided within an existing sidewalk, subway access points reduce the effective sidewalk width available for pedestrians. The existing sidewalks near the proposed subway stations currently experience moderate to heavy pedestrian volumes and the subway stations would contribute additional pedestrian traffic. Emergency exits are located away from the main station entrances and usually require a sidewalk bulb out to accommodate a steel hatch to access the exit. However, the establishment of these exits does not affect pedestrian access on the sidewalks.

TABLE 3-17

EXISTING AND PROJECTED PEDESTRIAN LEVEL OF SERVICE

AT PROPOSED STATION ENTRANCES

Alternative	Intersection	Corner	Street	Existing LOS	Existing 15-minute count[1]	3-hr PM Peak Period: PM peak period count	3-hr PM Peak Period: Projected 2030 Pedestrian Volumes	3-hr PM Peak Period: Projected Ridership Volumes at Portal[2]	Projected Total 15-min Ped Volume at Portal	Effective Walkway Width (ft)	Ped Unit Flow Rate (ped/min/ft)	LOS
2	**Market Street Station**											
	Third/Market	SW	Market	A	431	5172	7086	~~3565~~ 3250	~~888~~ 861	22.00	2.61	A
	Third/Market	SE	Market	A	523	6276	8598	~~3565~~ 3250	~~1014~~ 987	16.50	~~4.10~~ 3.99	A
	Union Square Station											
	Stockton/Maiden Lane	NE	Stockton	A	262	3144	4307	~~380~~ 270	~~391~~ 38~~1~~	5.81	~~4.47~~ 4.3~~8~~	A
	Stockton/Maiden Lane	SE	Stockton	A	261	3132	4291	~~380~~ 270	~~389~~ 38~~0~~	7.81	~~3.31~~ 3.24	A
	Chinatown Station											
	Stockton between Sacramento and Clay	Mid	Stockton	A	179	2148	2943	~~1255~~ 1350	~~350~~ 358	7.00	~~3.33~~ 3.41	A
	Hang Ah Alley (south of Clay)	Mid	Hang Ah	A	27	324	444	~~1255~~ 1350	~~142 149~~	11.00	~~0.86~~ 0.81	A
3A	**Moscone Station**											
	Fourth/Howard[3]	NE	Fourth	A	121	1452	1989	0	166	7.60	1.43	A
	Fourth/Howard	NW	Fourth	A	96	1152	1578	~~600~~ 570	~~182~~ 179	13.00	~~0.93~~ 0.92	A
	Fourth/Howard	NW	Howard	A	72	864	1184	~~600~~ 570	~~149~~ 146	14.00	~~0.71~~ 0.70	A
	Union Square/Market Street Station											
	Stockton/Maiden Lane	NE	Stockton	A	262	3144	4307	~~380~~ 1750	~~391~~ 505	6.50	~~4.01~~ 5.18	~~A B~~
	Stockton/Maiden Lane	SE	Stockton	A	261	3132	4291	~~380~~ 175~~0~~	~~389~~ 50~~3~~	8.50	~~3.05~~ 3.95	~~A B~~

TABLE 3-17 (CONTD.)

EXISTING PEDESTRIAN LEVEL OF SERVICE

AT PROPOSED STATION ENTRANCES

Alternative	Intersection	Corner	Street	Existing LOS	Existing 15-minute count[1]	3-hr PM Peak Period: PM peak period count	3-hr PM Peak Period: Projected 2030 Pedestrian Volumes	3-hr PM Peak Period: Projected Ridership Volumes at Portal[2]	Projected Total 15-min Ped Volume at Portal	Effective Walkway Width (ft)	Ped Unit Flow Rate (ped/min/ft)	LOS
	Chinatown Station											
	Stockton between Sacramento and Clay	Mid	Stockton	A	179	2148	2943	~~1675~~ 1950	~~385~~408	7.00	~~3.66~~ 3.88	A
	Hang Ah Alley (south of Clay)	Mid	Hang Ah	A	27	324	444	~~1675~~ 1950	~~177~~ 199	11.00	~~1.07~~ 1.21	A
	Chinatown Station											
	Stockton/Geary	NE	Geary	A	238	2856	3913	~~2990~~ 2230	~~575~~ 512	9.10	~~4.22~~ 3.75	A
3B	Stockton/ Washington	SW	Stockton	A	193	2316	3173	~~3130~~ 3700	~~525~~ 573	7.00	~~5.00~~ 5.45	B

Note: Pedestrian Growth Factor = 1.37

[1] Counts conducted April 2007. Analysis updated April 2008.

[2] Total projected station ridership (p.m. peak period) divided by the number of station exits. See Table E-11 (Appendix E) for total projected station ridership during the p.m. peak period.

[3] Proposed station elevator location.

Access to the proposed Moscone Station would be via two sets of stairs, two sets of escalators, and an elevator on the east side of Third Street between Clementina and Howard Streets (refer to Figure 2-7). The station entrance itself would be located within the private Tehama Street right-of-way, in an open space between two buildings (687 Folsom Street and 255 Third Street). The space between the two buildings is approximately 40 feet wide, which is more than enough room to accommodate the station entrance and meet the minimum Americans with Disabilities Act (ADA) 6-foot requirement. Since the station entrance is set back from the public sidewalk on Third Street, it would not have an effect on the effective width of the sidewalk. The emergency exit would be located on the north side of Clementina Street east of Third Street, with a hatch, which would also not affect the effective width of the sidewalk on Clementina Street.

Access to the proposed Market Street Station would be via two sets of stairs, two sets of escalators, and an elevator at two entrances on the south side of Market Street, east and west of Third Street (refer to Figure 2-8). The existing sidewalk on Market Street is 30 feet wide, with effective widths of 22.0 feet and 25.0 feet on the west and east side of Third street, respectively, adjacent to the subway access points. The effective sidewalk width would be reduced to 16.5 feet east of Third Street. These sidewalks would be adequate to handle pedestrian flows during peak periods. Pedestrian analysis for future conditions shows that the sidewalks at the station entrances would operate at LOS A. Two emergency access hatches would be located on Third Street at Jessie Street, one on each side of the street. The hatches would not affect the effective width of the sidewalks on Third Street.

Access to the proposed Union Square Station would be provided by one set of stairs and one escalator on the east side of Stockton Street and two sets of escalators and two elevators on the west side of Stockton Street (refer to Figure 2-9). In addition, a pedestrian connection between the station’s mezzanine and the Union Square garage elevators would be established. Stockton Street’s east side sidewalks are 15 feet wide (with a 7.0 foot effective width north of Stockton Street and a 9.0 foot effective width south of Stockton Street), but with the station access points, the sidewalks would be extended (bulbed-out) in order to accommodate the station entrances, with an increase to almost 20 feet wide. The east side sidewalk’s effective width would be 5.8 feet north of Stockton Street and 7.8 feet south of Stockton Street feet adjacent to the subway access points. The west side sidewalk, which is also 15 feet wide, would have its effective width unaffected since the station entrance is within Union Square. The emergency exit would be located on the east side of Stockton Street north of Post Street, with a hatch within the sidewalk, but would not affect the effective width of the sidewalk on Stockton Street. Pedestrian analysis for future conditions indicates that the sidewalks on the east side of Stockton Street where the station entrances are located would operate at LOS A. Pedestrian traffic through Union Square to access the station entry would increase. (See also Section 4(f) Report, Section 10.0)

Due to the narrow widths of Stockton Street sidewalks near Clay Street (9.5 to 11 feet with an effective width of 7.0 feet), it is proposed that the Chinatown Station's main access point be located off the sidewalk on property to be acquired by Muni, thereby maintaining the existing effective sidewalk widths and minimizing pedestrian overcrowding on the sidewalk. It is also proposed that the emergency access hatch be located at the northwest corner of Clay and Stockton Streets within an extended sidewalk or bulb-out. Since the curb lane on the west side of Stockton Street is not used as a travel lane, this would not reduce lane capacity (refer to Figure 2-10). The extended sidewalk/bulb-out would, however, eliminate on-street parking, as previously discussed. The pedestrian level of service would remain at LOS A with these measures in the vicinity of the Stockton/Clay intersection. A secondary access proposal via Hang Ah Alley would increase considerably the pedestrian volumes on this alley under the jurisdiction of San Francisco Recreation and Parks Department, but the alley would still operate at LOS A.

Mitigation Measures

During final design, consideration should be given to widening Stockton Street sidewalks near the proposed Union Square Station and/or using narrower stairways and escalators. Although the pedestrian LOS analysis indicates the sidewalks on the east side of Stockton Street between Post and Geary Streets operate without congestion, the presence of commercial and retail business and their seasonal impacts of attracting shoppers may impact pedestrian circulation on the sidewalks and would warrant such consideration of using narrower stairways and escalators. Trade-offs between pedestrian circulation impacts and traffic and parking impacts will be further evaluated during final design.

At the proposed Chinatown Station, efforts should be made to minimize pedestrian circulation impacts on Stockton Street and on streets adjacent to the station, where the placement of merchandise along storefronts on sidewalks in Chinatown is commonplace. Enforcement by DPW to keep sidewalks clear of such merchandise near the station entrances should be considered a priority to maintain adequate pedestrian circulation.

During final design, elevators would be located so as to not obstruct sight lines for motorists entering the major street from side streets, alleys, and driveways, or vice versa. For example, the proposed elevator on the east side of Third Street serving the Moscone Station would be located so as not to block sight lines for motorists exiting the adjacent parking garage. The proposed elevator could be located within the parking structure to minimize any visual impacts to motorists. Likewise, the proposed elevators on the west side of Third Street at Market Street would be located away from the corner, preferably further south along Third Street, so that the sight lines for motorists on Third Street would not be impeded from pedestrians and motorists crossing Third Street. Consideration would also be given to locating elevators inside adjacent private buildings or plazas for the Moscone and Market Street Stations. In all cases, efforts would be made to locate elevators as close as possible to the primary circulation path of the majority of transit patrons in order to minimize unnecessary long distances traveled by wheelchair users. Similar considerations would be given to the locations of stairways and escalators.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

<u>Operations and Cumulative Impacts</u>

Under the Fourth/Stockton Alignment Option A (LPA), the proposed station entrances would narrow the sidewalks at the Union Square/Market Street and Moscone stations and the effective walkway widths along the sidewalks (i.e., portion of sidewalk that can be effectively used for pedestrian movements) would be reduced to provide access stairways, escalators, and elevators. Sidewalks would not be narrowed at the remaining station locations.

At the proposed subway portal located on Fourth Street between Brannan and Townsend Streets, the sidewalk widths would remain unaffected on this block. Since there would be no reduction in sidewalk width, it is not expected that pedestrian crowding would occur during peak periods, particularly along Fourth Street's sidewalks before and after major events at the Ballpark.

Each of the proposed subway stations would be accessed via stairways, escalators, and elevators descending from the sidewalk area to the subway’s mezzanine and platform levels. When provided within an existing sidewalk, subway access points reduce the effective sidewalk width available for pedestrians. The existing sidewalks near the proposed subway stations currently experience moderate to heavy pedestrian volumes and the subway stations would contribute additional pedestrian traffic. Emergency exits are located away from the main station entrances and typically require a sidewalk bulb out to accommodate a steel hatch to access the exit. However, the establishment of these emergency exits does not affect pedestrian access on the sidewalks. Provision of stairways, escalators, and elevators would substantially reduce the effective sidewalk widths near two of the three proposed subway stations, potentially resulting in crowded pedestrian conditions near the access points and along the adjacent sidewalks, the same as described for Alternative 2.

Access to the proposed Moscone station would be via two sets of stairs, three sets of escalators, and an elevator (refer to Figure 2-13). The existing public sidewalk is 17 feet wide (with an 11-foot effective width) on the east side of Fourth Street, north of Howard Street, and 18 feet wide (with a 15-foot effective width) on the west side of Fourth Street between Clementina and Folsom Streets. The sidewalk's effective width would be 7.6 feet adjacent to the elevator at Fourth and Howard Streets, and the sidewalk would operate at LOS A. The resulting sidewalk width at the elevator would still conform to ADA guidelines and meet the 6-foot minimum clear space policy contained in San Francisco's *Downtown Streetscape Plan*. On the Fourth Street west sidewalk between Clementina and Folsom Streets, the sidewalk's effective width would remain unchanged at 15 feet since the stairs and escalators to the station would be located in a headhouse off of Fourth Street and the sidewalk would operate at LOS A. The station entrance on the west side of Fourth Street, north of Howard Street (15-foot effective width), and on the north side of Howard Street, west of Fourth Street (14-foot effective sidewalk width), are located on sidewalks along the frontage of Moscone West where there is walkway space within the private right-of-way in addition to the sidewalk to accommodate heavy pedestrian traffic. Pedestrian analysis for future conditions shows that the sidewalks next to these station access points would operate at LOS A.

Access to the proposed Union Square/Market Street Station would be provided by one set of stairs to Post Street, one escalator to Geary Street, two sets of escalators to the Union Square plaza, and one elevator to the upper concourse at Union Square (refer to Figure 2-14). A separate set of escalators and stairs would connect to the existing Powell Street BART/Muni Metro Station at the south end of the mezzanine level. In addition, a pedestrian connection between the station's mezzanine and the Union Square garage elevators would be established. Stockton Street's east side sidewalks are 15 feet wide, but with the station entrances established, the sidewalks would be extended to almost 20 feet in order to accommodate the entrances. Therefore, the east side sidewalk's effective width would be between 6.5 and 8.5 feet adjacent to the subway access points. The west side sidewalk, which is also 15 feet wide, would have its effective width remain unchanged since pedestrian access to the station from the west side of Stockton Street would take place within Union Square. Pedestrian analysis for future conditions indicates that the sidewalks on the east side of Stockton Street where the station access points are located would operate at LOS ~~A~~ B. Pedestrians would be likely to cut across Union Square to reach the station entry on the east side of the Square. (See also Section 4(f) Report, Chapter 10.0)

Due to the narrow widths of Stockton Street sidewalks near Clay Street (9.5 to 11 feet with an effective sidewalk width of 7.0 feet), it is proposed that the Chinatown Station's main access point be located within an off-street station property, thereby maintaining the existing effective sidewalk widths and minimizing pedestrian overcrowding on the sidewalk. There would also be an extension of the west sidewalk to accommodate an emergency hatch on Stockton Street between Clay and Sacramento Streets that would impact on-street parking, as previously discussed, but would not create pedestrian overcrowding. Since the curb lane on the west side of Stockton Street is not used as a travel lane, this would not reduce lane capacity (refer to Figure 2-15). The pedestrian level of service would remain LOS A in the vicinity of the Stockton/Clay intersection. As noted under Alternative 2, pedestrian volumes would increase considerably on Hang Ah Alley with the proposed secondary station entrance, but the alley would continue to operate at LOS A.

Mitigation Measures

The pedestrian LOS analysis indicates the sidewalks on the east side of Fourth Street north of Howard Street and on the north side of Howard Street west of Fourth Street would operate without congestion with the proposed station elevator (east side of Fourth Street) and stairway (west side of Fourth Street). However, the presence of Moscone Center and the high volumes of visitors to scheduled events may impact pedestrian circulation on the sidewalks and would warrant consideration of alternative station entrance locations within the Moscone Center right-of-way.

At the proposed Chinatown Station, efforts would be made to minimize pedestrian circulation impacts on Stockton Street and on streets adjacent to the station, where the placement of merchandise along storefronts on sidewalks in Chinatown is commonplace. Enforcement by DPW to keep sidewalks clear of such merchandise should be considered a priority to maintain adequate pedestrian circulation.

During final design, consideration should be given to using narrower stairways and escalators, and to ensure enough space is reserved in the landing area at the escalators to provide for adequate pedestrian flow with the sidewalks at stations. Consideration should also be given to widening Stockton Street's sidewalks near the proposed Union Square/Market Street station and/or using narrower stairways and escalators. Although the pedestrian LOS analysis indicates the sidewalks on the east side of Stockton Street between Post and Geary Streets operate without congestion, the presence of commercial and retail business and their seasonal impacts of attracting shoppers may impact pedestrian circulation on the sidewalks and would warrant such consideration of using narrower stairways and escalators. Trade-offs between pedestrian circulation impacts and traffic and parking impacts should be further evaluated during final design.

Other mitigation measures are the same as defined under Alternative 2.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Operations and Cumulative Impacts

Under the Fourth/Stockton Alignment Option B (LPA), the proposed station entrance would be established at the existing bus bulb located on the northeast corner of Geary and Stockton Streets at the Union Square/Market Station where the effective walkway widths along the sidewalks (i.e., portion of sidewalk that can be effectively used for pedestrian movements) would be reduced to provide an access stairway. The station escalator on the northeast corner of Union Square would be located within the Union Square terraced section of the Plaza and would not affect the sidewalk. Sidewalks would not be narrowed at the other station locations.

At the proposed surface platform stop located on Fourth Street between Brannan and Bryant Streets for this alternative, the sidewalk widths would remain unaffected on this block. Since there would be no reduction in sidewalk width, it is not expected that additional pedestrian crowding would occur during peak periods, such as along Fourth Street's sidewalks before and after major events at the new Giants Ballpark. At the proposed subway portal located on Fourth Street between Bryant and Harrison Streets, the sidewalk widths would also remain unaffected.

Each of the proposed subway stations would be accessed via stairways, escalators, and elevators descending from the sidewalk area to the subway’s mezzanine and platform levels. When provided within an existing sidewalk, subway access points reduce the effective sidewalk width available for pedestrians. The existing sidewalks near the proposed subway stations currently experience moderate to heavy pedestrian volumes and the subway stations would contribute additional pedestrian traffic. Emergency exits are located away from the main station portals and usually require a sidewalk bulb out to accommodate a steel hatch to access the exit. However, the establishment of these exits does not affect pedestrian access on the sidewalks. None of the three proposed subway stations would substantially reduce the effective sidewalk widths since the most of the stations’ access points would be located away from the sidewalks.

Access to the proposed Moscone Station would be via one set of stairs, two sets of escalators, and two elevators, all of which are housed in a headhouse on the west side of Fourth Street between Clementina and Folsom Streets (refer to Figure 2-20). At this location, the existing public sidewalk is just over 16 feet wide. The sidewalk’s effective width adjacent to the subway access points, would remain unchanged, thereby minimizing pedestrian overcrowding on the sidewalk. The resulting sidewalk width at the elevator would still conform to ADA guidelines and meet the 6-foot minimum clear space policy contained in San Francisco’s *Downtown Streetscape Plan*.

Access to the proposed Union Square/Market Street Station would be provided by two sets of stairs, two sets of escalators, both of which are at the north end of the station and one elevator located at the proposed Union Square entrance (refer to Figure 2-21). One of the station entrances would be located in the existing bus bulb at the northeast corner of Geary and Stockton Streets. In addition, a pedestrian connection between the station's mezzanine and the Union Square garage elevators would be established. The effective sidewalk widths on Stockton Street would remain unchanged since the station's main access point would be located within Union Square. Stockton Street's east and west side sidewalks are 15 feet wide. Currently, the sidewalk on the north side of Geary Street is 21 feet wide, including the bus bulb. With the station entrance, the effective sidewalk width on Geary Street would be 9.1 feet; however, pedestrian analysis for future conditions indicates that the sidewalk on the north side of Geary Street, east of Stockton Street where the station entrance is located, would operate at LOS A.

Due to the narrow widths of Stockton Street sidewalks near Washington Street (9.5 to 11 feet with a effective sidewalk width of 7.0 feet), it is proposed that the Chinatown Station's main access point be located within a station property on the southwest corner of Stockton and Washington Streets, thereby maintaining the existing effective sidewalk widths and minimizing pedestrian overcrowding on the sidewalk. There would be an extension of the west sidewalk to accommodate an emergency hatch on Stockton Street between Jackson and Washington Streets that would impact on-street parking, as previously discussed, but would not create pedestrian overcrowding. Since the curb lane on the west side of Stockton Street is not used as a travel lane, this would not reduce lane capacity (refer to Figure 2-22). The pedestrian level of service would be reduced from LOS A to LOS B as a result of the increased pedestrian volumes associated with station access in the vicinity of the Stockton/Washington Streets intersection.

<u>Mitigation Measures</u>

At the proposed Chinatown Station, efforts would be made to minimize pedestrian circulation impacts on Stockton Street and on streets adjacent to the station, where the placement of merchandise along storefronts on sidewalks in Chinatown is commonplace. Enforcement by DPW to keep sidewalks clear of such merchandise would be considered a priority to maintain adequate pedestrian circulation.

During final design, consideration would be given to ensure that stairways and escalators would not compete with sidewalk space for pedestrians, and to ensure enough space is reserved in the landing area at the escalators to provide for adequate pedestrian flow with the sidewalks at stations with headhouses. Consideration should also be given to widening Geary Street's sidewalk near the proposed Union Square/Market Street station and/or using narrower stairways and escalators. Although the pedestrian LOS analysis indicates the sidewalks on the north side of Geary Street east of Stockton Street operate without congestion, the presence of commercial and retail business and their seasonal impacts of attracting shoppers may impact pedestrian circulation on the sidewalks and would warrant such consideration of using a narrower stairway. Trade-offs between pedestrian circulation impacts and traffic and parking impacts should be further evaluated during final design.

The remaining mitigation measures would be the same as described under Alternative 2.

3.2.6 BICYCLES

The project would have an effect on the environment if it would create potentially hazardous conditions for bicyclists or otherwise substantially interfere with bicycle accessibility to the site and adjoining areas.

Although there are no designated bicycle routes on portions of the Project Corridor itself, the existing bicycle routes that run parallel and adjacent to the Project Corridor may be impacted due to the diversion of traffic to these parallel streets under the build alternatives.

As bicycle travel becomes more common in the Project Corridor, the potential for conflicts between motorists and bicyclists could increase; the reduction in the number of travel lanes could result in greater use of the outside travel lanes by motorized vehicles and more competition for the limited space between bicycles, autos, and trucks. Due to congestion, there would also be less opportunity for bicyclists to maneuver to avoid sudden obstacles, such as a door opening on a parked car. The impacts associated with each of the alternatives are discussed below.

Alternative 1 – No Project/TSM

<u>Operations and Cumulative Impacts</u>

Under the No Project/TSM Alternative, no significant bicycle impacts would occur.

<u>Mitigation Measures</u>

No significant bicycle impacts would occur under the No Project/TSM Alternative, therefore no mitigation is required.

Alternative 2 – Enhanced EIS/EIR Alignment

<u>Operations and Cumulative Impacts</u>

Provision of the light rail tracks and subway portal on Third Street between King and Bryant Streets would result in the loss of one traffic lane, eliminate most on-street parking, and retain 10-foot wide outside travel lanes. The traffic lane widths on Fourth Street between King and Bryant Streets would generally remain the same as they currently are. Diversion of traffic onto Second and Fifth Streets may impact bicycle travel on these streets (Bicycle Routes #11 and #19, respectively). The San Francisco Bicycle Program's May 2005 Proposition K 5-Year Prioritization Program identifies proposed bicycle lanes in both directions on Second Street from Market Street to King Street and in both directions on Fifth Street from Market Street to Townsend Street. These proposed bicycle lanes would require the removal of travel lanes in some locations, and the feasibility of these travel lane removals could be impacted by the diversion of traffic onto Second and Fifth Streets. These proposed bicycle lane changes are undergoing separate environmental review.

No impacts to bicyclists are foreseen near the proposed Moscone, Market Street, Union Square and Chinatown stations since the finished stations would not affect existing traffic or bicycle lanes. Existing curbs would remain, except at the Chinatown station, where sidewalk extensions would be constructed. However, the sidewalk extensions would replace existing on-street parallel parking spaces and not affect bicycle circulation.

<u>Mitigation Measures</u>

Existing bicycle traffic on Fourth Street could be diverted to Fifth Street. If bicycle lanes are provided, as identified in the San Francisco Bicycle Program's May 2005 Proposition K 5-Year Prioritization Program, this would further facilitate bicycle travel. The same is true for existing bicycle traffic on Third Street diverting to Second Street.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

<u>Operation and Cumulative Impacts</u>

Operation and cumulative impacts would be the same as those described under Alternative 2.

<u>Mitigation Measures</u>

Mitigation measures would be the same as described under Alternative 2.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Operations and Cumulative Impacts

Operation and cumulative impacts would be the same as those described under Alternative 2.

Mitigation Measures

Mitigation measures would be the same as described under Alternative 2.

3.2.7 EMERGENCY VEHICLE ACCESS

This section describes the potential consequences to emergency vehicle access under each of the alternatives. Again, the fire stations potentially affected by the Project are: Fire Station #1 located at 676 Howard Street, just east of Third Street; Fire Station #8, located at 36 Bluxome Street, just west of Fourth Street; and Fire Station #2, located at 1340 Powell Street between Broadway and Pacific Avenue.

Alternative 1 – No Project/TSM

Operations and Cumulative Impacts

The No Project/TSM Alternative would not substantially affect emergency vehicle access. Emergency vehicle access for Fire Station #8 would remain the same, by exiting Bluxome Street to either Fourth or Fifth Streets and traveling "contra-flow" if exiting to Fourth Street.

Mitigation Measures

This alternative would not result in any significant impacts, therefore no mitigation is required.

Alternative 2 – Enhanced EIS/EIR Alignment

Operation and Cumulative Impacts

Compared to existing conditions, emergency vehicles from Fire Station #8 would encounter a new roadway configuration on Fourth Street, which would include a 12 foot, 6-inch trackway in the middle of the street. If any emergency response requires emergency vehicles from Fire Station #8 to travel contra-flow on Fourth Street, they would have to cross the entire trackway in order to reach the intersection of Fourth and Brannan Streets. For emergency vehicles responding from Fire Station #1, it is expected they would continue to operate under existing conditions.

Mitigation Measures

DPT will be upgrading traffic signals with emergency vehicle preemption equipment in order to minimize the emergency response time and to improve the signal operation at several intersections near fire stations along the Corridor. At Fire Station #8, the following locations will be upgraded with emergency preemption equipment: Third and Brannan Streets, Fourth and Brannan Street, Fourth and Townsend Streets, and Fifth and Brannan Streets. For Fire Station #1, the following locations will be upgraded with emergency preemption equipment: Third and Howard Streets, Third and Mission Streets, Fourth and Howard Streets, Fourth and Mission Streets, Geary Street and Grant Avenue, Geary and Powell Streets, and Geary and ~~Post~~ Stockton Streets. These traffic signals could be programmed such that all approaches to these intersections are stopped except for the approaches which are receiving the emergency preemption call.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

Operation and Cumulative Impacts

Compared to existing conditions, emergency vehicles from Fire Station #8 will be impacted with a new roadway configuration on Fourth Street, which will include a 24 foot, 8 inch double-track portal at the intersection of Fourth and Bluxome Streets. If any emergency response requires emergency vehicles from Fire Station #8 to travel in a northerly direction on Fourth Street, they must travel contra-flow on Fourth Street in order to reach the intersection of Fourth and Brannan Streets.

Mitigation Measures

Mitigation measures would be the same as outlined above under Alternative 2, except as noted here.

Some of the existing perpendicular parking spaces on Bluxome Street may need to be converted into parallel parking spaces to accommodate the turning radii of the emergency vehicles due to the limited roadway space between the portal and the west side of Fourth Street. For emergency vehicles responding from Fire Station #1, it is expected they will continue to operate under existing conditions.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Operation and Cumulative Impacts

Compared to existing conditions, emergency vehicles from Fire Station No. 8 will encounter a new roadway configuration on Fourth Street, which would include a semi-exclusive 27 foot, 6 inch trackway in the middle of the street, with a raised 3 foot, 6 inch wide median. If any emergency response requires emergency vehicles from Fire Station #8 to travel in a northerly direction on Fourth Street, they must cross the entire trackway and, in order to reach the intersection of Fourth and Brannan Streets, the raised track bed. For emergency vehicles responding from Fire Station #1, it is expected they will continue to operate under existing conditions.

Mitigation Measures

Mitigation measures would be the same as for Alternative 2.

4.0 AFFECTED ENVIRONMENT

This chapter describes the environment that would be affected or existing conditions in the Project Corridor. How the Project alternatives would effect the environment during the operation phase along with the Project's cumulative effects and mitigation measures are detailed in Chapter 5.0. All construction effects and their mitigation are contained in Chapter 6.0.

4.1 LAND USE

4.1.1 ADOPTED PLANS AND POLICIES

Adopted land use goals and policies that currently guide development in the Study Area are contained in the various elements and area plans that comprise the San Francisco *General Plan*. Adopted plans of the San Francisco Redevelopment Agency, Port of San Francisco, San Francisco Department of Parking and Traffic, Metropolitan Transportation Commission (MTC) and San Francisco Bay Conservation and Development Commission (BCDC) also guide development in the Study Area. In addition, under the federal Coastal Zone Management Act (CZMA), local projects that would affect the coastal zone and use federal funding or require federal approval must, to the greatest extent practicable, be consistent with BCDC's management program.

Adopted local plans relevant to the Central Subway Project have not substantially changed since the Third Street Light Rail FEIS/FEIR was certified in 1998, however a new draft plan has been developed for the Eastern Neighborhoods. Local plans are described below, as well as relevant regional plans adopted by BCDC and MTC.

City and County of San Francisco

This section describes various elements of the San Francisco *General Plan (General Plan)*, as well as specific Area Plans, that contain the land use goals and policies that guide development in the Central Subway Corridor. The *General Plan* elements reviewed below include the Commerce and Industry Element, the Transportation Element, the Environmental Protection Element, and the Recreation and Open Space Element. The area plans reviewed are the South of Market, Northeastern Waterfront Plan, Rincon Hill, Downtown, Chinatown Plans and the Eastern Neighborhoods Community Plan. Redevelopment Plans that affect portions of the Study Area are also described. Descriptions are provided for San Francisco's recently adopted *Bicycle Plan*, the San Francisco County Transportation Authority's (SFCTA) Strategic Plan, and the Port of San Francisco's *Waterfront Land Use Plan*.

General Plan

Commerce & Industry Element. The Commerce and Industry Element of the *General Plan* guides both the public and private sector in making decisions related to economic growth and change in the City.[1]

The element contains eight objectives, three of which are general guidelines for citywide economic planning. The remaining five objectives relate to specific sectors of the San Francisco economy: industry, maritime, neighborhood commerce, government health and education services, and visitor trade. The overriding goals of the Commerce and Industry Element are continued economic vitality, social equity, and environmental quality for San Francisco.

Transportation Element. The Transportation Element of the *General Plan* focuses on meeting the travel needs of residents and visitors, and improving the environment.[2] Objectives and policies in this element focus on nine separate issues: 1) the general transportation system; 2) regional transportation; 3) congestion management; 4) vehicle circulation; 5) transit; 6) pedestrians; 7) bicycles; 8) citywide parking; and 9) the movement of goods. A primary objective of the Transportation Element is to develop transit as the "primary mode of travel to and from Downtown and all major activity centers within the region." Policy 1.3 states "Give priority to public transit and other alternatives to the private automobile as the means of meeting San Francisco's transportation needs, particularly of commuters." Policy 21.2, which also supports this objective, states that "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 Rail Transit map in the Transportation Element includes future rail/fixed guideway transit along the Third Street Corridor that connects with rail transit along the Geary Corridor and the Chinatown/North Beach Corridor.

In 1973, the Planning Commission adopted a Transit-First Policy for San Francisco. The Transit-First Policy is a set of principles that underscore the City's commitment that travel by transit, by bicycle and on foot be given priority over the private automobile. These principles are embodied in the policies and objectives of the Transportation Element and they have guided the planning and development in San Francisco for the past three decades. In 1998, the voters amended the City Charter (Section 16.102) to incorporate the Transit-First Policy into the charter. All City boards, commissions and departments are now required by law to implement Transit-First principles in conducting City business.

1 San Francisco Planning Department, Commerce & Industry Element of the *General Plan*. Adopted June,1978, last, amended December, 2004.

2 San Francisco Planning Department. Transportation Element of the *General Plan*. Adopted June, 1978, last amended February, 2005.

Environmental Protection Element. The Environmental Protection Element addresses the impact of urbanization, including the use of oil and gas resources and the production of hazardous waste, on the natural environment.[3] The element has three sections: the first section addresses natural resource conservation, the second transportation noise, and the third is an energy management plan. While the element does not specifically address the Central Subway Project, it does "encourage the development and use of urban mass transportation systems in accordance with the objectives and policies of the Transportation Element." The Environmental Protection Element also includes a policy to increase the use of transportation alternatives to the automobile.

Recreation and Open Space Element. The Recreation and Open Space Element of the *General Plan* is focused on maintenance of the existing open space system and on acquisition and development of new parks to better serve the City.[4] Improving accessibility to regional parks by improving public transit service (Policy 1.3) is considered key to making it easier for people to make use of existing parks and open space resources.

Area Plans

The six area plans that are relevant in the Study Area are described below. See Figure 4-1 for the boundaries of the area plans.

South of Market. South of Market (SOMA) is an economically, socially, and culturally diverse plan area of approximately 350 acres. SOMA is an irregularly shaped area extending roughly from Mission Street on the north to Townsend Street on the south and from Highway 101 on the west to First Street on the east. A portion of the proposed Central Subway would lie within the boundaries of the South of Market plan area.

Primary goals of the City's *South of Market Plan* are to protect and facilitate the expansion of industrial, artisan, home and business service, neighborhood-oriented retail, and community service activities; to protect the area's economic, social and cultural diversity; to preserve existing housing and encourage the development of new affordable housing; and to improve the area's livability for residents, workers and visitors.[5] The plan states that, on the whole, SOMA is well served by transportation facilities; freeways,

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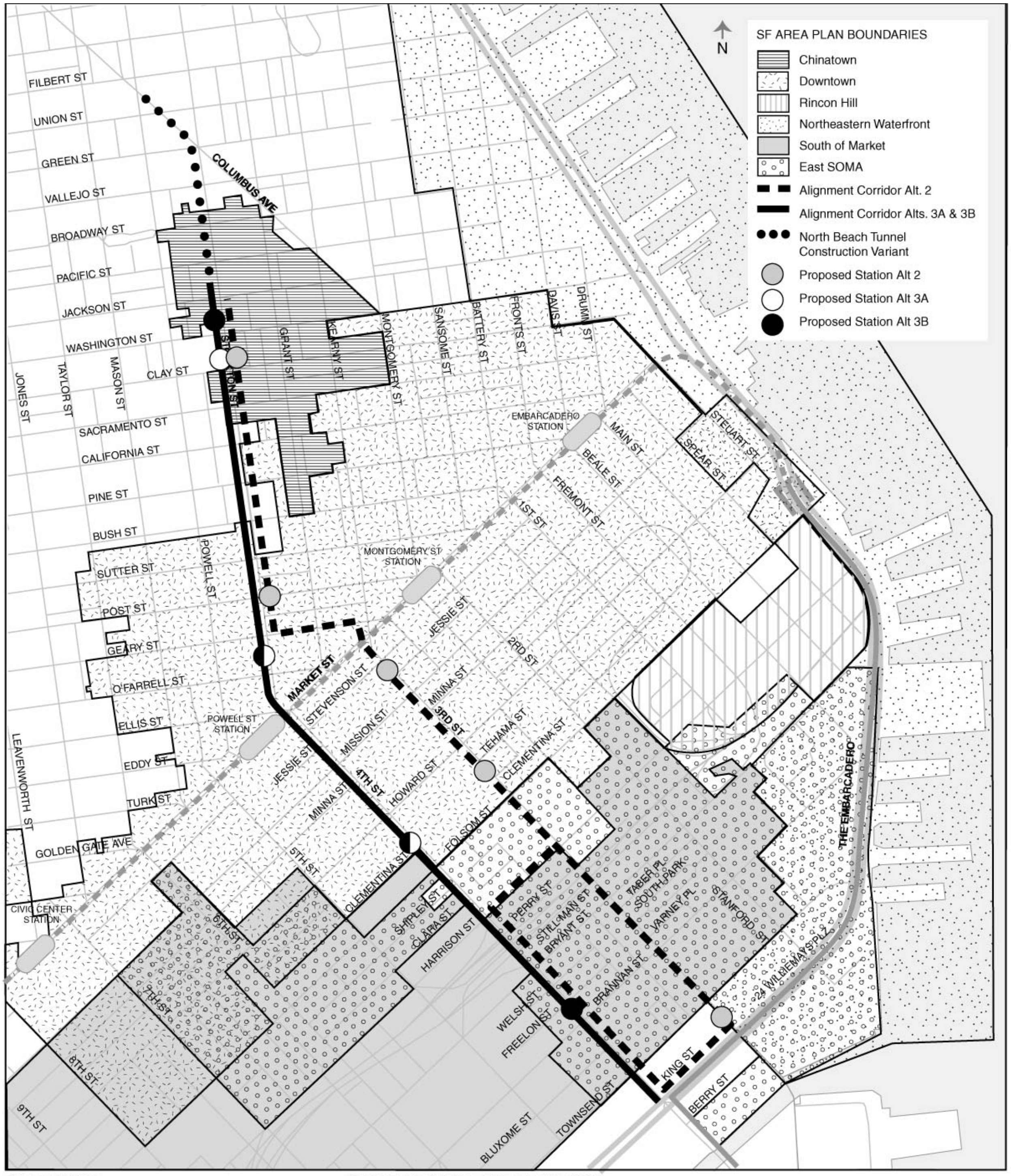
[3] San Francisco Planning Department. Environmental Protection Element of *the General Plan*. Adopted 1973, last amended December, 2004.

[4] San Francisco Planning Department. Recreation and Open Space Element of the *General Plan.* Adopted September 27, 1990, last amended May 25, 2005.

[5] San Francisco Planning Department. *South of Market Area Plan*. Adopted February, 1990, last amended July, 1995.

FIGURE 4-1

AREA PLAN BOUNDARIES



Source: PB/Wong
Not to scale

General approximation of Plan Area boundaries.

rail lines, maritime facilities, regional and local mass transit facilities are located within and along the periphery of the plan area. The plan states that portions of the plan area are somewhat better served by transportation facilities, particularly mass transit, than others. For example, the area between Second and Fourth Streets has considerably better transit service than the area west of Fourth Street and south of Mission Street. The plan suggests that the City examine the possibility of establishing new local transit lines in the north-south direction between Fifth and Eighth Streets to enhance transit travel opportunities for residents and employees in western SOMA.

Northeastern Waterfront. The *Northeastern Waterfront Plan* area extends south from the Municipal Pier in the Fisherman's Wharf area along the waterfront to Pier 46 in North China Basin.[6] The primary goal of the *Northeast Waterfront Plan* is to create a physical and economic environment in the Northeastern Waterfront area that will use the area's resources and potential in a manner that will best serve the needs of the community. Three planning principles of the plan include: 1) provide for those uses which positively contribute to the environmental quality of the area and contribute to the economic health of the Port and City; 2) preserve and enhance the unique character of the area and take advantage of the unique economic opportunity provided by San Francisco Bay; and 3) provide the maximum possible visual and physical access to San Francisco Bay while minimizing the adverse environmental impacts of existing and new activity. To accommodate the movement of people and goods, Policy 9.5 of the Plan calls for improving transit service between Fisherman's Wharf and China Basin.

Rincon Hill. The *Rincon Hill Plan* covers a twelve-block area close to the San Francisco Downtown.[7] The Plan area is a highly visible gateway to the City bounded by Folsom Street, The Embarcadero, Bryant Street, Beale Street, Essex Street, and the approaches to the Bay Bridge. The Plan called for transition of the area from an older industrial area with many parking lots to a mixed-use neighborhood with a significant housing presence. The Plan envisioned 10,000 new residents in this area. The Plan also calls for a more residentially scaled street pattern as redevelopment progresses in this neighborhood.

Downtown. The Central Subway bisects the *Downtown Plan* area.[8] The *Downtown Plan* is one of the City's most flexible plans, permitting almost every type of use except for manufacturing and automotive services in the plan area. The *Downtown Plan* is designed to manage growth in Downtown San Francisco and maintain the area's distinctive character, as well as its livability. The plan encourages more residential development within the planning area and also identifies locations for future commercial and secondary office uses in the area west of the Yerba Buena Center.

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[6] San Francisco Planning Department. *Northeastern Waterfront Area Plan.* Adopted January, 1977, last amended July 2003.
[7] San Francisco Planning Department. *Rincon Hill Plan*. Adopted July, 1995, last amended May 2005.
[8] San Francisco Planning Department. *Downtown Plan*. Adopted November, 1984, last amended May, 2005.

The City's Transit-First policy calls for accommodating future job growth in the Downtown with public transit rather than private automobiles. The *Downtown Plan* states that employment growth should not be accommodated by expanding street or bridge capacity or by lengthening the peak commute period. Instead, plan objectives and policies are aimed at encouraging an increase in the number of commuters per automobile and increasing the number and percentage of commuters using public transit. The plan also includes a policy to build and maintain rapid transit lines from Downtown to all suburban corridors and major activity centers in San Francisco.

Chinatown. The *Chinatown Plan* area is bounded roughly by Powell Street on the west, Broadway to the north, Columbus Avenue to the northeast, and California Street to the south (with a thin leg of the plan area extending along Grant Avenue to Bush Street).[9]

The Central Subway lies partially within the *Chinatown Plan* area. Many of the plan objectives and policies relate to the overarching goals of maintaining and/or enhancing the area's livability, and preserving the area's historic and aesthetic resources. The plan also states that the need for more frequent, less crowded bus service and better east-west links is often expressed by residents. <u>Chinatown's role as a residential and commercial neighborhood, visitor center and "capital city" is highlighted in the Chinatown Plan.</u>

<u>Section 812.1.39b of the San Francisco Planning Code prohibits demolition of residential apartment units in the Chinatown Residential Neighborhood Commercial District. The Chinatown Station site at 933-949 Stockton Street is located in this zoning district and would require an amendment to the Planning Code for the demolition of the residential units at this location.</u>

Eastern Neighborhoods Community Plan. The Eastern Neighborhoods Community planning process began in January, 2002 in response to growing land use conflicts in the Mission, East SOMA, Showplace Square/Potrero, and Central Waterfront areas of the City. The primary goal was to develop new zoning controls for the industrially-zoned land in these neighborhoods. The portion of the Central Subway Corridor on Third and Fourth Streets between Townsend and Folsom Streets passes through the East SOMA area of the Eastern Neighborhoods plan area.

9 San Francisco Planning Department. *Chinatown Area Plan*. Adopted February, 1987, last amended July, 1995.

In East SOMA, the *Eastern Neighborhoods Community Plan* goals include encouraging an appropriate mix of uses, encouraging more neighborhood-serving businesses, attracting jobs for local residents, encouraging a mix of incomes in renter and owner-occupied housing, increasing affordable housing opportunities, improving the character of streets, encouraging pedestrian safety, improving community facilities, enhancing open spaces, and offering a variety of transportation options.[10] Based on the *Draft East SOMA Area Plan*, proposed land use in the area generally bounded by Harrison and Townsend Streets to the north and south and Third and Fourth Streets to the east and west is designated as mixed-

[10] San Francisco Planning Department, *Community Planning in the Eastern Neighborhoods*. February, 2003

use with an affordable overlay.[11] Affordable and group housing would be allowed as a permitted use and the Mayor's Office of Housing will work to facilitate affordable housing development in this area. Market rate housing would not be permitted in this area. The mixed-use designation would protect and facilitate the expansion of commercial, manufacturing, production distribution and repair (PDR) uses in the area. The EIR for the *Eastern Neighborhoods Community Plan* is being prepared and is expected to be completed in 2007. Upon adoption of the *Eastern Neighborhoods Community Plan,* it would be incorporated into the *General Plan*.

<u>Redevelopment Plans</u>

There are several Redevelopment Plans that control development in the Study Area. See Figure 4-2 for the boundaries of the Redevelopment Plans.

Yerba Buena Center Redevelopment Plan. Yerba Buena Center is a 87-acre combined rehabilitation and new development project located between Market, Harrison, Second, and Fourth Streets. The Central Subway would run through this redevelopment area. The *Yerba Buena Center Redevelopment Plan* was adopted in 1966 and the proposed redevelopment project is now in the final stages of completion.[12]

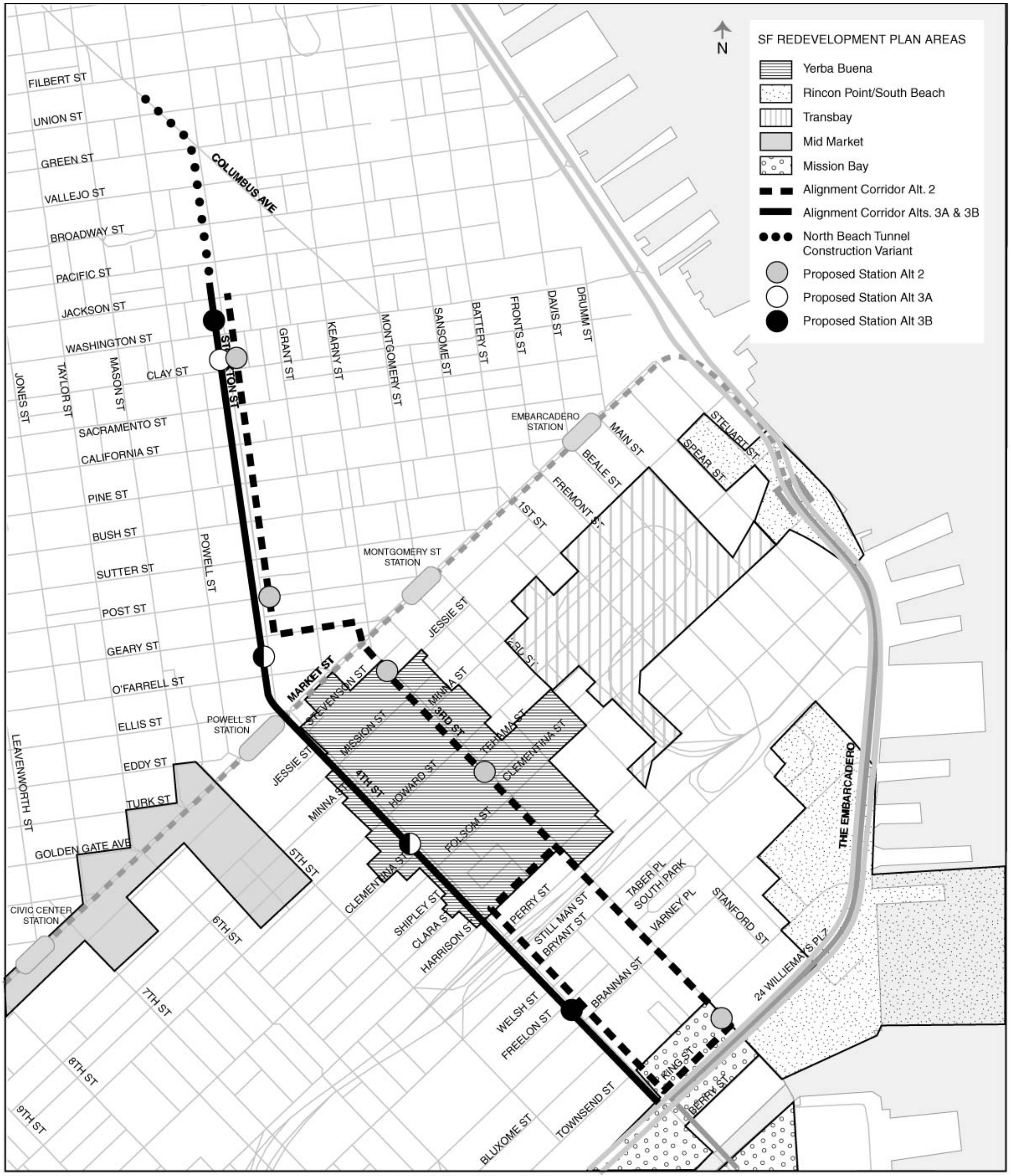
The *Yerba Buena Center Redevelopment Plan* proposed mixed-use development around the Yerba Buena Gardens, incorporating major hotel, office, housing, retail, recreational and cultural uses. The plan designated the northern and eastern portions of Yerba Buena Center as Downtown office space, the south-central and western portion for housing (business and light industry as alternate uses), the southern portion for business services and light industry (housing as the alternate use) and the central and eastern portions as "Special Use."

The Yerba Buena Center, which serves as a business and cultural center for the City, includes the Moscone Convention Center and the recently completed Moscone West annex. Other facilities in the Center include: the 1,500-room Marriott Hotel; 425-room W Hotel; Sony Metreon Entertainment Center, a 350,000 square foot retail and entertainment complex with 15 movie screens and 9 restaurants; 6 acres of gardens; Yerba Buena Center for the Arts; and the 5-acre Rooftop at Yerba Buena Gardens. The Rooftop includes a child care center, an ice rink, bowling center, an arts and technology center for children and youth called Zeum, the historic Playland-at-the-Beach carousel, and a two-acre interactive play garden. The Four Seasons Hotel and condominiums occupy a site fronting Market Street between Third and Fourth Streets. Construction of the Jewish Museum began in July 2006 and the museum is set

[11] San Francisco Planning Department, *Draft East SOMA Area Plan.* October 3, 2006.
[12] San Francisco Redevelopment Agency. *Yerba Buena Center Redevelopment Plan*. Adopted April, 1966, last amended October, 2000.

FIGURE 4-2

REDEVELOPMENT PLAN BOUNDARIES



Source: PB/Wong
Not to scale

General approximation of Plan Area boundaries.

to open in 2008 on Mission Street directly across from the Yerba Buena Gardens. The Mexican Museum hopes to begin construction by 2009 at Mission and Third Streets.

Over 2,500 housing units have been created in the Yerba Buena redevelopment area since it's creation, and more than 1,400 of them are for low to moderate-income residents. Among them is a 257-unit Single Room Occupancy (SRO) housing development at Third and Harrison Streets and a 500-unit residential tower at the northeast corner of Third and Mission Streets.

Rincon Point/South Beach Redevelopment Plan. Rincon Point/South Beach is an existing redevelopment project area, containing residential and commercial uses, the Giants AT&T Ballpark, marina and other park facilities along the northeastern waterfront. The Redevelopment Plan for this area, which followed on the heels of the *Northeastern Waterfront Plan*, was adopted in 1982.[13] The purpose of the Plan was to assist the area's transition from a predominantly industrial/warehouse area with ties to the maritime industry, to a mixed-use residential, commercial, and recreational community. The plan calls for a total of 2,800 new housing units to be built, with 25 percent for low and moderate income households. In addition, the area has over a million square feet of commercial space. Rincon Point/South Beach is composed of two non-contiguous areas along the northeastern waterfront. The northern area is generally bounded by Harrison Street on the south, Spear Street on the west, Mission Street on the north, and the bay on the east. The southern area is located directly east of the Mission Bay Development with a northern boundary at Bryant Street and extending south to encompass the ballpark and the South Beach Marina.

Mission Bay Redevelopment Plans. The *Mission Bay Plan* adopted by the City in 1991 was subsequently amended when Catellus joined with the Redevelopment Agency to develop a new plan for the area. Two related redevelopment plans, *Mission Bay South* and *Mission Bay North Redevelopment Plans* were evaluated in an Environmental Impact Report certified in 1998 and were adopted by the Redevelopment Agency that same year.[14, 15] The new plans feature the following elements:

Mission Bay North:

- Up to 3,000 residential units (20 percent affordable)
- 505,000 square feet of commercial retail and entertainment space next to the Giants Ballpark

[13] San Francisco Redevelopment Agency. Rincon Point – South Beach Redevelopment Project. http://www.sfgov.org/site/sfra_page.asp?id=5601

[14] San Francisco Redevelopment Agency. *Redevelopment Plan for the Mission Bay North Redevelopment Projec*t, October 26, 1998 and *Redevelopment Plan for the Mission Bay South Redevelopment Project*, November 2, 1998.

[15] San Francisco Planning Department and San Francisco Redevelopment Agency, Mission Bay Subsequent Environmental Impact Report, 96.771E, Certified September 17,1998.

- 6 acres of public open space

Mission Bay South:

- New 43-acre medical research campus for the University of California at San Francisco (UCSF), containing 2,650,000 square feet of instruction, research and administrative uses
- 14.5-acre Mission Bay Hospital with a planned capacity of 550 beds[16]
- Up to 3,090 residential units (37 percent affordable)
- 500-room hotel
- 295,000 square feet of retail
- 5,954,000 square feet of research and development, light industrial and office use
- 22 acres of public open space
- New 500-student public school

Adoption of these plans required amendments to various elements of the *General Plan* and replaced the original Mission Bay Plan.

Mid-Market Redevelopment Plan. The *Mid-Market Redevelopment Plan* was adopted by the San Francisco Redevelopment Commission in October 2005.[17] The 14-block plan area area extends from Fourth Street on the east to Tenth Street on the west and zigzags along the Market Street Corridor. The plan focuses on historic preservation and seismic retrofitting issues and development of several large vacant parcels in the plan area, such as those at on Mission Street at Seventh and Eighth Streets. There are no formal actions before the Board of Supervisors at this time for the adoption of the Plan. Analysis undertaken for the Plan would need to be updated prior to its adoption.[18]

<u>San Francisco Bicycle Plan</u>

The San Francisco Department of Parking and Traffic (DPT) adopted the *San Francisco Bicycle Plan Policy Framework* (*Bicycle Plan*) in June, 2005.[19] This Plan updated the first *Bicycle Plan* adopted by the City in 1997. The fundamental goal of the *Bicycle Plan* is to guide San Francisco in becoming a more "bicycle friendly" city. The plan describes the existing City policies, procedures, practices and infrastructure capabilities and constraints that affect bicycling. Recommendations for making bicycling

[16] Kevin Beauchamp, Director of Planning, UCSF, April 2007. The *Mission Bay South Plan* was amended in 2005 to incorporate the proposed hospital.
[17] San Francisco Redevelopment Agency, *Redevelopment Plan for the Mid-Market Redevelopment Project*, October 18, 2005.
[18] Lisa Zayas-Chein, San Francisco Redevelopment Agency, May 4, 2007.

safer and more convenient in San Francisco include street improvements, bicycle parking facilities, new city policies, education programs, promotional efforts and improved transit access. Street improvements for bicycles include a comprehensive system of bicycle routes developed for integration into the City's General Plan.

The plan states that, wherever possible, bike routes should be established on streets without transit or heavy truck traffic. In some parts of the City, however, this is not possible due to geography or other factors.

There are five bike routes designated in the *Bicycle Plan* in the vicinity of the Central Subway (refer to Figure 3-4).

Route 11 - Columbus Avenue. Route 11 runs the length of Columbus Avenue between North Point and Washington Streets, connecting Aquatic Park and Fisherman's Wharf with North Beach and the Financial District. Although Columbus Avenue has narrow lanes and high traffic volumes, it provides a direct and flat route connecting these districts.

Route 17 - Stockton Street. Route 17 begins at Broadway and continues south along Stockton Street to the Sutter/Post Street one-way couplet. This route is intended to serve Chinatown, Union Square and the Financial District. This route is centrally located between the routes on The Embarcadero and Polk Street. The light rail would operate in a subway at this section.

Route 19 - Fifth and Fourth Streets. Route 19 begins in Mission Bay South at Third and Owens Streets, and then continues west on Owens to Fourth Street, north on Fourth Street to Townsend Street, west on Townsend Street to Fifth Street, and then north on Fifth Street to its terminus at Fifth and Market Streets.

Route 30 - Howard and Folsom Streets. Route 30 cuts across on the surface of the Central Subway Corridor with dedicated bicycle lanes on Howard and Folsom Streets. The light rail would operate in a subway at this section.

Route 36 - Townsend Street. Route 36 follows Townsend Street between Third and Eighth Streets. The Department of Parking and Traffic (DPT) and the San Francisco County Transportation Authority (SFCTA) are discussing bicycle upgrades for a segment on Townsend Street west of Third Street. In this segment bikes and autos share an extra wide curb lane. Various options for a proposal to convert the

[19] San Francisco Department of Parking and Traffic and San Francisco County Transportation Authority, *San Francisco Bicycle Plan Policy Framework,* May, 2005, prepared by Alta Planning and Design.

shared lane to a dedicated bike lane with parking next to the curb have been presented to the public and are under consideration.

Route 50 - Market Street. Route 50 travels along Market Street through the Study Area and would cross over the subway portion of the Corridor.

The *Bicycle Plan*, as amended in June 2005, proposes a modification to Route 19 that would directly affect Alternative 3 - Fourth/Stockton Street Alignment. The amended plan recommends re-striping Fifth Street with two northbound lanes and one southbound lane to provide two six-foot bike lanes, suggesting that adjacent streets appear to have enough capacity to absorb the diversion of southbound traffic. Traffic diversion to Fourth Street as a result of the implementation of bicycle lanes on Fifth Street could potentially impact the implementation of the Fourth/Stockton Alignment alternative because traffic lanes and capacity would need to be reduced on Fourth Street to accommodate rail operation. The *Bicycle Plan* also recommends improvements for Route 11 on Columbus Avenue and for Route 17 on Stockton Street.[20] On Columbus Avenue, improvement options include installing "Bikes Allowed Use of Full Lane" signage and exploring better pavement markings for the cable car tracks. On Stockton Street, improvement options include re-striping and exploration of a short contra-flow lane between Sutter and Post Streets.

On November 3, 2006, the Superior Court ruled that the City must complete a full environmental review of the entire *Bicycle Plan* and its cumulative impacts. This ruling has not altered the initial scope or nature of the proposed bike facility improvements or the proposed network that will be reviewed. At this point, it is not clear how long this environmental review process will take, or when the planned improvements, once reviewed and certified would be expected to be approved and completed.

San Francisco County Transportation Authority Strategic Plan

In 1989, San Francisco voters passed Proposition B, a local ballot measure authorizing a one-half percent sales tax increase to fund specific transportation improvements. The SFCTA prepared a Strategic Plan in 1993, which is to be updated every two years, to verify funding commitments to specified transportation improvement projects.[21] The 1995 Strategic Plan Update identified the Third Street Light Rail Project as one of four major programs or projects to which over 70 percent of the Proposition B revenues would be committed through 2004.[22] In addition, in June 1995 the SFCTA passed a resolution adopting the *Four*

[20] San Francisco Department of Parking and Traffic. *Network Improvement Document.* Adopted June, 2005.
[21] San Francisco County Transportation Authority. *Strategic Plan*. May, 1993.
[22] San Francisco County Transportation Authority. *1995 Strategic Plan Update.* October, 1995.

Corridor Plan, effectively designating the Bayshore Corridor (Third Street), as the top priority for fixed guideway projects funded with Proposition B revenues. The Four Corridor Plan identified four corridors--Bayshore, Van Ness, Geary and North Beach--to be upgraded with fixed guideway transit lines over a 20-year period. The Bayshore (Third Street) Corridor was listed as Phase One of the long range plan to construct rail transit in all four corridors. All of the projects were eligible, at least in part, for Proposition B funding.[23]

The *Four Corridor Plan* recommended that the Bayshore Corridor (Third Street) rail line begin at the San Francisco/San Mateo county line, run along the median of Third Street, transition to a subway between Brannan and Bryant Streets, cross Market Street and cross under Stockton/Kearny Streets to a terminus near California Street. The plan recommended that, if leveraged funds were not available, an initial surface segment be constructed from the county line to Third and King Streets, to connect with existing light rail tracks on King Street and The Embarcadero. The plan stated that this portion of the line (the IOS) could be constructed with Proposition B funds alone (a large percentage for construction of the IOS came from Proposition B sales tax monies).[24]

In November 2003, San Francisco voters approved Proposition K, which reauthorized the half-cent sales tax for 30 years, to pay for transportation improvements outlined in a New Expenditure Plan. The Expenditure Plan outlines eligibility requirements and maximum Prop K funds available for specific projects and programs that implement the priorities of the Countywide Transportation Plan. The Plan includes four major investment categories: Transit, Streets and Roads, Paratransit, and Transportation System Management/Strategic Initiatives. Prop K identified $70 million in funds for the Third Street Light Rail IOS (Phase 1) and an additional $126 million for the Phase 2 Central Subway.[25]

<u>The Port of San Francisco Waterfront Land Use Plan</u>

In November 1990, the voters of San Francisco adopted Proposition H, which required preparation of a comprehensive waterfront land use plan. The Port of San Francisco *Waterfront Land Use Plan* covers the 7.5 mile waterfront area from Fisherman's Wharf to India Basin, all of which is under the jurisdiction of the Port of San Francisco.[26] The plan area is divided into five waterfront subareas: 1) Fisherman's Wharf; 2) Northeast; 3) Ferry Building; 4) South Beach/China Basin; and 5) Southern. The EIR for this plan was certified in January 1997 and the Port Commission adopted the plan in June 1997.

[23] San Francisco County Transportation Authority. *The Four Corridor Plan.* June, 1995.
[24] San Francisco County Transportation Authority, Resolution 95-22. June 19, 1995.
[25] San Francisco County Transportation Authority. *New Transportation Expenditure Plan for San Francisco*. July, 2003.
[26] Port of San Francisco. *Waterfront Land Use Plan.* Adopted June, 1997.

Although the *Waterfront Land Use Plan* was developed to meet the requirements of Proposition H, the policies, objectives and site specific land use designations contained in the plan are consistent with the state, regional, and local regulations which govern waterfront land use including the City's General Plan and Planning Code, as well as the BCDC plans described below.

The overarching goal of the *Waterfront Land Use Plan* is to "reunite the City with its waterfront." To this end, land use objectives and policies in the plan are guided by seven subgoals to establish: 1) a working waterfront; 2) a revitalized port; 3) a diversity of activities for residents and visitors; 4) improved access to and along the waterfront; 5) preservation of the waterfront's historic character; 6) urban design worthy of the waterfront setting; 7) and economic access to the area that reflects the diversity of San Francisco's population. The plan states that improved waterfront access will involve a "network of parks, plazas, walkways, open spaces and integrated transportation improvements... to improve access to, and enhance the enjoyment and appreciation of the Bay environment."

Discussion of the Ferry Building subarea also states that the Port "should promote a direct, continuous transit line between the northern and southern waterfront and, in particular, between the F-line and the Muni Metro extension when funding permits. Direct continuous transit lines are promoted to encourage the public to use transit rather than private cars.

San Francisco Bay Conservation and Development Commission

The McAteer-Petris Act of 1965 grants BCDC permit authority over the San Francisco Bay, a band of land 100 feet from the shoreline of the Bay, saltponds, managed wetlands and certain specified waterways. Any project or development proposed for these areas must be reviewed by BCDC for consistency with the plans described below. In addition, under the Coastal Zone Management Act (CZMA), BCDC has the authority to review local projects that would affect the "coastal zone" and that use federal funding or require federal approval to ensure that the projects are, to the maximum extent practicable, consistent with BCDC's coastal management program. Under this law, the coastal zone in the San Francisco Bay area has historically been interpreted to include priority use areas identified in the San Francisco Bay Plan, as well as, areas within the San Francisco Waterfront Special Area Plan. The Waterfront Special Area Plan extends from Hyde Street Pier in the north to India Basin and includes all areas within the jurisdiction of the Port of San Francisco. Thus, for certain projects, the CZMA effectively extends BCDC's area of jurisdiction, for certain projects, beyond the 100-foot band of shoreline specified in the McAteer-Petris Act.[27]

[27] Blanchfield, Jeff. Chief Planner, BCDC. Personal communication, November, 1997.

San Francisco Bay Plan

The *San Francisco Bay Plan* (*Bay Plan*)is the policy document of the San Francisco Bay Conservation and Development Commission that specifies land use goals, objectives, and policies for the San Francisco Bay waterfront, as well as for other BCDC jurisdictional areas.[28] The plan's area of jurisdiction is defined in the McAteer-Petris Act (the enabling legislation for BCDC and the Bay Plan) as the San Francisco Bay, a band of land 100 feet from the shoreline of the San Francisco Bay, saltponds, managed wetlands and certain specified waterways. Portions of the Central Subway Corridor--roughly between China Basin and Market Street--are within the plan's area of jurisdiction.

The *Bay Plan* addresses the effects of filling and development on the Bay, as well as the issue of public access to the Bay. The plan concludes that the remaining water volume and surface area of the Bay should be maintained to the greatest extent feasible for the benefit and protection of Bay fish and wildlife. The plan details specific water-oriented uses allowed on the Bay, as well as non-priority uses allowed in the shoreline band.

San Francisco Waterfront Special Area Plan

The San Francisco *Waterfront Special Area Plan (Special Area Plan)*, developed by BCDC, is an amendment to the *Bay Plan*.[29] The *Special Area Plan* does not supersede either the *Bay Plan* or the provisions of the McAteer-Petris Act. Any new development proposed for the area within BCDC's jurisdiction must be consistent with the McAteer-Petris Act, the *Bay Plan* and the *Waterfront Special Area Plan*. The Special Area Plan recommends uses for the land and water located along the existing San Francisco shoreline, from the Hyde Street Pier to India Basin, including all areas within the jurisdiction of the Port of San Francisco. While the *Special Area Plan* examines all of the land in this area, the policies in the plan apply only to those areas within the jurisdiction of the BCDC, i.e. the 100-foot band of land along the shoreline. The plan was developed to help public agencies and private parties seeking BCDC permits identify when and where fill, dredging or changes in land use appear to be consistent with the McAteer-Petris Act and the *Bay Plan*. The Central Subway Corridor lies within the plan boundaries at various points, generally between China Basin and Market Street. The plan contains no specific policies or recommendations about general transportation services, or the Third Street Light Rail Project (including Phase 2 Central Subway).

The San Francisco Waterfront -- Piers 7 through 24--Total Design Plan

[28] San Francisco Bay Conservation and Development Commission. *San Francisco Bay Plan.* Adopted January, 1969, last amended January 2006.

[29] San Francisco Bay Conservation and Development Commission. *San Francisco Waterfront Special Area Plan.* Adopted April, 1975, amended March, 1996.

The San Francisco *Waterfront Total Design Plan (Total Design Plan)* is another amendment to the Bay Plan.[30] The *Total Design Plan* was developed to provide more detailed planning for the Ferry Building area, particularly for the uses of replaced piers, than what was provided in the *San Francisco Waterfront Special Area Plan*. The *Total Design Plan* was a joint effort of the San Francisco Planning Department, the San Francisco Redevelopment Agency, the Port of San Francisco and BCDC. The area covered by the plan includes the water and the band of shoreline within BCDC's jurisdiction. The plan encourages development of continuous rail transit service along the length of the waterfront in the future.

Metropolitan Transportation Commission

The Metropolitan Transportation Commission is the nine-county regional transportation planning agency for the San Francisco Bay Area. The Commission is responsible for development of regional transportation plans and for making regional recommendations in transportation investments.

<u>Regional Transportation Plan</u>

The *Transportation 2030 Plan* for the San Francisco Bay Area is the long range Regional Transportation Plan (RTP) for transportation projects and identifies planned transportation investments for the region over the next 25 years.[31] The plan identifies transportation projects that can be built with funds expected to be available over the 25-year time frame of the plan and those that are of priority to the region, but are not yet fully funded. Goals and objectives from the RTP are aimed at improving safety, reliability, access to the system, promoting livable communities, clean air and providing for efficient freight travel. The fully-funded or Tier 1 portion of the RTP includes a fixed guideway extension for the Third Street Light Rail Project (Phase 1 IOS service initiated in April 2007) and the Phase 2 Central Subway in San Francisco. The plan describes a mixture of local, regional and federal funds to be used for the two-phase project and notes that an updated cost estimate for the Phase 2 Central Subway will be provided following selection of a new locally-preferred alternative (LPA). Updated cost estimates have been developed and will be incorporated into the RTP once a project has been adopted.

4.1.2 PROPOSED PLANS AND PROJECTS IN THE CORRIDOR

There are a number of major developments that have either occurred since certification of the 1998 EIS/EIR or are proposed for construction in the northeastern quadrant of San Francisco and in the Downtown area by 2030. In addition, the San Francisco Redevelopment Agency is conducting studies on a proposed new Redevelopment Plan Area near the Corridor. Refer to Figure 4-2 for the locations of these major proposed developments and redevelopment areas, which are described below.

[30] San Francisco Bay Conservation and Development Commission. *The San Francisco Waterfront -- Piers 7 through 24 -- Total Design Plan.*

Major Development Activity Since 1998

Mission Bay

As described in the previous section for Redevelopment Plan Areas, Mission Bay is an approximately 300-acre site located just south of the rapidly developing South of Market area of San Francisco. The site, which had been characterized mainly by abandoned railroad yards and other industrial uses, is owned primarily by a single developer, the Catellus Corporation. The redevelopment of these areas is directed by two plans–the *Mission Bay North Redevelopment Plan* and the *Mission Bay South Redevelopment Plan*. The Redevelopment Plan for Mission Bay North addresses the 65-acre area north of Mission Creek channel between Third and Seventh Streets, but excludes the China Basin Building and the Caltrain Terminal. The proposed *Mission Bay South Redevelopment Plan* addresses the portion of the plan area south of the Mission Creek channel and does not address the Central Subway phase of the Third Street Light Rail Project.

The Mission Bay North Redevelopment project began construction in mid-1998, with the first building opening in 2000. The plan provides for a maximum of 3,000 residential units, with 20 percent of these units to be set aside as affordable housing. The residential area will be adjacent to the South Beach area and west of the ballpark. (The ballpark, located northeast of Mission Bay boundaries is not part of the Mission Bay development.) A total of 600,000 square feet of retail/commercial space is proposed for this area, including 350,000 square feet for a retail complex close to the ballpark. Approximately six acres along the north shore of the channel will be in open space.

Construction is complete on many commercial, residential, and open space projects in Mission Bay. As of July 2006, projects completed included:[32]

- 1,224 residential units (288 affordable)
- 63,000 square feet of office space
- 118,450 square feet of retail space
- 465,000 square feet of commercial development
- 3 UCSF life science buildings totaling 707,000 square feet
- 430 UCSF student housing units
- 155,000 square feet of campus community center

Adopted June, 1980, amended August, 1990.

- 6 acres of park land

Giants Ballpark

The San Francisco Giants opened their new baseball stadium in April 2000. The ballpark, along with associated entertainment-oriented retail development, is located between Second and Third Streets south of King Street. The ballpark has a capacity of approximately 40,000 seats. The 13-acre site includes a playing field, stadium seating and commercial space. The Giants and the City formed a partnership to promote public transit as a major means of transportation to the new ballpark. The ballpark is directly served by regular Muni Metro and bus service, as well as supplemental Metro service on game days. In addition, Phase 1 of the Third Street Light Rail Project now serves the ballpark. Current estimates place access to the ballpark by non-auto modes (transit, bicycle, walking, etc.) at approximately 50 percent of total trips. The ballpark also represents an important source of employment for local residents, as does the associated restaurants and retail establishments.

Transbay Redevelopment Plan

The removal of The Embarcadero Freeway and the reconfiguration of the I-80 Terminal Separator Structure in the early 1990s created surplus vacant land in the vicinity of Transbay Terminal. To facilitate new development around the Terminal, the area bounded roughly by Spear, Market, Third, and Bryant Streets was designated a redevelopment survey area. A Transbay Terminal Concept Plan developed in 1996 for the Redevelopment Agency outlined a vision for a new regional transit and commercial center for the Terminal area, as well as an educational/cultural campus, several mixed use residential neighborhoods and an integrated system of parks, plazas and pedestrian ways.[33]

In March 2003, the Transbay Joint Powers Authority (JPA) selected an alternative that proposed rebuilding the terminal facility on a larger site with new elevated viaducts leading to the Bay Bridge, a 1.3-mile subsurface extension of Caltrain commuter rail service from its present terminal at Fourth and Townsend Streets to the new terminal, and a development plan that provided for up to 4,700 residential units and two million square feet of commercial space as the Locally Preferred Alternative (LPA). The FEIR for this project was certified in April 2004 and the FTA issued a Record of Decision (ROD) for the EIS in February 2005.[34]

[31] Metropolitan Transportation Commission. *Transportation 2030 Plan for the San Francisco Bay Area.* February, 2005.
[32] Redevelopment Agency of the City of San Francisco, Project Overview Mission Bay Redevelopment Study Area, July 2006.
[33] San Francisco Redevelopment Agency and San Francisco Planning Department with Simon Martin-Vegue Winkelstein Moris. *Transbay 20/20 Concept Plan*. December, 1996.
[34] U.S. Department of Transportation Federal Transit Administration and the City and County of San Francisco, Peninsula Corridor Joint Powers Board, and San Francisco Redevelopment Agency, *Transbay Terminal/Caltrain Downtown Extension /Redevelopment Project EIS/EIR/Section 4(f) Evaluation*, March 18, 2004.

The Transbay JPA completed preliminary engineering for the Terminal improvements and in late 2006 initiated a design and development competition for a Transbay Transit Center and Tower. A design/development team will be selected in late 2007. The TJPA will have responsibility for the transportation related improvements and the Redevelopment Agency will have responsibility for the remaining development.

The new Transbay Transit Center will accommodate significant expansion of the region's commuter bus service, including the Alameda-Contra Costa Transit District (AC Transit) transbay service, the Golden Gate Bridge, Highway and Transportation District (GGBHTD) service, and San Mateo County's SamTrans service. The terminal will enhance connectivity with expanded Muni service and promote ridership growth for Greyhound, paratransit, and other transit providers. The rail terminal will be capable of accommodating future high-speed and conventional intercity and corridor rail service to and from Los Angeles, Sacramento, the Central Valley, and the East Bay.

Key terminal characteristics include:

- 600,000 square foot multi-modal transit facility
- 80,000 daily train/bus passengers on opening day
- 300,000 daily train/bus passengers capacity
- 225,000 square feet of retail joint development in terminal

Relocation of the GGBHTD daytime bus storage facility for buses serving the Transbay Terminal will also be completed as part of the redevelopment of the Transbay Terminal. The new bus storage facility will be located under the I-80 freeway adjacent to the Central Subway Corridor on the blocks bounded by Fourth, Perry, Second, and Stillman Streets. Access to the bus storage site from Fourth Street will be directly affected by the Central Subway Project and the location of the subway portal under Alternative 3B. MTA is coordinating with GGHBTD and the Transbay Joint Powers Authority on the portal design to ensure access to the bus storage facility is maintained (refer to Section 3.2.2 Traffic Impacts of Alternative 3B for a more detailed discussion of the effect and mitigation).

The new facility will also provide for a future Downtown extension of Caltrain, which will serve commuters as far south as Monterey County. From the current terminus at Fourth and Townsend Streets, Caltrain would be extended easterly under Fourth Street and continue under the Townsend Street right-of-way to Second Street where the rail would swing north under Second Street to approach the Transbay

Terminal. The rail alignment would cross under the Central Subway surface operation on Fourth Street, at Townsend Street, for all Build Alternatives and also under Third Street for Alternative 2.

A phased implementation of the project is proposed; with Phase I including construction of the new Transbay Bus Terminal. Construction is expected to begin in 2010 and be completed in 2014. Phase 2, the Caltrain Downtown Extension is not yet fully funded; other funds will need to be secured to complete the project. The Downtown Extension is not included in the 2005 RTP and therefore was not assumed as part of the 2030 transportation network. Design of the Central Subway will take into account the future extension of Caltrain, but a detailed analysis of the project and its design have not been undertaken at this point as the implementation of the Downtown Extension is expected to occur well after the construction of the Central Subway is completed.

4.1.3 EXISTING LAND USES IN THE CORRIDOR

A broad range of land uses exist along the Central Subway Corridor, including residential, commercial, industrial, and institutional uses. The sections below describe land uses along the proposed light rail alignment, moving from south to north. Figure 4-3 illustrates current generalized land uses.

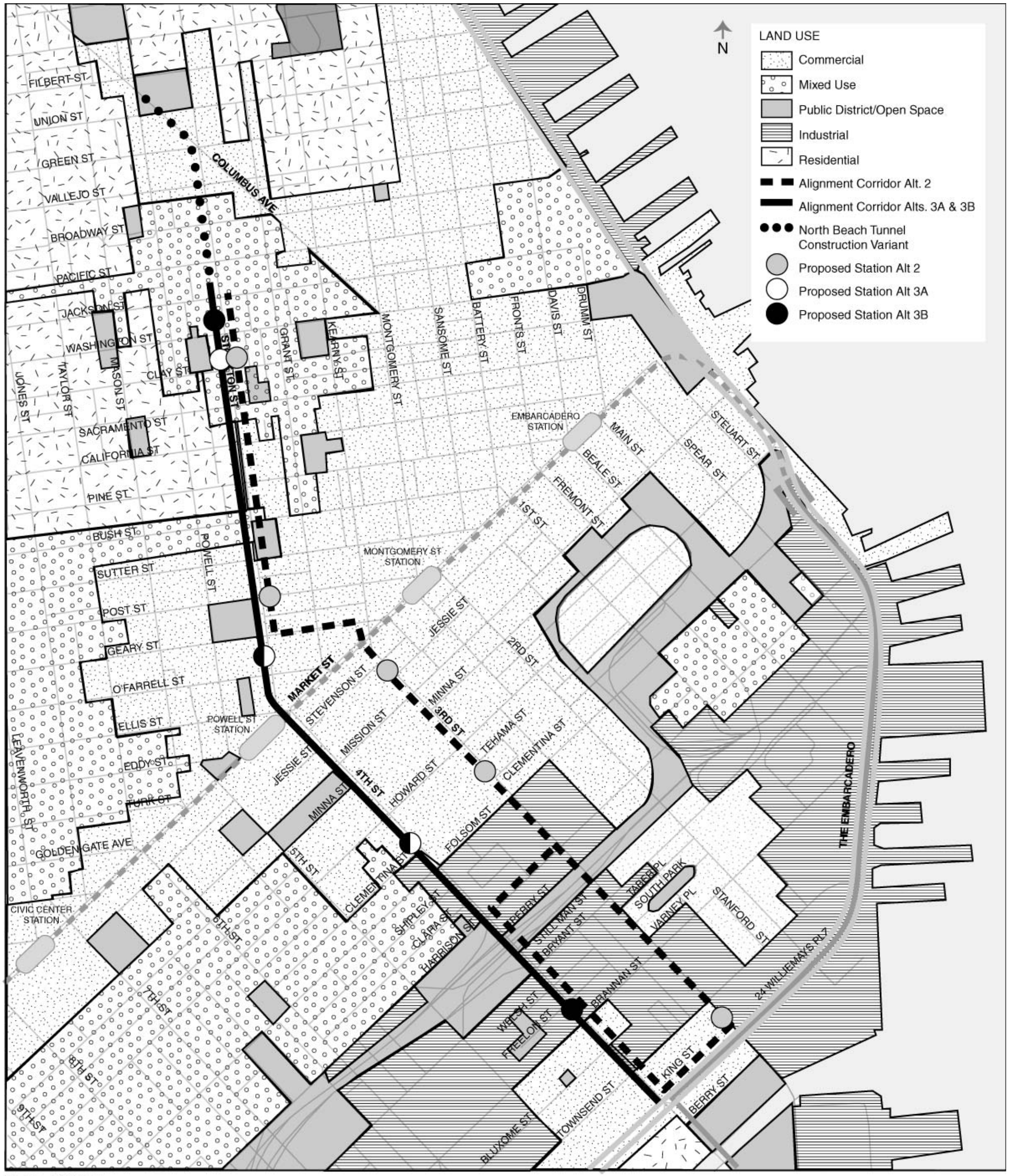
South of Market, Union Square, and Downtown

South of Market

This area is expected to experience strong growth over the next two decades, with high density residential, high-tech office and a variety of retail uses continuing to fill in sites formerly occupied by industrial uses. Significant amounts of new development have occurred in the South Beach area, as well as at Yerba Buena Center (refer to Figure 4-3). Between Berry and Harrison Streets, just north of I-80, land uses are primarily commercial and industrial, with restaurants, banks, and multi-story industrial buildings. There are also several loft live-work buildings. South Park, with its mixed-use residential, loft and commercial environment, is located just east of Third Street in this area. Exceptions to the general land use pattern are the I-80 ramps at Fourth Street and the Caltrain Terminal west of Fourth Street

FIGURE 4-3

GENERALIZED LAND USE



Source: PB/Wong
Not to scale

between King and Townsend Streets. The Giants Ballpark is located east of Berry and Third Streets intersection.

Land uses along Harrison Street between Third and Fourth Streets are primarily industrial with the exception of two large office buildings on the north side. There are also several high density residential buildings mid-block between Harrison and Folsom Streets. North of Harrison Street, uses along the west side of Third Street include modern commercial, multi-story residential, the Moscone Convention Center and the Yerba Buena Center for the Arts. On the east side, office buildings dominate, but land uses also include modern multi-story residential development with ground-floor retail use and parking lots. The new San Francisco Museum of Modern Art is located between Howard and Mission Streets in this segment. West of Moscone Center, land uses are mixed with multi-story residential buildings as well as industrial, retail, and office commercial buildings.

Uses along Fourth Street are primarily commercial and multi-story residential. Many of the residential buildings include ground floor commercial space. Between King and Townsend Streets, the Caltrain terminal occupies the west side of Fourth Street and a multi-story residential building with a first floor supermarket occupies the east side. Between Bryant and Harrison Streets, the I-80 freeway crosses Fourth Street with on- and off-ramps on the west side of Fourth Street. The Yerba Buena Community Center is on the east side of Fourth Street between Harrison and Folsom Streets, opposite another multi-story residential building with a first floor supermarket. Continuing north, the Moscone Convention Center South including the Yerba Buena Ice Skating and Bowling Center and the Zeum arts and technology center is on the east side of Fourth Street between Folsom and Howard Streets. The west side of this segment consists of a gas station at the corner of Fourth and Folsom Streets and a multi-story residential building with ground floor retail. The Metreon Center is located along the east side of Fourth Street between Howard and Mission Streets, opposite the Moscone Convention Center West and a multi-story parking garage. Approaching Market Street, land uses are a mix of residential and commercial with several hotels and office buildings.

Downtown

This is San Francisco's Central Business District, the densest and most transit-accessible downtown on the West Coast. The "Financial District" section of Downtown alone contains approximately 320,000 jobs or about 30 percent of all jobs in the City.[35]

[35] Census "Transportation Planning Package" (CTPP, 2000) available http//www.mtc.ca.gov/news/press releases/archive/rel263.htm.

The Corridor from Market Street to the Stockton Tunnel traverses the Union Square retail district, a major tourist attraction in the City. Union Square is the City's primary retail district – a dense pedestrian and transit-oriented district with large and small retail establishments, office, hotels, theaters, and some high-density residential uses. Union Square plaza, which is located at the heart of this district and serves as the district's primary focal point, was rebuilt in 2003 to make it more accessible to the street and the many visitors in the district. The Union Square below-grade garage and multi-story Sutter-Stockton garage are also in this segment of the Corridor.

Chinatown

With over 100 housing units per net acre, Chinatown is one of the most densely populated areas in the City. Although Chinatown is a major tourist destination, Stockton Street between Sacramento Street and Broadway is considered the "Main Street" for the Chinatown neighborhood and is the heart of the Chinatown Residential Neighborhood Commercial District (San Francisco Planning Code Sec. 812.1). Land uses along Stockton Street in Chinatown, north of the Sacramento Street portal of the Stockton Tunnel, remain primarily commercial, with some buildings containing residential uses over ground-floor commercial. Cross streets have primarily residential and residential uses over ground-floor commercial. A preschool and several community service agencies are located in a multi-story building at the southwest corner of Stockton and Sacramento Streets. ~~Other exceptions to the primary land uses include a~~ A Post Office and several schools, including the Chinese Central High School and Gordon Lau Elementary School are located between Clay and Washington Streets. The St. Mary's Chinese Catholic Center is located on the northeast corner of Stockton and Clay Streets and the Sun Yat-Sen Memorial Hall is on the east side of Stockton Street. The Willie "Woo Woo" Wong Playground (formerly Chinese Playground), on Sacramento Street just east of Stockton Street, is the only open space along the Corridor north of Union Square. These institutions are an integral part of Chinatown, the historic heart of the Chinese-American community.

North Beach

The North Beach neighborhood is located just north of Chinatown. The area is a popular tourist destination known for its many restaurants, cafes, shops and nightlife attractions. Land use along Columbus Avenue in North Beach are primarily commercial with some buildings containing residential uses over ground-floor commercial. Cross streets are primarily residential. Washington Square, a large public park, is bordered by Stockton Street and Columbus Avenue to the east and west and Filbert and Union Streets to the north and south. The north side of Washington Square is bordered by Saints Peter and Paul Church, School, and Parish Offices. A Post Office and Italian Athletic Club are located on

Stockton Street along the east side of Washington Park, while various commercial uses are located along the southern edge of the park on Union Street.

4.2 SOCIOECONOMIC CHARACTERISTICS

The socioeconomic characteristics described for the Study Area include population, housing and households, employment and income. A brief description of neighborhoods is also included. For the purpose of this analysis, the Study Area is defined as the Central Subway alignment plus up to 1,500 feet around proposed stations. The data presented are primarily from the 2000 U.S. Census. Although this information is from 2000, there have not been any major developments that have significantly changed the general population and employment information or the relative relationship between neighborhoods.

The Central Subway Corridor passes through thirteen census tracts, proceeding north from approximately Fourth and King Streets to Chinatown. The Central Subway includes five census tracts - 179.01, 176.02, 180, 178 and 176.01 - south of Market Street and eight census tracts on the north side of Market Street – 125, 123, 121, 119, 118, 117, 114, and 113. The North Beach Tunnel Construction Variant area includes two additional census tracts - 106 and 107.

4.2.1 POPULATION

San Francisco demographic characteristics are shown in Table 4-1. Relative to other cities in California, it is more densely populated, with a population of approximately 776,730 in an area covering only 49 square miles. The central city of a nine county region containing close to seven million people, San Francisco contains about 11.5 percent of the regional population. Between 1990 and 2000, San Francisco's population increased approximately seven percent; while the regional population growth was almost twice that rate. Compared to regional population characteristics, San Francisco’s population is older on average. Fifteen percent of the residents are under 18 compared to 24 percent in the region, and 14 percent are over the age of 65, somewhat above the 11 percent average for the region.

The Central Subway Corridor has a population of approximately 52,000. Population characteristics here are distinct from the Third Street Light Rail Corridor. The population of the segment as a whole is over half minority. Several census tracts along Stockton Street are over 85 percent Asian. Seventeen percent of the population of the Central Subway segment is at least 65 years old, and eight percent are under the age of 18. Similarly, the North Beach Tunnel Construction Variant segment has greater percentages of Asians and older residents than the San Francisco averages. The combined Central Subway and North Beach Tunnel Construction Variant segments have approximately 62,000 residents, or about eight percent of the City’s population.

TABLE 4-1

POPULATION, RACE, HISPANIC ORIGIN AND AGE: 2000

Segment	Population	% Black	% White	% Asian	% Hispanic	% under Age 18	% over Age 65
Central Subway	52,160	9%	37%	40%	4%	8%	17%
North Beach Variant	9,910	1%	23%	73%	1%	12%	26%
San Francisco Total	776,730	8%	44%	31%	6%	15%	14%

Note: Percentages do not add to 100% because American Indian and "Other" are not included and because "Hispanic" is not counted as a separate race in the U.S. Census.

Source: U.S. Census 2000.

4.2.2 HOUSING AND HOUSEHOLD CHARACTERISTICS

Compared to San Francisco totals, both the Central Subway and the North Beach Tunnel Construction Variant segments have lower percentages of owner occupied units and higher percentages of overcrowding and buildings with five or more units as shown in Table 4-2. In the Central Subway segment, only about 9 percent of the housing units are owner-occupied, well below the City average of 35 percent. The U.S. Census reported a high vacancy rate in this segment of nine percent, which reflected several large new (and not yet fully occupied) developments south of Market Street. The average household size in the Central Subway segment is 1.7 persons. The vast majority (93 percent) of the housing units in the Central Subway segment are in buildings with five or more units. Approximately 20 percent of the households in this segment are considered to be overcrowded (with more than one resident per room).

TABLE 4-2

HOUSING CHARACTERISTICS: 2000

Segment	# of Units	% Owner Occupied	Average HH Size	Vacancy Rate	% Over-Crowded	% with 5> units
Central Subway	30,910	9%	1.7	9%	20%	93%
North Beach Variant	5,120	8%	2.0	5%	27%	72%
San Francisco Total	346,530	35%	2.3	5%	12%	44%

Note: Overcrowded is defined as more than one person per room.
Source: U.S. Census 2000.

In the North Beach Tunnel Construction Variant segment, only eight percent of the housing units are owner occupied. The vacancy rate in this area is consistent with the San Francisco average of five percent. The average household size is 2.0 persons. Approximately 72 percent of the housing units in the North Beach Tunnel Construction Variant segment are in buildings with five or more units and 27 percent of households in this area are considered to be overcrowded.

4.2.3 EMPLOYMENT

According to the U.S. Census and Association of Bay Area Governments (ABAG) data, there were approximately 427,820 employed San Francisco residents in 2000 (see Table 4-3).[36] San Francisco serves as a major employment hub for the Bay Area. Although 322,000 of the San Francisco employed residents work in the City, an additional 261,000 people from other counties commute to jobs in San Francisco, bringing the total daily workforce to approximately 583,000.[37] Approximately 55 percent of all jobs in San Francisco are located downtown.

In the census tracts adjacent to the Central Subway alignment, nearly 24,790 residents were employed in 2000, with 37 percent in management, 19 percent in service, 23 percent in sales, and 9 percent in production jobs. The unemployment rate along this segment was nine percent. This is nearly 50 percent higher than the citywide unemployment rate.

TABLE 4-3

RESIDENT EMPLOYMENT CHARACTERISTICS BY SEGMENT: 2000

Segment	# Residents Employed	% Mgmt.	% Service	% Sales	% Production	% Unemployed
Central Subway	24,790	37%	19%	23%	9%	9%
North Beach Variant	4,570	29%	21%	24%	15%	7%
San Francisco Total	427,820	48%	14%	26%	8%	5%
Source: U.S. Census 2000.						

Along the North Beach Tunnel Construction Variant segment almost 4,600 residents were employed, with 29 percent in management, 21 percent in service, 24 percent in sales, and 15 percent in production. The unemployment rate along this segment was seven percent, compared to a citywide unemployment rate of 5 percent.

36 Employed residents is defined as the employed civilian population residing in San Francisco 16 years old and over.
37 ABAG, The Census Transportation Planning Package 2000 (CTPP 2000) , available.

4.2.4 FISCAL AND ECONOMIC CHARACTERISTICS

Income Levels

Average household incomes in both the Central Subway and North Beach Tunnel Construction Variant segments were considerably below the City average of $55,220 in 2000, as shown in Table 4-4. The per capita income was also generally lower than the citywide figure of $34,560.

TABLE 4-4

ECONOMIC CHARACTERISTICS BY SEGMENT: 2000

Segment	Average HH Income	Per Capita Income	% Below Poverty	% Without Vehicle
Central Subway	$30,400	$26,920	23%	72%
North Beach Variant	$24,890	$20,600	19%	34%
San Francisco Total	$55,220	$34,560	11%	29%
Source: U.S. Census 2000.				

In the Central Subway segment, the average household income was $30,400 and the average per capita income was $26,920. Twenty-three percent of residents were below the poverty line and 72 percent did not own vehicles. The median household incomes ranged from a low of $12,000 in Tract 125 along Market Street to a high of $78,000 in Tract 179.01, which includes new waterfront development in the South Beach area of the South of Market.

In the North Beach Tunnel Construction Variant segment, the average household income was approximately $24,890 and the average per capita income was approximately $20,600. Nineteen percent of residents were below the poverty line and 34 percent did not own vehicles.

Fiscal Environment

The 2006/2007 General Fund budget for the City and County of San Francisco is $2.6 billion, and the total budget including capital and enterprise accounts is $5.7 billion. This represents an increase of 7.3 percent over the previous fiscal year’s budget.

Sources of revenue for the General Fund include various taxes and state subventions. Approximately 32 percent of the General Fund comes from property taxes, 18 percent from state government, 17 percent from other local taxes, and 13 percent from business taxes. The remainder comes from other taxes such as motor vehicle and utility taxes, hotel taxes, traffic fines, departmental fees, and major federal and state subventions for social service and health care programs.

The General Fund does not include activities that are considered enterprise accounts, which raise revenues to cover their costs through direct charges, fees, or other revenue sources. Examples of enterprise accounts are the Airport, Port, Water Department, Hetch Hetchy, General Hospital, and Laguna Honda Hospital. The Airport, Water Department, and Hetch Hetchy meet all costs with fee revenues, while the Hospitals receive subsidies from other governmental agencies as well as fee revenues.

According to the Mayor's 2006/2007 budget summary, 38 percent of the General Fund is allocated to public works, transportation and commerce; 21 percent to community health; 17 percent to public protection; 13 percent to human welfare and neighborhood development; and the remainder is allocated to a variety of programs and activities, including culture and recreation, general administration and finance, and general city responsibilities.[38]

4.2.5 ENVIRONMENTAL JUSTICE CONSIDERATIONS

The environmental justice analysis considered Project impacts on minority and/or low-income populations. Determination of the presence of environmental justice populations and the potential effects on those populations rely, to a large degree, on analysis of demographic information, such as the U.S. census data and information gathered through public involvement and outreach activities.

Regulatory Setting

Federal laws and regulations guide the analysis of environmental justice. These include:

- Executive Order No. 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (signed by President Clinton on February 11, 1994) directs Federal agencies to achieve environmental justice by identifying and addressing disproportionately high and adverse human health and environmental effects, including interrelated social and economic effects of the programs, and activities on minority populations and low-income populations of the United States and assuring that Project information is available to those populations.
- Title VI of the Civil Rights Act of 1964 and related statutes prohibits discrimination on the basis of race, color, and national origin in programs and activities receiving federal financial assistance. Direct property acquisition under the Central Subway Project alternatives would require implementation of this Act along with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

[38] Mayor’s Office of Public Policy and Finance. *Mayor’s Proposed Budget 2006/2007*. June, 2006.

The environmental justice analysis was prepared following Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994). The methodology was based on FHWA Order 6640.23 (December 2, 1998). Ethnic and racial minority and/or low-income population groups in the affected community are identified in this report using 2000 U.S. Census data that describe racial and income characteristics, and project impacts that disproportionately affect these groups, if any, are evaluated.

As defined in Executive Order 12898 and subsequent agency guidance, the term "minority" includes any individual who is an American Indian or Alaskan Native, Asian or Pacific Islander (including Native Hawaiian), Black/African American (not of Hispanic origin), or Hispanic/Latino. The term "low-income" is defined in accordance with Executive Order 12898 and agency guidance as a person with household income at or below the U.S. Department of Health and Human Services (HHS) poverty guidelines.[39]

Minority and/or low-income populations are identified when (a) the minority or low-income population of the affected area exceeds fifty percent or (b) the minority or low-income population percentage of the affected area is meaningfully greater than the minority or low-income population percentage in the general population. For the purposes of this analysis, this difference was assumed to be more than ten percentage points. The Study Area for environmental justice analyses was based on U.S. Census Tracts within the Corridor as previously defined. The minority and/or low-income populations within these census tracts were compared to San Francisco and the Bay Area as a whole.

Community outreach and participation have been integrated into the Project development process from the beginning, including public scoping, alternatives development, public and agency involvement and environmental analysis. Efforts have been made to avoid or minimize adverse impacts to minority or low-income populations, as well as, to address community concerns by refining the Project alternatives.

Identification of Minority and Low Income Communities

The Project Corridor was divided into three neighborhood areas based on census tracts and the definitions of neighborhoods according to the San Francisco Planning Department. The three neighborhoods and corresponding census tracts include South of Market (census tracts 176.01, 176.02, 178, 179.01, and 180), Downtown/Financial District (census tracts 117, 119, 121, 123, 123, and 125), and Chinatown (census tracts 113, 114, and 118). A fourth neighborhood, North Beach (census tracts 106 and 107), is included to cover the North Beach Tunnel Construction Variant associated with the Central Subway Fourth/Stockton Alignment Options.

[39] California Department of Transportation, Desk Guide: *Environmental Justice in Transportation Planning and Investments*, January 2003

The demographic characteristics of the Central Subway Study Area are presented in Table 4-5.

According to U.S. Census Bureau data, the overall population of San Francisco in 2000 was approximately 49.7 percent white, with just over 50 percent of the City's 2000 population composed of minority populations. For the Central Subway Corridor, approximately 39.6 percent of the population is white, with the remaining approximately 60 percent of the population composed of minorities. In the Central Subway neighborhood of Chinatown, the minority (largely Asian) population is even higher at about 92 percent. Minority populations in the Downtown and South of Market neighborhoods are about 52 percent, with a larger concentration of African American residents in South of Market. Similarly, for the North Beach segment, approximately 24 percent of the population is white with approximately 76 percent of the population composed of minority populations.

The Department of Housing and Urban Development defines a low-income household as one in which income is 80 percent, or less, of the County median income. The median household income for San Francisco in 2000 was approximately $55,000 as noted in Table 4-6**,** and 80 percent of this figure is approximately $44,000. Within the Corridor the majority of census tracts are considered low-income (106, 107, 113, 114, 117, 118, 121, 123, 125, 176.01, and 178). Even though three of the five South of Market census tracts have median incomes above the City median, each neighborhood in the Study Area contains low-income tracts.

South of Market and Downtown

In recent years, the South of Market district (refer to Figure 4-2) has become one of the most economically vibrant in the City, with a mix of industrial, commercial, residential, and public uses. The area includes older industrial buildings that have been modernized for office commercial and live/work space, new office buildings, and new residential development, particularly along Third Street, the South Beach area along The Embarcadero, and the Mission Bay North development along King Street. These uses co-exist with remaining industrial uses that range from business services to clothing manufacturing to artisans. The Moscone Convention Center (East and West), San Francisco Museum of Modern Art, and Yerba Buena Center, and the Sony Metreon Entertainment Center are also contributing to the transformation of the South of Market area.

TABLE 4-5

POPULATION AND RACE/ETHNICITY CHARACTERISTICS, 2000

Census Tract	Population	White	Black or African American	Native American & Alaska Native	Asian	Hispanic or Latino (of any race)
Central Subway Segment						
Chinatown						
113	3,265	13.8%	1.0%	0.1%	82.2%	2.1%
114	3,175	1.9%	1.1%	0.1%	95.1%	1.4%
118	1,530	9.0%	0.3%	0.0%	88.9%	0.7%
Downtown						
117	1,745	34.5%	4.3%	0.9%	53.3%	8.2%
119	5,245	65.0%	2.6%	0.5%	25.5%	7.9%
121	3,460	60.2%	3.4%	0.6%	28.4%	7.4%
123	6,205	46.4%	10.8%	1.2%	31.0%	13.1%
125	7,725	35.3%	15.2%	1.5%	36.2%	11.5%
South of Market						
176.01	5,755	35.5%	15.9%	1.4%	36.4%	6.4%
176.02	535	60.1%	16.3%	0.4%	15.4%	10.5%
178	5,830	40.2%	8.7%	0.8%	39.8%	10.0%
179.01	5,410	67.3%	8.3%	0.4%	16.4%	6.5%
180	2,285	45.8%	29.3%	1.2%	10.8%	18.4%
Summary	*52,165*	*39.6%*	*9.0%*	*0.7%*	*43.0%*	*8.0%*
North Beach Tunnel Construction Segment						
107	5,635	14.3%	1.0%	0.1%	81.6%	2.4%
106	4,280	33.5%	1.0%	0.2%	62.2%	3.1%
Summary	*9,915*	*23.9%*	*1.0%*	*0.2%*	*71.9%*	*2.8%*
City & County of San Francisco	*776,735*	*49.7%*	*7.8%*	*0.4%*	*30.8%*	*14.1%*

Note: Percentages do not add to 100% because Hispanic is not counted as a separate race in the U.S. Census. Census categories of “Some Other Race” or “Two or more Races” were also unaccounted for.

Source: 2000 U.S. Census

The Downtown District includes both the Financial District, dominated by high-rise office buildings with ground floor banking and retail activity, and the Union Square Downtown retail core, one of the most vibrant retail districts in the country. Geary, Post, and Stockton Streets represent key arteries of the retail district, with multi-floor retail uses and hotels the primary uses.

Chinatown

Chinatown is a vibrant mixed-use area, combining high density residential, neighborhood- and regional-serving specialized shopping, central religious and social service functions for the Chinese community,

TABLE 4-6

INCOME CHARACTERISTICS, 2000

Census Track	Median Household Income (1999 Dollars)	Percentage of Population Below Poverty[1]
Central Subway Segment		
Chinatown		
113	$23,930	19.7
114	$15,060	23.8
118	$18,260	17.3
Downtown		
117	$18,960	29.6
119	$44,200	12.2
121	$32,440	16.5
123	$21,290	27.4
125	$12,160	32.1
South of Market		
176.01	$23,900	29.3
176.02	$56,840	11.2
178	$14,730	20.9
179.01	$77,920	19.2
180	$61,460	9.4
Average	$37,040	23.0
North Beach Tunnel Construction Segment		
107	$16,100	20.8
106	37,040	16.1
Average	$24,890	19.0
City & County of San Francisco Average	$55,220	11.0

Note: Percentage below poverty is based on the U.S. Census Bureau definition of poverty status which is determined by weighted average thresholds.

Source: 2000 U.S. Census

and a prominent visitor destination. Stockton and Grant Streets are the center of retail and community service functions, with residential uses above retail and business uses and along the crossing east-west streets from Sacramento Street to Pacific Avenue. Approximately 10,000 to 15,000 residents live in the district, many of them elderly and/or recent immigrants.

North Beach

Situated adjacent to the north of Chinatown is North Beach. The high density North Beach area, known as San Francisco's Little Italy, is a popular tourist destination filled with restaurants, cafes, nightclubs and bars. The area also has a large residential make-up with approximately 10,000 people living in the area.

Community Participation

The Central Subway Project has been conducted with extensive public participation throughout the project development and environmental review process. Meetings were conducted within affected neighborhoods on the Corridor to ensure that residents who would be most affected by the Project had an opportunity to comment. Special outreach efforts have been taken to encourage participation by minority and low-income residents of the Corridor. Since 2004, there have been over 100 presentations to neighborhoods, community organizations, and individual stakeholders. Community meetings have been held in the immediate vicinity of each of the proposed four stations to update the community and impacted residents on the Project, as well as to hear any concerns or issues they may have. Formal presentations at the community meetings were preceded by open house sessions where attendees could ask staff general questions about the Project. All locations for the community meetings have been ADA accessible. Further discussion of community coordination and consultation can be found in Chapter 11.0.

Project meeting announcements and informational materials were available in English, Chinese, and Spanish. Translation services at public meetings were available with a 72-hour notice. Four newsletters were published in English, with approximately 15,000 copies of each issue distributed by mail. These newsletters were also available in Spanish and Chinese.

In September 2006, the Central Subway information phone line was updated so callers could leave a message of any length. The caller can select English, Chinese, or Spanish and have their call returned no later than the next business day.

In Chinatown, additional outreach efforts were conducted to ensure appropriate participation by the Chinese community. Approximately 3,000 copies of each Project newsletter were published in Chinese and distributed by mail, as well as door-to-door and at community meetings. Chinese-translated meeting notices and Project fact sheets were hand-delivered to community groups or posted on community bulletin boards at recreation and senior centers, public housing, and other appropriate posting locations throughout the community. In addition to this outreach effort, the MTA had bus car cards in English, and Chinese in the vehicles that served the Chinatown community. Information for all public meetings was included on all postings.

4.3 COMMUNITY FACILITIES AND SERVICES

The Community Facilities and Services section identifies and describes the existing public facilities, parklands, recreational centers, and institutions that lie within one block of the proposed Central Subway alignments on Third, Fourth and Stockton Streets, as well as the public services provided by these facilities. Figure 4-4 indicates the location of these community facilities.

4.3.1 PUBLIC AND COMMUNITY FACILITIES

The Central Subway Corridor contains numerous public and community facilities, such as community centers, libraries, health centers, post offices, transportation centers, cultural and religious institutions, and social service centers. Table 4-7 lists those facilities that are within one block of the proposed Central Subway alignments on Third, Fourth and Stockton Streets. The list includes the location, jurisdiction, and brief description of the activities occurring at the facility, for each community in the Corridor.

4.3.2 POLICE, FIRE, AND EMERGENCY SERVICES

The Central Subway alignment alternatives contain several police and fire stations. Emergency response services are provided by the San Francisco Fire Department, which assigns medical personnel to local fire stations and is responsible for ambulance dispatch. Table 4-7 identifies the location of the police and fire stations within one block of the Central Subway alignments.

4.3.3 PARKS AND RECREATIONAL FACILITIES

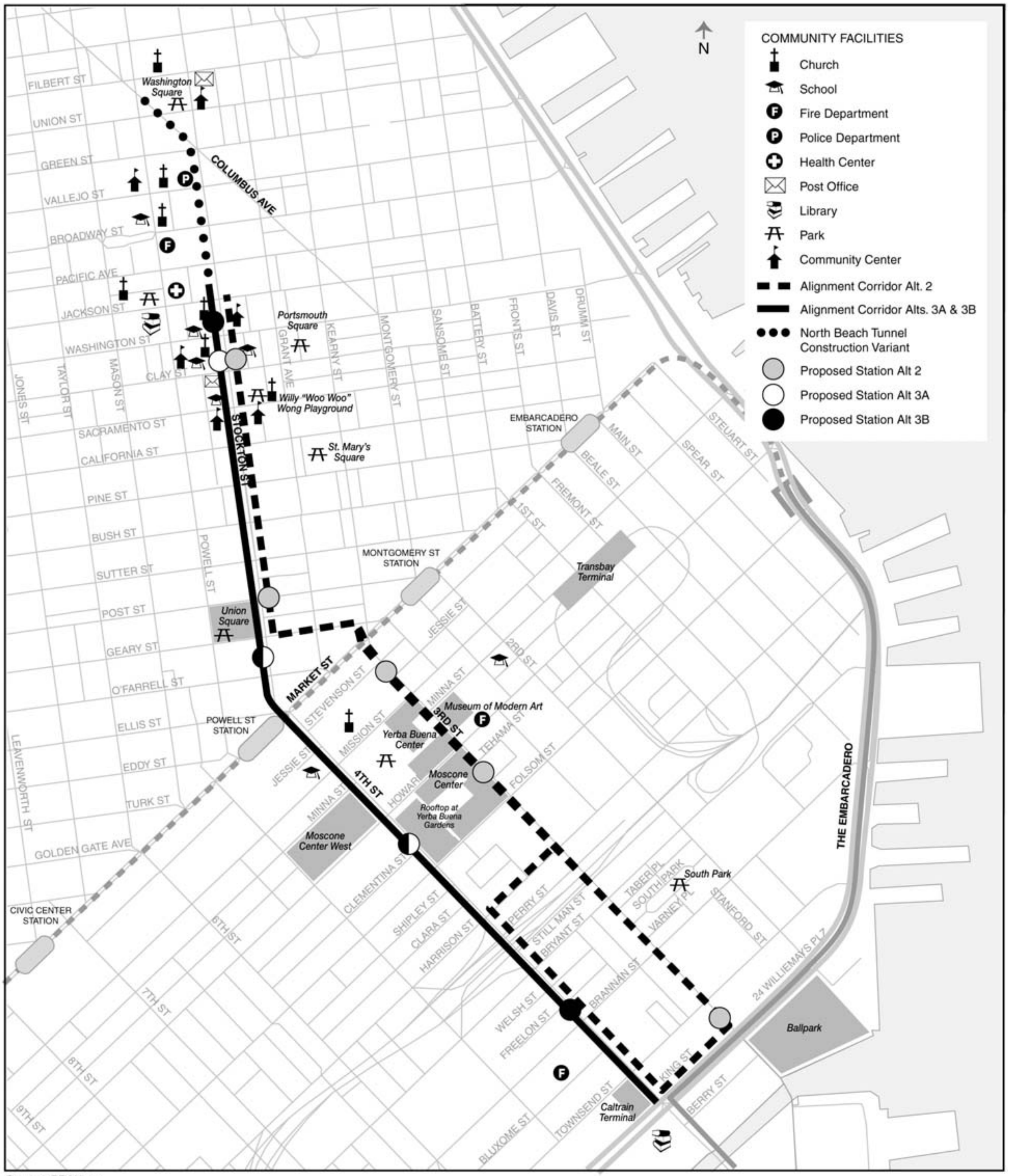
The Central Subway alignments include parks, playgrounds, recreational centers, public squares, and open spaces (refer to Figure 4-4). Those that are near the proposed Project alignments are described below.

South Park

Surrounded by residences and commercial uses, South Park lies mid-block between Third and Second Streets, south of Bryant Street. The 0.85-acre park is under the jurisdiction of the San Francisco Recreation and Park Department and contains a children’s playground and picnic tables. This park is only near the Alternative 2 alignment on Third Street and is not within one block of Alternatives 3A and 3B on Fourth Street.

FIGURE 4-4

PUBLIC FACILITIES ALONG CENTRAL SUBWAY CORRIDOR



Source: PB/Wong
Not to scale
Revised 1/08

TABLE 4-7

PUBLIC AND COMMUNITY FACILITIES WITHIN THE CORRIDOR

FACILITY	ADDRESS	JURISDICTION	ACTIVITY
South of Market/ Downtown			
Caltrain Terminal	Fourth/Townsend	Joint Powers Board	Caltrain San Francisco terminal station
Station 8	38 Bluxome	City	Fire house
Station 35	676 Howard	City	Fire house
Moscone Convention Center West	Fourth between Howard and Mission	City	Exhibit halls and meeting rooms
Moscone Convention Center	Howard between Third and Fourth	City	Exhibit halls and meeting rooms
Museum of Modern Art	Third between Howard and Mission	Private	Art museum and retail store
Yerba Buena Center for the Arts	Third/Mission	City	Theater and art center
San Francisco Community College	800 Mission	City	Business school and City College
Academy of Art	79 New Montgomery	Private	Fine arts college
Yerba Buena Community Center	Fourth between Folsom and Harrison	Private	Community Center
St. Patrick's Church	756 Mission	Private	Catholic church
Mission Bay Branch Library	960 Fourth	City	Public library
Chinatown			
<u>Chinatown YMCA</u>	<u>855 Sacramento</u>	<u>Private</u>	<u>Residential, and community center/events</u>
<u>Donaldina Cameron House</u>	<u>920 Sacramento</u>	<u>Private</u>	<u>Community Center</u>
<u>First Chinese Baptist Church</u>	<u>15 Waverly Place</u>	<u>Private</u>	<u>Baptist Church</u>
Chinese Central School	829/843 Stockton	Private	High school
Post Office	867 Stockton	Federal	Postal services
St. Mary's Chinese Day School	902 Stockton	Private	Catholic school and mission
<u>Presbyterian Church in Chinatown</u>	<u>925 Stockton</u>	<u>Private</u>	<u>Presbyterian Church</u>
Commodore Stockton School	950 Clay	SF Unified School District	Elementary school
<u>Chinese Historical Society</u>	<u>965 Clay</u>	<u>Private</u>	<u>Historical Society meetings and events</u>
Commodore Stockton Annex II	949 Washington	SF Unified School District	Child care center
Chinese Education Center	657 Merchant	SF Unified School District	Elementary school
Chinese Hospital	845 Jackson	Private	Medical services
Cumberland Presbyterian Chinese Church	865 Jackson	Private	Presbyterian church
Station 2	1340 Powell	City	Fire house
Gordon Lau Elementary School	950 Clay	SF Unified School District	Elementary School
Salvation Army Chinatown Corps	1450 Powell	Private	Sunday school, senior center, community center
Central Police Station	766 Vallejo	City	Police station
Cathay Post #384 American Legion	1524 Powell	Private	Veterans association
Pin Yuen Senior Recreation Center	799 Pacific	Private	Senior center

San Francisco Chinese Baptist Church	1524 Powell	Private	Baptist church
Chinese United Methodist Church	1009 Stockton	Private	Methodist church

TABLE 4-7 (CONT.)

PUBLIC AND COMMUNITY FACILITIES WITHIN THE CORRIDOR

Chinese American Citizens Alliance	1044 Stockton	Private	Political, social and educational citizens group
North Beach			
San Francisco Italian Athletic Club	1630 Stockton	Private	Athletic and social club
Post Office	1640 Stockton	Federal	Postal services
Saints Peter and Paul School, Parish Center & Church	600-620-660 Filbert Street	Private	Catholic church and school
Salesian Boys & Girls Club	680 Filbert	Private	Community center and camp
Source: PB/Wong, Consultants, December 2006.			

Yerba Buena Gardens

This 5.5-acre landscaped garden is owned and maintained by the San Francisco Redevelopment Agency and serves as the center piece of the Yerba Buena complex. The garden, which is bordered by the Center for the Arts, the Moscone Convention Center, the Sony Metreon Entertainment Center, and the Contemporary Jewish Museum (under construction) on Mission Street, contains meadows, unique gardens, public art, an outdoor area for staging performances, a tribute to the native Ohlone Indians, and a memorial to Dr. Martin Luther King, Jr.

Union Square

Union Square, bounded by Geary, Powell, Post, and Stockton Streets, is in the heart of the San Francisco Downtown retail core. The 2.6-acre public park is under the jurisdiction of the San Francisco Recreation and Park Department and contains flower beds and sitting areas as well as an area for staging outdoor exhibits and performances. On the east side of the plaza, Union Square is elevated above street level to cover a 985-space underground parking garage administered by the Department of Parking and Traffic. Union Square is also identified as a California State Landmark (No. 623). (See also Union Square description in Section 9.0 of this document.)

Willie "Woo Woo" Wong Playground

The Willie "Woo Woo" Wong Playground (formerly known as the Chinese Playground) is approximately 0.60 acres of park space consisting of two sand play areas, a basketball court, tennis court, volleyball court, two play structures, and a community recreation center and indoor gym on multi-levels of park. The recreation center runs an after school program that helps children with homework and offers various activities. The playground is located between Clay and Sacramento Streets one-half block east of the proposed alignment for the Central Subway on Stockton Street, and adjacent to the parcel indentified for the Chinatown station in Alternative 2 and 3A.

Woh Hei Yuen Recreation Center

The Woh Hei Yuen Recreation Center located on Powell Street at John Street (near Jackson Street) provides educational and recreational activities for children and adults. The two-story facility includes, a basketball court, auditorium, meeting/recreation room, kitchen, outdoor basketball court, court yard, children’s play structure, and weight training facility.

Portsmouth Square

Portsmouth Square has historically been known as the Heart of San Francisco as it was the site of the first public square of the community of Yerba Buena, which eventually became San Francisco. Located along Kearny Street between Washington and Clay Streets, the square features numerous statues, markers and plaques, an open plaza and children’s playground. Below the square is the four-level, 500-space Portsmouth Square Parking Garage.

Washington Square

Washington Square is a 2.26-acre park bordered by Filbert and Union Streets to the north and south and Columbus Avenue and Stockton Street to the west and east. The park is under the jurisdiction of the San Francisco Recreation and Park Department and features strolling paths, small gathering areas, a greensward, seating throughout, historic sculptures, restrooms and a children's playground. In 1999 the park was designated as a Landmark, requiring it to undergo specific reviews by the San Francisco Landmarks Preservation Advisory Board for any future potential changes. The small triangular area bounded by Columbus Avenue, and Union, Filbert and Powell Streets was once part of the original Washington Square, but was severed in the 1870’s with the construction of Columbus Avenue. Known as Marini Plaza, the small area features plants, sculpture and a pond. Washington Square park includes several mature trees, some along Columbus Avenue. To date, none of these trees have been designated by the City as historic landmark trees.

4.4 CULTURAL RESOURCES

Cultural resources include buildings, sites, districts, structures, or objects having historical, architectural, archaeological, cultural, or scientific importance. Technical reports produced for the 1998 environmental document include an Archaeological Survey Report (Hupman and Chavez 1997) and a Historic Architectural Survey Report conducted by Dames & Moore (Corbett et al. 1997); also produced was a Historic Property Survey Report (December 1997) that summarizes the information in the technical reports. These reports examined the same alignments as the Alternative 2 (Enhanced EIS/EIS Alignment) of the Central Subway segment of Phase 2 of the Third Street Light Rail Project. Additional research resulting in a Historic Context and Archaeological Survey Report (HCASR), Anthropological Studies Center (ASC), 2007 and a Historic Architectural Evaluation Report (Garcia and Associates, 2007) was completed for this supplemental environmental document. These reports are on file at the San Francisco Planning Department.

4.4.1 REGULATORY FRAMEWORK

This cultural resources section of the SEIS/SEIR meets both state and federal environmental requirements, including the CEQA, as amended (PRC Section 21000 et seq.), and its implementing regulations (CCR 14 Section 15000 et seq.); NEPA, as amended (42 USC 4321-43470); and Section 106 of the National Historic Preservation Act of 1969 (36 CFR 800).

The first step in complying with these laws is the identification of resources and evaluation of their significance based on the criteria of the above legislation and its guidelines. The Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation (46 FR 44716.44740) provide the relevant standards by which these activities are carried out. Historic properties include the buildings, districts, structures, objects, and sites that are listed on, or determined eligible for listing on, the National Register of Historic Places (NRHP). Properties eligible for listing on the California Register of Historical Resources (CRHR) are called historical resources*;* the evaluation criteria of the CRHR closely follow those of the NRHP. In addition to resources determined eligible under these evaluation criteria, the CRHR also includes properties listed on or eligible for listing on the NRHP, California Historical Landmarks, and properties of local significance designated under a local preservation ordinance. CEQA states that it is the policy of the state of California to "take all action necessary to provide the people of this state with . . . historic environmental qualities . . . and preserve for future generations examples of the major periods of California history" (PRC Section 21001[b], [c]). CEQA Section 21084.1 states that "A project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment." CEQA defines an historical resource as one which "is listed in, or determined eligible for listing in the California Register of Historical

Resources," and also states that historical resources included in a local register of historical resources as defined in subdivision (k) of Public Resources Code Section 5020.1, are "presumed to be significant" unless the preponderance of the evidence suggests otherwise. "Unique archaeological resources" are considered under PRC Section 15064.5 (c)(3) and 21083.2.

The City and County of San Francisco's Planning Department and Commission maintain a list of significant historic architectural resources, historic districts, and conservation districts; these lists are found in Articles 10 and 11 of the Planning Code. The boundaries of Article 10 historic districts and Article 11 conservation districts do not correspond with the NRHP and CRHR boundaries, because the locally identified boundaries tend to be larger and more inclusive. A Landmarks Preservation Advisory Board makes recommendations to the Planning Department about properties to be added to the list of significant properties and they maintain a stewardship role to protect landmarks from inappropriate modifications.

Previous Approvals

The State Historic Preservation Office (SHPO) approved an Area of Potential Effects (APE) for archaeologic and historic resources for the Central Subway and Third Street Light Rail Project in 1997. At that time, only one build alignment for the Central Subway phase of the project was being considered. This SEIS/SEIR evaluates three build alternatives for the Central Subway: an Enhanced EIS/EIR Alternative and a Fourth/Stockton Alternative with two options for portal location and surface operations.

The Programmatic Agreement for the construction of the Third Street Light Rail (including the Central Subway) was signed on 1999 by the Advisory Council on Historic Preservation, SHPO, FTA, and the San Francisco Planning Department, pursuant to 36 CRF 800.6 This agreement identified measures to mitigate the effects of the Project on historic properties (Appendix C).

This section of the SEIS/SEIR discusses Archaeological Resources first, followed by Historic Architectural Resources.

4.4.2 ARCHAEOLOGICAL RESOURCES

Archaeological APE

The SHPO reviewed and approved the APE for the three alternatives in March 2007 (see Appendix D for copies of the APE maps and SHPO approval letter). The APE for archaeology is defined both horizontally and vertically to include all areas where potential ground-disturbing activities may affect historic properties, with the vertical and horizontal extent of these activities varying within and between alternatives. These locations include proposed tunnels, stations, ventilation structures, surface tracks, and temporary construction facilities. A five-foot buffer was imposed outside the planned construction to account for voids behind tunnel panels, grouting, and other tunnel and trench shoring cuts. The APE for Alternatives 2, 3A, and 3B are 12,900, 10,800, and 9,800 feet in length, respectively. The width of surface tracks and tunnels for all alignments ranges from 35 to 75 feet, not including stations. The vertical APE for archaeology varies within and between alignments, from surface to depths of nearly 120 feet below street level. Larger scale APE maps are available for review, by appointment, at the San Francisco Planning Department, 1650 Mission Street, San Francisco.

Expected Archaeological Resources within the APE

The HCASR provides a summary of archaeological research in the APE, a discussion of the prehistoric and historical archaeological resources background of the Study Area; a description and listing of known prehistoric and historical resources within a 1/2-mile radius of the APE; identification of anticipated property types that may be present within the Study Area; and a discussion of expected prehistoric and historical archaeological resources in the APE. Several methods were used to collect and analyze this information. To identify known prehistoric and historical resources, a records search (Northwest Information Center (NWIC) Search No. 06-461) was conducted on December 15, 2006 with the NWIC, California Historical Resources Information System. The records search provided the mapped locations and descriptions of all recorded archaeological sites, as well as reports describing archaeological research. Review of these reports and archaeological literature also allowed identification of archaeological sites that have not been formally recorded, including several locations of shipwreck remains. SHPO’s list of historic properties in San Francisco was checked for any resources that fall within the APE, including updated listings for State Historic Landmarks and NRHP properties; the CRHR was also checked.

The NWIC records search revealed that 11 prehistoric, 43 historical archaeological resources, and 4 prehistoric/historic archaeological sites have been recorded within 1/2 mile of the APE; these are mentioned below, followed by a discussion of the sites within or adjacent to the APE.

Known Prehistoric Archaeological Resources In or Adjacent to the APE

At least 33 prehistoric archaeological sites or components have been recorded on the northern San Francisco peninsula, most located in sheltered coves or near streams within 1/2 mile or less of the historic margins of San Francisco Bay. To provide context for discovery and evaluation of prehistoric archaeological sites, records searches typically include all archaeological sites recorded within a given radius of a project APE. Because prehistoric archaeological sites can often be much larger than their surface remains suggest, it is also prudent to consider that sites some distance away might extend into the APE.

The records search indicated that 11 prehistoric sites have been recorded within 1/2 mile of the APE; most were found from about 6 to 20 feet below ground surface. All but one of the sites are residential shell middens, three of which contain human remains; the exception is CA-SFR-28, a single, isolated human burial discovered during construction of the Civic Center BART station approximately 75 feet below ground. CA-SFR-28 is over 5,000 years old and is the oldest to date encountered prehistoric archaeological resource in San Francisco.

The locations of two prehistoric sites, CA-SFR-2 and CA-SFR-154/H, are located within or adjacent to the APE. A third site, CA-SFR-114, is located almost midway between the alternatives. Table 4-8 summarizes which alternatives would potentially impact known archaeological resources.

TABLE 4-8

KNOWN ARCHAEOLOGICAL RESOURCES WITHIN OR ADJACENT TO THE APE

	Enhanced EIS/EIR Alignment - Alternative 2	**Fourth/Stockton Alignment - Alternative 3A**	**Fourth/Stockton Alignment - Alternative 3B**
Prehistoric Archaeological Site	CA-SFR-2 (CA-SFR-154/H) (CA-SFR-114)	– – (CA-SFR-114)	– – (CA-SFR-114)
Historical Archaeological Site	(CA-SFR-154/H)	CA-SFR-137H	CA-SFR-137H
Parentheses = Resource that may extend in or near the APE			

CA-SFR-2, the only known prehistoric archaeological site clearly situated within the project horizontal APE, is located at Third and Harrison Streets. The site is a shell midden deposit that was first documented by U.C. Berkeley archaeologist Nels C. Nelson in 1909. Cultural materials, as well as human remains, were encountered at a depth of about 6 feet below the ground surface during construction excavation in the 1920s (Gifford 1929; Rudo 1982:20). The site is located immediately northeast of the large, prehistoric marsh associated with Mission Bay and the mouth of Mission Creek. Given the site's apparent high density of faunal remains, diversity of artifacts, and human remains, intact deposits from CA-SFR-2 would likely be considered eligible to the NRHP/ CRHR under Criterion D/4.

CA-SFR-154/H was discovered and excavated during pre-construction investigations for the San Francisco–Oakland Bay Bridge (SFOBB) West Approach Project, at the east end of the block bounded by Third and Fourth and Harrison and Bryant. It is a midden site with a low density of artifacts. The site was evaluated as eligible to the NRHP/ CRHR under Criterion D/ 4 (Martin 2006). Although the midden deposit at CA-SFR-154/H was completely removed during these investigations, it is possible that other associated remains are present.

CA-SFR-114 (called the Moscone/Yerba Buena or Surprise Shellmound) was recorded on the north side of Howard Street between Third and Fourth Streets, approximately midway between the alternatives. Discovered at a depth of 10 to 21 feet, the midden site has yielded a possible sweathouse feature and at least 11 human burials, one with extensive grave goods (Holman & Associates 1995; Walsh 1988). Radiocarbon dates (Pastron, Gottsfield, and Vanderslice 2004:27) and diagnostic artifacts indicate that the site was occupied between about 1,000 and 2,500 years ago. Given the density and diversity of artifacts and the human remains, intact deposits from CA-SFR-114 would likely be considered eligible to the NRHP/ CRHR under Criterion D/ 4. It is unclear whether the site deposit extends to the APE.

Known Historical Archaeological Resources In or Adjacent to the APE

The 43 known historical sites or components within 1/2 mile of the APE represent an array of types, such as a cemetery; dumpsite; buried ship and artifacts; hotel and bathhouse refuse; and several Chinese residential or commercial sites, including a Chinese Fishing Village dating from 1850 to 1852. There are also several large sites that are the remains of city blocks comprising historical ground surfaces and hollow-filled features from 19th-century working-class families. Of these 43 known sites, 5 are within or adjacent to the APE for one or more of the Project alternatives; some sites have been entirely removed by previous archaeological data recovery. These sites are listed below; only CA-SFR-137H is located within the APE, for Alternatives 3A and 3B.

CA-SFR-137H consists of buried remains of a historic city block (bounded by Fourth, Fifth, Harrison, and Bryant Streets) uncovered during archaeological investigations for SF-80 Bayshore Viaduct Project (Praetzellis 2004). The resource includes the remains of residential and commercial buildings, 1906 earthquake/fire debris, intact ground surfaces, and hollow-filled features from the 1870s. The site was determined eligible to the NRHP under Criterion D and eligible to the CRHR under Criterion 4.

CA-SFR-153H was recorded on historic city block (bounded by Second, Third, Harrison, and Bryant Streets) on the SFOBB West Approach Project (Praetzellis 2006a). The resource includes 1906 earthquake and fire debris, intact ground surfaces, and hollow-filled features from 1870s; and deposits from the first free kindergarten west of the Rocky Mountains. The site was determined eligible to the NRHP under Criterion D and eligible to the CRHR under Criterion 4.

CA-SFR-154/H is on the city block (bounded by Third, Fourth, Harrison, and Bryant Streets) recorded on the SFOBB West Approach Project (Praetzellis 2006b). Includes 1906 fire-scarred building foundations;

25 artifact-filled privies; and 2 deep wells; the resources are below at least 8 feet of fill (McIlroy 2004). Targeted areas include domestic occupation sites, stores, Chinese laundries, a hotel, and a restaurant. A prehistoric midden site is also present. The site was determined eligible to the NRHP under Criterion D and eligible to the CRHR under Criterion 4.

P-38-004294 consists of archaeological features associated with San Francisco Glass Works (SFGW), 1865–1868, found on block bounded by Third, Fourth, King, and Townsend Streets during monitoring for the Mission Bay Development Project (Beevers 2003). SFGW was destroyed in July 1868, just months before a major earthquake. Excavated features included the remains of two brick furnaces and a brick chimney; two artifact deposits were covered in a burn layer possibly related to 1868 quake. The site may be eligible to the NRHP/ CRHR under Criterion D/ 4.

Jessie Square Garage Feature #1 is a deposit of carbon rods recorded during construction monitoring inside the Jessie Street substation, on Jessie Street between Market, Third, and Fourth Streets (Pastron, Gottsfield, and Vanderslice 2004). These rods are thought to be associated with the California Electric Light Company founded in June 1879; the first in the U.S. to offer central-station electric service distribution to the public. The deposit contained various sizes and types of rods used in arc lamps. The site was determined eligible for the NRHP under Criteria A and D; it is also eligible to the CRHR under Criteria 1 and 4.

Identifying Archaeological Resource Sensitivity

It is unlikely that archaeological resources—either known sites or previously undiscovered ones—can be identified until the Project is under construction, as they are buried under city streets and substantial quantities of fill. Consequently one important goal of the archaeological investigation and historic context report was to identify where subsurface historic properties are likely to be found. The methods used in the archaeological survey report for predicting prehistoric and historical archaeological resource locations are summarized below. For prehistoric archaeological sites, the assessment was based on the archaeological sensitivity of specific geological landforms, as determined from ongoing geoarchaeological research in the northern San Francisco Peninsula. For historical archaeological sites, predictions were based on historic maps, other historical documents, and prior archaeological investigations in urban settings. The impacts that the Central Subway Project might have on these predicted resources are discussed in Section 5.4 of this document.

Expected Prehistoric Archaeological Resources. The HCASR presents an overview of the paleoenvironmental history of the northern San Francisco Peninsula, a discussion of how these changes have affected the age and distribution of archaeological sites, and a summary of previous geoarchaeological studies in the area. Based on these studies, it is clear that people were present in the Study Area by 5,000 years ago and possibly much earlier, and that intensive occupation sites were established as early as 2,000 years ago. Additional unidentified prehistoric sites are almost certainly associated with dunes, bay marsh margins, alluvial deposits, or other landforms that have been buried by natural geologic processes near the margins of San Francisco Bay.

The assessment of potential Project effects on prehistoric sites has been based on a review and analysis of (1) selected historic maps (Coast Survey maps 1852/53 and 1857/59); (2) modern geologic maps and other data (Knudsen et al. 2000; Schlocker 1974); (3) relevant geoarchaeological studies; (4) logs from soil borings conducted for the Project; and (5) preliminary geologic sections of the proposed alignments (Geomatrix 2003, 2006). Approximately 100 subsurface borings, as well as other data sources, were used to create the geologic sections, including previously collected geotechnical data, as well as new information gathered from an additional 22 subsurface borings. The borings do not provide a continuous profile of the APE, however, and only preliminary assessments of archaeological sensitivity in specific Project impact areas are possible.

Using these data, prehistoric archaeological sensitivity was predicted based on the geoarchaeological units present within the APE. The units identified include the Colma Formation, colluvial deposits, alluvial deposits, bay mud and marsh deposits, Late Holocene sand dunes, and artificial fill. The sensitivity of each geologic unit depends on its age and the length of time the surface was exposed, and thus available to human occupation. This is determined by radiocarbon dating or the degree of soil development, or inferred from underlying or overlying units. Much of this information was generated from previous geoarchaeological studies in the vicinity of the APE (Mc Ilroy, Meyer, and Praetzellis 2001; Meyer 2003; Praetzellis 2004). The sensitivity of these units is summarized below.

The Colma Formation was deposited before the arrival of humans in the San Francisco Bay Area and therefore represents the area’s “cultural basement.” Geologic units that are earlier than this formation have little or no potential to contain buried prehistoric archaeological resources. Only the top 3 feet of the Colma Formation is considered of high archaeological sensitivity.

Colluvial deposits are mapped only in isolated areas around Nob Hill. No archaeological materials have been recovered in colluvial deposits on the northern San Francisco Peninsula. These deposits may contain stable ground surfaces when occurring as ravine fill, but this is unlikely when occurring as slope debris. Consequently, this geological unit is considered to have a low to moderate sensitivity for archaeological resources.

One meter or more of alluvium overlies the Colma Formation throughout much of the APE. The various natural resources associated with alluvial deposits, including the presence of fresh water, have long attracted humans, and numerous Bay Area prehistoric archaeological sites are associated with alluvial soils. Alluvial deposits in the APE, which can reach considerable depth, have a moderate to high sensitivity. As this unit is probably the result of numerous episodes of deposition and may contain several former surfaces and soils, the entirety of this geologic unit is considered sensitive for archaeology. This alluvium may date to the Late Pleistocene and therefore may represent the cultural basement in some areas.

Although bay mud and marsh deposits do not represent a stable landform, portions of this geologic unit are sensitive for prehistoric archaeological resources. The lower vertical margin and lateral margins (as well as immediately adjacent units such as alluvium or sand dunes) of this unit are considered to have a high sensitivity, while the middle and upper vertical margins of this unit (open water bay mud rather than marsh) have low sensitivity. Where bay mud and marsh deposits are encountered, a 3-foot zone at the lower margin of the deposit is highly sensitive for archaeology.

Sand dunes are mapped as overlying alluvial and bay deposits, and underlying artificial fill throughout much of the southeastern portion of the APE. While several episodes of dune stability and soil formation occurred from the Late Holocene to the historic period, two time periods—dating to 2,000 and 1,000 years ago—are important in that they reflect discrete periods of landform stability. Each has a different degree of sensitivity for prehistoric archaeological deposits: the earlier deposition represents a relatively stable landform, while the latter is generally unstable. Based on previous geoarchaeological studies, dunes in the southeastern end of the APE are known to represent the more recent deposition (the Latest Holocene), while the sand dunes in the Market Street area are likely from the Late Holocene, overlain by the more recent, “latest” deposits. Thus, sand dune units in the Market Street area are considered highly sensitive, whereas those in the southeastern portion of the APE are of low sensitivity for archaeology.

Prehistoric archaeological remains that have been documented within artificial fill are the result of secondary deposition related to historic cutting and filling. Therefore, this unit is considered to have very low sensitivity to contain intact prehistoric archaeological resources.

The HCASR details the locations and sensitivity of the six reaches defined for the Study Area within each of the alternatives. Each alternative contains from 5 to 15 locations of moderate to high prehistoric archaeological sensitivity, with a few locations considered of low sensitivity. A summary of these results and of the Project effects on potentially important prehistoric sites is provided in Section 5.4 of this document.

Expected Historical Archaeological Resources. The assessment of historical archaeological sensitivity in the Project APE was based on review and analysis of historic maps, municipal reports, and other documents to identify historic land use and the area's evolving topography. Historical development along each section of roadway was characterized using information from a variety of sources in order to identify the potential types of historic archaeological deposits that may be present within or adjacent to the APE. The primary sources included: U.S. Coast Survey maps (1852/53, 1857/59, 1869); Sanborn Company fire insurance maps (1887-1899, 1899-1900, 1913-1915); San Francisco Board of Engineers city grades report (1854); San Francisco Board of Supervisors street grades report (1877); San Francisco Board of Supervisors Special Committee report on Chinatown (1885); San Francisco Office of the City and County Surveyor report (1887/88); San Francisco City Directories (various dates); and San Francisco Municipal Reports (various dates). Information for blocks previously studied for the Third Street Light Rail Project, identified as Alternative 2, has been drawn from that report (Hupman and Chavez 1997). These sections typically include information after 1906. Research for blocks on Alignment Alternatives 3A and 3B are focused on the built environment prior to 1906, based on the following assumptions:

- Artifact deposits in the form of domestic or commercial refuse are less likely to be deposited in hollow-filled features within street alignments once a street is paved. Refuse is also less likely to remain in situ on a paved street.
- Paving dates listed in the 1877 Board of Supervisors report indicate established ultimate grade.
- The presence of sewer lines does not necessarily indicate abandonment of privies and connection to city sewer, only the potential to do so.
- Domestic and commercial artifact caches, especially those in hollow-filled features, are more likely to be found dating prior to rather than after post-1906 redevelopment.

Property types identified from the block-by-block research include Domestic Occupation Sites, Domestic Architecture Sites, Commercial Sites, Institutional Sites, Industrial Structures/Architecture, Industrial Features, Gardens and Parks, Landfills and Dumps, and pre-Gold Rush and Gold Rush-period sites that may contain some or all of the above types. In most cases, the importance of individual resources representing these property types will depend on the ability of the data they contain to address important research issues as required by Criterion D of the NRHP and Criterion 4 of the CRHR.

The locations described below are all considered highly sensitive for historical archaeological resources. The sensitivity of these and other archaeological resources with respect to the effects of specific project components is presented in Section 5.4 of this document.

- Just south of Market on Third Street was the end of Happy Valley, an informal settlement of tents and improvised dwellings. Low areas at Third Street and further south may contain sheet refuse and archaeological features associated with the people who occupied the area in the first years of the Gold Rush.
- South of Market Street, the Fourth Street alignment passes through a former area of undulating dunes adjacent to marshlands at Mission Bay. The roadway and surrounding lands were cut or filled to extend the City during the 1850s and 1860s. Filled areas of the marsh and bay may also contain the remains of abandoned small watercraft. Some blocks were filled with debris after the 1906 Earthquake and Fire; historical artifacts are expected within the fill layers.
- A row of buildings stood on the west side of Fourth Street between Clementina and Folsom Streets at the proposed Moscone Station location beginning in the 1850s until 1906. Commercial establishments and households within these structures are likely to have left various archaeological deposits and features that may have survived to the present.
- On Stockton Street near Union Square, areas between Nob Hill and former sandhills toward Market Street, and within Market Street itself, were filled by the 1860s to improve street grades; filled spots may contain remains from the Gold Rush period. Between 1852 and 1859, a building was constructed within the Stockton Street alignment in a low spot at the base of a sandhill. Archaeological resources associated with this structure, including privies, architectural and garden remains, and domestic, commercial, and industrial features, may have survived within Stockton Street.
- Where Stockton Street passes over the saddle between Russian Hill and Telegraph Hill was an elite residential enclave for many of the city’s early merchants. The sidewalks shown are an irregular combination of dirt, planks, and paving, and archaeological deposits could be encountered below modern sidewalks.
- The section of APE from Broadway to Clay was part of Chinatown by 1885. Both station locations and the area within the roadways have the potential for archaeological resources, including architectural, domestic, commercial, industrial, garden, and Gold Rush period archaeological deposits. The parcel containing the pre-Gold Rush Paty–Hinckley Adobe lies within Stockton Street between Clay and Jackson Streets, while a trail from Yerba Buena Cove to the Presidio passed through this area. This section of Stockton Street is highly sensitive for archaeological resources associated with Yerba Buena (1835-1848).

- Three Great Fires that occurred in 1849 and 1850 were the impetus for organizing fire companies and the construction of water cisterns. The Coast Survey maps of 1852/53 and 1857/59 shown the locations of cisterns built at intersections throughout the City. Many of the original cisterns were built of wood; most were rebuilt in brick. The cisterns were constructed at depths ranging from 10 to 27 feet (Boden 1936). There are five potentially affected cisterns within the APE.
- Columbus Avenue (historically Montgomery Avenue) cut through several city blocks—including that bounded by Stockton, Union, Powell, and Green Streets—that contained many buildings by the 1850s. When the roadway was cut through the block between 1873 and 1875, it affected at least 10 lots, including buildings and yards. Due to the depth of the tunnel at this location, the only potential historical archaeological resources that may be encountered are artifacts from filled wells.
- At the TBM retrieval shaft in Columbus Avenue at Washington Square, the roadway (originally Montgomery Avenue) was cut through between 1873 and 1875, bisecting Washington Square. Deposits related to the early years of Washington Square as a public space and park may be present.

4.4.3 HISTORIC ARCHITECTURAL RESOURCES

Historic Architectural APE

An APE for historic buildings was defined to guide background research and field inventory for the Phase 2 Central Subway Project. The proposed APE conforms to the approach used for the Central Subway segment of the Third Street Light Rail Project historic architectural investigation conducted by Dames & Moore (Corbett et al.1997), which was approved by the State Historic Preservation Officer (SHPO). The APE is defined as the first row of parcels or buildings fronting either side of the street for each alignment alternative. For the proposed station and vent locations, the APE was expanded to include two rows of parcels and buildings because it is possible that new construction could visually and/or physically impact the historic integrity of buildings or structures. The APE was approved by SHPO in March 2007 (see Appendix D for SHPO approval letter and copy of APE maps).

Historic Architectural Resources Methods

This section of the SEIS/SEIR summarizes information contained in the Historic Architectural Evaluation Report (HAER) prepared for this Project (Garcia and Associates 2007). Prior to undertaking field studies, background research was initiated to identify previous studies conducted in and around the Study Area. Numerous reports and studies have been researched for this environmental document and references are listed in Appendix F. Previous studies, site records, historic maps, NRHP listings, California Points of Historical Interest, California Historic Landmarks, the Office of Historic Preservation (SHPO) *Directory of Historic Properties in the Historic Property Data File*, and other applicable material was compiled from the California Historical Resources Information System (CHRIS) at the Northwest Information Center (NWIC), Sonoma State University, California. The Office of Historic Preservation's (OHP) *Directory of Properties in the Historic Property Data File* for San Francisco County, updated on September 18, 2006 contains a current inventory of historic properties and their associated NRHP status. This directory was the primary resource used to determine if properties had been previously evaluated for significance. The data file includes information regarding properties listed in the NRHP and CRHR; note that the NRHP was also independently reviewed to confirm inclusion and status noted in the OHP's Directory.[40] Other registers, including the California Historical Landmarks (1995) and California Points of Historical Interest (2004), were also consulted to determine if the Study Area contains important listed historic properties. The San Francisco Planning Department's list of existing historic preservation districts and surveys was also a resource.

In order to determine NRHP eligibility, historical research pertaining to each property within the APE was compiled. Information relevant to the construction history, history of use, and affiliation with important historical figures was gathered for each property using resources at the San Francisco Public Library, San Francisco Assessor's Office, San Francisco Architectural Heritage Commission, and the San Francisco Planning Department. Additional information was gathered through website searches.

Resource materials consulted at the San Francisco Public Library included: Sanborn Fire Insurance Company maps; San Francisco City Directories; the *Architect and Engineer* journal; San Francisco Handy Block Books; historic newspapers comprising the *San Francisco Call*, *San Francisco Chronicle*, and *San Francisco Examiner*; the San Francisco Blue Book directories (billed as "the fashionable private address directory"); and special subject books.

Databases consulted at the San Francisco Assessor's Office included recorded dates of construction, property ownership transactions, and names and addresses of current owners. Assessor's parcel maps were also reviewed to cross-check lot numbers and addresses.

At the archives of the San Francisco Architectural Heritage Commission and the San Francisco Planning Department, existing records of Study Area properties were reviewed, and the information was incorporated into the current research. These records include Articles 10 and 11 of the *San Francisco Planning Code*; the *San Francisco Citywide Architectural Survey* (San Francisco Planning Department 1976); *Foundation for San Francisco's Architectural Heritage Survey* (Hasbrouck and Hall 1978); *San Francisco Downtown Architectural Survey: C-3 Zoning District* (FSF Heritage 1982);

40 National Register of Historic Places website, http://www.nationalregisterofhistoricplaces.com/ca/San+Francisco/state.html, accessed February 2007.

Architectural/Historical Survey of Unreinforced Masonry Building Construction from 1840 to 1940 (Marsh 1990); *San Francisco Chinatown Historic Survey* (Choy and Yip 1979); *Chinatown Historic District Case Report* (Choy, McGrew, and Marsh 1994) and *North Beach Historic Properties Survey-Completion Report* (Bloomfield 1982). The book, *Splendid Survivors: Downtown San Francisco Architectural Heritage*, was also an important reference for this project (Corbett 1979).

Historic Architectural Resources within the APE

There are eight existing or proposed historic districts of local or national importance, and one local conservation district that would be crossed by the Central Subway alternatives (see Table 4-9 and Figure 4-5). A historic district is a group of neighboring buildings that meet the criteria for listing on the National Register of Historic Places. Historic districts include a cohesive collection of buildings that represent a particular period or architectural style that serves to characterize a neighborhood. Locally-established conservation districts are groupings of buildings based on their architectural quality and contribution to the built urban environment. There is a potential for impacts to historic properties or, in the case of the conservation district, architecturally-significant properties within the districts that are crossed by segments of the alternative alignments that are either above ground or in the portal and station areas where the surface disturbance would take place. NRHP eligible historic districts are a cohesive

TABLE 4-9

HISTORIC AND CONSERVATION DISTRICTS IN THE APE BY ALTERNATIVE

District	Enhanced EIS/EIR Alignment	Fourth/Stockton Alignment Option A	Fourth/Stockton Alignment Option B	Reference
South End Historic District	X			San Francisco Planning Code, Article 10, Appendix I 1990
Rincon Point/South Beach Industrial Warehouse District	X			CRHR 1998
South Park Historic District[2]	X			Newly Proposed by Garcia and Associates
Kearny-Market-Mason-Sutter Conservation District	X	X	X	San Francisco Planning Code, Section 1103.1 of Article 11
Lower Nob Hill Apartment Hotel District[1]	X	X	X	NRHP listed 1991
Chinatown Historic District	X	X	X	CRHR 1998
North Beach Historic District[2]		X	X	Bloomfield 1982
Washington Square Historic District[2]		X	X	Bloomfield 1982
Powell Street Shops Historic District		X	X	Bloomfield 1982

[1] Part of San Francisco Apartment Hotel District

[2] Proposed districts; not presently on any city, state, or federal lists

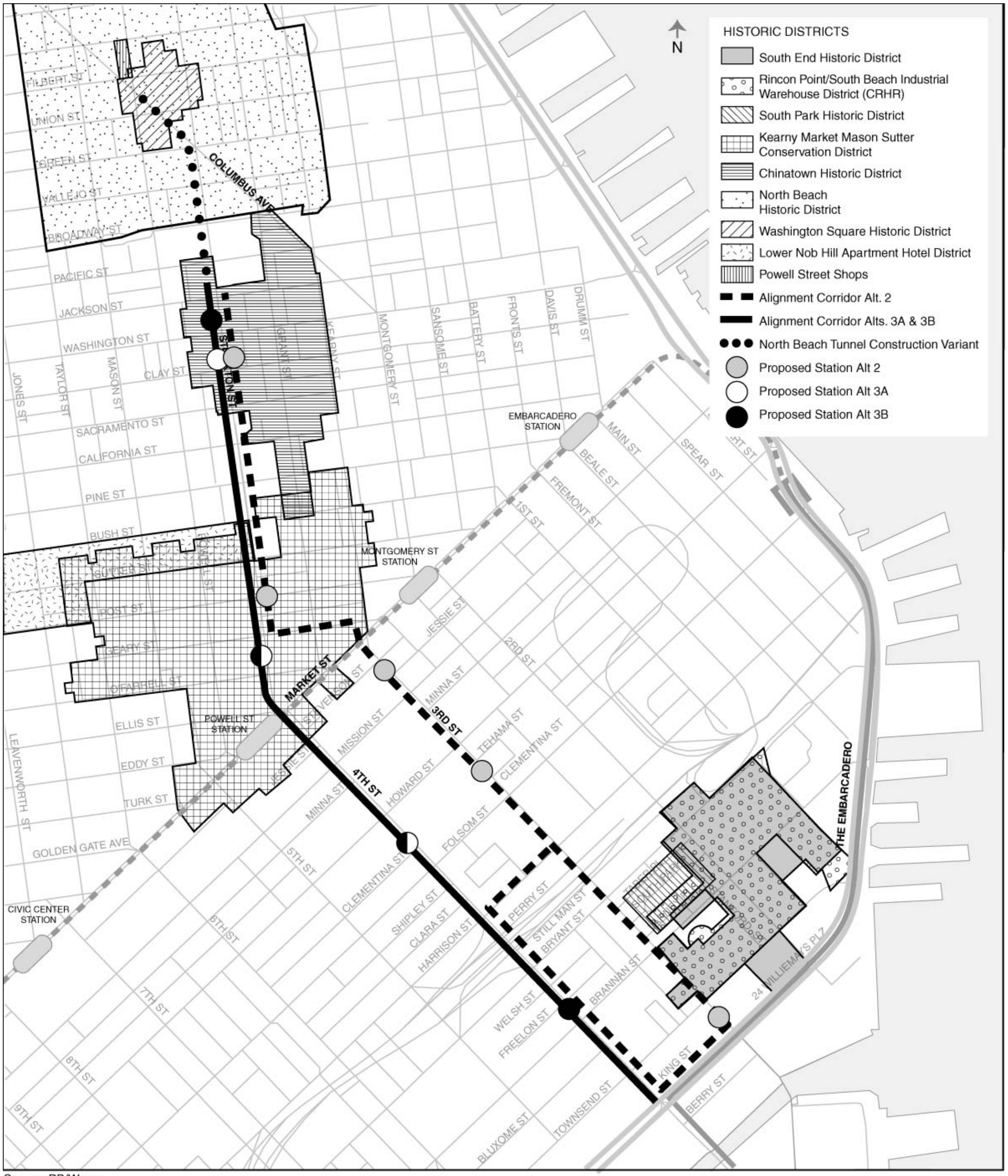
grouping of buildings that share a common history, visual appearance, or development. Historic districts can be contiguous or non-contiguous groupings of buildings. Each of these districts is described below.

South End Historic District and Rincon Point/South Beach Historic Industrial Warehouse District

Historic buildings that are eligible as contributors to the South End Historic District also appear to be within the boundaries of the Rincon Point/South Beach Historic Industrial Warehouse District (refer to Figure 4-5). The South End Historic District was listed as an Article 10 Historic District in 1990, with boundaries that generally include Stillman Street to the north, First Street to the east, Ritch Street to the west, and King Street to the south. The Rincon Point/South Beach Historic District is a CRHR-listed property and NRHP- eligible district identified and evaluated by Caltrans in 1983 for the I-280 Transfer Concept Project. Its boundary is larger and more inclusive than the CRHR boundary of the Rincon Point/South Beach Industrial Warehouse Historic District. The Rincon Point/South Beach district boundaries extend from First Street to Third Street between Townsend and Brannan Streets, with portions extending to King and Bryant Streets.

FIGURE 4-5

HISTORIC DISTRICTS



Source: PB/Wong
Not to scale

In the 1850s-1860s, while hilltops were leveled and streets were graded in the retail area of San Francisco, attempts were made south of Market Street to dispose of the excess fill material and create buildable lots. During that time, warehouses began to increase in the area. These districts currently include industrial warehouses that date from 1880 to 1915, when warehouses, dry docks, and shipyards were developed in response to construction of a new seawall during the period of 1878 to 1924. After the 1906 earthquake and fire, what had been predominantly industrial warehouses became mixed with apartments, hotels, and family businesses.

Six contributors to the two overlapping districts front the area where surface tracks would be located in the center of Third Street for the Enhanced EIR/EIS Alignment (see Table 4-10).

South Park Historic District (Proposed)

South Park, a small, oval-shaped park, was created in the 1850s, and is now surrounded by industrial buildings and warehouses. The South Park neighborhood was established as one of the most exclusive areas in San Francisco, but after the 1906 disaster it was unable to regain its former luster. Nonetheless, all of the post-1906 buildings fronting and adjacent to the park represent a cohesive grouping, unified by their association with the park. Only one historic property within the Study Area, 166 South Park, is considered to be a contributor to this proposed historic district. The building fronts South Park Avenue before it splits to surround South Park. South Park Street bisects the block bounded by Second, Third, Bryant, and Brannan Streets. This building is in the second row of buildings east of the NB Portal for the Enhanced EIR/EIS Alignment (Table 4-11).

Kearny-Market-Mason-Sutter Conservation District

The Kearny-Market-Mason-Sutter (KMMS) Conservation District, as depicted in Article 11 of the San Francisco Planning Code, covers an irregular area which encompasses much of the downtown retail district of San Francisco with Union Square in the center (refer to Figure 4-5).

The Kearny-Market-Mason- Sutter (KMMS) Conversation District, while not presently determined to be a NRHP-eligible district, has numerous buildings within its boundaries that are eligible for listing. In keeping with the City of San Francisco's intent to designate Conservation Districts to recognize and protect architecturally-significant buildings, this collection of historic buildings is exquisite, as many were constructed during the City's Beautification Movement. The buildings convey a sense of unity as architectural forms created by prominent architects influenced by the Ecole des Beaux-Arts in Paris. Within the KMMS Conservation District, there are three types of buildings, including hotels, department stores, and retail lofts. The majority of buildings included in the APE are retail lofts, which are generally

TABLE 4-10

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE AREA OF POTENTIAL EFFECT (APE) IN THE SOUTH END HISTORIC DISTRICT AND THE RINCON POINT/SOUTH BEACH HISTORIC INDUSTRIAL WAREHOUSE DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/Location	NR Status
178	660-670 Third	South End Terminal Warehouse	1906	3787/008	Enhanced EIR/EIS Alignment- Third Street surface tracks	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district
185	689-699 Third	Wall & Co./ Anna Davidow Bldg.	1917	3788/014	Enhanced EIR/EIS Alignment- Third Street surface tracks	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district
186	679-685 Third	A Nice Co.	1906	3788/015	Enhanced EIR/EIS Alignment- Third Street surface tracks	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district
187	665 Third	M.J. Brandenstein Bldg.	1916	3788/041	Enhanced EIR/EIS Alignment- Third Street surface tracks	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district
188	625 Third	Rolling Stone Magazine offices 1970-1977	1909	3788/045	Enhanced EIR/EIS Alignment- Third Street surface tracks	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district
189	601 Third	General Cigar Co. Bldg.	1909	3788/020	Enhanced EIR/EIS Alignment- Third Street surface tracks	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district

[1] Reference numbers correspond to property numbers on the APE maps that are available for public review, by appointment, at the San Francisco Planning Department, 1650 Mission Street, San Francisco.

multi-storied buildings with display windows and flexible floor plans (Corbett et al. 1997:21). Union Square serves as the heart of the KMMS Conservation District and it is also eligible for the NR and it is listed as California State Landmark No. 623.

Twenty-six buildings within the KMMS Conservation District are within the Project APE. These properties are summarized in Table 4-12. Twenty-four of these buildings are identified as properties

TABLE 4-11

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE IN THE PROPOSED SOUTH PARK HISTORIC DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/ Location	NR Status
192	166 South Park Avenue		1912	3775/070	Enhanced EIR/EIS Alignment- NB Portal	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district
[1] Reference numbers correspond to property numbers on the APE maps that are available for public review, on request, at the San Francisco Planning Department, 1650 Mission Street, San Francisco.						

eligible for individual listing. However, they also qualify as a cohesive collection of buildings within the conservation district. With the exception of Union Square and two buildings, each of these buildings has been rated as being either significant (Categories I or II) or contributory (Categories III or IV) under the Category I – V classification system established in Article 11 of the San Francisco *Planning Code*.

Seven of the buildings are in the first row of buildings along Stockton Street, but they are outside the potential station impact area. They include 700-706 Market Street, 722-742 Market Street, 146 Geary Street, 152 Geary Street, 156 Geary Street, 417 Stockton Street, and 423-439 Stockton Street. Two more, outside the station areas, are in the second row, including 825-833 Market Street, and 785 Market Street. The remaining 17 historic buildings either front the proposed station locations within each of three alternatives or they are in the second row of buildings; although, there is some overlap of buildings between alternatives.

Union Square is recognized as State Historical Landmark No. 623, and has been proposed for designation as a San Francisco Landmark.[41] Union Square has not been listed in the California Register of Historical Resources, which was enacted by legislation to automatically include State Historic Landmark No. 770 and all succeeding State Historic Landmarks. (For State Historical Landmarks preceding No. 770, the State Historic Preservation Officer must review each structure's eligibility in accordance with State Office procedures.) Union Square is also not individually included in a local register of historical resources, since it has not been designated a Landmark by the Board of Supervisors, although the Square is within the Kearny-Market-Mason-Sutter Conservation District, established by ordinance in 1985.

[41] On May 3, 1995, the Landmarks Preservation Advisory Board initiated the nomination under resolution No. 470, and on September 19, 1996, the Planning Commission held a public hearing on the proposal, and voted to continue the matter. No subsequent action has been taken. Information regarding the Landmark nomination may be found in the case file number 95.233L at the Planning Department, 1650 Mission Street.

TABLE 4-12

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE

KEARNY-MARKET-MASON-SUTTER CONSERVATION DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/Location	NR Status
71	700-706 Market	Mutual Building, Citizen Savings	1902	0312/010	Enhanced EIR/EIS Alignment-Geary and Stockton streets, first row	Office of Historic Preservation 3S-Appears eligible for a separate NRHP listing; Article 11, Category IV Building
78	722-742 Market	Banker's Investment Bldg.	1912	0312/009	Enhanced EIR/EIS Alignment- Geary Street, first row	Office of Historic Preservation 3S-Appears eligible for a separate NRHP listing; Article 11, Category IV Building
85	150 Stockton	Neiman Marcus	1908	0313/018	Alternatives 3A and 3B- Union Square/Market Street Station-first row	Office of Historic Preservation 3S-Appears eligible for a separate NRHP listing; Article 11, Category IV Building
89	146 Geary		1907	0309/007	Enhanced EIR/EIS Alignment- Geary Street, first row	Office of Historic Preservation 3S-Appears eligible for a separate NRHP listing; Article 11, Category IV Building
90	152 Geary		1907	0309/008	Enhanced EIR/EIS Alignment- Geary Street, first row	Office of Historic Preservation 3S-Appears eligible for a separate NRHP listing; Article 11, Category IV Building
91	156 Geary		1907	0309/009	Enhanced EIR/EIS Alignment- Geary Street, first row	Office of Historic Preservation 3S-Appears eligible for a separate NRHP listing; Article 11,

TABLE 4-12

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE

KEARNY-MARKET-MASON-SUTTER CONSERVATION DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/Location	NR Status
						Category IV Building
92	160-170 Geary	Whittell Building	1906	0309/010	Alternative 3A- Union Square/Market Street Station-second row	Office of Historic Preservation 3S- Appears eligible for a separate NRHP listing (Article 11, Category I Building)
95	333 Post Street	Union Square (including Parking Garage)	1942	0308/001	Enhanced EIR/EIS Alignment-Union Square Station- placement of vent and station entry at east side of structure; Alternative 3A-Union Square/Market Street Station- placement of vent and station entry at east side of structure; Alternative 3B-Union Square/Market Street Station- placement of station entry and elevator at southeast side of structure	Office of Historic Preservation 3S- Appears eligible for a separate NRHP listing California State Landmark No. 623 (CHL 1996: 220)
97	218-222 Stockton	A. M. Robertson Building	1908	0309/014	Enhanced EIR/EIS Alignment- Union Square Station- first row; Alternative 3A- Union Square/Market Street Station-first row	Office of Historic Preservation 3S- Appears eligible for a separate NRHP listing (Article 11, Category IV Building)
98	234-240 Stockton	Scroth Building (aka TWA Building)	1908-1909	0309/020	Enhanced EIR/EIS Alignment- Union Square Station- first row; Alternative 3A- Union Square/Market Street Station- first row	Office of Historic Preservation 3S- Appears eligible for a separate NRHP listing (Article 11, Category I Building)
100	275-299 Post	Lathrop Building	1909	0309/022	Enhanced EIR/EIS Alignment- Union Square Station- first row; Alternative 3A -	Office of Historic Preservation 3S- Appears eligible for a separate

TABLE 4-12

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE

KEARNY-MARKET-MASON-SUTTER CONSERVATION DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/Location	NR Status
					Union Square/Market Street Station- first row	NRHP listing (Article 11, Category I Building)
102	278-298 Post	Joseph Fredericks Co. Building	1910	0294/011	Enhanced EIR/EIS Alignment- Union Square Station- first row	Office of Historic Preservation 3S- Appears eligible for a separate NRHP listing (Article 11, Category I Building)
104	340 Stockton	Hotel Drake Wilshire Building	1909; 1984 remodeled	0294/013	Enhanced EIR/EIS Alignment- Union Square Station- first row; Alternatives 3A and 3B- Union Square/Market Street Station-first row	Office of Historic Preservation 3S- Appears eligible for a separate NRHP listing (Article 11, Category I Building)
108	417 Stockton	Hotel Navarre, All Seasons Hotel	1907	0285/004	Enhanced EIR/EIS Alignment- Fourth Street- first row; Alternatives 3A and 3B- Fourth Street-first row	1D- Contributor to a listed district- NHAHD; (Article 11, Category IV Building)
109	423-439 Stockton	Natalia Apartments	1911	0285/003	Enhanced EIR/EIS Alignment- Fourth Street- first row; Alternatives 3A and 3B- Fourth Street-first row	2D2-eligible for the NRHP; listed in the CRHR (Article 11, Category IV Building)
242	825-833 Market	Commercial Building; California Academy of Sciences	1908	3705/037	Alternative 3A- Fourth Street-second row	Office of Historic Preservation 3S- Appears eligible for a separate NRHP listing (Article 11, Category II Building)
244	785 Market	Humboldt Savings Bank Building	1906	3706/075-092	Alternatives 3A and 3B- Fourth Street-second row	Office of Historic Preservation 3S- Appears eligible for a separate

TABLE 4-12

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE

KEARNY-MARKET-MASON-SUTTER CONSERVATION DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/Location	NR Status
						NRHP listing (Article 11, Category I Building)
266	101 Stockton	Macys	1928; addition 1948	0314/002; 0314/004	Alternatives 3A and 3B- Union Square/Market Street Station-first row	Office of Historic Preservation 3S- Appears eligible for a separate NRHP listing (Article 11, Category I Building)
272	177-179 Maiden		1907	0309/012; 0309/010	Enhanced EIR/EIS Alignment- Union Square Station- second row; Alternative 3A- Union Square/Market Street Station- second row	Office of Historic Preservation 3S- Appears eligible for a separate NRHP listing (Article 11, Category IV Building)
273	259 Post	Ransohoffs Department Store	1909	0309/023	Enhanced EIR/EIS Alignment- Union Square Station- second row; Alternative 3A- Union Square/Market Street Station-second row	Office of Historic Preservation 3S- Appears eligible for a separate NRHP listing (Article 11, Category IV Building)
275	250 Post (246-268 Post)	Gumps Dept. Store	1865; 1906	0294/009	Enhanced EIR/EIS Alignment- Union Square Station- second row; Alternative 3A and 3B- Stockton Street -second row	Office of Historic Preservation 3S- Appears eligible for a separate NRHP listing (Article 11, Category II Building)
276	272 Post	Martin Sachs Company; Lengfeld Drug Company.	1909	0294/010	Enhanced EIR/EIS Alignment- Union Square Station- second row	Office of Historic Preservation 3S- Appears eligible for a separate NRHP listing (Article 11, Category IV Building)
249	760 Market/35 O'Farrell	Phelan Building	1908	0328/001	Alternatives 3A and 3B- Union Square/Market Street	Office of Historic Preservation 3S- Appears eligible

TABLE 4-12

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE

KEARNY-MARKET-MASON-SUTTER CONSERVATION DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/Location	NR Status
					Station-second row	for a separate NRHP listing (Article 11, Category I Building)
250	790 Market	Roos Bros. (Grodins)	1907	0328/002	Alternatives 3A and 3B- Union Square/Market Street Station-first row	Appears eligible for listing as a contributor to a NR eligible district (3D)
251	77-81 O'Farrell	Newman & Levinson; Joseph Magnin	1909	0328/003	Alternatives 3A and 3B- Union Square/Market Street Station-first row	Office of Historic Preservation 3S-Appears eligible for a separate NRHP listing
252	79 O'Farrell (previously 46-68 Stockton/77-79 O'Farrell)		1909	0328/004	Alternatives 3A and 3B- Union Square/Market Street Station-first row	Office of Historic Preservation 3S-Appears eligible for a separate NRHP listing (Article 11, Category I Building)

[1] Reference numbers correspond to property numbers in the APE maps that are available for public review, by appointment, at the San Francisco Planning Department, 1650 Mission Street, San Francisco.

Union Square is not "rated" as a Category I, II, III, IV, or V resource within the Conservation District, but Appendix E to Article 11 of the City Planning Code calls Union Square "an integral part of the District," and "a unique resource" ranking with the finest open spaces in the country (Section 5(d)). Appendix E also states: "The District is further defined by the location of Union Square in its heart. This square is, in many ways, the premier public open space in the City, as well as a primary public forum" (Section 5(b)). The Dewey monument has received an "A" rating from the Foundation for San Francisco's Architectural Heritage.

While Union Square does not technically meet CEQA's definition of an historical resource on an individual basis, it is clearly an important element of a designated Conservation District, and therefore an important component of a larger historical resource warranting particular attention. Little of Union Square's importance is derived from its internal configuration or landscape features, however. The

Square is significant because of its relationship to surrounding buildings and the urban setting, its history as one of San Francisco's first public squares, and the successful integration of an underground garage, which was the first of its kind in the world.[42]

Five additional buildings in the KMMS Conservation District front the Union Square Station in the Enhanced EIR/EIS Alignment, and another four properties occupy the second row of buildings. Nine contributors to the KMMS Conservation District front the Union Square/Market Street Station under the Alternative 3A Alignment, and four more are within the second row of buildings. Six contributors to the KMMS Conservation District front the Alternative 3B Alignment, and one contributor is in the second row.

The two remaining contributing properties occupy the first row of building on Fourth Street under the Alternatives 3A and 3B alignments.

Lower Nob Hill Apartment Hotel District

The Lower Nob Hill Apartment Hotel District is listed in the National Register of Historic Places and is part of the larger San Francisco Apartment Hotel District that is on the CRHP. The historic district contains 295 buildings and one structure within an area of 570 acres. The approximate extent of the historic district boundaries is 590-1209 Bush Street, 680-1156 Sutter Street, and 600-1099 Post Street, and the intersecting cross streets, including Stockton Street.

There are eleven buildings within the Central Subway APE that are contributors to the Lower Nob Hill Apartment Hotel District (see Table 4-13). These buildings represent a grouping of apartments and/or hotels that replaced the earlier mansions after the 1906 San Francisco earthquake and fire. The majority of buildings within the present Study Area are apartments designed for individuals employed in the nearby retail and financial districts. These buildings are within the limits of the fireproof zone, so fireproof materials were used in their construction. The use of similar materials, construction methods, design, and function serves to unify this collection of buildings.

[42] San Francisco Beautiful, Landmarks Preservation Advisory Board Nomination Form, April 1995. Charles Hall Page Assoc., State Department of Recreation & Parks Historic Resources Inventory Form, September 1978. Application for Registration of Historical Point of Interest. Copies of these materials are available for review in the project case file at the San Francisco Planning Department, 1650 Mission Street.

TABLE 4-13

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE

LOWER NOB HILL APARTMENT HOTEL DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/Location	NR Status
108	417 Stockton	Hotel Navarre, All Seasons Hotel	1907	0285/004	Enhanced EIR/EIS Alignment, Alternative 3A, Alternative 3B – Stockton Street	1D- Contributor to a listed district
109	423-439 Stockton	Natalia Apartments	1911	0285/003	Enhanced EIR/EIS Alignment, Alternative 3A, Alternative 3B – Stockton Street	2D2- Contributor to a district determined eligible for the NR; Listed in the CR
111	600-604 Bush		1915	0272/004	Enhanced EIR/EIS Alignment, Alternative 3A, Alternative 3B – Stockton Street	1D- Contributor to a listed district
114	525 Stockton		1921	0272/002	Enhanced EIR/EIS Alignment, Alternative 3A, Alternative 3B – Stockton Street	1D- Contributor to a listed district
116	535 Stockton	Pon Apartments	1925	0272/001A	Enhanced EIR/EIS Alignment, Alternative 3A, Alternative 3B – Stockton Street	1D- Contributor to a listed district
118	701-737 Pine	Agatha Apartments	1925	0272/001	Enhanced EIR/EIS Alignment, Alternative 3A, Alternative 3B – Stockton Street	1D- Contributor to a listed district
112	590-598 Bush	Victoria Hotel	1908	0271/015	Enhanced EIR/EIS Alignment, Alternative 3A, Alternative 3B – Stockton Street	1S- Individual property listed in the NR; 1D- Contributor to a listed district
113	510 Stockton		1920	0271/016	Enhanced EIR/EIS Alignment, Alternative 3A, Alternative 3B – Stockton Street	1D- Contributor to a listed district
115	530 Stockton		1925	0271/017	Enhanced EIR/EIS Alignment, Alternative 3A, Alternative 3B – Stockton Street	1D- Contributor to a listed district
117	540 Stockton		1922	0271/018	Enhanced EIR/EIS Alignment, Alternative 3A, Alternative 3B – Stockton Street	1D- Contributor to a listed district

119	550 Stockton	Pinemont Apartments	1923	0271/019	Enhanced EIR/EIS Alignment, Alternative 3A, Alternative 3B – Stockton Street	1D- Contributor to a listed district
[1] Reference numbers correspond to property numbers on the APE maps that are available for public review, on request, at the San Francisco Planning Department, 1650 Mission Street, San Francisco.						

Each of these buildings fronts the APE along Stockton Street. Two of the buildings, 417 Stockton Street and 423-439 Stockton Street, overlap the boundaries of the KMMS Conservation District. None of the eleven buildings are within a station or portal area.

Chinatown Historic District

Buildings within the Chinatown District generally occupy a small lot and have three or more stories with storefronts on the ground floor and residential flats, offices, or meeting rooms upstairs. Some buildings within the area are schools or churches. Most of the buildings are brick two- or three-part block vertical compositions. In some cases, the brick is now covered with stucco and Moderne influences have been infused with the formerly Renaissance/Baroque forms. A National Register of Historic Places Inventory Nomination Form was completed for the Chinatown Historic District in 1979 (Gardner 1979) and the district boundaries were refined in 1994 (Choy et al. 1994). The Chinatown Historic District is listed on the California Register of Historic Resources with a status code rating of “3D”.

Twenty-five significant buildings are within the APE in and around the proposed station locations of the Chinatown Historic District; together, they qualify as a cohesive collection of buildings within the historic district (see Table 4-14). They include buildings that either front the proposed station locations within each of three alternatives or they are in the second row of buildings. Some of the buildings are affected by more than one alternative.

Nine contributors to the Chinatown Historic District front the Chinatown Station in both the Enhanced EIR/EIS Alignment and the Alternative 3A Alignment, and another one property occupies the second row of buildings. Seven contributors to the Chinatown Historic District front the Alternative 3B Alignment, and six additional contributors are in the second row. Another contributor in Block 211 is in the third

TABLE 4-14

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE

CHINATOWN HISTORIC DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/Location	NR Status
133	800-810 Stockton	Lewis Gasner Hotel	1911	0225/013	Enhanced EIR/EIS Alignment, Alternative 3A- Chinatown Station- first row on east side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
135	814-828 Stockton		1923-1924	0225/014	Enhanced EIR/EIS Alignment, Alternative 3A- Chinatown Station- first row on east side of	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through

TABLE 4-14

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE

CHINATOWN HISTORIC DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/Location	NR Status
					Stockton- **This building is slated for demolition for station entry**	survey evaluation
137	830-848 Stockton	Kuo Ming Tang	1915	0225/016	Enhanced EIR/EIS Alignment, Alternative 3A- Chinatown Station- first row on east side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
140	850-898 Stockton	Oriental Hotel	1910	0225/017	Enhanced EIR/EIS Alignment, Alternative 3A-Chinatown Station- first row on east side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
146	930 Stockton	St. Mary's School	1906	0210/047 (0210/014)	Alternative 3B- Chinatown Station- first row on east side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
284	857-865 Clay		1913	0225/019	Enhanced EIR/EIS Alignment, Alternative 3A- Chinatown Station- second row on east side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
294	868-870 Clay		1911-1912	0210/012	Alternative 3B- Chinatown Station- second row on east side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
295	31-37 Spofford		1907	0210/015	Alternative 3B - Chinatown Station- second row on east side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
297	867-869 Washington		1929	0210/018	Alternative 3B- second row on east side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
132	801-805 Stockton		1925	0224/006	Enhanced EIR/EIS Alignment, Alternative 3A- Chinatown Station- first row on west side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
134	809-815 Stockton	Burke Lodging House	1915	0224/005	Enhanced EIR/EIS Alignment, Alternative 3A - Chinatown	Office of Historic Preservation 3D- Appears eligible as a contributor to a

TABLE 4-14

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE

CHINATOWN HISTORIC DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/Location	NR Status
					Station- first row on west side of Stockton	NR eligible district through survey evaluation
136	827-829 Stockton	Chinese High School, Victory Hall	1908	0224/004	Enhanced EIR/EIS Alignment, Alternative 3A - Chinatown Station- first row on west side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
138	833-841 Stockton		1914	0224/003	Enhanced EIR/EIS Alignment, Alternative 3A - Chinatown Station- first row on west side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
139	843 Stockton	Chinese Benevolent Society (Chinese Six Companies)	1908	0224/002	Enhanced EIR/EIS Alignment, Alternative 3A - Chinatown Station- first row on west side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
143	901-907 Stockton		1907	0211/004	Alternative 3B - Chinatown Station- first row on west side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
144	913-917 Stockton	Hop Wo Benevolent Society	1910	0211/003	Alternative 3B - Chinatown Station- first row on west side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
145	925 Stockton	Chinese Presbyterian Church	1907	0211/002	Alternative 3B - Chinatown Station- first row on west side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
147	933-949 Stockton	S.H. Woodruff	1906	0211/001	Alternative 3B - Chinatown Station- first row on west side of Stockton - **This building is slated for demolition under Alternative 3B Alignment for station entry**	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
149	1003-1011 Stockton	Chinese Methodist Episcopal Church	1910	0192/004	Alternative 3B - Chinatown Station- first row on west side of Stockton	Office of Historic Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
151	1013-1017		1910	0192/003	Alternative 3B -	Office of Historic

TABLE 4-14

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE

CHINATOWN HISTORIC DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/Location	NR Status
	Stockton				Chinatown Station- first row on west side of Stockton	Preservation 3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
289	910-914 Clay	Chinese Mission	1907	0211/005	Alternative 3B - Chinatown Station- second row on west side of Stockton	3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
290	916-918 Clay		1907	0211/006	Alternative 3B - Chinatown Station- third row on west side of Stockton	3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
292	950 Clay	Commodore Stockton School	1913	0211/007	Alternative 3B - Chinatown Station- second row on west side of Stockton	3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
305	940 Washington	Gum Moon Residence Hall	1911	0192/005	Alternative 3B - Chinatown Station- second row on west side of Stockton	3S- Appears eligible for a separate NRHP listing
148A		Washington Street Street Lights	1925		Alternative 3B - Chinatown Station	3D- Appears eligible as a contributor to a NR eligible district through survey evaluation

[1] Reference numbers correspond to property numbers on the APE maps that are available for public review, on request, at the San Francisco Planning Department, 1650 Mission Street, San Francisco.

row from Stockton Street, but only one building separates it from the proposed station location. Two buildings are proposed for demolition and removal in the Chinatown Historic District: one in the first row of the Enhanced EIR/EIS and 3A alignments, and another in the first row of the 3B Alternative Alignment. One additional resource, the Washington Street Street Lights, is within the Alternative 3B Alignment.

Various surveys have identified the Chinatown Historic District as having expansive boundaries that encompass an area of several blocks. Corbett et al. (1997) identified 814-828 Stockton Street and 933-949 Stockton Street and other surrounding buildings as contributors to a NRHP eligible historic district in Chinatown. These buildings are linked through their association with the development of the Chinatown community. Each of the two buildings lies within an area known to be a part of Chinatown since at least the 1880s and has continuously remained a vibrant part of the community. Constructed in 1923, 814-828

Stockton Street is noted for initial Chinese ownership in the 1920s, use of its basement as a Chinese school, and it housed the *World Journal* Chinese newspaper during the 1970s and 1980s. Designed by S.H. Woodruff and erected in 1906, 933-949 Stockton Street served the immediate need of lodging and use of the storefronts by Chinese merchants in the aftermath of a natural disaster.

There are architectural similarities shared with a large percentage of the Chinatown buildings. The architecture is loosely tied to the significance of the Chinatown Historic District, although it is not exclusive to this part of the City. Most convey Renaissance or Baroque design influences produced by architects whose designs were found throughout the City. Visual differences expressed in Chinatown include bright banners and awnings, and in some cases, Chinese design elements have been infused in the architecture. 933-949 Stockton Street conforms to the two-part commercial block composition also found in other areas of San Francisco. The architectural design of the 824-828 Stockton Street building, with one story fronting Stockton Street, is less common.

Especially in the case of 814-828 Stockton Street, the visual representation of the building is less important than its history. However, within that block (Block 225), the three remaining buildings on the east side of Stockton Street are also contributing elements to a historic district, as are many of the properties across the street. Equally important buildings also surround 933-949 Stockton Street. Removal of either building breaks up the continuity of contextually linked buildings on the two blocks.

North Beach Historic District, Washington Square Historic District, and Powell Street Historic District

The North Beach Historic District was proposed by Bloomfield in 1982. Within the North Beach Historic District, four historic sub-districts have been identified: the Upper Grant Avenue Historic District, Jackson Square Historic District Extension, Powell Street Shops Historic District, and Washington Square Historic District. Each of these historic sub-districts has been determined to be eligible for the NRHP. Of these four sub-districts, only the Powell Street Shops Historic District and the Washington Square Historic District are within the Project Area boundaries.

The Washington Square Historic District was also proposed by Bloomfield in 1982. The Washington Square Historic District includes historic properties that surround the park. Washington Square Park is listed as San Francisco Landmark No. 226. It is bounded by Filbert, Union, Powell, and Stockton Streets, and creates a visual focal point for historic buildings that front the park. With the exception of a Catholic Church on the north side, these properties exhibit the same architectural forms as those found throughout North Beach.

The Powell Street Shops Historic District is a block-long section on the west side of the1800 block of Powell Street from Filbert to Greenwich Streets, consisting of eleven street-level shops in eight buildings, with flats and apartments above. The block is remarkable for the nearly intact state of most of its storefronts; the whole streetscape is virtually unaltered since its construction early in the twentieth century. However, none of the buildings in the Powell Street Shops Historic District are located within 200 feet of the extraction shaft.

North Beach was one of the first areas to rebuild after the 1906 earthquake and fire, and thereafter, developed into the center of San Francisco's Italian American community. The vast majority of new buildings were wood-framed flats of two or three stories, built on row-house lots whose narrow dimensions remained unchanged from before the earthquake. These buildings usually had bay windows, with either rounded or slanted sides, that overhung the sidewalk. Many were decorated with Classical Revival ornamentation, including classical cornices that wrapped around the bay windows, subordinate cornices at the second floor level, and columns at the porches. The proposed North Beach Historic District encompasses the Washington Square Historic District, although its boundaries are imprecisely defined.

Washington Square Park and the associated Washington Square Park Triangle are the only properties in close proximity to the Tunnel Boring Machine extraction shaft that would be placed in the middle lanes of Columbus Avenue between Union and Powell Streets for the Alternative 3A and 3B Alignments (see Table 4-15). Washington Square Park is listed as locally significant both individually (listed, eligible, or appears eligible) and as a contributor to a district that is locally listed, designated, determined eligible or appears eligible through survey evaluation (Bloomfield 1982). Five additional properties, considered contributors to the Washington Square Historic District, are located within 200 feet of the extraction shaft.

TABLE 4-15

NATIONAL REGISTER-LISTED OR -ELIGIBLE PROPERTIES WITHIN THE APE

NORTH BEACH, WASHINGTON SQUARE, AND POWELL STREET HISTORIC DISTRICTS

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/Location	NR Status
366	600-668 Columbus	Washington Square Park	Ca. 1860	0102/001	Alternatives 3A, 3B-TBM Extraction Shaft	5S2-locally significant both individually (listed, eligible, or appears eligible) and as a contributor to a district that is locally listed, designated, determined eligible or appears eligible through survey evaluation. San Francisco Landmark No. 226
367	651 Columbus	Washington Square Park Triangle	Ca. 1860	0102/002	Alternatives 3A, 3B-TBM Extraction Shaft	3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
359	1636-1656 Powell	Verdi Apartments	1914	0117/016	Alternatives 3A, 3B-TBM Extraction Shaft- within 200 feet of extraction shaft	3S- Appears eligible for a separate NRHP listing
358	575-579 Columbus		1912	0117/017	Alternatives 3A, 3B-TBM Extraction Shaft- within 200 feet of extraction shaft	3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
371	1731-1741 Powell	Pagoda Theatre	1908	0101/004	Alternatives 3A, 3B-TBM Extraction Shaft- within 200 feet of extraction shaft	7N1- may become eligible for NR w/restoration or when meets other specific conditions.
370	1717-1719 Powell		1914	0101/005	Alternatives 3A, 3B-TBM Extraction Shaft- within 200 feet of extraction shaft	3D- Appears eligible as a contributor to a NR eligible district through survey evaluation
369	1701-1711 Powell 1715 Powell		1908	0101/005A	Alternatives 3A, 3B-TBM Extraction Shaft- within 200 feet of extraction shaft	3D- Appears eligible as a contributor to a NR eligible district through survey evaluation

[1] Reference numbers correspond to property numbers on the APE maps that are available for public review, on request, at the San Francisco Planning Department, 1650 Mission Street, San Francisco.

San Francisco Planning Code Resources within the Project Area

Historic buildings in the C-3 Downtown Commercial districts have been rated using a classification system under Article 11 of the San Francisco *Planning Code*. The rating system assessed the architectural design, history of the property, and aesthetic value to devise four categories. The highest rated buildings are Category I and II buildings, which are identified as "Significant Buildings." Category I and II buildings are exempt from demolition unless their condition prevents them from being economically viable for rehabilitation and reuse. Category III and IV buildings represent "Contributory Buildings." Although they are important as contributors to the C-3 Downtown Commercial districts, the standards for demolition are slightly less restrictive. A third category, Category V is used for buildings that are designated as unrated.

The rating system differs from the criteria used to evaluate historic buildings for the NRHP. For instance, of the twenty-six properties within the Project APE, twenty-one are also NRHP-eligible buildings within the boundaries of the Kearny-Market-Mason-Sutter District (refer to Table 4-12). Of those, eight are Category I, three are Category II, and ten are Category IV buildings. One the two buildings that overlap in the Kearny-Market-Mason-Sutter Conservation District and the Lower Nob Hill Apartment Historic District is NRHP-eligible and the other is a contributor to the historic district, but they both are rated Category IV. Six more rated buildings within the APE are outside the boundaries of a Historic District or Conservation District (see Table 4-16).

In accordance with Article 10 of the *Planning Code*, the Landmarks Preservation Advisory Board (LPAB) maintains a list of historic landmarks. The LPAB and the San Francisco Planning Commission review proposed plans for modifications to listed historic landmarks and make recommendations. Article 10 identifies seven San Francisco landmarks in the Study Area as depicted in Table 4-17.

National Register and California Register Properties within the Project Area

In the Study Area there are historic buildings, structures, and objects that are listed in state and federal registers, including the California Register of Landmarks, California Register of Historic Resources, and the National Register of Historic Places (see Tables 4-18, 4-19, and 4-20, respectively). One California Historical Landmark (No. 623) has been identified in the Study Area. Union Square, though it has not been listed in the California Register of Historical Resources, is also proposed for designation as a San Francisco Landmark (No. 210). Union Square is not "rated" as a Category I, II, III, IV, or V resource within the Conservation District.

TABLE 4-16

CATEGORY RATED BUILDINGS WITHIN THE PROJECT APE NOT ASSOCIATED WITH A HISTORIC DISTRICT OR A CONSERVATION DISTRICT

Ref. No.[1]	Address	Current or Historic Name	Date Built	Parcel No. (Block/Lot)	Alternative/ Location	Status
238	54 Fourth	Keystone Hotel	1910	3705/004	3A	3S - Appears eligible for the NR
121	600 Stockton	Met Life-Pacific Coast Head Office	1909	0257/012	2, 3A, 3B	Landmark No. 167
62	17-29 Third	Herman Levy Bldg	1907	3707/057	2	3S- Appears eligible for a separate NRHP listing
64	691-699 Market	Hearst Building	1909	3707/057	2	3S- Appears eligible for a separate NRHP listing
65	673-687 Market	Monadnock Building		3707/051	2	3S- Appears eligible for a separate NRHP listing
63	703-705 Market (26 Third)	Claus Spreckels Bldg./Call Bldg.	1898	3706/001	2	3S- Appears eligible for a separate NRHP listing

[1] Reference numbers correspond to property numbers on the APE maps that are available for public review, on request, at the San Francisco Planning Department, 1650 Mission Street, San Francisco.

TABLE 4-17

SAN FRANCISCO LANDMARKS IN THE STUDY AREA

Ref. No.[1]	Alt. No.	Address	Property	Date	Parcel	District	Landmark No.
95	2, 3A, 3B	333 Post	Union Square	1942	0308/001	KMMS	SF Landmark No. 210
121	2, 3A, 3B	600 Stockton	Metropolitan Life Building- Pacific Coast Head Office	1909	0257/012		SF Landmark No. 167
366	3A, 3B	600-668 Columbus	Washington Square Park	1900	0102/001	WS	SF Landmark No. 226
285	3A	920 Sacramento	Donaldina Cameron House	1908	0224/008	CH	SF Landmark No. 44
249	3A,	760 Market/35	Phelan Building	1908	0328/001	KMMS	SF Landmark No. 156

	3B	O'Farrell	(William Curlett- architect)				
66	2	Pedestrian island at intersection of Market, Geary and Kearny streets	Lotta Crabtree Fountain- cast iron statue and fountain presented to the City in 1875 by Lotta Crabtree, a noted entertainer	1875	------	KMMS	SF Landmark No.73
---	2,3A, 3B	1-2490 Market Street	Path of Gold Standards (historic street lights)	1908, 1916, 1925	-------		SF Landmark No.200

[1] Reference numbers correspond to property numbers on the APE maps that are available for public review, on request, at the San Francisco Planning Department, 1650 Mission Street, San Francisco.

TABLE 4-18

CALIFORNIA HISTORICAL LANDMARKS IN THE STUDY AREA

Ref. No.[1]	Alt. No.	Address	Property	Date	Parcel	District	Status
95	2, 3A, 3B	333 Post	Union Square	1942	0308/001	KMMS	California Historical Landmark No. 623

[1] Reference numbers correspond to property numbers on the APE maps that are available for public review, on request, at the San Francisco Planning Department, 1650 Mission Street, San Francisco.

TABLE 4-19

HISTORIC RESOURCES LISTED IN THE CALIFORNIA REGISTER OF HISTORIC RESOURCES

Ref. No.[1]	Alt. No.	Address	Property	Date	Parcel	District	Status
113	2, 3A, 3B	510 Stockton		1920	0271/016	LNHAH	1D-Contributor to District or Multiple Resource Property listed in NR by Keeper. Listed in CR.
115	2, 3A, 3B	530 Stockton		1925	0271/017	LNHAH	1D-Contributor to District or Multiple Resource Property listed in NR by Keeper. Listed in CR.
117	2, 3A, 3B	540 Stockton		1922	0271/018	LNHAH	1D-Contributor to District or Multiple Resource Property listed in NR by Keeper. Listed in CR.
119	2, 3A, 3B	550 Stockton	Pinemont Apartments	1923	0271/019	LNHAH	1D-Contributor to District or Multiple Resource Property listed in NR by Keeper. Listed in CR.
66	2	Pedestrian island at intersection of Market, Geary and	Lotta Crabtree Fountain	1875	------	KMMS	1S- Individual Property listed in NR by the Keeper. Listed in CR.

		Kearny streets					
124A	2, 3A, 3B	California; Kearny	San Francisco Cable Cars	1873	------		1S- Individually property listed in the NR by the Keeper. Listed in CR.
58	2	700-706 Mission	Aronson Bldg., Mercantile Bldg.	1906	3706/093		2S1-Individual property determined eligible by the Keeper. Listed in CR.
217	3A, 3B	360 Fourth	Salvation Army Senior Activities Center	1925	3752/010		2S- Individual property determined eligible for NR by the Keeper. Listed in CR.

TABLE 4-19 (CONTD.)

HISTORIC RESOURCES LISTED IN THE CALIFORNIA REGISTER OF HISTORIC RESOURCES

108	2, 3A, 3B	417 Stockton	Hotel Navarre, All Seasons Hotel	1907	0285/004	LNHAH KMMS	1D-Contributor to a district or multiple property listing on NR by Keeper. Listed in CR.
109	2, 3A, 3B	423-439 Stockton	Natalia Apartments	1911	0285/003	LNHAH KMMS	2D2-Contributor to a district determined eligible for NR by consensus through Section 106 process. Listed in CR.
110A	3A, 3B	Stockton Tunnel		1914	-----		2S- Individual property determined eligible for NR by the Keeper. Listed in CR.

[1] Reference numbers correspond to property numbers on the APE maps that are available for public review, on request, at the San Francisco Planning Department, 1650 Mission Street, San Francisco.

TABLE 4-20

NATIONAL REGISTER-LISTED HISTORIC PROPERTIES IN THE STUDY AREA

Ref. No.[1]	Alt. No.	Address	Property	Date	Parcel	District	Status
66	2	Market/Geary/Kearny streets	Lotta Crabtree Fountain	1875	-----	KMMS	NRHP No. 1975000475
---	2, 3A, 3B	590-1209 Bush 680-1156 Sutter 600-1099 Post, and intersecting streets	Lower Nob Hill Apartment Hotel District			Lower Nob Hill Apartment Hotel District	NRHP No. 1991000957

[1] Reference numbers correspond to property numbers on the APE maps that are available for public review, on request, at the San Francisco Planning Department, 1650 Mission Street, San Francisco.

Historic properties listed in the NRHP have been recognized to be nationally significant properties using criteria for evaluation developed by the National Park Service. The existing historic property that was identified in the Study Area is the Lotta Crabtree Fountain (which is also a San Francisco Landmark). The fountain, which includes a cast iron statue, was presented to the City in 1875 by Lotta Crabtree, a noted entertainer. The Lower Nob Hill Apartment Hotel District is a NRHP-listed historic district and it includes contributing buildings within the district. Table 4-13, above, provides a list of the eleven historic buildings of the Lower Nob Hill Apartment Hotel District within the Project APE.

Summary of Historic Architecture within the Study Area

There are 376 properties located within the APE, including buildings, structures (e.g., Lotta's Fountain), and linear features (e.g., street lights, Stockton Tunnel). Of the 376 properties, 161 of the properties and six historic districts were included in the Study Area previously evaluated by Corbett et al. in 1997 for the Central Subway segment of the Third Street Light Rail Project. These were identified as reference numbers 1 through 158 on the APE map (in some instances, more than one property was assigned to the same reference number; e.g., 66, 66A). Refer to Corbett et al. (1997) for additional information regarding historic architectural properties reviewed in that study.

The Central Subway HAER (as summarized in this SEIS/SEIR) has updated the findings of the Corbett et al. (1997) study by conducting significance evaluations on those additional properties included in the 1997 study that have become historic (45 years of age) in the intervening years ("newly historic") and eliminating from further study those previously evaluated properties that were demolished between 1997 and 2006. It was also necessary to reevaluate properties in close proximity to the proposed station locations that were previously assigned a NRHP code of 4S (might become eligible for a separate listing in the National Register when more historical or architectural research is performed on the property) or 4D (might become eligible as contributor to a fully documented district when more historical or architectural research is performed on the district), so an explicit determination could be made about eligibility. As a result, 218 additional properties have been identified and categorized within the APE (see Table 4-21).

The remaining 218 properties in the APE of the Central Subway Project (reference numbers 159 to 376 on the APE maps) are the main focus of this SEIS/SEIR. A review of the *Directory of Historic Properties in the Historic Property Data File for San Francisco* (SHPO 2006) revealed 59 properties out of the 218 have been evaluated prior to the start of this SEIS/SEIR. Of those, 49 properties were evaluated as eligible for the NRHP (Item No. 1 in Table 4-21); nine properties were evaluated as ineligible for the NRHP; and one property was determined to be eligible for local listing only (Item No.

2). Another 55 properties have been eliminated from consideration because they have been identified as being less than 45 years of age and do not appear to possess exceptional significance to qualify them as eligible for the NRHP/CRHR (Item No. 3). These include 42 buildings and nine vacant parcels or parking lots that did not require evaluation. Another four properties have been demolished since the previous study (Item No. 4). After eliminating these 114 properties from further review; 104 properties of the 218 properties required further evaluation for historic significance for this SEIS/SEIR (Item Nos. 5

TABLE 4-21

HISTORIC ARCHITECTURAL RESOURCES WITHIN THE APE

IN ADDITION TO THOSE EVALUATED IN CORBETT ET AL. (1997)

Item No.	NRHP Evaluation	Results
1	Properties previously listed on the NRHP	49
2	Properties previously determined to be ineligible	10
3	Properties not evaluated- less than 45 years of age, moved, altered, or other	51
4	Properties demolished and replaced after 1997	4
5	"Newly historic" properties determined to be eligible in this study	42
6	"Newly historic" properties determined to be ineligible	62
	Total	**218**
Source: Garcia and Associates, February 2007.		

and 6). It was determined that 42 of the properties appear eligible for listing on the NRHP and the remaining 62 properties appear to be ineligible.

4.5 VISUAL AND AESTHETIC RESOURCES

4.5.1 VIEWSHED

The viewshed for the Central Subway Corridor consists of the actual area in which Project features (track, overhead catenary, stations and station entries, vent shafts) would be visible. Due to changes in topography and adjacent buildings in the surrounding built environment the viewshed varies in character and in the extent of visible areas along the Corridor. In general the viewshed consists of urban landscapes along Third Street, Fourth Street, Geary Street, Market Street, Stockton Street, Columbus Avenue and those streets which run perpendicular to the Corridor where views of Project features would be prominent. Sensitive viewing points within the viewshed include parks, residential buildings, historic properties and sidewalks that offer a view of the urban landscapes making up the viewshed.

4.5.2 VISUAL CHARACTER

The visual character of the Central Subway Corridor reflects the built-up features of San Francisco's urban landscape. The landscape is characterized by streets and buildings typical of a densely built-up urban area, interspersed with some open spaces, plazas, alleyways and parking areas. Overhead utilities and signage as well as freeway overpasses, bridges, tunnels and elevated roadways punctuate the visual landscape. Views from vantage points along Third Street, Fourth Street, Stockton Street, and Columbus Avenue are summarized for each segment of the Corridor. Views are described as foreground, middle-ground or background. Generally, foreground views are of within one-quarter mile of the viewer; middle-ground views are within one mile; and the background views are beyond one mile.

South of Market Segment

The Central Subway landscape from the southern-most connection with the T-Third line at Fourth Street and King Street along surface alignments on Third and Fourth Streets to where the Project would be in subway can be characterized as a landscape in transition, from previously undeveloped vacant land and warehouses until the mid to late 1990s, to newly developed mixed commercial and residential properties and the brick-clad ballpark. Also in the foreground of the Corridor segment looking south is the elevated structure of the I-280 on- and off-ramps at King and Sixth Streets, the Caltrain tracks and station at King and Fourth Streets, and the elevated I-80 freeway viaduct between Bryant and Harrison Streets looking north from Third and Fourth Streets. The area under the I-80 freeway ramp and elevated structure between Bryant and Harrison Streets (where the tunnel portal and construction staging area is proposed for Alternative 3B) is an unpaved gravel and dirt area. The landscape in this segment is also characterized by billboards and signs and low-rise commercial buildings. Downtown highrise buildings to the east and north form the background for views in this segment (see Figure 4-6). The viaduct for the

FIGURE 4-6

FOURTH STREET LOOKING TO I-80 (TUNNEL & STAGING AREA)

Source: PB/Wong

I-80 Freeway and Bay Bridge ramps and support towers break the view of Downtown from many vantage points along Third and Fourth Streets.

Foreground landscapes along both Third and Fourth Streets are characterized by newly constructed multi-family residential buildings and by office buildings, with commercial properties often located on the streetfront. North of Harrison Street is Moscone Center, a light colored concrete complex, located between Third, Fourth, Mission, and Folsom Streets. This complex is a visually dominating feature in the landscape.

Market Street to Chinatown (Stockton Street tunnel) Subway Segment

This segment of the Project corridor is characterized by densely developed large buildings, typical of the Downtown commercial area of the City. Also characteristic of this segment are congested streets and sidewalks, with many large delivery trucks and buses, blocking all but foreground views of the landscape.

The one exception is Union Square at Stockton, Geary, Powell and Post Streets, where the 1998 redesigned plaza is characterized by a hardscape open space with palm trees, a cafe, a ticket center, and seating areas elevated above the street level and accessed by a series of steps and lawn terraces around the perimeter of the Park (see Figures 4-7 and 4-8). The Union Square Improvement Project was granted a Negative Declaration by the San Francisco Planning Department on August 18, 1998 (Case 98.257E).

FIGURE 4-7

UNION SQUARE LOOKING WEST

Source: PB/Wong

FIGURE 4-8

UNION SQUARE FROM MAIDEN LANE

Source: PB/Wong

The improvements included removal of all existing park features, except for the Dewey Monument, and replacing them with new paving, vegetation, and landscape elements and improved connections to surrounding sidewalks. The ratio between hard and softscape increased from 50/50 to 70/30. Vistas from Union Square are of large department stores along adjacent streets, with display windows facing the plaza and streets and the St. Francis Hotel to the west. Views of the eastern side of Union Square are prominent from Maiden Lane, the eastern side of Stockton Street, the northern side of Post Street, and the southern side of Geary Street. Views to the north along Stockton Street include hotels and retail/office buildings up to the Stockton Street tunnel in the background.

Chinatown to North Beach Subway Segment

From the Stockton Street tunnel under Pine and California Streets, the Project Corridor shifts from the densely developed downtown commercial area characterized by multi-story large buildings, to Chinatown, characterized by a colorful shopping and residential streetscape that is heavily congested with pedestrians and vehicles, and food and merchandise displays and bright banners and awnings extending out of the storefronts onto the sidewalks (see Figure 4-9). Most buildings, with the exception of a few taller structures, are two to four stories high, with commercial uses along the street level and residential uses above. Several churches, banks, and schools are located along Stockton Street between Sacramento Street and Broadway and many of the buildings have a historic architectural character of old Chinatown. One public park, called Willie “Woo Woo” Wong Playground (the former Chinese Playground), is located one-half block to the east of Stockton Street between Sacramento and Clay Streets. Views of Pagoda Alley and Hang Ah Alley and the back of the row of buildings fronting Stockton Street (station location under Alternative 2 and 3A) are available from the Playground tennis and volleyball courts (see Figure 4-10).

As described in the previous Section 4.4.3, Historic Architectural Resources, there are architectural similarities shared with a large percentage of Chinatown buildings. Most convey Renaissance or Baroque design influenced by architects whose designs are found around the City.

Views of the two-story building (station location under Alternative 3B) on Stockton and Washington Streets are available from the playground of the Gordon Lau Elementary School to the west of Stockton Street. Distant views looking east of the Bay and the TransAmerica building are available from streets perpendicular to Stockton Street (Clay, Sacramento, and Washington Streets).

FIGURE 4-9

CHINATOWN, STOCKTON STREET AT SACRAMENTO

814-828 STOCKTON STREET LOCATION

Source: PB/Wong

FIGURE 4-10

WILLIE "WOO WOO" WONG PARK PLAYGROUND VIEW

Source: PB/Wong

North Beach Segment (Construction Tunnel Variant Option)

The streetscape from Green Street to Columbus Avenue at Union Street is representative of the historic North Beach neighborhood and is characterized by restaurants and shops. Columbus Avenue is a wide, four-lane thoroughfare and is heavily used by buses, trucks and automobiles. Tables and chairs dot the sidewalks and are used by coffee houses, cafes and restaurants for added table space and are a buzz of activity on most days of the week. Street banners and colorful signage characterize this streetscape. At the end of the Study Area, along Columbus Avenue, between Union and Filbert Streets, is Washington Square (see Figure 4-11). This historic park is lined with mature trees, statues, a children's playground and a pond (southwest corner). This open green-space is regularly used to walk dogs, do Tai Chi in the mornings, sun bathe in the good weather, and is also used for art shows and festivals. The large cathedral of Saints Peter and Paul is the dominant landscape feature at the north side of the park.

FIGURE 4-11

WASHINGTON SQUARE PARK

Source: PB/Wong

4.6 UTILITIES AND ENERGY

4.6.1 UTILITIES

Each Central Subway alternative alignment has extensive underground and above ground utilities serving the residents and businesses adjacent to the alignments. The primary utilities serving the Corridor are:

- City and County of San Francisco Public Utilities Commission (PUC) underground sewer system;
- City and County of San Francisco Water Department (SFWD) potable water lines;
- San Francisco Fire Department (SFFD) auxiliary water supply service (AWSS) lines;
- Pacific Gas and Electric (PG&E) underground natural gas lines;
- PG&E electrical transmission and distribution lines and ductbanks (overhead and underground);
- AT&T underground and overhead telecommunications lines (although AT&T has the most extensive network of underground telecommunications cables, MCI, Sprint, and various other telecom providers also have a limited number of underground cables in the Corridor);
- NRG Energy Center steam lines;
- Municipal Railway (Muni) traction power ductbanks and overhead contact system.

Other utilities in the Study Area include:

- Electrical and communications vaults located along the ductbanks alignment to facilitate the installation of conductors and cables;
- North Point trunk sewer line (96-inch) which runs below Mission Street, crosses under Third Street, and continues to Fourth Street where it turns south to Howard Street and continues west on Howard Street;
- Sewer manholes used for maintaining the sewer mains;
- Water main gate valves and other appurtenances for isolating sections of the main for maintenance;
- Service laterals to adjacent residences and businesses for all utilities.

4.6.2 ENERGY

Transit Traction Power System

More than half of Muni's transit fleet--trolley buses, cable cars, streetcars, and light rail vehicles--use electrical power for operation. The diesel buses are the only mode that uses fossil fuel. Muni's electric fleet operates with power that is generated at the San Francisco Public Utilities Commission (PUC) Hetch Hetchy hydroelectric facility in the Sierra foothills, and is distributed via a long distance transmission system to customers in San Francisco and the Peninsula. Under City agreements, Hetch Hetchy provides power to Muni that is transmitted to the electric fleet through Muni's traction power substations and overhead wire system. The trolley bus and rail modes each have their separate substations and overhead systems. Four new traction power substations and a new overhead wire system were built along the Third Street Corridor as part of the Phase 1 for the T-Third line.

4.7 GEOLOGY AND SEISMICITY

4.7.1 TOPOGRAPHY

The topography of the Study Area is characterized by a series of gently sloping hills with intervening alluvial-filled valleys. The Central Subway alternative alignments start in the flat-lying area south of Brannan Street, near Mission Creek, where the surface elevation is approximately 0 feet San Francisco City Datum (SFCD).[43] The topography of the Study Area gently slopes upward along the alignment reaching a high point ground elevation of approximately 172 feet SFCD at Stockton and California Streets, where it begins to slope downward.[44] The ground surface elevation at Stockton and Washington Streets terminus is approximately 102 feet SFCD and approximately 70 feet on Columbus Avenue, near the terminus of the North Beach Construction Variant. The approximate surface elevations along other portions of the alignment are presented in Table 4-22.

TABLE 4-22

APPROXIMATE SURFACE ELEVATIONS

ALONG CENTRAL SUBWAY ALIGNMENTS

Location	**Approximate Elevation (feet, SFCD)**
Central Subway (Ground Surface Elevations)	
Fourth and Bryant Streets	0
Third and Bryant Streets	7
Kearny and Market Streets	33
Stockton and Geary Streets	49
Stockton and California Streets	172
Stockton and Sacramento Streets	128
Stockton and Washington Streets	102

Notes: SFCD = +8.616 feet National Geodetic Vertical Datum

Sources: USGS, 1973, San Francisco North Quadrangle, 7½-minute series (Topo).
USGS, 1980 San Francisco South Quadrangle, 7½-minute series (Topo).
ICF Kaiser, 1996, Central Subway Alignment, Plan and Profile, October.

4.7.2 GEOLOGY

San Francisco is located in the Coast Range geomorphic province of California. The regional topography is characterized by relatively rugged bedrock hills surrounded by flat, low-lying valleys underlain by

[43] SFCD = +8.616 feet National Geodetic Vertical Datum.
[44] ICF Kaiser. Preliminary Plans and Profile, Central Subway Alignment, Stockton/Third/Fourth Streets. 1 October, 1996.

Quaternary sedimentary deposits or artificial fill. Bedrock in the area consists of the highly deformed Franciscan Formation.[45] The Study Area is underlain by four general types of near-surface geologic material: 1) bedrock, 2) dune sand, 3) artificial fill, and 4) surficial deposits.[46,47]

Along the Central Subway Corridor, the Fourth Street tunnel and surface alignment is located in an area of artificial fill. The Third Street tunnel and surface alignment is located in an area of surficial deposits that extends north from approximately Townsend Street. Dune sand deposits are encountered from approximately Harrison Street to Geary and Sutter Streets. Bedrock is encountered from approximately Geary Street to the northern end of the alignment in the Chinatown area.[48, 49]

Bedrock

Bedrock is present in the Study Area at depths ranging from over 249 feet to outcropping at the surface.[50] The bedrock consists of the Jurassic- to Cretaceous-aged Franciscan Formation. The Franciscan Formation varies in composition, consisting of graywacke sandstones, shales with thin-bedded sandstones, cherts and shales, and intruded serpentine. Exposed bedrock in the Study Area consists of graywacke sandstones in the Nob Hill area.[51] Locally, bedrock has been crushed and sheered through geologic and tectonic processes making their engineering properties variable.[52]

Dune Sand

Over half of the City of San Francisco is underlain by Quaternary-age dune sand. The sands are wind-deposited from sources historically located near Ocean Beach. The sands are fine- to medium-grained, well sorted, and generally yellowish brown in color.[53] Thickness of the sand in the Study Area along Third Street ranges up to 98 feet.[54] In places within the Study Area, the dense sands are overlain by artificial fill. The engineering properties of the sand vary depending on the level of saturation. Saturated dune sand is susceptible to liquefaction; unsaturated, well compacted sand provides moderate to high shear strength, when confined.[55]

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45 Schlocker, J. Geology of the San Francisco North Quadrangle, California, U.S. Geological Survey, Professional Paper, 782. 1974.
46 Ibid.
47 Bonilla, M. Preliminary Geologic Map of the San Francisco South Quadrangle and Part of the Hunters Point Quadrangle, California, U.S. Geological Survey Miscellaneous Field Studies, Map MF-311. 1971.
48 ICF Kaiser. Preliminary Plans and Profile, Central Subway Alignment, Stockton/Third/Fourth Streets. October 1, 1996.
49 Geotechnical Consultants, Inc. Geotechnical Report for MUNI Metro East Facility, LRT Extension, San Francisco, California. 11 August, 1993.
50 Phillips, S.P., S. Hamlin, and E. Yates. Geohydrology, Water Quality, and Estimation of Groundwater Recharge in San Francisco, California, 1987-1992, U.S. Geological Survey Water Resources Investigations, Report 13-4019. 1993.
51 Schlocker, J. Geology of the San Francisco North Quadrangle, California, U.S. Geological Survey, Professional Paper, 782. 1974.
52 Ibid.
53 Ibid.
54 Lee & Praszker. Geotechnical Report, Idealized Subsurface Profiles, San Francisco Museum of Modern Art, San Francisco, California. 14 August, 1990.
55 Schlocker, J. Geology of the San Francisco North Quadrangle, California, U.S. Geological Survey, Professional Paper 782. 1974.

Artificial Fill

Much of the Study Area consists of fill areas where fill materials were deposited on Bay Mud or directly into open waters of the Bay.[56] The practice of creating land by placing fill on tidal flats along the eastern margins of San Francisco began in the 1800s.[57] Fill was placed on mudflats and in estuaries within the South of Market areas of the Central Subway Corridor.

The fill material generally consists of clay to cobble-sized material including dune sand that was excavated during the development of San Francisco and hauled to the waterfront and dumped on top of the Bay Mud or other surface deposits. The fill also includes building demolition rubble (concrete, bricks, and wood) from the 1906 earthquake and fire.[58] Organic and inorganic debris, refuse, and other materials were also deposited in the fill areas.

In many areas, the fill is underlain by a soft, silty clay (Bay Mud). The Bay Mud has a high water content, is plastic, weak, and highly compressible. When overlain by fill, it becomes unstable.[59] Thickness of the Bay Mud reaches to a depth of over 25 feet in the Study Area.[60] Because the fill was largely placed before or around the 1950s, there was little control or engineering of the fill. Therefore, the material is highly variable with respect to compaction and settlement. Where the fill is saturated in low-lying areas, it is also subject to liquefaction during earthquakes. Numerous fill areas within the Study Area experienced differential settlement, ground failure, and surface cracking during the 1989 Loma Prieta earthquake.

Surficial Deposits

The valleys between the bedrock hills of the Study Area are generally filled with unconsolidated surficial deposits consisting of Quaternary age slope debris and ravine fill or alluvial deposits. These deposits have been variously classified by different geologists and are not well differentiated in the Study Area. The slope debris and ravine deposits generally consist of angular rock fragments in a matrix of sand, silt, and clay derived from nearby bedrock hills. Transportation of materials downslope was mostly through colluvial processes such as creep, mud flows, and debris flows. Alluvial deposits were generally associated with historic streams, such as Mission Creek, located just south of the Study Area. These

[56] Ibid.

[57] Goldman, H., Editor. *Geologic and Engineering Aspects of San Francisco Bay Fill*, California Department of Conservation, Division of Mines and Geology, Special Report 97. 1969.

[58] Ibid.

[59] Goldman, H., Editor. Geologic and Engineering Aspects of San Francisco Bay Fill, California Department of Conservation, Division of Mines and Geology, Special Report 97. 1969.

[60] Lee & Praszker. Geotechnical Report, Idealized Subsurface Profiles, San Francisco Museum of Modern Art, San Francisco, California. 14 August, 1990.

undifferentiated deposits can reach up to 100 feet in thickness within the Study Area.[61] The engineering characteristics of these materials is highly variable depending on the nature and origin of the deposits.[62]

4.7.3 SEISMICITY

The City of San Francisco and the Study Area are located in a region of northern California with a high degree of seismic activity.[63] There are no known active faults that traverse the Study Area; however, several nearby active faults could affect the area. Significant regional faults that could serve as sources of seismic activity include the San Andreas Fault, located approximately 8 miles west of Downtown; the Hayward Fault, located in the East Bay approximately 9 miles east of Downtown; the Calaveras Fault, located approximately 25 miles east of Downtown; the Rodgers Creek Fault, located approximately 25 miles northwest of Downtown and the San Gregorio Fault, located approximately 14 miles west of Downtown.

Active faults in the Bay Area are presented in Table 4-23**.** Inactive faults within the City of San Francisco are unlikely to generate earthquakes, but numerous other active faults in northern California can generate earthquakes. Earthquakes generated from active faults can generate significant seismic hazards within the Study Area. This was evidenced in the 1989 Loma Prieta Earthquake, where the epicenter was located over 62 miles from San Francisco.

The measure of an earthquake's magnitude (M) is reported in moment magnitude (M_w); a measurement of the energy released by the earthquake. Moment magnitude is calculated based on the length and width (area) along the fault plane that experienced movement. It has commonly replaced the familiar Richter (or "local") magnitude (M_L) due, in part, to the difficulty in differentiating the size of large (larger than M_L 7-1/2) magnitude earthquakes.[64]

The California Department of Conservation, Division of Mines and Geology (CDMG) has developed estimates for parameters related to future activity for major faults in California based on length, width, and slip rate. Using these parameters, maximum moment magnitudes (M_{max}) have been developed for

[61] Schlocker, J. Geology of the San Francisco North Quadrangle, California, U.S. Geological Survey, Professional Paper 782. 1974
[62] Ibid.
[63] Perkins, J. and J. Boatwright. *The San Francisco Bay Area - On Shaky Ground*, Association of Bay Area Governments. April, 1995.
[64] Ibid.

TABLE 4-23

MAJOR SAN FRANCISCO BAY AREA

EARTHQUAKE FAULTS AND THEIR MAXIMUM MOMENT MAGNITUDE

Fault Name	Length (miles)	Slip Rate (mm/year)	Maximum Magnitude (M_{max})	Return Interval (years)	Nearest Distance from Downtown San Francisco (miles)
San Andreas-Peninsula Segment	55	17±3	7.1	400	8
San Andreas-North Coast Segment	200	24±3	7.6	NA	17
San Andreas-Santa Cruz Segment	23	14±3	7.0	400	48
Northern Hayward	27	9±1	6.9	167	9
Southern Hayward	27	9±1	6.5	167	15
Entire Hayward	53	9±1	7.1	167	9
San Gregorio	80	5±2	7.3	400	14
Northern Calaveras	32	6±2	6.8	146	25
Rogers Creek	39	9±2	7.0	222	25
Concord-Green Valley	40	6±3	6.9	176	24

Notes: mm = millimeters.
Slip rate based on historic earthquake records and geologic evidence.
M_{max} = Maximum moment magnitude.
Return interval calculated using slip rate in relation to the displacement occurring during the M_{max} earthquake.
NA = Not calculated by CDMG.

Sources: California Department of Conservation, Division of Mines and Geology, 1996, *California Fault Parameters, San Francisco Bay Area Faults*.
Wells, D.L. and Coppersmith, K.J., 1994, New empirical relationships among magnitude, rupture length, rupture width, rupture area, and surface displacement. *Seismological Society of America Bulletin*, v. 84, no. 4, pp. 974-1002.

each segment of major faults.[65, 66] The slip rate of a fault is estimated based on historic earthquake records and geologic evidence. Although earthquakes cannot be predicted, return intervals are calculated using the slip rate in relation to the displacement occurring during the M_{max} earthquake.[67] Major faults proximate to the Study Area, their M_{max}, return interval, and distance from Downtown San Francisco are presented in Table 4-23. The Working Group on California Earthquake Probabilities has estimated that there is a 62 percent probability that one or more major, damaging earthquakes (M_L 6.7 or greater) will occur in the San Francisco Bay Region during the 30-year period between 2002 and 2031.[68]

The Bay Area faults with the greatest slip rates include the San Andreas Fault, Hayward/Rodgers Creek Fault, Calaveras Fault, and San Gregorio Fault. Each of these faults have displayed evidence of historic earthquake activity and have potential to generate large-magnitude earthquakes. The 1989 Loma Prieta Earthquake had a M_w of 6.9; while the 1906 San Francisco Earthquake is estimated to have had a M_w of approximately 7.9.[69]

The design parameters to be used for construction under the 1994 Uniform Building Code (UBC) Section 1629A.2.6 require the determination of a Design-Basis Earthquake (DBE) for each specific project location.[70] The DBE is defined as the seismic event that has a 10 percent chance of exceedance in 50 years.[71] It is specific to a project location and is based on the M_{max} of earthquakes for all faults located within reasonable distance of the project and the seismic characteristics of the geologic material underlying the project. The DBE calculation results in the determination of a specific set of ground motion values (measured by a strong motion seismograph as the acceleration of gravity) for a project site.

The ground motion values for the Study Area will vary along the alignment. Ground motion values must be carefully developed for the Study Area to determine appropriate DBE parameters. The DBE parameters for this Project will require evaluation using the International Building Code (IBC) 2003 standards which vary from the 1994 UBC standards and will be established during Project design.[72, 73]

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65 California Department of Conservation, Division of Mines and Geology. California Fault Parameters, San Andreas Fault Zone. 1996.
66 California Department of Conservation, Division of Mines and Geology. California Fault Parameters, San Francisco Bay Area Faults. 1996.
67 Peterson, M. California Department of Conservation, Division of Mines and Geology. Personal communication with Baseline Environmental Consulting. 22 November, 1996.
68 U.S. Geological Survey. Working Group on California Earthquake Probabilities. Probabilities of Large Earthquakes in the San Francisco Bay Region: 2002-2031, California,, Open File Report 03-214. 2003.
69 Bray, J. and Kelson, K. Observations of Surface Fault Rupture from the 1906 Earthquake in the Context of Current Practice, Earthquake Spectra, Special Issue II, Vol. 22. April 2006.
70 Uniform Building Code. International Conference of Building Officials. 1994
71 Ibid.
72 Ibid.
73 Sydnor, R. California Department of Conservation, Division of Mines and Geology. Personal communications with Baseline Environmental Consulting. 21 November, 1996.

Groundshaking

The occurrence of an earthquake produces seismic waves that emanate in all directions from the origin of the earthquake, or epicenter. The seismic waves cause groundshaking, which is typically strongest at the epicenter and diminishes (attenuates) as the waves move through the earth away from the source of the quake. The severity of groundshaking at any particular point is referred to as "intensity" and is a subjective measure of the effects of groundshaking on people, structures, and earth materials.[74] The effects of groundshaking on structures depends on the design, quality of construction, and foundation materials. A critical factor affecting intensity at a site is the geologic material underneath that site. Deep, loose soils tend to amplify and prolong the shaking; soft clay and silty clay amplify the most. Igneous rock amplifies ground shaking the least.[75]

During an earthquake, portions of the Study Area are subject to higher groundshaking risks than others. Where the underlying geologic material consists of unconsolidated sediments, artificial fills, and Bay Mud, groundshaking during an earthquake can be amplified, resulting in greater damage to structures.[76] The ABAG has mapped and classified San Francisco according to groundshaking amplification. The Study Area is located within areas classified from "Extremely High" shaking amplification, the highest risk classification, to "Low" shaking amplification.[77] The areas of high amplification are those where the underlying geologic materials consist of artificial fill, dune sand, and surficial (alluvial/colluvial) sediments. Higher risk areas are typically underlain by Bay Mud, as present in the South of Market area. The areas of lower amplification are those underlain by bedrock in the Nob Hill area.

Liquefaction

A secondary effect of amplified ground shaking in unconsolidated (cohesionless) sediments, such as silts and sands, is liquefaction. Liquefaction occurs when saturated, cohesionless soils become "liquid" due to groundshaking.[78] When a soil liquefies, it loses its load-bearing strength. Liquefaction can result in a drop in the ground surface or cause buckling, rippling, and cracking of the ground surface. This can result in roads, rail lines, or buildings being displaced or severed. Liquefaction resulted in differential

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[74] Perkins, J. and J. Boatwright. *The San Francisco Bay Area - On Shaky Ground,* Association of Bay Area Governments. April, 1995.
[75] Ibid.
[76] Ibid.
[77] Association of Bay Area Governments. On Shaky Ground City Maps, City of San Francisco. October, 1995.
[78] Liquefaction is the rapid transformation of loose, saturated sand or soil to a fluid-like state due to groundshaking during an earthquake. The loss of pore pressure in the material causes it to lose its shear strength resulting in soil losing its bearing capacity and spreading laterally or vertically.

settlement, sand boils, and lateral spreading within the Study Area during the 1989 Loma Prieta Earthquake. Geologic profiles of the Study Area for each alternative are shown in Section 5.7 of the SEIS/SEIR.

4.8 HYDROLOGY AND WATER QUALITY

4.8.1 REGULATORY FRAMEWORK

The U.S. Environmental Protection Agency (EPA) is responsible for enforcing the federal Clean Water Act of 1972 (amended in 1987). The Clean Water Act (CWA) established the National Pollution Discharge Elimination System (NPDES) program to regulate municipal and industrial wastewater discharges. The CWA provides that the discharge of pollutants to waters of the United States from any point source is unlawful, unless the discharge is in compliance with an NPDES permit.

In 1990, the EPA published final regulations that establish storm water permit application requirements for specific categories of industries. The regulations require that discharges of storm water associated with construction activities from soil disturbances of five acres or more must be regulated as an industrial activity and covered by an NPDES permit. On December 8, 1999, the EPA finalized regulations (Phase II Rule) which expand the existing NPDES program to address storm water discharges from construction sites that disturb land equal to or greater than one (1) acre and less than five (5) acres (small construction activity).[79] In California, the EPA has delegated responsibility for the program to the state Water Resources Control Board (WRCB) and the California Regional Water Quality Control Boards (RWQCB).

The WRCB has adopted general NPDES permit requirements for owners of land where construction activities occur. These requirements include: 1) elimination or reduction of non-storm water discharges to the storm sewer system, 2) development and implementation of a Storm Water Pollution Prevention Plan (SWPPP), and 3) inspections of storm water pollution prevention measures. The RWQCB is responsible for adopting, monitoring, and enforcing compliance with the NPDES permit requirements and Waste Discharge Requirements for point and non-point sources.

San Francisco's combined storm and sanitary sewer system collects storm water and sewage and conveys the combined flows to wastewater treatment facilities; therefore, construction operations that drain to the sewer system are not required to comply with the general permit requirements for non-point source discharges or preparation of SWPPPs.[80] However, under San Francisco Ordinance 19-92, Sections 118 and 123, discharges of materials, including soil, sand, or gravel that can obstruct the sewers are prohibited.[81] Best Management Practices (BMPs) must be implemented at construction sites to ensure that unauthorized discharges do not occur. During construction activities for the Project, BMPs for non-point source discharge control will be required.

[79] National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated With Construction Activity (General Permit) Water Quality Order 99-08-DWQ.

[80] Lee, T. Section Engineer, San Francisco Department of Public Works, Bureau of Environmental Regulation and Management, personal communication with BASELINE, 25 November, 1996.

[81] Ibid.

The groundwater underlying the Study Area and the surface waters of San Francisco Bay constitute the receiving waters, which could be affected by implementation of the Central Subway Alternatives. The Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) was first adopted by the RWQCB in 1975, and amended most recently in 2005, to implement state and federal laws requiring the preservation and enhancement of water quality.[82] The Basin Plan identifies the beneficial uses of and water quality objectives for water resources within distinct subregions of the San Francisco Bay Region. The Study Area is within the Central Bay subregion, an inland surface water resource. Current beneficial uses include industrial process and industrial service water. Potential beneficial uses include municipal and agricultural water.

The Basin Plan also defines water quality objectives for surface and subsurface waters within the San Francisco Bay Basin. The water quality objectives specifically identify recommended contaminant concentrations for the protection of human health and aquatic life for the groundwater and the saline marine surface waters of the Bay. The groundwater in the low-lying portions of the Study Area is brackish and is not typically used as a water supply source.[83]

During times of normal (dry and wet) weather, combined flows to the sewer system are treated prior to discharge to surface waters. In some wet weather events, the Southeast and North Point treatment plants cannot accommodate all of the combined storm drain/sewer system flows, resulting in partially treated discharges to the Bay. The points of discharge for wet weather overflows in the Study Area are located along the eastern waterfront.[84,85]

Direct discharge of partially treated wastewater is allowed by the RWQCB under the Wet Weather Overflow Control Strategy under an NPDES permit issued by the RWQCB.[86] The rationale for allowing the discharges recognizes that adverse impacts of the discharges on the beneficial uses of the Bay are minimal compared to the cost of eliminating wet weather overflows.

Protection of groundwater quality in the Study Area is also the responsibility of the RWQCB through authority under the Porter Cologne Water Quality Control Act of 1969. Although the Study Area is not located within an area identified as a major groundwater basin and groundwater is not used as a municipal

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82 California Regional Water Quality Control Board, San Francisco Bay Region. Water Quality Control Plan, San Francisco Bay Basin (Region 2), Amended November 2005.

83 Ibid.

84 Loiacono, J. Section Manager, Environmental Engineering, San Francisco Department of Public Works, Southeast Water Pollution Control Plant. Personal communication with BASELINE, 20 November, 1996.

85 San Francisco Planning Department, *San Francisco Waterfront Land Use Plan, Final Environmental Impact Report*. January 8, 1997.

86 California Regional Water Quality Control Board. NPDES Permit No. CA0037664, Waste Discharge Requirements for City and County of San Francisco, Southeast Water Pollution Control Plant, North Point Wet Weather Facility and Bayside Wet Weather Facilities. June 2002.

or domestic water supply, the RWQCB enforces the provisions of the State statutes, which protect groundwater resources.

The San Francisco Department of Public Health (DPH) implements the state underground storage tank regulations (California Code of Regulations Title 23) within the Study Area. These regulations include the requirements for groundwater investigations in the case of fuel releases.

The San Francisco Public Utilities Commission (SFPUC) regulates the discharge and potential discharge of industrial wastewater, including dewatering effluent, to the combined sewer system under the San Francisco Public Works Code - Industrial Waste Ordinance and Department of Public Works Order No. 158170, which cites local discharge limits. Discharges resulting from dewatering of construction sites, wells drilled to investigate or mitigate a suspect contaminated site, or any other activities which generate wastewater other than from routine commercial/industrial processes, must comply with the Requirements for Batch Wastewater Discharges issued by the BERM.[87] The requirements specify analytical approaches and discharge limits for organic and inorganic constituents in discharges. Applications for permits to perform batch wastewater discharges must be submitted to BERM for approval. In areas along the alignment where groundwater dewatering will be necessary (for example, tunnels and underground stations), permits to perform batch wastewater discharges will be required.

4.8.2 SURFACE WATER

The climate of the Study Area is characterized by near-shore Mediterranean conditions. The mean annual temperature in San Francisco is 58° Fahrenheit. Rainfall is variable throughout San Francisco and generally increases with elevation west of the Study Area. The range of average annual rainfall within the Study Area is about 20 inches per year.[88] More than 90 percent of the rainfall occurs between November and April.[89]

Runoff from paved urbanized areas, such as the Study Area, is recognized as a principle non-point source of pollutants contributing to water quality degradation. The pollutants typically carried by urban runoff

[87] City and County of San Francisco, Public Utilities Commission, Bureau of Environmental Regulation and Management. Requirements for Batch Wastewater Discharges. 11 April, 1994.
[88] Rantz, S.E. Mean Annual Precipitation Depth Frequency Data for the San Francisco Bay Region, California, U.S. Geological Survey, Open File Report 3019-21, 1971
[89] Ibid.

include suspended sediments, heavy metals, and petroleum (particularly oil and grease components). Roadway use contributes significantly to the generation of contaminants in urban runoff. Tire and pavement wear, vehicle rust, mud, dust, and car exhaust produce solid particles on roadways. Petroleum products leaking or spilled from vehicles and emitted with exhaust also accumulate on roadway surfaces. Heavy metals are contributed through exhaust, corrosion or wear of metallic vehicle components, roadway structures, and tires. These contaminants build up on the paved areas and are entrained in runoff during rainstorms.

Surface runoff throughout most of the Study Area is collected into the City's combined storm and sanitary sewer system. The combined sewer system carries both sanitary sewage (municipal and industrial wastewater) and, during rainy weather, rainfall runoff from streets, sidewalks, and building roofs. Streams or surface drainage systems are not located in the Study Area.

There are no perennial surface waters in the Study Area. During times of dry weather, surface water flows from the Study Area are routed to the Southeast Water Pollution Control Plant located on Jerrold Avenue and Phelps Street, where they are treated and discharged to San Francisco Bay. During rainy weather, the North Point Water Pollution Control Plant, located on Bay Street and The Embarcadero, is operational for the flows from the northern part of the Study Area; the Southeast Plant also processes wet weather flows.[90] During major storms, the storage capacities of the combined sewers and the treatment plants are exceeded and combined flows of sewage and storm water overflow into the Bay through overflow points along the bayside waterfront. There are a total of 28 overflow points along the bayside waterfront including Mission Creek.[91,92]

4.8.3 FLOODING/TSUNAMIS

San Francisco does not participate in the Federal Emergency Management Agency's floodplain identification program and no flood plains have been identified within San Francisco.[93] The Study Area elevations range from approximately 0 feet San Francisco City Datum (SFCD) at the southern end of the Central Subway Corridor at King and Fourth Streets, to a high point of approximately 172 feet SFCD along Stockton Street between Pine and California Streets. At the north end of the Corridor along Columbus Avenue, the elevation is approximately 70 feet SFCD.[94]

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[90] Loiacono, J. Section Manager, Environmental Engineering, San Francisco Department of Public Works, Southeast Water Pollution Control Plant. Personal communication with BASELINE, 20 November, 1996.

[91] Ibid.

[92] California Regional Water Quality Control Board. Order No. 95-039, NPDES Permit No. CA0038610, Waste Discharge Requirements for City and County of San Francisco, Bayside Wet Weather Facilities, 15 February, 1995.

[93] Federal Emergency Management Agency. National Flood Insurance Program, Community Status Book, January, 1997.

[94] San Francisco Enterprise GIS, Elevation Contours Data Set developed from Digital Elevation Model used for 2001 orthophotography. San Francisco City Datum is equal to +8.616 feet National Geodetic Vertical Datum (NGVD).

The 100-year high tide (the height that is equaled or exceeded with an average frequency of once every 100 years) would reach an elevation of approximately -2.0 feet SFCD.[95] Inundation of the Study Area from a 100-year high tide would not be expected.

The projected sea level rise in the San Francisco Bay has historically been estimated to be approximately 1.25 feet in the next 100 years.[96] However in the last 50 years, the rise in sea-level has increased by 0.023 inches/year, nearly double the previous rate.[97] By 2100, using these modified rates, future sea-level rise due to the greenhouse effect can be projected to range from 20 inches to over 120 inches.[98] An increase of 5 feet to the 100-year high tide (currently -0.7 feet SFCD) would result in an elevation of about +4.3 feet SFCD.

Portions of the Study Area are located near the landward edge of an area designated as possibly being inundated by tsunami waves generated by earthquakes.[99] The potential tsunamis considered for the hazard evaluation would be similar to the wave produced by the 1964 tsunami from the Alaska earthquake which generated a wave run-up (height of wave above water level at the time of the event) of 7.40 feet at the Golden Gate.[100] The narrow mouth of the Golden Gate limits the extent of tsunami incursion into the Bay; the run-up attenuates with distance from the Golden Gate. The estimated run-up from a tsunami with 100-year return period (i.e., expected to occur once every 100 years, on average) range from 5.6 feet near the Ferry Building to 4.9 feet near China Basin.

4.8.4 GROUNDWATER

The Study Area for the Central Subway alignment alternatives is underlain by the Downtown Basin as defined by the U.S. Geological Survey.[101] The groundwater basin is separated by hills (bedrock outcrops) along the eastern portion of San Francisco and occupies the intervening valleys.

Depths to groundwater in the Study Area are highly variable due to geologic and geographic conditions. Groundwater occurs at depths along the Central Subway Corridor ranging from approximately 40 feet below ground surface near Stockton and Washington Streets to 10 feet below ground surface near Fourth

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95 Mission Bay Plan FEIR, Volume 2, page VI.L.9 and Volume 4, page XV.J.4

96 Titus, J., and V. Narayanan. The Probability of Sea Level Rise, U.S. Environmental Protection Agency, EPA 230-R-95-008. October, 1995.

97 Gornitz, V. and L. Lebedeff. “Global Sea-Level Changes During the Past Century” published in Sea-Level Change and Coastal Evolution, SEPM Publication, No. 41, p. 3-16. 1987.

98 Gleick, P. and E. Maurer. Assessing the Costs of Adapting to Sea Level Rise, A Case Study of san Francisco Bay, Pacific Institute for Studies in Development, Environemnt and Security. February, 2004.

99 Ritter, J.R. and W.R. Dupre. Map showing potential inundation by tsunami in the San Francisco Bay Region, California. U.S. Geological Survey Miscellaneous Field Studies Map MF-480. 1972

100 Garcia, A.W., and J.R. Houston. Type 16 Flood Insurance Study: Tsunami Predictions for Monterey and San Francisco Bays and Puget Sound, Final Report, prepared for the Federal Insurance Administration, Department of Housing and Urban Development, Technical Report H-75-17. November, 1975.

101 Phillips, S.P., S. Hamlin, and E. Yates. Geohydrology, Water Quality, and Estimation of Groundwater Recharge in San Francisco, California, 1987-1992, U.S. Geological Survey Water Resources Investigations, Report 13-4019. 1993.

and Harrison Streets.[102] At Market Street, where the Central Subway tunnel would cross over or under the existing BART/Muni Metro tunnels, the groundwater table was last measured in 2005 to be approximately 25 feet below the surface. Given the depth of the Powell Street Station, sump pumps are required to continuously pump water from the station at the rate of 100,000 to 500,000 gallons a day.

Within the Downtown Basin, the groundwater generally flows east toward the Bay. Groundwater flows from areas of high head to areas of relatively lower head. Therefore, the groundwater flows in the basins would be expected to be from the uplands and hills (recharge areas) toward lowlands and valleys (discharge areas).

This pattern can vary locally due to unusual subsurface conditions, such as heterogeneous geology, steep slopes, and undulating bedrock topography. Human activities such as groundwater pumping or injection can also affect the local groundwater flow direction.[103]

The dominant source of groundwater recharge in the Downtown Basin is leakage from the sewer and water delivery pipes, which form a dense network in the Downtown area. Due to the relatively high water table in the Downtown Basin, dewatering operations are required for building foundations, underground structures (such as BART/Muni Metro stations), and construction sites. This dewatering constitutes the primary source of discharge from the aquifer. Most of the pumped groundwater is discharged directly to the City storm sewer system.

The only known uses of groundwater in the Downtown Basin are limited non-potable uses such as fountains and HVAC systems. Potential future uses of groundwater in the Downtown Basin would also be limited to non-potable uses, because the basin contains high levels of groundwater pollutions and meets the exemption criteria of the State Water Resources Control Board (SWRCB) Sources of Drinking Water Policy.[104] Since the Downtown Basin is almost entirely covered with impermeable surfaces, leaking sewer lines provide the majority of the groundwater recharge. In addition, historic industrial development and placement of artificial fill have contributed to the degradation of groundwater quality.

[102] Lee & Praszker. Geotechnical Report, Idealized Subsurface Profiles, San Francisco Museum of Modern Art, San Francisco, California. 14 August, 1990.
[103] San Francisco Public Utilities Commission. San Francisco Groundwater Master Plan. 1997
[104] San Francisco Bay Regional Water Quality Control Board. Update on the Status of the Groundwater Basin Plan Amendments (August 2004) available at: http://www.swrcb.ca.gov/rwqcb2//basin_plan_ammend.htm.

4.9 BIOLOGICAL AND WETLAND RESOURCES

4.9.1 SPECIAL-STATUS SPECIES

Special-status species are plants and animals that are legally protected under the state and/or federal Endangered Species Acts or other regulations, as well as other species that are considered rare enough by the scientific community and trustee agencies to warrant special consideration, particularly with regard to protection of isolated populations, nesting or denning locations, communal roosts, and other essential habitat.[105] Special-status species include:

- Listed (rare, threatened, or endangered) and candidate species for listing by the California Department of Fish and Game (CDFG);
- Listed (threatened or endangered) and candidate species for listing by the US Fish and Wildlife Service (USFWS);
- Species considered to be rare or endangered under the conditions of Section 15380 of the CEQA Guidelines, such as those identified on lists 1A, 1B, and 2 in the Inventory of Rare and Endangered Vascular Plants of California by the California Native Plant Society (CNPS);
- Other species that are possibly considered sensitive or of special concern due to to limited distribution or lack of adequate information to permit listing or rejection for state or federal status, such as those included on lists 3 and 4 in the CNPS Inventory or identified as animal "Species of Special Concern" by the CDFG. Species of Special Concern have no legal protective status under the state Endangered Species Act, but are of concern to the CDFG because of severe decline in breeding populations in California.

Based on occurrence information from the California Natural Diversity Data Basse (CNDDB), there are no special status biological resources in the Central Subway Study Area. The nearest occurrence record in the CNDDB is a overwintering site for monarch butterfly at Telegraph Hill, approximately ¼ mile northeast of Washington Square at Columbus Avenue and Union Street.

4.9.2 WETLANDS

Although definitions used by jurisdictional agencies vary to some degree, wetlands are generally considered to be areas that are periodically or permanently inundated by surface or groundwater, and support vegetation adapted to life in saturated soil. Wetlands are recognized as important features on a

[105] The federal Endangered Species Act (FESA) of 1973 declares that all federal departments and agencies shall use their authority to conserve endangered and threatened plant and animal taxa. The California Endangered Species Act (CESA) of 1984 parallels the policies of FESA and pertains to native California taxa.

regional and national level due to their high inherent value to fish and wildlife, use as storage areas for storm and flood waters, and water recharge, filtration, and purification functions. Technical standards for delineating wetlands have been developed by the US Army Corps of Engineers (Corps) and the USFWS, which generally define wetlands through consideration of three criteria: hydrology, soils, and vegetation. The Corps and CDFG have jurisdiction over modifications to stream channels, river banks, lakes, and other wetland features.[106]

A wetland assessment was conducted during the field reconnaissance surveys for the Third Street Light Rail project in July 1997. Vegetative cover was used as the primary indicator of potential wetland habitat during the survey effort. Due to the extent of development and past filling, jurisdictional wetlands and other water in the Study Area are not present. The only wetlands identified during the 1998 EIS/EIR study for the Third Street Light Rail project were in the Mission Creek and Islais Creek channels. There are no wetlands in the Central Subway Study Area.

[106] Jurisdiction of the Corps is established through the provisions of §404 of the Clean Water Act, which prohibits the discharge of dredged or fill material into "waters," including wetlands and unvegetated "other waters," of the United States without a permit. All three of the identified technical criteria must be met for an area to be identified as a wetland under Corps jurisdiction, unless the area has been modified by human activity.

4.10 HAZARDOUS MATERIALS

This section describes hazardous materials that could be encountered in the Study Area.[107] This section also includes a description of the general regulatory framework for hazardous materials management and the nature and extent of hazardous materials known to be, or potentially, present in subsurface soil and groundwater within the Study Area.

This section summarizes information from detailed technical reports describing known soil and groundwater contamination and past and current land uses in the Study Area that may have affected or could potentially affect the quality of soil and groundwater.[108,109,110,111,112] Existing reports and regulatory databases were reviewed to determine known areas of contamination and areas suspected of containing hazardous materials throughout the Study Area. Previous reports, including site investigation reports, leaking underground storage tank site files, and EIS/EIR documents prepared for projects in the Study Area, were reviewed and independent regulatory records database searches, which included federal, state, and local data bases, were also conducted. A Phase II Hazardous Materials Investigation (HMI) was conducted in 2005 to screen for the presence of contaminants of concern that could affect (1) the health and safety of construction workers and the public and (2) the handling and disposal of excavated materials and groundwater encountered during construction of the project.

4.10.1 REGULATORY FRAMEWORK

Hazardous materials and hazardous wastes are controlled by federal, state, regional and local regulations, with the objective of protecting the public health and environment. In general, these regulations provide definitions of hazardous substances; establish reporting requirements; set guidelines for handling, storage, transport, remediation, and disposal of hazardous wastes; and require health and safety provisions for both workers and the public. Sites that comply with hazards regulations are identified on periodically-updated lists at the federal, state, and local levels.

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[107] Hazardous materials are defined as any material that, because of its quantity, concentration, or physical chemical characteristics, poses a significant present or potential hazard to human health and safety, or to the environment if released into the workplace. Hazardous materials include, but are not limited to, hazardous substances, hazardous waste, radioactive materials, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment (HSC 25501).

[108] No. 96.218E, Hazardous Materials Technical Report by Baseline Environmental Consulting, June, 1997

[109] Phase I Environmental Site Assessment and Site History Report, Central Subway Alignment, San Francisco, California, Revision 1, December 18, 2003.

[110] Addendum to Phase I Environmental Site Assessment and Site History Report, Task 1.02-03, Hazardous Material Investigations, Revision 0, April 1, 2005.

[111] Phase II Hazardous Materials Investigation Report, for the Fourth/Stockton Alignment, Task 1.02-03, Hazardous Material Investigations, Revision 0, May 18, 2006.

[112] Addendum No. 2 to Phase I Environmental Site Assessment and Site History Report, Task 1.02-03, Hazardous Material Investigations, Revision 0b, February 9, 2007.

Agencies enforcing these regulations in San Francisco include: the U.S. Environmental Protection Agency (federal); the Department of Toxic Substance Control, California Environmental Protection Agency (state); the California Regional Water Quality Control Board (state); the Bay Area Air Quality Management District (regional); the San Francisco Department of Public Health, Bureau of Toxics, Health and Safety Services (local); and the San Francisco Fire Department (local). A brief overview of the applicable hazardous materials regulatory requirements is presented below.

A portion of the Study Area is located in areas formerly bayward of the 1851 high tide line. Areas of the City located bayward of the 1851 high tide line are subject to the requirements of Article 20 (also known as the Maher Ordinance) of the San Francisco Municipal Code. Article 20 requires that, if development is proposed bayward of the 1851 high tide line, and more than 50 cubic yards of soils are excavated, the following actions must be undertaken:

- Preparation of a site history report;
- Collection of soil samples in accordance with an approved work plan;
- Preparation of a soils analysis report; and
- Preparation of a site mitigation report.

Article 20 is administered by San Francisco Department of Public Health (DPH). DPH reviews and approves all site history reports, sampling work plans, soil analyses reports, and site mitigation reports. The site mitigation reports delineate remedies to be undertaken during project construction and operation to protect the public and the environment. DPH coordinates the Article 20 documentation and mitigation with the State Department of Toxic Substances Control (DTSC) and the Regional Water Quality Control Board (RWQCB).

Discovery of hazardous substances in the subsurface, in areas not subject to the requirements of Article 20, could also result in investigation oversight by regulatory agencies. Such oversight could be from DPH, DTSC, and/or RWQCB. DPH may provide remedial action oversight for the cleanup of waste releases provided that the requisite technical expertise and capabilities are available to supervise the action. DPH would be required to notify the DTSC and the RWQCB prior to the commencement of oversight.[113]

[113] Applicability and implementation of remedial action oversight must comply with the requirements in the Health and Safety Code, Section 512.

The majority of federal hazardous materials regulations has been incorporated into California's hazardous materials regulations. California's hazardous materials statutes and regulations are contained in the California Health and Safety Code (HSC) Section 25130 et seq. and Title 22 of the California Code of Regulations (CCR). Title 22 CCR is administered by the DTSC.

4.10.2 WASTE CLASSIFICATION AND MANAGEMENT

According to Title 22 CCR Section 66261, a waste is considered hazardous if it exhibits at least one of four specified characteristics (ignitability, corrosivity, reactivity, or toxicity) or if it is a "listed waste" (i.e., the waste is generated from a specific process). A waste can be present in a liquid, semi-solid, solid, or gaseous form.

Waste types generated from public transit construction projects include pavement and roadbed debris, soils, and wastewater. Pavement and roadbed debris is not a "listed waste" and generally does not exhibit hazardous characteristics. Waste soils are also not a "listed waste" and generally are not ignitable, corrosive, or reactive. Excavated soils could be hazardous by exhibiting the toxicity characteristic. Excavated soils would constitute a hazardous waste based on toxicity characteristics, if representative samples collected from the soils contain concentrations of contaminants listed in Title 22 CCR Section 66261 at levels exceeding the specified limit, which would define the waste as either a Federal hazardous waste (RCRA Waste) or a California hazardous waste.

Waste containing friable, finely divided, and powdered asbestos at levels equal to or greater than one percent asbestos is defined as a California hazardous waste. A friable waste is one that can be reduced to a powder or dust under hand pressure when dry. Non-friable asbestos-containing waste would not be considered hazardous.

California regulations require that hazardous waste be managed according to applicable regulations, which include: worker operational safety procedures as identified in Title 8 CCR; handling and storage and exposure requirements; transportation and disposal requirements under a uniform hazardous waste manifest; and documentation procedures. In California, waste disposal facilities have been classified into three categories, Class I, Class II, and Class III. A Class I disposal facility may accept federal and California hazardous waste. Class II and III facilities are only permitted to accept non-hazardous waste at facility-specific acceptance threshold levels established by the RWQCB, the permitting agency.

In San Francisco, water generated from dewatering of construction sites is commonly discharged to the City's combined storm drain/sewer system. Discharges must be managed in accordance with the San Francisco Department of Public Works Batch Wastewater Discharge (BWWD) requirements. Discharges to the combined storm drain/sewer system must comply with established threshold levels for chemical and physical parameters.

4.10.3 HEALTH AND SAFETY

Exposure to hazardous materials (or soils containing hazardous materials) could adversely affect construction workers and the public. Exposure routes include inhalation, absorption through exposed skin area, and ingestion. Federal and state regulations were developed to address worker exposure to safety and health hazards; these regulations are contained in 29 CFR on the federal level and in Title 8 CCR in California. The Occupational Safety and Health Administration (OSHA) and California OSHA (CalOSHA) are the primary agencies responsible for enforcing these federal and state regulations.

4.10.4 POTENTIAL AND KNOWN SOIL AND GROUNDWATER CONTAMINATION ON SITES ALONG LIGHT CENTRAL SUBWAY ALIGNMENT

The Study Area constitutes an urban area with a history of commercial, industrial, and residential land uses dating back to before the turn of the century. Urban areas with these types of historic land uses generally have various types of contaminants in the subsurface from disposal, storage, or spillage of hazardous materials.

This section identifies known subsurface soil and groundwater quality conditions within each segment of the Corridor. These available soil and groundwater quality data may be used to provide a general assessment of subsurface conditions. The available sampling points are not uniformly distributed throughout the area and the number of sampling points is insufficient to provide a comprehensive characterization of the soils and groundwater quality of the Study Area. Soil and groundwater sampling activities were not completed specifically for this project, but were undertaken by individual property owners in response to various regulatory requirements. However, the available data can be used as an indicator of possible contamination that could be encountered in the Study Area.

In general, the primary contaminants of concern identified in the soils within the Study Area include metals, volatile organic compounds (VOCs), and total petroleum hydrocarbons (TPH). Several samples contained metals and VOCs at concentrations greater than the regulatory limit threshold concentrations. Soils containing serpentine fragments and asbestos were also identified in portions of the Study Area. A summary of the analytical results is included in the technical reports referenced previously.

The primary contaminants identified in groundwater within the Study Area generally consist of metals (nickel and mercury), benzene, trichloroethylene (TCE), tetrachloroethylene (PCE), and oil and grease;

these contaminants were identified in the groundwater samples at levels greater than the BWWD requirements established by San Francisco Department of Public Works.

There may be sources of contaminants from historic or current land uses or artificial fill in areas that have not been subject to subsurface investigations. Land uses that could potentially affect the quality of underlying soil and groundwater include spillage or releases of hazardous materials; the land uses of special concern are those associated with industrial activities. Typical contaminants that could be expected to be associated with industrial land uses are summarized in the detailed technical reports.

A portion of the Study Area is also within the boundary of Article 20; that area has been filled, since the turn of the century, with materials of various origins. The quality of the fill is largely unknown, but generally has been found to contain hazardous substances that could affect construction workers and render the soil a hazardous waste, if excavated. The fill areas generally coincide with the Article 20 boundary, which is shown as the 1851 High Tide Line on Figure 4-12.

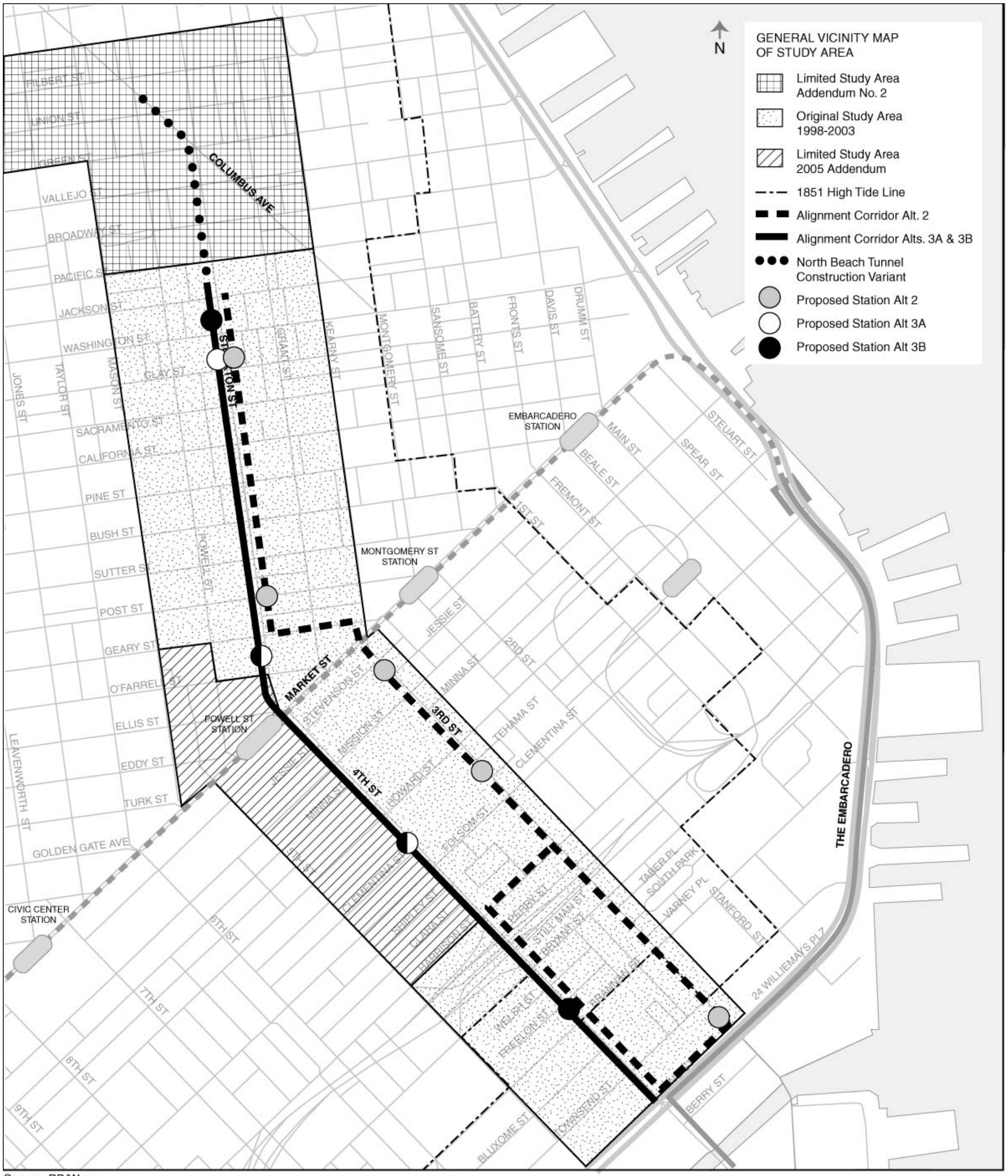
Historic and current land uses in the Study Area include residential, commercial, and industrial land uses. The land uses and known contamination are summarized from the detailed technical reports. The technical studies previously referenced include tables which summarize the results of the regulatory file reviews, available chemical analytical data, and locations of underground storage tanks. See Appendix G for maps depicting the sites of potential hazardous materials.

Central Subway Corridor - King Street to Chinatown

Past land uses along the Central Subway Corridor included a combination of residential, commercial, and industrial uses. Along Third and Fourth Streets (between Townsend and Folsom Streets), land uses were primarily commercial and industrial; land uses and activities in these areas included oil and gas use (specific business unknown), lithographics, bus garage, spray painting booth, machine shop, auto truck freight depot, paint spraying, printing warehouse, metal shop, auto body and greasing garage, blacksmith shop, and scrap metal facility. A coal gasification plant (Citizens Gas Company), that operated between 1866 and 1886, was reportedly located near Townsend and Second Streets. A second gas manufacturing facility (Pacific Gas Improvement Company) was reportedly located south of Townsend Street between Second and Third Streets and operated between the 1880s and early 1900s. It is likely that waste products from these two plants were discharged to the Bay and may be present within the fill in this area. Between Folsom and Sutter Streets, past land uses included gas and oil (of undermined form), printing and sign painting, an underground garage (which currently exists), retail stores, hotels, and offices. North of Sutter Street, land uses were primarily commercial and residential.

FIGURE 4-12

GENERAL VICINITY MAP OF STUDY AREA



Source: PB/Wong
Not to scale

Current land uses along Third and Fourth Streets (between Townsend and Folsom Streets) are primarily commercial (gas stations, parking, auto service and body, paint company) and residential. Offices, parking garages, and the Moscone Convention Center are located between Folsom and Sutter Streets. North of Sutter Street, current land uses consist of offices, retail stores, hotels, and apartments. A number of vacant lots were observed during site reconnaissance activities in 2003; many of these lots appeared to have been subjected to random dumping of various materials, including trash, whereas others were in the process of being redeveloped.

The regulatory database searches and file reviews identified numerous sites along or in the proximity of the alignment where chemical compounds are likely present in soil and groundwater. In general, the chemical compounds likely to be present in soil and groundwater along the Corridor are as follows:

- Petroleum hydrocarbon compounds (TPH as gasoline, diesel, and motor oil) and fuel-related VOCs, such as benzene, are likely to be present in the near-surface soil and groundwater, especially near leaking underground storage tank (LUST) and underground storage tank (UST) sites.
- Other VOCs, such as degreasers and thinners, may be present from former activities in the Study Area.
- According to the San Francisco DPH, groundwater in the northern portion of the Study Area is affected by a regional-scale chlorinated solvent plume.
- Polynuclear aromatic hydrocarbons (PAHs) associated with former coal gasification plants likely are present in the area south of Market Street, particularly in areas underlying fill bayward of the 1851 high tide line. Dumping of slag on adjacent properties has been associated with the historical operation of several former coal gasification plants. Previous investigations at plants located along The Embarcadero have revealed the presence of waste materials at depths ranging from approximately 28 to 40 feet below ground surface (bgs).
- Historical Sanborn maps indicated the locations of several electrical substations and transformers. Polychlorinated biphenyl (PCB) compounds may be present in soil in those areas.
- Various metals are likely present in fill. Lead has been reported at concentrations exceeding its hazardous waste threshold. Arsenic may be present in soil along railroad tracks, such as the area just south of Townsend Street. According to DPH, asbestos-containing material (ACM) and lead-impacted soil were detected during construction of the Chinese Playground in Chinatown.

Groundwater quality in the Downtown area of San Francisco generally is degraded due to the presence of solvents, petroleum hydrocarbon constituents, and other chemicals. Due to the degraded nature of the groundwater, the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB), has approved closure for several LUST sites that are characterized by contaminant levels higher than those that are typically allowed for site closure. Refer to the tables in the technical studies for a summary of available chemical analytical data for groundwater along the alignment.

Depth to groundwater in the Study Area is highly variable and ranges from approximately 3 to 50 feet bgs. The reported groundwater flow directions are inconsistent and, at several sites, have been shown to be different from the regional groundwater flow direction (generally towards San Francisco Bay). The high variability in groundwater gauging data is attributed to variable topography and geology in the area, in combination with dewatering processes associated with construction projects and existing building foundations or basements.

North Beach Tunnel Construction Variant – Chinatown to Vicinity of Washington Square

The approximately 2000-foot extension for the North Beach Tunnel Construction Variant would be via Stockton Street and Columbus Avenue to a temporary construction shaft on Columbus Avenue near Washington Square in North Beach. Past land uses in this area included residential, commercial, and industrial. Commercial uses identified included retail shops and hotels. There were many industrial uses, including numerous factories, which manufactured various items, including food (e.g., ravioli, macaroni, sausage, tortillas, noodles, and candy), overalls, paste, cigars, and garments. Other industrial and commercial facilities included machine shops, tin shops, photo shops, paint shops, drugstores, dyeing and cleaning shops, auto service shops, undertakers, plumbing shops, electrical shops, oil and gas facilities (of undetermined form), plating works, printing and sign painting, movie theaters, and stables.

Current land uses within the North Beach portion of the Study Area consist of a mixture of commercial and residential uses. In general, the area west of Powell Street is dominated by residential uses, as is the area north of Broadway from the eastern boundary of the Study Area west to Stockton Street. The remaining portions of the Study Area, are dominated by commercial facilities (e.g., retail shops, restaurants, and parking structures) and include apartments on the upper floors. The dominantly commercial portions of the Study Area also include some high-density San Francisco Housing Authority residential complexes (e.g., on the southern side of Pacific Avenue). Auto service shops were observed at the corner of Pacific Avenue and Powell Street and at the corner of Filbert Street and Grant Avenue.

Federal or California hazardous waste generators/facilities were identified in the North Beach Study Area, including those reported to have had a release of petroleum due to a leaking underground storage tank.

Numerous LUST sites, both open and closed, are located within the limited Study Area. Chemical compounds that may be present in soil and groundwater along the North Beach Construction Variant may include, but not be limited to, petroleum hydrocarbon compounds and fuel-related volatile organic compounds (VOCs), such as benzene; other VOCs, such as degreasers and thinners; and various metals (likely present in fill). At four LUST sites (766 Vallejo Street, 1625 Powell Street, 1636 Powell Street, and 1641 Powell Street), the regulatory database and review of DPH files indicated that subsurface soil and groundwater were impacted with fuel-related VOCs, total petroleum hydrocarbons (TPH) as gasoline, diesel, and motor oil.

Groundwater measurement data were available at the four LUST sites discussed above. Data collected at 766 Vallejo Street in 1998 indicate groundwater at approximately 8 feet bgs. At 1636 Powell Street, groundwater was encountered at 1 to 16 feet bgs. At 1625 and 1641 Powell Street, groundwater was encountered at 4 to 18 feet bgs.

4.11 AIR QUALITY

4.11.1 AIR QUALITY STANDARDS

National Ambient Air Quality Standards (NAAQS) were established in 1970 by the federal Clean Air Act for airborne concentrations of six national criteria pollutants, including; ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and particulate matter with a diameter of 10 microns or less (PM_{10}). In July 1997, the US Environmental Protection Agency (EPA) promulgated new NAAQS for particulate matter with diameters less than or equal to 2.5 microns ($PM_{2.5}$). The NAAQS for $PM_{2.5}$ are 15 micrograms per cubic meter (μ/m^3) and 65 μ/m^3 for the annual average and 24-hour periods, respectively. In addition, the 1-hour ozone standard of 0.12 parts per million (ppm) was revoked on June 15, 2005 and was replaced by an 8-hour standard of 0.08 ppm.

The California Air Resources Board (CARB) has established State Ambient Air Quality Standards (SAAQS), many of which are more stringent than the corresponding NAAQS. The 1988 California Clean Air Act, amended in 1992, sets standards for the six national criteria pollutants as well as for hydrogen sulfide, sulfates, and vinyl chloride, for which there are no corresponding NAAQS. In May 2006, the CARB created a new 8-hour O_3 standard of 0.07 ppm. The ambient air quality standards are designed to protect segments of the population most susceptible to the pollutants' adverse effects, or sensitive receptors. Sensitive receptors are considered the very young, the elderly, people weak from disease or illness, or persons doing heavy work or exercise. National and state standards for these criteria pollutants are presented in Table 4-24. The source of each criteria pollutant and the corresponding health effects are described below.

The Central Subway Project is located within the San Francisco Bay Area Air Basin which is composed of nine counties. Air quality in the Bay Area Air Basin is regulated by the Bay Area Air Quality Management District (BAAQMD), which operates ambient air quality monitoring stations within the Bay Area. CARB regulates mobile source emissions and is responsible for reviewing state-required documentation submitted by regional agencies such as the BAAQMD and for submitting federally-required documents to EPA.

4.11.2 AIR POLLUTANTS OF CONCERN

Smog or O_3 is formed in the atmosphere by complex chemical reactions between nitrogen oxides (NO_x) and reactive organic gases (ROG) in the presence of sunlight. The main sources of the ozone precursors are combustion processes and the evaporation of solvents, paints and fuels. Automobiles are the largest

TABLE 4-24

CALIFORNIA AND NATIONAL AMBIENT AIR QUALITY STANDARDS

POLLUTANT	AVERAGING TIME	SAAQS$^{(1),(2)}$	NAAQS$^{(2),(3)}$
Ozone (O_3)	1-hour 8-hour	0.09 ppm 0.07 ppm	n/a 0.08 ppm
Carbon Monoxide (CO)	1-hour 8-hour	20 ppm 9.0 ppm	35 ppm 9 ppm
Nitrogen Dioxide (NO_2)	1-hour Annual Arithmetic Mean	0.25 ppm n/a	n/a 0.053 ppm
Sulfur Dioxide (SO_2)	1-hour 24-hour Annual Arithmetic Mean	0.25 ppm 0.04 ppm n/a	n/a 0.14 ppm 0.03 ppm
Suspended Particulate Matter with diameter ≤10 microns (PM_{10})	24-hour Annual Arithmetic Mean	50 μ/m^3 20 μ/m^3	150 μ/m^3 50 μ/m^3
Suspended Particulate Matter with diameter ≤2.5 microns ($PM_{2.5}$)	24-hour Annual Arithmetic Mean	n/a 12 μ/m^3	35 $\mu/m^{3\ (4)}$ 15 μ/m^3
Sulfates	24-hour	25 μ/m^3	n/a
Lead (Pb)	30-day Calendar Quarter	1.5 μ/m^3 n/a	n/a 1.5 μ/m^3
Hydrogen Sulfide (H_2S)	1-hour	0.03 ppm	n/a
Vinyl Chloride (VC)	24-hour	0.010 ppm	n/a

Notes: (1) SAAQS stands for State Ambient Air Quality Standards (California). SAAQS for ozone, carbon monoxide, sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, and respirable particulate matter are values that are not to be exceeded. All other California standards shown are values not to equaled or exceeded.
(2) ppm = part per million by volume; μ/m^3 = micrograms per cubic meter; n/a = not applicable.
(3) NAAQS stands for National Ambient Air Quality Standards. NAAQS, other than ozone and those based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.
(4) On October 17, 2006, the NAAQS for $PM_{2.5}$ was lowered to 35 μ/m^3 from 65 μ/m^3.
n/a = not applicable

Source: California Air Resources Board, Ambient Air Quality Standards, September 2007.

single source of ozone precursors in the Bay Area. Short-term exposure to ozone can irritate the eyes and cause shortness of breath. Chronic exposure to high ozone levels can permanently damage lung tissue.

CO is a colorless, odorless gas, formed by incomplete combustion of fuels. The single largest source of CO is motor vehicles. When inhaled at high concentrations, CO combines with the hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood.

NO_2 is a reddish-brown gas that is a by-product of the combustion process. Automobiles and industrial processes are the main sources of NO_2. Nitrogen dioxide is an ozone precursor and can increase the risk of acute and chronic respiratory disease, as well as reduce visibility.

SO_2 is a colorless acid gas with a strong odor. It is produced by the combustion of sulfur-containing fuels, such as coal, oil and diesel. Sulfur dioxide can irritate lung tissue and increase the risk of acute and chronic respiratory disease.

In the past, airborne lead was primarily caused by gasoline-powered automobile engines, but since leaded fuels have been phased out of the gasoline market, it is no longer as prevalent. Lead can cause hematological (blood-related) effects, such as anemia (iron-deficient blood), and inhibition of enzymes involved in blood synthesis. Ambient levels of lead in the Bay Area are well below the ambient standard and are expected to continue to decline.

PM_{10} refers to particulate matter ten microns and less in size and encompasses many solid or liquid particles in the atmosphere, including smoke, dust aerosols and metallic oxides. Motor vehicles are the single largest source of PM_{10} in the Bay Area. Other sources are combustion, construction, grading, demolition and agricultural activities. Some particulate matter is naturally occurring, such as pollen. Extended exposure to particulate matter can increase the risk of chronic respiratory disease. PM_{10} also includes $PM_{2.5}$ which is particulate matter with a diameter of less than 2.5 microns. These particles have an even higher likelihood of entering the body and lungs due to its smaller size and may be more harmful to humans.

Most diesel-related particulate matter (about 90 percent) falls within the $PM_{2.5}$ subgroup. Particulate matter from diesel-fueled vehicles and equipment is of special concern because this type of particulate matter is small enough to be respirable and has many chemicals adsorbed to the surface, including known or suspected mutagens (causing changes in genetic structure) and carcinogens (cancer causing). Diesel emissions are complex mixtures containing thousands of organic and inorganic constituents.

4.11.3 METEOROLOGY AND TOPOGRAPHY

The primary factors that determine air quality levels are the location of air pollutant sources and the amount of pollutants being emitted. Meteorological and topographical conditions, however, are also important. Atmospheric conditions such as wind speed, wind direction, and air temperature determine the movement and dispersal of air pollutants, as well as, the rate of photochemical reactions in the atmosphere. Another important factor in California is the Pacific Ocean, which moderates temperatures and helps create consistent wind gradients.

The San Francisco Bay Area is characterized by complex terrain consisting of coastal mountain ranges, inland valleys, bays, and associated flatlands. Consequently, the Bay Area is subject to a combination of climatic factors that result in low potential for accumulation of pollutants near the coast and high potential in sheltered inland valleys. The Study Area is located in the western portion of the Bay Area. Because of the relatively flat terrain and the close proximity to the bay, the Project is located in an area where the dispersal of pollutants is relatively good compared to inland sheltered valleys.

The marine air creates cool summers, mild winters and infrequent rainfall; it drives the cool daytime sea breeze and maintains comfortable humidities. Temperatures in San Francisco average 58 degrees Fahrenheit annually, ranging from the mid-40s on winter mornings to the mid-70s on late summer afternoons. Rainfall averages 20 inches per year and is confined primarily to the wet season from late October to early May.[114] Exceedances of air quality standards occur primarily during meteorological conditions conducive to high pollution levels, such as cold, windless winter nights, or hot, sunny, summer afternoons.

4.11.4 EXISTING AIR QUALITY AND REGIONAL ATTAINMENT STATUS

The BAAQMD takes primary responsibility for national and state standard attainment planning, implementation and enforcement in the Bay Area. Air quality conditions in the Bay Area have improved since the BAAQMD was created in 1955. Ambient concentrations of air pollutants and the number of days on which the region exceeded the air quality standards have decreased.

Existing levels of air quality in the Study Area can generally be inferred from ambient air quality measurements conducted by the BAAQMD at two of its San Francisco monitoring stations. The Potrero Hill station at 10 Arkansas Street measures all criteria pollutants (except for lead), including regional pollution levels (O_3), as well as primary vehicular emissions levels near busy roadways (CO). The station at the BAAQMD headquarters, 939 Ellis Street, monitors only carbon monoxide. Table 4-25 summarizes five years of published data (2002 through 2006) from the monitoring stations. The highest CO concentrations from either of the two monitoring stations are presented in Table 4-25. Monitoring for lead, hydrogen sulfide, and vinyl chloride is not conducted in the Project vicinity. During this five-year period, there were no violations of the one-hour or the eight-hour CO standards at either the Ellis Street or Arkansas Street monitoring station. At the Arkansas Street monitoring station, the state PM_{10} standard was violated on four days in 2002 and one day in both 2003 and 2004. These high levels also resulted in exceedences of the state annual arithmetic mean standard. In 2005 and 2006, there were no

[114] Western Regional Climate Center, Western U.S. Historical Summaries (Individual Stations), 2007; www.wrcc.dri.edu

TABLE 4-25

SAN FRANCISCO AIR POLLUTANT SUMMARY, 2002-2006

		MONITORING DATA BY YEAR[1]				
POLLUTANT	STATE/ FEDERAL STD.[2]	2002	2003	2004	2005	2006
Ozone [3]						
Highest 1-hr. average, ppm[4]	0.09/0.12	0.05	0.09	0.09	0.06	0.05
Number of state/federal violations		0/0	0/0	0/0	0/0	-/-
Highest 8-hr. average, ppm	0.07/0.08	-/-	-/-	-/-	-/-	0.05
Number of state/federal violations		-/-	-/-	-/-	-/-	0/0
Carbon Monoxide						
Highest 1-hr average, ppm	20/35	6.8	5.1	3.7	4.1	2.7
Number of state/federal violations		0/0	0/0	0/0	0/0	0/0
Highest 8-hr. average, ppm	9.0/9	2.6	3.6	2.7	3.1	1.7
Number of state/federal violations		0/0	0/0	0/0	0/0	0/0
Nitrogen Dioxide						
Highest 1-hr. average, ppm	0.25/--	0.08	0.07	0.06	0.07	0.11
Number of state violations		0	0	0	0	0
Annual arithmetic mean, ppm	--/0.053	0.019	0.018	0.017	0.016	0.015
Number of federal violations		0	0	0	0	0
Sulfur Dioxide						
Highest 1-hr. average, ppm	0.25/--	0.053	0.024	0.034	0.019	0.010
Number of state violations		0	0	0	0	0
Highest 24-hour average, ppm	0.04/0.14	0.007	0.007	0.006	0.007	0.007
Number of state/federal violations		0/0	0/0	0/0	0/0	0/0
Annual arithmetic mean, ppm	--/0.03	0.002	0.002	0.001	0.001	0.001
Number of federal violations		0	0	0	0	0
Particulate Matter (with diameter ≤ 10 microns)						
Highest 24-hr. avg (state/federal)[5], $\mu g/m^3$	50/150	78.6/74.1	51.7/50.8	51.8/48.6	46.4/44.6	46.8/44.5
Number of state/federal violations[6]		4/0	1/0	1/0	0/0	0/0
Annual arithmetic mean (state/federal), $\mu g/m^3$	20/50	26.0/24.7	22.7/21.8	22.5/21.6	20.1/19.2	n/a/19.2
Number of state/federal violations		1/0	1/0	1/0	0/0	n/a/0
Particulate Matter (with diameter ≤ 2.5 microns)						
Highest 24-hr. avg, $\mu g/m^3$	--/65 (35)	70.2	41.6	45.8	43.6	31.5
Number of violations[6]		4	0	0	0	0
Annual arithmetic mean (state/federal), $\mu g/m^3$	12/15	13.1	10.2	9.9	9.5	n/a
Number of state/federal violations		1/0	0/0	0/0	0/0	n/a

Notes:
(1) Most of the data comes from the monitoring station located at 10 Arkansas Street in San Francisco. The CO concentrations represent either the Arkansas Street Station or the Ellis Street Station depending on which location had the highest value.
(2) State standard, not to be exceeded, except for Lead standard, which is not to be equaled or exceeded.
(3) The federal 1-hour standard listed in the table was revoked in June 2005. Federal and state 8-hour standards were not in effect during the monitoring period analyzed until 2006. On October 17, 2006, the NAAQS for $PM_{2.5}$ was lowered to 35 μ/m^3 from 65 μ/m^3.
(4) ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter.
(5) State and federal statistics differ due to different samplers being used.
(6) Samples typically taken every six days.
Underlined values are in excess of applicable standards. n/a = not available.

Source: California Air Resources Board, *Air Quality Data Summaries,* 2002-2006; www.arb.ca.gov.

violations of the state PM_{10} standard. The state/federal $PM_{2.5}$ standard was violated four times in 2002. The annual arithmetic mean in 2002 also exceeded the state standard. All other monitored pollutants were below federal and state standards.

The federal Clean Air Act requires non-attainment and maintenance areas to prepare air quality plans that include strategies for attaining and maintaining the federal standards. Regional air quality plans developed under the federal Clean Air Act are included in an overall program referred to as State Implementation Plans (SIPs). The California Clean Air Act also requires plans for non-attainment areas (the state PM standards are exempt from these plans) that will specify strategies to attain state air quality standards. Thus, an area may have two sets of air quality plans.

Regionally, the San Francisco Bay Area air basin is currently designated as a non-attainment area for ozone at both the federal and state level. On April 15, 2004, the EPA classified the Bay Area as a marginal non-attainment area for the federal ozone eight-hour standard. Marginal non-attainment areas must attain the national 8-hour ozone standard by June 15, 2007. However, certain elements of EPA's 8-hour ozone standard implementation rule are still undergoing legal challenge. It is not currently anticipated that marginal non-attainment areas will be required to prepare attainment demonstrations for the 8-hour standard. Other planning elements may be required. The Bay Area plans to address all requirements of the national 8-hour ozone standard.

The California Clean Air Act requires the BAAQMD to update its Clean Air Plan for meeting the state one-hour ozone standard every three years. The BAAQMD, in association with Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG), has prepared the Bay Area 2005 Ozone Strategy to meet this requirement. It was approved on January 4, 2006. The Bay Area is currently unclassified for the recent state 8-hour ozone standard that went into affect in May 2006. However, CARB is currently considering changing the status to non-attainment.

An important component of the Bay Area Ozone Strategy is a set of control measures that would further reduce ozone precursor emissions from a wide range of sources. In addition to stationary and area source control measures, measures for on- and off-road mobile sources and transportation are included. Depending on the type of mobile source, the EPA and/or CARB are the only agencies authorized to adopt fuel and emission control system specifications. As such, the BAAQMD can only reduce mobile source emissions by providing grants or incentives to encourage the use of cleaner vehicle and fuels. The Bay Area Ozone Strategy measures encourage the retirement of older, more-polluting equipment and vehicles, introduction of new, less-polluting equipment, and operational changes such as reduced idling.

With respect to PM (PM_{10} and $PM_{2.5}$) non-attainment for the state air quality standards, the California Legislature recognized that PM was relatively intractable and excluded it from the basic planning requirements. The control measures of the Clean Air Plan will reduce PM emissions through measures to reduce vehicular traffic.

The Bay Area Air Basin is in attainment or unclassified (i.e., available data does not support a designation of non-attainment or attainment) for all other federal and state ambient air quality standards.

4.11.5 PROJECT CONFORMITY

In addition to SIP and Air Quality Plan activities, federal agencies must also make a determination of conformity with the SIP before taking any action on a proposed project located in a non-attainment or maintenance area. In 1993, EPA published the General Conformity Rule that indicates how federal agencies are to make such a determination. A similar rule was created to specifically address conformity issues related to highway or transit projects that receive funding or approval from the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA). In general, transportation projects must not cause or contribute to new violations of air quality standards, worsen existing violations or interfere with timely attainment of standards. Project conformity is evaluated at both the local level ("hot spot" analysis) and the regional level. At the regional level, one aspect of the conformity determination is to confirm that the proposed project is included in currently conforming regional transportation plans as fiscally constrained (i.e., the project would be funded through revenues projected to be reasonably available over the next 25 years). Another aspect is to confirm that the proposed project is included in transportation improvement programs, which list projects and their specific funding sources. This would also result in the proposed project being included in regional air quality analyses. The local level analysis requirements in the 1993 rules focused on CO levels in areas designated as non-attainment or maintenance for CO. In March 2006, procedures were adopted to include $PM_{2.5}$ and PM_{10} non-attainment and maintenance areas.

The Central Subway Project is located in a maintenance area for CO and as a result must have a local CO analysis conducted. The area is currently unclassified for the federal 24-hour standard for both PM_{10} and $PM_{2.5}$. It is also in attainment for the annual $PM_{2.5}$ standard. The EPA is required to designate attainment status for the newer 24-hour $PM_{2.5}$ standard by December 2009. As a result, a hot spot analysis for particulate mater is not currently required for the Central Subway Project.

For the Bay Area, MTC adopted the conformity analysis for the Final *Transportation 2030 Plan* (RTP) and the 2005 *Transportation Improvement Program* (TIP) in February 2005. The Third Street Light Rail Project Phase 2 Central Subway is included in both these documents as part of the financially constrained

Tier 1 plan. As a result, the Central Subway Project was included in the conformity analysis for these plans. Project conformity of the Central Subway Project is further discussed in Section 5.11.

4.11.6 EXISTING POLLUTANT SOURCES

Pollutants are emitted by a variety of stationary, area and mobile sources. Stationary sources are identified as utility, industrial, institutional, and commercial facilities operating at fixed locations. Area sources are activities that individually emit relatively small quantities of air pollutants, but which cumulatively may emit a large amount of emissions. Examples are gasoline service stations, consumer use of solvents, and fireplace use.

The greatest sources of emissions in the Study Area are mobile sources. Mobile sources are considered to be on-road vehicles such as cars and trucks, airplanes, trains, and off-road vehicles such as diesel-powered construction equipment.

The estimated emissions associated with motor vehicles in the Study Area in 2006 are presented in Table 4-26. For a sense of magnitude, motor vehicle emissions in the Study Area account for approximately one to eight percent of San Francisco County's overall total for pollutant emissions from all sources, depending on the pollutant.[115] CO accounts for the highest percentage of motor vehicle emissions while particulate matter is the lowest.

TABLE 4-26

ESTIMATED 2006 MOTOR VEHICLE EMISSIONS IN THE STUDY AREA

(IN POUNDS/DAY)

CO	**ROG**	**NO_x**	**PM_{10}**	**CO_2**
33,795	3,405	4,225	445	1,122,045
Note: PM_{10} includes $PM_{2.5}$				
Source: PB/Wong, 2007				

one to eight percent of San Francisco County's overall total for pollutant emissions from all sources, depending on the pollutant.[116] CO accounts for the highest percentage of motor vehicle emissions while particulate matter is the lowest.

[115] California Air Resources Board, The California Almanac of Emissions and Air Quality - 2006 Edition, April 2006 and Bay Air Quality Management District, Source of Inventory of Bay Area Greenhouse Gas Emissions, November 2006..

[116] California Air Resources Board, The California Almanac of Emissions and Air Quality - 2006 Edition, April 2006 and Bay Air Quality Management District, Source of Inventory of Bay Area Greenhouse Gas Emissions, November 2006..

4.11.7 SENSITIVE RECEPTORS

Air quality standards are set at pollutant levels considered to be safe for the public. Of most concern are localized pollutant (CO and PM) impacts because these impacts are greater when members of the public are closer to the source of the emissions. In general, air pollution is a concern wherever the public has access. In the proposed Study Area, this could include locations such as sidewalks, boarding platforms, etc. However, it is unlikely that a member of the public would be at any of these locations for a long period of time and would not have long-term exposure to pollutants generated in the area. Particular attention is paid to locations where people who are more susceptible to respiratory infections and other air quality-related health problems are more likely to spend time. These locations are termed sensitive receptors. Land uses such as playgrounds and parks, schools, hospitals, clinics and health centers, and community centers are used by people who could be susceptible to the results of poor air quality. Schools, hospitals and convalescence homes are relatively sensitive to poor air quality because of the people who frequent these locations (see Sections 4.1.3 and 4.3.1). Residential areas are considered sensitive to poor air quality because people in residential areas are often home for extended periods. Recreational land uses are moderately sensitive to air pollution, because vigorous exercise associated with recreation places a high demand on the human respiratory function.

School playgrounds and parks along the Project corridor are shown on Figure 4-4 and discussed in Section 4.3.3. Sensitive receptors of particular interest for air quality include:

- Yerba Buena Center of the Arts at Third and Mission Streets;
- Union Square along Stockton Street;
- Gordon Lau Elementary School playground at Washington Street;
- Willie “Woo Woo” Wong Playground at Sacramento Street;
- Washington Square at Columbus Avenue and Union Street

4.11.8 CLIMATE CHANGE/GREENHOUSE GAS EMISSIONS

At one time, all climate change occurred naturally. However, now through human activity such as fossil fuel burning, deforestation, and growing population, the mixture of gases in the Earth’s atmosphere is being changed. Certain gases are considered “greenhouse gases” because they absorb infrared radiation and trap the heat in the atmosphere thereby contributing to global warming. Greenhouse gases include carbon dioxide (CO_2), methane, nitrous oxide, ozone, and water vapor. Some of the gases occur naturally, while others are exclusively human-made. The majority of human-made gases are from burning fossil fuels and include CO_2 and methane.

California, despite its many environmental regulations, is still one of the largest producers of greenhouse gases. State and local governments and agencies are becoming more active in the climate change issue.

In the Bay Area, fuel consumption from transportation (on-road motor vehicles, off-road mobile sources, and aircraft) account for more than fifty percent of greenhouse gases generated in the Bay Area. According to the BAAQMD, the Bay Area generates over 85 million tons of greenhouse gases and the City and County of San Francisco generates 6.7 million tons.[117]

In 2002, the San Francisco Board of Supervisors passed the Greenhouse Gas Emissions Reduction Resolution, committing the City and County of San Francisco to a greenhouse gas emission reduction goal of 20 percent below 1990 levels by the year 2012. In September 2004, San Francisco released its Climate Action Plan, which provides an inventory and reduction target of greenhouse gas emissions. The Plan also contains actions and implementation strategies to reduce greenhouse gas emissions from the transportation and solid waste sectors and through energy efficiency and renewable energy programs.

On June 1, 2005, Governor Schwarzenegger signed Executive Order S-3-05 establishing climate change emission reductions targets for the State of California. The greenhouse gas reduction targets are as follows: reduce emissions to 2000 levels by 2010, reduce emissions to 1990 levels by 2020, and reduce emissions to 80 percent below 1990 levels by 2050. In addition, Governor Schwarzenegger signed AB 32 (known as the California Global Warming Solutions Act of 2006) on September 27, 2006 to create a comprehensive statewide program to reduce greenhouse gas emissions. One of the requirements is that on or before June 30, 2007 CARB is required to publish a list of discrete greenhouse gas emission reduction measures that can be implemented.

117 Bay Area Air Quality Management District, Source Inventory of Bay Area Greenhouse Gas Emissions, November 2006.

4.12 NOISE AND VIBRATION

4.12.1 NOISE AND VIBRATION MEASURES

The following are brief descriptions of the measures used to characterize community noise and vibration in the Corridor.

A-Weighted Sound Level

Sound is measured using microphones that respond accurately to all audible frequencies. The human hearing system does not respond equally well to all frequencies. Low frequency sounds below about 400 Hz are progressively and severely attenuated, as are high frequencies above 10,000 Hz.[118] To approximate the way humans interpret sound, a filter circuit with frequency characteristics similar to the human hearing system is built into sound measurement equipment. Measurements with this filter enacted are referred to as "A-weighted sound levels", expressed in dBA. Community noise is almost always characterized in terms of A-weighted levels.

Equivalent Sound Level (Leq)

Leq is a measure of sound energy over a period of time. It is referred to as the equivalent sound level because it is equivalent to the level of a steady sound which, over a referenced duration and location, has the same A-weighted sound energy as the fluctuating sound. Leq's for periods of one hour, during daytime or nighttime hours and 24 hours are commonly used in environmental assessments. Because Leq is a measure of the total sound energy, any new community noise source will cause Leq to increase. To estimate how the Third Street Light Rail Project would increase Leq, it is necessary to know the existing Leq and add in the sound energy that would be created by light rail operations. The more train operations and the longer and faster the trains, the more sound energy is added to the existing Leq.

Day-Night Sound Level (Ldn)

Ldn, also abbreviated DNL, is a 24-hour Leq, but with a 10 dB penalty assessed to noise events occurring at night. Nighttime is defined as 10 p.m. to 7 a.m. The effect of this penalty is that, in the calculation of Ldn, any event during nighttime hours is equivalent to ten events during the daytime hours. This strongly weights Ldn toward nighttime noise to reflect most people being more easily annoyed by noise during the nighttime hours when both background noise is lower and most people are sleeping. Ldn is often used to characterize community noise when assessing community noise impacts. Almost all urban and suburban

[118] Sound is caused by vibrations that generate waves of minute air pressure fluctuations in the air. Air pressure fluctuations that occur from 20 to 20,000 times per second can be detected as audible sound. The number of pressure fluctuations per second is normally reported as cycles per second or Hertz (Hz). Different vibrational frequencies produce different tonal qualities for the resulting sound.

neighborhoods are in the range of Ldn 50 to 70. An Ldn of 70 dBA represents a relatively noisy area, which might be found near a freeway or a busy surface street. Residential neighborhoods that are not near major sound sources are usually in the range of Ldn 50 to 60 dBA. If there is a freeway or moderately busy arterial nearby, or any substantial nighttime noise, Ldn is usually in the range of 60 to 65 dBA.

Vibration Velocity

Vibration velocity is the basic measure of ground-borne vibration. It is a measure of the rate at which particles in the ground are oscillating relative to the equilibrium point.

Vibration Velocity Level

It is generally accepted that, over the frequency range important for ground-borne vibration from transit systems, human response to vibration is best correlated to the root-mean square (rms) vibration velocity. In this report, rms vibration velocity is always expressed as decibels relative to 1 micro-inch per second. A one second rms time constant is assumed. The units are abbreviated as VdB to avoid any confusion with noise decibels.

Following are typical responses to different levels of building vibration caused by rail transit operations:

- Less than 65 VdB: The building vibration is imperceptible or just barely perceptible.
- 70 to 75 VdB: The vibration may be noticeable, but most people will not consider it intrusive.
- 80 to 85 VdB: The vibration is very noticeable and many people may find the vibration to be unacceptable for residential uses.
- Greater than 85 VdB: If the vibration lasts for more than a couple of seconds, it could make some tasks, such as working at a computer screen, difficult.

Peak Particle Velocity (ppv)

Specifications for allowable levels of vibration from blasting, pile driving and other construction processes with the potential of causing building damage are almost always expressed in terms of peak particle velocity since this is thought to be well correlated with maximum stresses in buildings. Peak particle velocity is the instantaneous positive or negative peak in the vibration signal. The peak may occur for only a small fraction of a second even when the vibration event is several seconds long. As discussed above, it is generally accepted that human response to vibration is better correlated to rms velocity than peak particle velocity. Peak particle velocity is normally expressed in units of inches per second. Limits to avoid cosmetic building damage from construction vibration are usually in the range of 0.9 to 2 inches per second.

4.12.2 NOISE AND VIBRATION STANDARDS

Construction Noise

Most large construction projects have the potential of being sufficiently noisy to be intrusive to adjacent communities, particularly when construction must be performed at night. However, construction noise is temporary in nature and usually has no permanent effects. Although no standardized criteria have been developed for assessing construction noise impact, the FTA guidance manual “Transit Noise and Vibration Impact Assessment” includes guidelines to use when local ordinances or other standards are not applicable. The FTA guidelines are summarized below in Table 4-27**.**

TABLE 4-27

FTA GUIDELINES FOR IMPACT FROM CONSTRUCTION NOISE

Land Use	8-hour Leq, dBA		Ldn, dBA
	Day	Night	30-Day Average
Residential	80	70	75 [1]
Commercial	85	85	80 [2]
Industrial	90	90	85 [2]

Notes: (1) In urban areas with very high ambient noise levels (Ldn>65 dBA), Ldn from construction should not exceed existing ambient plus 10 dB.
(2) Twenty-four hour Leq, not Ldn.

Source: FTA, 2006

Since the proposed Central Subway project would be entirely within the City and County of San Francisco, all construction would be subject to San Francisco regulations. Article 29, Regulation of Noise, of the San Francisco Police Code includes specific limits on noise from construction. The basic requirements are:

- Maximum noise level from any piece of powered construction equipment is limited to 80 dBA at 100 ft. This translates to 86 dBA at 50 feet;
- Impact tools are exempted, although such equipment must be equipped with effective mufflers and shields (the noise control equipment on impact tools must be as recommended by the manufacturer and approved by the Director of Public Works); and

- Construction activity is prohibited between 8 p.m. and 7 a.m. if it causes noise that exceeds the ambient noise plus 5 dBA. In many cases, this condition acts to prohibit nighttime construction unless the City grants a variance.

Performing construction in compliance with the City regulations would ensure that construction noise would be below the FTA guidelines.

Construction Vibration

Ground-borne noise, is vibration that is transmitted through the soil to a building where it causes the elements of the building to radiate noise. During construction potential sources of ground-borne noise would be the tunnel boring machine, muck trains removing the tunnel spoils, and other underground activities. It is proposed that 5 dBA be added to the FTA ground-borne noise criteria presented in Table 4-19 as the basis for a noise level limit during construction, for protection of adjacent historic architectural buildings.

Damage Risk Vibration Criteria

Vibration, as it is related to building damage, is generally assessed in terms of peak particle velocity (PPV). PPV is defined as the maximum instantaneous positive or negative peak of the vibration signal in any of three directions, vertical, horizontal or lateral (x, y or z). PPV is the appropriate metric for evaluating the potential of building damage and is often used in monitoring blasting and construction vibration since it relates to the stresses that are experienced by buildings.

Peak particle velocity is typically a factor of 1.7 to 6.0 times greater than root mean square (rms) vibration velocity. Root mean square vibration velocity is used to assess potential human annoyance from vibration. A factor of 4.0 has been used to relate the building damage criteria used in this report to approximate rms vibration velocity levels, which are used by FTA to define the vibration generated by LRT operations.

The severity of vibration-induced structural damage can be categorized as major or minor. Major damage caused by high levels of ground vibration would include serious structural damage, glass breakage, and serious plaster cracking possibly accompanied by falling plaster. For lower levels of vibration, minor damage, which would include fine plaster cracking and the reopening or widening of old cracks, may be observed.

The U.S. Bureau of Mines has identified ground vibration levels that may produce damage in residential structures. By averaging the data of many investigators, the Bureau has found that ground vibration with peak velocities (PPV) on the order of 7.6 inches/second (in/sec) may cause major damage in residential structures, whereas a PPV near 5.4 in/sec may cause minor damage. The Bureau therefore suggests that a safe limit for structural damage would be a PPV of 2.0 in/sec, as measured in any of the three directions (x, y or z) in the ground adjacent to a structure. This limit is based on the probability that 95 percent of the structures exposed to this level of vibration would not have any structural damage.

A widely accepted criterion is that below 0.5 inch per second peak velocity there is no risk of minor damage to non-historic residential and office buildings. This criterion level is far below the threshold of risk of major structural damage, but it makes some allowance for buildings of all types and for the triggering effect of vibration on stress concentrations that may already be present in the affected buildings.

In the case of old and historic buildings, the situation is not as clear. The level cited as safe from minor damage (0.2 inch per second peak velocity) is probably adequate for historic buildings as a simple guideline level, but it cannot account for long-term fatigue damage that may occur after many years of vibration. Such fatigue damage has been observed in very old structures, e.g. European cathedrals erected in the Middle Ages. In view of this uncertainty, a peak ground vibration velocity of 0.12 in/sec based on German standard, DIN 4150 is recommended as a conservative "minor damage" criterion to be applied in the assessment for buildings of historic value.

The Federal Transit Administration, in their *Transit Noise and Vibration Impact Assessment*, 2006 report recommends applying a vibration damage threshold criterion of PPV 0.20 in/sec for fragile buildings, or PPV 0.12 in/sec for extremely fragile historic buildings.

Based on the research to date, as discussed above, the following criteria levels, presented in Table 4-28 would be used to judge the potential risk of damage to historic buildings or cultural resource structures during construction of the project. These levels are significantly lower than the FTA vibration criteria of 72 to 75 VdB for LRT operations and are also lower than the maximum vibration levels projected from the LRT operations at any structure along the alignment.

Operation Noise

The operation of light rail vehicles along at-grade track presents the greatest potential for noise impact. Impact from operational noise for this project is based on the FTA criteria as defined in the guidance manual “Transit Noise and Vibration Impact Assessment.” The FTA noise impact criteria are founded on well-documented research on community reaction to noise. The criteria are based on the change in

TABLE 4-28

DAMAGE RISK VIBRATION CRITERIA

	Peak Particle Velocity (in/sec)	RMS Velocity – VdB (re: 1 micro inch/sec)
Structural Building Damage	2.0	120
Architectural Building Damage	0.5	108
Damage Risk to Historic Buildings and Cultural Resource Structures	0.12 to 0.20	95 to 100
Note: Peak particle velocity is assumed to be four times greater than root mean square (rms) vibration velocity.		

noise exposure using a sliding scale. Although the FTA criteria allow more transit noise in neighborhoods with high levels of existing noise, they also reduce the amount that total noise exposure can be increased in neighborhoods with high levels of existing noise.

The FTA Noise Impact Criteria group noise sensitive land uses into the following three categories:

Category 1: Buildings or parks where quiet is an essential element of their purpose.

Category 2: Residences and buildings where people normally sleep. This includes residences, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.

Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches.

Ldn is used to characterize noise exposure for residential areas (Category 2). For other noise sensitive land uses, such as parks and school buildings (Categories 1 and 3), the maximum 1-hour Leq during the facility’s operating period is used.

There are two levels of impact included in the FTA criteria. The interpretation of these two levels of impact is summarized below:

- Severe: Severe noise impacts are considered "significant" as this term is used in NEPA and implementing regulations. Noise mitigation will normally be specified for severe impact areas unless there is no practical method of mitigating the noise.
- Moderate Impact: In this range of noise impact, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These other factors can include the predicted increase over existing noise levels, the types, and number of noise-sensitive land uses

affected, existing outdoor-indoor sound insulation, and the cost effectiveness of mitigating noise to more acceptable levels. Although other factors should be considered when designing mitigation for Moderate Impact, it is assumed by FTA that some sort of mitigation will be specified for most Moderate Impacts.

The noise impact criteria are summarized in Table 4-29. The first column shows the existing noise exposure and the remaining columns show the additional noise exposure caused by the transit project that is necessary for the two levels of impact. The future noise exposure would be the combination of the existing noise exposure, the additional noise exposure caused by the transit project, and the small reduction in noise because of fewer diesel buses and a slightly lower volume of vehicular traffic in the Third Street Corridor. The impact thresholds given in Table 4-29 have been rounded off to the nearest decibel, which is appropriate given that a one decibel difference in noise level is barely perceptible for humans. However, in performing the noise impact assessment, the projections and the impact thresholds are not rounded off until the final step.

Operation Vibration

Ground-borne vibration from light rail operations may be perceived by building occupants in the following manners: 1) perceptible vibration of floors and walls; 2) rattling of windows; 3) rattling of items hanging on walls, or rattling of dishes and bric-a-brac on shelves; or 4) as a low-frequency rumbling noise. The rumbling noise is caused by sound radiated from vibrating room surfaces and is referred to as ground-borne noise. Table 4-30 shows the limits on ground-borne vibration and ground-borne noise that are applicable to this Project. Although there is only limited information on how occupants respond to building vibration, the limits in Table 4-30 are based on available research and on the experience of rail transit systems and their vibration complaints.

International standards have been developed for the effects of vibration on people in buildings with ratings related to annoyance and interference with activities based on frequency distribution of acceptable vibrations. These criteria have been supplemented by industry standards for vibration-sensitive equipment. Both sets of criteria are expressed in terms of one-third octave band velocity spectra, with transient events like train passbys described in terms of the maximum rms vibration velocity level with a one-second averaging time. The measurement point is specified as the floor of the receiving building at the location of the prescribed activity.

The vibration impact criteria are shown in Figure 4-13 where the international standard curves and the industry standards are plotted on the same figure. Interpretations of the various levels are presented in

TABLE 4-29

FTA NOISE IMPACT CRITERIA

Existing Noise Exposure Leq or Ldn (1)	Project Noise Exposure Impact Thresholds, Ldn or Leq, (1) dBA			
	Category 1 or 2 Sites		Category 3 Sites	
	Moderate Impact	Severe Impact	Moderate Impact	Severe Impact
<43	Amb.+10	Amb.+15	Amb.+15	Amb.+20
43	52	59	57	64
44	52	59	57	64
45	52	59	57	64
46	52	59	57	64
47	52	59	57	64
48	53	59	58	64
49	53	59	58	64
50	53	60	58	65
51	54	60	59	65
52	54	60	59	65
53	54	60	59	65
54	55	61	60	66
55	55	61	60	66
56	56	62	61	67
57	56	62	61	67
58	57	62	62	67
59	57	63	62	68
60	58	63	63	68
61	58	64	63	69
62	59	64	64	69
63	60	65	65	70
64	60	66	65	71
65	61	66	66	71
66	61	67	66	72
67	62	67	67	72
68	63	68	68	73
69	64	69	69	74
70	64	69	69	74
71	65	70	70	75
72	65	71	70	76
73	65	72	70	77
74	65	72	70	77
75	65	73	70	78
76	65	74	70	79
77	65	75	70	80
>77	65	75	70	80

Note: (1) Ldn is used for land uses where nighttime sensitivity is a factor; maximum 1-hour Leq is used for land use involving only daytime activities.

Category Definitions:

Cat 1: Buildings or parks where quiet is an essential element of their purpose.
Cat 2: Residences and buildings where people normally sleep. This includes residences, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.
Cat 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches.

Source: FTA, 2006.

TABLE 4-30

GROUND-BORNE VIBRATION (GBV) AND GROUND-BORNE NOISE (GBN) IMPACT CRITERIA

Land Use Category	GBV Impact Levels (VdB re: 1 micro-inch/sec			GBN Impact Levels (dB re” 20 micro Pascals)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]	N/A[4]	N/A[4]	N/A[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB	40 dBA	43 dBA	48 dBA

Notes:

1. “Frequent Events” is defined as more than 70 vibration events of the same source per say. Most rapid transit projects fall into this category.
2. “Occasional Events” is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have operations with this many events.
3. “Infrequent Events” is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

Source: FTA, 2006.

Table 4-31. One-third octave band levels that exceed a particular criterion curve indicate the need for mitigation and the frequency range within which the treatment needs to be effective.

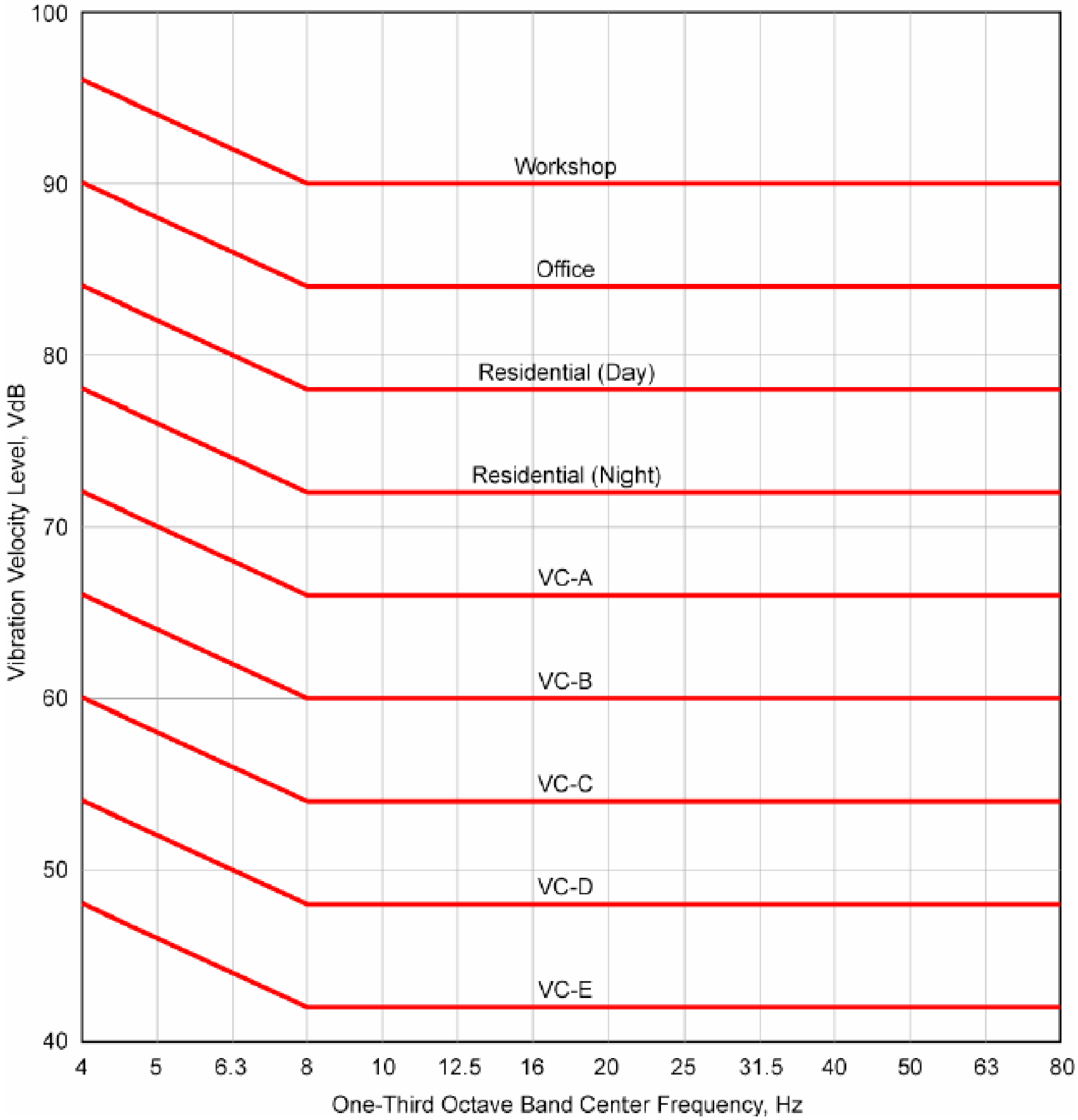
The residential limits presented in Figure 4-13 has been used on a number of previous Muni projects. The vibration is considered acceptable as long as no part of the 1/3 octave band spectrum is exceeded.

4.12.3 EXISTING NOISE CONDITIONS AT SENSITIVE RECEPTORS

Existing noise exposure at sensitive receptors along the Corridor was documented through noise monitoring and analysis. Noise monitoring was performed at a total of 15 locations (6 of the samples used were taken along the Central Subway in 1997) throughout the corridor that are representative of the noise sensitive receptors in the corridor. Measurements taken in 1997 remain representative at noise levels at these locations when compared with nearby measurements taken in 2007. As discussed below, the monitoring showed existing noise exposure to be relatively high in the Corridor due to existing traffic on Third Street, Fourth Street, Stockton Street, and other heavily traveled arterials.

FIGURE 4-13

DETAILED GROUND-BORNE VIBRATION CRITERIA



Source: FTA 2006

TABLE 4-31

INTERPRETATION OF DETAILED VIBRATION ANALYSIS CRITERIA

Criterion Curve (see Figure 4-13)	Max Lv (VdB)[1]	Description of Use
Workshop	90	Distinctly feelable vibration. Appropriate to workshops and non-sensitive areas.
Office	84	Feelable vibration. Appropriate to offices and non-sensitive areas.
Residential Day	78	Barely feelable vibration. Adequate for computer equipment and low-power optical microscopes (up to 20X).
Residential Night, Operating Rooms	72	Vibration not feelable, but ground-borne noise may be audible inside quiet rooms. Suitable for medium-power optical microscopes (100X) and other equipment of low sensitivity.
VC-A	66	Adequate for medium- to high power optical microscopes (400X), microbalances, optical balances, and similar specialized equipment.
VC-B	60	Adequate for high-power optical microscopes (1000X), inspection, and lithography equipment to 3 micron line widths.
VC-C	54	Adequate for most lithography and inspection equipment to 1 micron detail size.
VC-D	48	Suitable in most instances for the most demanding equipment, including electron microscopes operating to the limits of their capability.
VC-E	42	The most demanding criterion for extremely vibration-sensitive equipment.

[1] As measured in 1/3-octave bands of frequency over the frequency range 8 to 80 Hz.

Source: FTA 2006

Existing noise is an important element of the noise impact assessment as the FTA criteria for noise impact from transit operations are based on the levels of existing noise. Since it is not possible to measure ambient noise at every noise sensitive receptor in the Corridor, the noise monitoring results are generalized so that a limited number of measurements can be used to estimate existing noise exposure at all sensitive receptors in the Corridor. The generalization process is relatively straightforward since traffic is the major existing noise source and the traffic volumes are similar in large sections of the Corridor.

The following sections discuss the approach and results of the noise monitoring program. The generalized noise levels used for the evaluation of noise impact are also described.

Noise Monitoring Program

Noise monitoring was performed at a total of 15 locations using two approaches:

1. Long-Term Monitoring: Continuous noise monitoring over a 24-hour weekday period was performed at a total of five locations using unattended monitors. The monitors were programmed to provide several measures of noise exposure for each hour and for the entire 24-hour period.

2. Short-Term Monitoring: The 24-hour monitoring was supplemented with short-term noise measurements performed at an additional ten locations throughout the corridor. Traffic counts were

made at the same time as the measurements to provide a means of correlating traffic volumes with ambient noise levels. The short-term measurements were all 30 minutes long on a weekday between 8 a.m. and 6 p.m.

The monitoring sites were selected to be representative of noise sensitive land uses in the Corridor, typically single- or multi-family residences, churches, or parks. Figures 4-14 and 4-15 show the general locations of the monitoring sites for the different alternatives. The measurement microphones were positioned to characterize the exposure of the site to the dominant noise source in the area, which was almost always vehicular traffic on busy arterials. The measurement microphones were located at the approximate set-back lines of residences from the road and were positioned to avoid acoustic shielding by buildings, landscaping, walls, fences, or other obstructions.

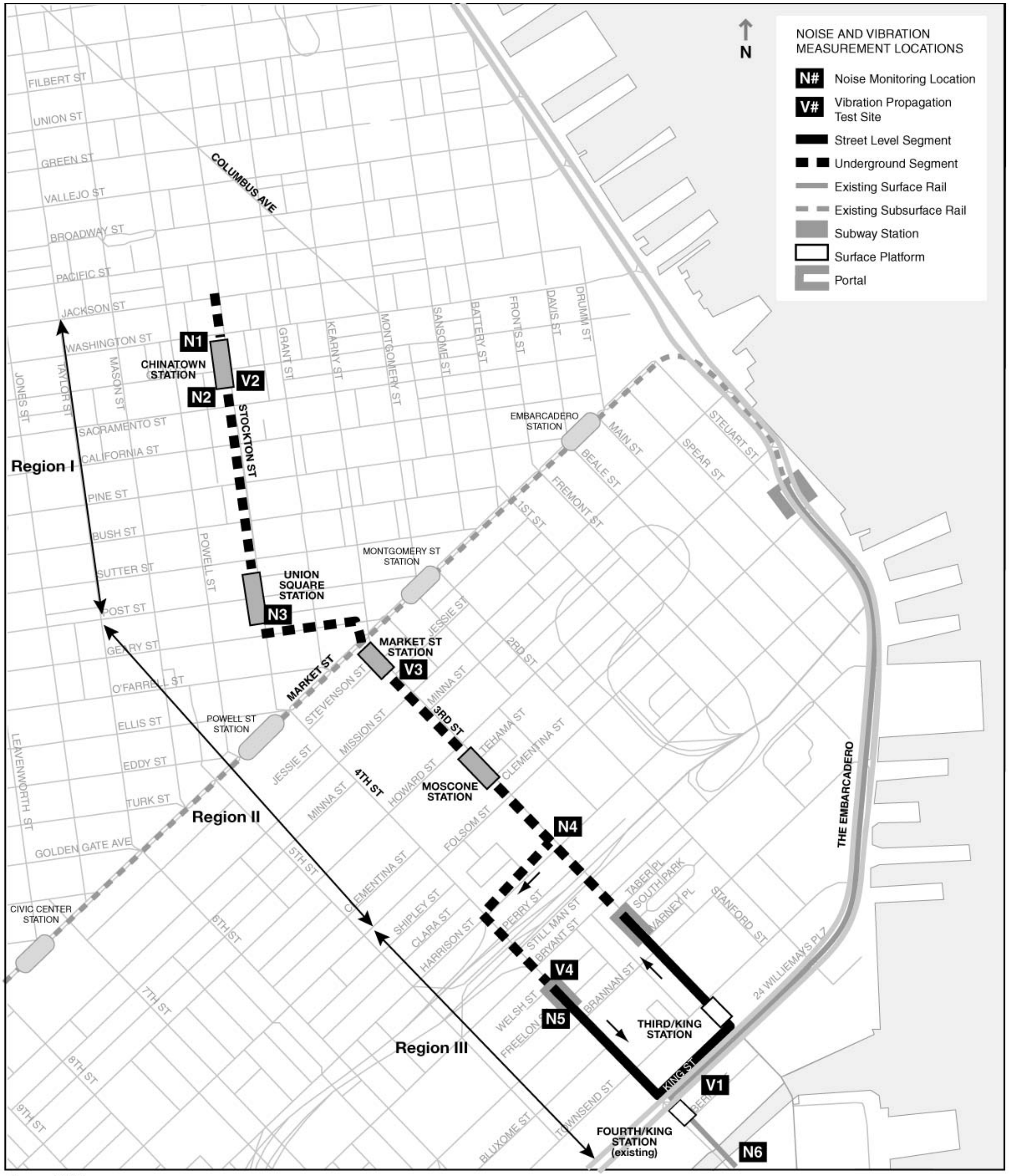
The results of the noise monitoring are summarized in Table 4-32 in terms of Ldn and peak hour Leq during daytime and nighttime hours. Each short-term noise measurement is compared to the closest 24-hour measurement site at the same hour of the day. The short-term noise levels are then adjusted relative to the 24-hour levels in order to develop a peak Leq and Ldn for each of the short-term measurement locations.

Traffic counts were performed at representative receiver locations where short-term ambient noise measurements were conducted. Table 4-33 shows the results of the traffic counts at these sites in the traffic count column. Projections of noise levels developed using a simplified version of the approved FHWA model for traffic noise and traffic counts are also presented in Table 4-33. Measurement Site N6, the measurement site near the houseboat community in the China Basin channel west of Fourth Street, is not shown in Table 4-33 because a single source of traffic noise was not dominant at this location. Noise at Site N6 was a composite of traffic noise from a number of sources including the I-280 freeway, Fourth Street, and Channel Street.

The projected levels of traffic noise in Table 4-32 are within 1 dBA of the measured level at six of the sites and within 3 dBA of the measured level at one site, and 5 dBA at one site. The general trend is that the projections are higher than the measured levels. This is a reasonably good agreement given that the FHWA model is designed for freely flowing traffic at speeds above 30 mph, while the traffic in the measurement area was typically stop and start, with the speed being highly variable. The comparison of the measurements and the projections using the simplified FHWA model validate use of the model to

FIGURE 4-14: NOISE AND VIBRATION MEASUREMENT POSITIONS

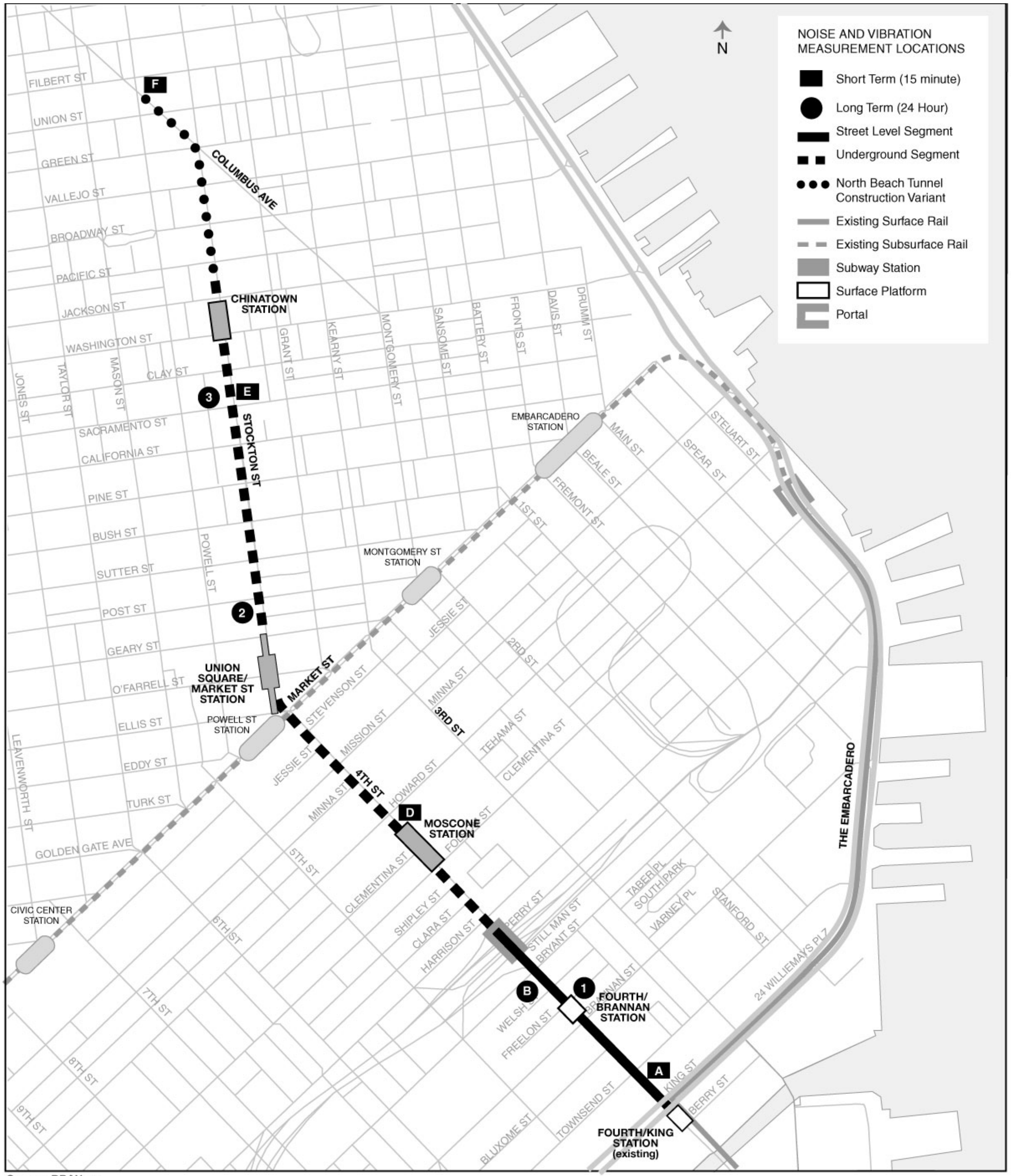
(ENHANCED 1998 EIS/EIR ALIGNMENTS SITES N1 - N6)



Source: PB/Wong
Not to scale

FIGURE 4-15: NOISE AND VIBRATION MEASUREMENT POSITIONS

(FOURTH/STOCKTON ALIGNMENT - SITES 1 - 3, AND SITES A - F)



Source: PB/Wong
Not to scale

TABLE 4-32

SUMMARY OF NOISE MONITORING RESULTS

Site	Description	Type	Noise Monitoring Results, dBA	
			Peak Hour Leq[1]	Ldn[(3)]
N1	Chinatown, Stockton & California	24-hr	66	70
N2	Stockton & Sacramento	short-term	72	74
N3	Stockton Street & Post	short-term	69	71
N4	Third Street, between Harrison & Folsom	short-term	70	72
N5	Third Street, south of Moscone Center	short-term	69	71
N6	Channel Street	short-term	60	62
1	The Palms on 4th Street	24-hr	70	71
2	Union Square at Stockton Street– Grand Hyatt Hotel	24-hr	67	70
3	Chinatown – Stockton Street Upper Floor Residential	24-hr	70	73
A	The Beacon Condominiums – 266 King Street	short-term	72	73
B	Hotel Utah – 4th and Bryant Street	short-term	74	75
C	Avalon Yerba Buena Apartments	short-term	76	77
D	Moscone Station-Apartments on 4th and Howard Street	short-term	71	73
E	Willie "Woo Woo" Wong Playground	short-term	62	NA
F	Washington Square Park - 2nd Floor Residential	short-term	71	74

NA – These sites do not have sleep activity. Ldn existing noise levels are not applicable at these sites.

1 Each 15-minute noise measurement is compared to the closest 24-hour measurement site at the same hour of the day. The 15-minute noise levels are then adjusted relative to the 24-hour levels in order to develop a peak Leq and Ldn for each of the 15-minute measurement locations.

Source: PB/Wong 2006

TABLE 4-33

TRAFFIC COUNTS DURING SHORT-TERM MEASUREMENTS

Site	Description/Street	Main Noise Source	Start		Traffic Counts, vehicles/hour			Leq, dBA	
			Date	Time	Autos	Trucks		Actual Measurements	FHWA Model
						Med.	Heavy		
N2	Stockton & Sacramento	Stockton	7/29/97	11:02 a.m.	793	63	57	72	71
N3	Stockton & Post	Stockton	7/29/97	11:43 a.m.	1,434	84	45	69	70
N4	Third Street between Harrison and Folsom	Third	7/29/97	12:23 p.m.	1,494	45	51	70	75
N5	Third Street, south of Moscone Center	Third	7/23/97	06:28 p.m.	1,647	43	46	69	72
A	Fourth & Townsend Streets	Fourth	11/14/07	11:57 a.m.	472	32	16	71	71
1	Fourth Street	Fourth	11/14/07	11:25 a.m.	570	18	18	68	68
C	Fourth & Bryan Streets	Fourth	11/14//07	10:56 a.m.	488	22	18	74	74
D	Fourth & Harrison Streets	Fourth	11/15/07	11:10 a.m.	485	23	18	74	74

Source: PB/Wong 2006

determine whether the change in the traffic patterns resulting from this project would cause any noise impacts.

4.12.4 EXISTING VIBRATION CHARACTERISTICS

Ambient Vibration

Existing sources of ground-borne vibration in the Study Area include: vehicular traffic on surface streets, particularly heavy trucks and buses; the BART and Muni subway lines operating under Market Street; vehicular traffic on the Hwy 101 and I-280; Caltrain operations; and the Muni Metro Extension to the Caltrain Terminal at Fourth and King Streets. All of these sources can cause perceptible ground-borne vibration at distances up to about 30 meters (100 feet) from the source, although the vibration from street and freeway traffic is not generally perceptible unless there are some sort of irregularities in the roadway surface such as potholes. As a result, even though there are a number of sources of ground-borne vibration in the Corridor, ambient vibration is not expected to exceed the threshold of human perception except in localized areas near these sources.

Although ambient vibration is rarely an issue, a limited number of measurements are usually performed to document existing vibrations levels. Even when existing ground-borne vibration is not expected to be perceptible, documenting the existing levels of ground-borne vibration can help identify whether the local geology is prone to vibration problems.

Short-term vibration measurements of 20 minutes were carried out near the corner of Stockton and Sacramento Streets (noise monitoring site N2) as a representative location where residential uses would be affected by ambient vibration. The ambient vibration measurements were made with high-sensitivity accelerometers mounted in the vertical direction on flat, paved surfaces and set back from the street at the nearest residential building facade. The acceleration signal was recorded using a digital audio tape (DAT) recorder. The tape recording was subsequently analyzed in the laboratory to determine average and maximum vibration levels.

The results of the ambient vibration measurements are summarized in Table 4-34. The highest observed vibration levels were caused by buses and heavy trucks. As a point of reference, the threshold of human perception is around 65 VdB. The average vibration levels, which are around 50 VdB, are well below the threshold of human perception. Even the maximum levels during the 20-minute measurement periods were below the threshold of human perception. The measurements confirm that existing ground-borne vibration in the Corridor is not sufficient to be intrusive.

TABLE 4-34

AMBIENT VIBRATION MONITORING RESULTS

Site	RMS Vib. Velocity Level, VdB	
	Average(1)	**Max(2)**
N2. Near corner of Stockton Street & Sacramento Street.	52	63

Notes: (1) Energy average over 20-minute measurement period.
(2) Maximum vibration velocity level with 1-second rms time constant.

Vibration Propagation

In addition to the measurements of ambient vibration, a special test was performed to characterize vibration propagation in the Study Area. The vibration propagation test basically consists of using a weight dropped onto a load cell to cause a ground-vibration pulse. The impact force of the dropped weight is measured with the load cell and accelerometers are used to measure the vibration pulse at distances from 25 to 200 feet from the load cell. These measurements are a key component of the ground-borne vibration projection procedure since they eliminate the need to approximate how a particular set of geologic conditions will affect levels of ground-borne vibration.

The quantity used to characterize vibration propagation is transfer mobility, which describes the ground's response to a vibration input at a given distance. The goal is to determine the difference between the transfer mobility measured at a reference site where trains are operating and the transfer mobility at a new site where similar trains are proposed. This difference is then used to adjust train vibration data from the reference site to the conditions of the new site.

The alignment was divided into three regions with similar soil types and layering. Transfer mobility data were collected at three monitoring well boreholes: Pagoda Alley (Chinatown), Jessie and Third Streets, and Welsh and Fourth Streets. Transfer mobility data from these three boreholes were taken as representative for their specific alignment region as shown in Table 4-35.

TABLE 4-35

VIBRATION PROPAGATION TEST LOCATIONS

Region	Borehole	Description Station Limits Area
I	V-2	Pagoda Alley 10+000 – 10+850 Chinatown to Post Street
II	V-3	Jessie Street 10+850 – 11+750 Post Street to Folsom Street
III	V-4	Fourth Street 11+750 – 12+740 (SB) Folsom Street to Townsend Street

Groundbourne Noise and Vibration Study Task 1.02-07, Revision 1, February 27, 2004
Source: PB/Wong

Additional surface vibration-propagation testing was performed at two locations: Freelon Alley (next to 570 Fourth Street), and Varney Place. All measurement locations are shown in Figure 4-14.

Details of the vibration propagation tests are contained in the Noise and Vibration Technical Report. The vibration propagation curves for the four sites were similar even though the sites were distributed along the Corridor. None of the sites displayed any evidence of unusually efficient vibration propagation. For this preliminary analysis, the results at the four test sites were combined into one curve that was used to characterize all of the proposed locations of at-grade track in the Corridor. At the sites where vibration impacts have been predicted (Section 5.12), detailed propagation testing would be performed during the final design phase of the Central Subway project to improve the estimates of vibration propagation and to design specific improvement measures into track design.

5.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

This chapter of the SEIS/SEIR identifies and evaluates the potential environmental operational and cumulative consequences of each of the Central Subway alternatives described in Chapter 2.0: Alternative 1 - No Project/TSM, Alternative 2 - Enhanced EIS/EIR Alignment, and Alternative 3 - Fourth/Stockton Alignment with Options A and B. Mitigation measures that would reduce or avoid impacts are then described for each potential adverse impact identified. All construction impacts and mitigation measures are detailed in Chapter 6.0, Construction.

Consistent with CEQA, the San Francisco Planning Department considers mitigation measures when necessary and feasible in order to reduce or eliminate potentially significant environmental effects. Improvement measures may also be proposed to further minimize the affects of impacts that are less-than-significant reducing those effects even further. Under NEPA and FTA procedures, mitigation measures may be recommended to address project-related adverse effects even if impacts would not necessarily be considered significant.[1] This section identifies mitigation measures intended to reduce Project impacts to comply with both CEQA and NEPA requirements. For CEQA purposes, Chapter 7.0 provides the determination of significance and distinction between mitigation and improvement measures.

5.1 LAND USE

5.1.1 INTRODUCTION

An adverse impact on land use would occur if the Project would conflict with any applicable land use plan, policy, regulation, or zoning code; have a substantial adverse impact upon the existing character of the project's vicinity; or physically divide an established community. An impact would be considered generally significant if it were to change land use in a manner that would be incompatible with surrounding land uses.

The Project alternatives could affect surrounding land use in a variety of ways, both during the construction and operational phases. These impacts include the physical impacts of the right-of-way and ancillary facilities, such as mid-street portals, emergency ventilation shafts, electrical substations, station entrances and the surface street station platform south of Market Street.

In this section, potential land use impacts are assessed in terms of Corridor, neighborhood, and site-specific impacts. The Project alternatives are assessed against the existing and planned developments in

1 Council on Environmental Quality, Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Federal Register, 18026, 1981.

the Corridor and surroundings areas, in order to evaluate the compatibility of the proposed facilities with neighboring land uses. The land use analysis incorporates a 300-foot area along either side of the proposed alignments and a 1,500-foot area around the boundaries of the proposed light rail stations.

Other considerations include whether the Project would disrupt access to neighborhoods, physically divide or isolate some areas within a neighborhood from others. The operation of the Project could adversely affect businesses by disrupting access or by separating a business from its customers. The potential direct and indirect impacts and benefits of the operation on neighborhoods and on business communities are described below.

5.1.2 CONSISTENCY WITH ADOPTED PLANS AND POLICIES AND LAND USE COMPATIBILITY

Alternative 1 - No Project/TSM

The No Project/TSM Alternative would be consistent with many of the adopted plans and policies reviewed in Section 4.1.1. For example, the No Project/TSM Alternative would support policies contained in San Francisco's *General Plan* aimed at encouraging the development and use of urban mass transportation systems, such as Objective 1, Policy 1.3 contained in the Transportation Element - "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." Similarly, this alternative would be consistent with goals and objectives contained in the *Regional Transportation Plan* (RTP), including the following: "Improve mobility of persons and freight" and "Support transportation investments that promote community social and economic objectives" through transportation system improvements.

The No Project/TSM Alternative would include a variety of roadway and Muni service improvements, including the operation of the T-Third line as an extension of the Castro Shuttle to Visitacion Valley, extension of N-Judah rail service to a turnaround loop at 18th, Illinois, 19th and Third Streets to serve expected UCSF and Mission Bay ridership volumes, and bus service modifications that would occur independent of this Project. As no new project-related fixed rail facilities would occur, there would be no change in the physical environment and therefore no adverse impacts to land use or neighborhood character associated with this Alternative.

Under the No Project/TSM Alternative, however, transit services would not keep pace with future travel demand in the Study Area. As the quality and efficiency of public transit service deteriorates (see Section 3.0 Transit Impacts), users could be attracted to alternative modes of transportation, including use of private vehicles. For this reason, the No Project/TSM Alternative would be inconsistent with transportation policies contained in Area Plans, including the *South of Market Plan*, *Northeastern*

Waterfront Plan, *Downtown Plan*, *Chinatown Plan*, and *Eastern Neighborhoods Community Plan*, that encourage accommodating future employment and population growth in San Francisco through transit, rather than private automobiles.

While the No Project/TSM Alternative would generally support locally adopted "Transit First" policies, it would not support the specific policies that are aimed at providing fixed rail service in the corridor, e.g., as reflected on the Rail Transit map in the Transportation Element, in the San Francisco Transportation Authority's *Strategic Plan* and *Four Corridor Plan*, and in the MTC *Regional Transportation Plan*. It may also not accommodate future employment and population growth in transit as effectively as the Build Alternatives.

Alternative 2 - Enhanced EIS/EIR Alignment

The Enhanced EIS/EIR Alignment would be generally consistent with San Francisco's "Transit First" policy, as well as regional government policies aimed at improving transportation access to job centers and recreational opportunities. The alternative also would be consistent with rail project funding priorities identified in the San Francisco County Transportation Authority's *Strategic Plan* and *Four Corridor Plan* as well as MTC's RTP, which "supports transportation investments that promote community social and economic objectives."

The Enhanced EIS/EIR Alignment would be consistent not only with *General Plan* policies aimed at developing transit as the primary mode of transportation within San Francisco, but also with specific policies that encourage the provision of a light rail transit service along the Third Street Corridor from Visitacion Valley in the south to Chinatown in the north. Such policies are contained in the Transportation Element – Rail Transit Plan of the *General Plan*. Area Plans such as the *South of Market Plan*, *Northeastern Waterfront Plan*, *Downtown Plan*, *Chinatown Plan*, and *Eastern Neighborhoods Community Plan*, all have policies focused on improvements to transit service.

<u>Operation Impacts</u>

Since the Project would be primarily an underground operation, the Enhanced EIS/EIR Alignment would not have significant impacts on surface land uses, disrupt neighborhood character, or physically divide or isolate areas of a neighborhood. Stations would be located in urban areas that are already substantially built out. Land uses in the vicinity of stations could benefit from and be supported by the Central Subway, by making it easier and more efficient for riders to access commercial and residential development in the vicinity of stations.

Along the surface segment, there would be no changes to the land uses and no physical division to the neighborhood because the light rail would be in the existing street right-of-way. The light rail would serve as a unifying element as it will draw pedestrians to the stations.

In the subway segment, the main station entries and emergency ventilation shafts would generally be at off-street locations. The Market Street Station would require new entrances to the station on the south side of Market Street at Third Street and would require the elimination of parking spaces at the Hearst Garage (located at the southeast corner of Stevenson and Third Streets) to accommodate vent shafts. The entrance to the Union Square Station in the plaza would result in a potential loss of 29 parking spaces out of 985 spaces in the Union Square Garage and additional foot traffic in the park. The removal of parking spaces from the Hearst and Union Square garages would not hinder their continued use as parking facilities. (Specific impacts on parking are discussed in Chapter 3.0 Transportation).

Private and public right-of-way would be required to accommodate the Enhanced EIS/EIR Alignment station entries and ventilation shafts, but would minimally affect land use. Further discussion of property acquisition is found in Section 5.2.

Cumulative Impacts

The Enhanced EIS/EIR Alignment is not expected to have any long-term cumulative impacts on land use or neighborhood character, since it would primarily serve fully developed, urban areas and would not physically divide existing neighborhoods.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Like the Enhanced EIS/EIR Alignment, the Fourth/Stockton Alignment Option A would be generally consistent with the adopted plans and policies contained in the *General Plan* and Area Plans aimed at improving transit service in corridors with high potential ridership. The Fourth/Stockton Alignment Option A would be consistent with the *Downtown Plan*'s "Transit First" policy, as well as with rail project funding priorities identified in the San Francisco County Transportation Authority's *Strategic Plan* and *Four Corridor Plan*, as well as in the MTC RTP. The additional transit capacity would better provide for increased transit demand associated with growth in the corridor.

Operation Impacts

Since the proposed Project would be primarily an underground operation, the Fourth/Stockton Alignment Option A would not significantly impact surface land uses, disrupt neighborhood character, or physically divide an existing neighborhood. Stations would be located in urban areas that are already substantially built out. Land uses in the vicinity of stations could benefit from and be supported by the subway, by making it easier and more efficient for riders to access commercial and residential development in the vicinity of stations.

Along the surface segment, the width of the roadway will be maintained and no changes to the adjacent land uses would be required, however, some loss of on-street parking would occur on blocks with station entrances or tunnel portals (see Section 3.2.4, Parking). The roadway would be modified to accommodate surface light rail operations within the street right-of-way, but this would not be expected to disrupt the character of the neighborhood or to physically divide it.

As with the EIS/EIR Enhanced Alignment, in the subway segment, the main station entries and emergency ventilation shafts would be at off-street locations. There would also be street and sidewalk modifications, such as bulb-outs, at certain subway station locations to provide secondary entries. Construction of the Moscone Station would require the accommodation of stairs on the west side of Fourth Street at Howard Street and one elevator on the east side of Fourth Street at Howard Street, but would not disrupt adjacent land uses. The station entrance in the Union Square plaza would add foot traffic in the plaza and would result in a loss of 29 out of 985 parking spaces in the Union Square Garage, but would not hinder its continued use as a parking facility. (Specific impacts on parking are discussed in Chapter 3.0, Transportation.)

Acquisition of private property and use of public right-of-way would be required to accommodate Fourth/Stockton Alignment Option A station entries and ventilation shafts at certain locations, but would minimally affect land use. Sub-sidewalk basements in the public right-of-way along Stockton Street between Geary and Ellis Streets would need to be eliminated to accommodate the Union Square/Market Street Station. Further discussion of property acquisitions is found in Section 5.2.

Cumulative Impacts

The cumulative impacts would be the same as those described under Alternative 2.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

The consistency with adopted plans and policies would be the same as described for Alternative 3A.

Operation Impacts

Operation impacts on land use are the same as for Alternative 3A, except that an amendment of the Planning Code, which prohibits the demolition of residential apartment units, at this location would be required for the Chinatown Station. The impacts would be the same as those discussed in Section 6.5.2, Property Acquisition."

Cumulative Impacts

Cumulative impacts on land use would be the same as for Alternative 3A.

Mitigation Measures

No mitigation measures would be required.

5.2 SOCIOECONOMIC CHARACTERISTICS

The potential impacts and potential benefits of each Project alternative on population and employment patterns and economic development are described in this section. A socioeconomic impact is considered significant if the alternative would induce substantial growth or concentration of population or if it would displace a large number of people.

5.2.1 DEMOGRAPHIC AND ECONOMIC IMPACTS

Major projects can impact a region's or a city's economy. A large construction labor force may not be available, requiring workers to temporarily relocate to the Project vicinity. This could have an effect on housing markets, school enrollment, and many other neighborhood characteristics. Likewise, a major project can generate jobs and local revenues, and this can affect the economy of a city or a neighborhood. Table 5-1 identifies the construction employment impacts of the Project Alternatives. Potential demographic and economic impacts associated with each of the Central Subway Project Alternatives are described below.

TABLE 5-1

CONSTRUCTION AND EMPLOYMENT IMPACTS

(COSTS IN $MILLIONS)

ALTERNATIVE	COST OF FACILITIES	COST OF LRVS	COST OF PROF. SERVICES	TOTAL COST
No Project/TSM	$0	$0	$0	$0
Enhanced EIS/EIR	$1,095	$21	$229	$1,345
Alternative 3A	$908	$21	$202	$1,131
Alternative 3B	$1,026	$21	$188	$1,235

Note: Costs in 2007 Dollars
Source: PB/Wong, 2007

Alternative 1 - No Project/TSM

The No Project Alternative/TSM would not generate the local revenues compared to the Build Alternatives shown in Table 5-1 above. This alternative would not affect neighborhoods or businesses along the Corridor. However, the lack of transit improvements could result in a long-term degradation of mobility along the Corridor, and transit services with the adjacent community; particularly relative to other San Francisco neighborhoods that have the benefit of Muni light rail or BART service.

Alternative 2 - Enhanced EIS/EIR Alignment

Operation Impacts

The operation of Enhanced EIS/EIR Alignment would generate approximately 40 jobs for station operation and maintenance.[2] This would be a beneficial impact.

In addition, the new rail connections to Chinatown provided under the Enhanced EIS/EIR Alternative would facilitate residential and employment growth planned for the Study Area, particularly around station areas and in the South of Market area along the Third and Fourth Street corridors, by improving transit reliability and services; reducing transit travel times to Chinatown; and improving access to Downtown employment opportunities. These Project goals and objectives would be met by this alternative.

Cumulative Impacts

No long-term cumulative impacts on the labor market or resources would be expected to occur.

Mitigation Measures

No substantial adverse impacts on demographic or economic conditions are anticipated from the operation of the Enhanced EIS/EIR Alignment. While beneficial to the City and region in terms of employment opportunities and income, the long-term direct employment impacts are not considered to be substantial. No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Operation Impacts

The operation of the Fourth/Stockton Alignment Option A would generate approximately 40 additional jobs; like the Enhanced EIS/EIR Alternative. This would be a beneficial impact.

The economic benefits under the Fourth/Stockton Alignment Option A would be the same as those identified for the Enhanced EIS/EIR Alignment, except they would be focused along Fourth Street in the South of Market area and around stations at Moscone, Union Square, and Chinatown. Greater travel time savings would occur under this alternative, but would not be substantial enough to result in major economic benefits when compared to other alternatives.

Cumulative Impacts

No long-term cumulative impacts on the labor market or resources would be expected to occur.

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2 Dan Rosen, MTA, April 2007.

Mitigation Measures

As with Alternative 2, no mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Operation Impacts

The operation of the Central Subway Fourth/Stockton Alignment Option B would be the same as those identified for Alternative 3A.

Cumulative Impacts

No long-term cumulative impacts on the labor market or resources would be expected to occur.

Mitigation Measures

As with Alternative 2, no mitigation measures would be required.

5.2.2 ACQUISITION AND DISPLACEMENT OF EXISTING USES

The acquisition and relocation of businesses or residents as a result of the Project would be a construction-related impact and is discussed in Section 6.5.2.

Alternative 1 - No Project/TSM

The No Project/TSM Alternative would not require the acquisition of any property for stations or ancillary facilities and therefore, would not have any displacement impacts.

Alternative 2 - Enhanced EIS/EIR Alignment

There would be no operation or cumulative impacts.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

There would be no operation or cumulative impacts.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Central Subway Fourth/Stockton Alignment Option B (Modified LPA)

There would be no operational or cumulative impacts.

Mitigation Measures

No mitigation measures would be required.

5.2.3 ENVIRONMENTAL JUSTICE FINDINGS

Several of the defined goals for the Central Subway Project – achieving equity in transit investments, obtaining community acceptance and political support, and supporting economic revitalization efforts for the Central Subway Corridor – relate to environmental justice principles. Input from community meetings has revealed that the Project is perceived by many area residents as an overdue public investment that will improve transit accessibility in neighborhoods that have been overlooked in the past and will strengthen local businesses. For these reasons, the Project has considerable local support and is viewed by many as a means of mitigating past environmental "injustices" that the City's minority neighborhoods located along the Corridor may have experienced. (See Tables 11-1 and 11-2 in Section 11.0, Coordination and Consultation.)

A transportation project must consider potential effects to human health or the environment on a community composed of minority or low-income populations. This section includes a discussion of Project impacts on low-income and minority neighborhoods to determine whether or not these are "disproportionate" in comparison with impacts on other neighborhoods within the Corridor.

The population and household income information provided in Section 4.2, indicates that almost the entire Central Subway Corridor traverses low-income and minority neighborhoods, as well as a major retail district and pockets of higher-income neighborhoods in the South of Market area. Implementation of the Central Subway Project would include direct mobility benefits to all of these neighborhoods that are expected to be equitably shared across communities by various demographic groups. The section below considers whether the Project would have disproportionate health and environmental impacts on the high minority or low-income neighborhoods identified as defined by Executive Order No. 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*.[3]

[3] Federal Highway Administration, Federal Transit Administration, *Addressing Environmental Justice in the Environmental Impact Statement*, May 9, 1997.

Alternative 1 - No Project/TSM

The No Project/TSM Alternative would not directly impose adverse health or environmental impacts disproportionately on any of the minority or low-income neighborhoods identified. However, with increases in transit service limited to bus service, this alternative would result in increased traffic congestion, more noise and emissions, and slower travel times throughout the Central Subway Corridor. Adjacent neighborhoods, with the exception of the Financial District, would remain underserved by transit in comparison to other parts of San Francisco under this alternative. Failure to implement the Project would do little to address the lack of public investment in the underserved low-income and minority communities traversed by the Project Corridor.

All Build Alternatives

The Project is intended to provide a long-term improvement in transit mobility and accessibility in the Study Area. Adverse impacts identified in this section of the SEIS/SEIR are distributed throughout the Corridor, which traverses minority and low-income neighborhoods, as well as a major retail district. Adverse impacts do not unduly impact any one neighborhood, except for residential and business displacement. Each of the Build Alternatives would displace ~~residential dwellings and~~ small businesses and Alternative 3B would displace residential units in the predominantly minority and low-income Chinatown District. To mitigate these impacts, it is recommended that redevelopment on the station sites incorporate affordable housing and ground floor retail where possible. Other mitigation measures proposed are consistent throughout the Corridor.

Operation Impacts

The Build Alternatives would require limited acquisition of properties to accommodate station entrances. Acquisition of one parcel with a gas station at 266 Fourth Street would be required in the South of Market area for the Fourth/Stockton Alignment, Options A and B alternatives. In order to accommodate a station in Chinatown and bring the benefits of the subway to the neighborhood, between 8 and 10 businesses and up to 17 residential units would be displaced in this area of minority concentration. While the greatest impact on businesses and residences would occur in Chinatown, ~~the number of relocations is not substantial and~~ the community has expressed strong support of the Project. The impact of these acquisitions would be mitigated through existing relocation assistance programs and through opportunities for developing affordable housing on the Chinatown Station site.

Cumulative Impacts

The Project would not contribute substantially to cumulative changes in population or employment in San Francisco, but would serve the existing population in a built-out, urban environment, rather than stimulate new population growth. While the Project would create new operation and maintenance jobs, neither direct nor indirect employment would contribute substantially to cumulative employment growth. (See Section 7.4 for additional discussion of cumulative population and employment impacts.) The Build Alternatives would result in a potential loss of affordable housing units in Chinatown for the Chinatown station. If affordable housing units are incorporated into the redeveloped station, then the Project would not contribute to a cumulative impact on low-income or affordable housing.

Community Participation

As noted in Section 4.2.5 and Chapter 11.0, an extensive community participation effort was undertaken to provide information to the public and solicit input during the development of the Project alternatives. This effort will continue through the Project implementation phase. Not only have over 100 presentations been made to neighborhood groups, community and business organizations, and individual stakeholders, but printed materials have been made available in Chinese and Spanish as well as English. The Central Subway telephone information line provides responses in English, Chinese, and Spanish.

Community meetings have been held in each of the neighborhood areas surrounding proposed stations and Project alternatives have been refined based on community input to ensure that community concerns are addressed. The breadth and depth of community outreach has ensured equal access to the process regardless of income level or ethnicity to ensure the Project is consistent with Environmental Justice objectives.

5.3 COMMUNITY FACILITIES AND SERVICES

5.3.1 INTRODUCTION

Impacts on community services and facilities would result if the Project displaced or physically altered a community facility, restricted access to that facility, or hindered the operation or services offered at the facility, either on a short-term or long-term basis.

Parks and recreational facilities would be affected if they were altered or displaced or their use or function was diminished. In addition, parkland and recreational facilities are subject to guidelines established by Section 4(f) of the U.S. Department of Transportation Act (USC 1653 (f)) (refer to Chapter 10.0, Section 4(f) Evaluation). Taking of parkland or recreational properties for the implementation of the Central Subway Project would be an adverse impact, requiring consultation with the U.S. Department of Transportation, U.S. Department of the Interior, and San Francisco Recreation and Parks Department.

For police and fire services, an impact would be considered adverse if the alternative would require additional equipment or personnel to maintain acceptable service levels or if access to police or fire stations or emergency vehicle routes were impeded.

5.3.2 PUBLIC AND COMMUNITY FACILITIES

Alternative 1 - No Project/TSM

For the No Project/TSM Alternative, congestion along the Corridor’s roadways and highways is expected to increase, adversely affecting mobility and travel times within the Corridor (refer to Section 3.2). As transit and auto traffic slow, the time required to reach public and community facilities would increase. In addition, by 2030, transit operating along Third, Fourth and Stockton Streets is expected to be over capacity, thereby constraining demand and potentially impairing the accessibility and mobility of transit dependent residents who are not within walking distance of these facilities.

Alternative 2 - Enhanced EIS/EIR Alignment

<u>Operation Impacts</u>

The placement of vent shafts, station entrances, and elevators in Union Square plaza would permanently remove an estimated 1,517 square feet of open space out of a total 112,256 square feet–or 1.35 percent–for transportation purposes. The pedestrian traffic in the plaza would also increase to access the escalator on the east side. Otherwise, operation of the Central Subway Enhanced EIS/EIR Alignment would not adversely affect the community and public facilities that are situated along the alignment or near other subway stations. Access to these facilities by transit would improve.

<u>Cumulative Impacts</u>

The continued growth in the Mission Bay, South of Market and Eastern Neighborhood areas would put increased demand on existing community facilities. Improved transit access to community facilities serving neighborhoods within the Study Area would be consistent with the City's Transit-First policies, but could also increase use of these facilities. This potential increase in use of community facilities due to accessibility improvements would not be so substantial that it could not be managed.

<u>Mitigation Measures</u>

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

<u>Operation Impacts</u>

Operation impacts of the Central Subway Fourth/Stockton Alignment Option A would be the same as those described for Alternative 2.

<u>Cumulative Impacts</u>

Cumulative impacts of the Central Subway Fourth/Stockton Alignment Option A would be the same as those described for Alternative 2.

<u>Mitigation Measures</u>

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

<u>Operation Impacts</u>

Operation impacts of the Central Subway Fourth/Stockton Alignment Option B would be the same as those described for Alternative 2 and 3A, except that less than 1,690 square feet or 1.51 percent of open space would be permanently removed for transportation purposes from Union Square. The vent shafts under this alternative would be located in the Ellis/O'Farrell garage rather than in Union Square.

<u>Cumulative Impacts</u>

Cumulative impacts of the Central Subway Fourth/Stockton Alignment Option B would be the same as those described for Alternative 2 and 3A.

<u>Mitigation Measures</u>

No mitigation measures would be required.

5.3.3 POLICE, FIRE AND EMERGENCY SERVICES

Alternative 1 - No Project/TSM

The No Project/TSM Alternative could adversely affect response times for police, fire, and emergency services since traffic congestion on Corridor roadways is expected to increase substantially by 2030 (refer to Section 3.2). The increased response times would also impede the ability of these City departments to quickly respond to safety and security problems involving Muni patrons or facilities.

Cumulative Impacts

An increased demand for police, fire, and emergency services may result from cumulative development in the Study Area, including new development in the South of Market, Eastern Neighborhood, and Mission Bay areas, but the demand would not be affected by the lack of a rail transit investment. Muni provides its own security officers, who would respond to safety incidents in the transit system.

Mitigation Measures

No mitigation would be required.

Alternative 2 - Enhanced EIS/EIR Alignment

Operation Impacts

Operation of the Enhanced EIS/EIR Alignment would require the development of security and emergency response systems that can be integrated with Muni's existing procedures and facilities. For example, Muni provides its own (contracted) security guards for patrolling its fixed facilities and uses a closed circuit system for monitoring subway stations. In addition, Muni in concert with the San Francisco Fire Department and the Department of Public Health, holds two to three emergency drills per year and emergency orientation sessions to ensure a coordinated response effort for emergencies occurring in the Market Street Subway. Expanding these services to include the Central Subway is not expected to require additional police, fire, or emergency services personnel. However, if the surveillance system were expanded to include the Central Subway, additional Muni resources would be required. Muni will provide the resources necessary to secure the stations and other fixed facilities associated with the Central Subway. As an added safety measure, ventilation shafts for all new stations will be placed in secure above-grade locations.

Cumulative Impacts

An increased demand for police, fire, and emergency services may result from cumulative development in the Study Area including new development in the South of Market, Eastern Neighborhood, and Mission

Bay areas. Muni provides its own security officers, who would respond to safety incidents in the Central Subway system, therefore implementation of the Enhanced EIS/EIR Alignment would not result in an increased demand for emergency services.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Central Subway Fourth/Stockton Alignment Option A(LPA)

Operation Impacts

The operation impacts would be the same as described above for Alternative 2, except improvements to the existing Powell Street station, as needed for the connection to the UMS Station, will be addressed in cooperation with BART during final design of the station connections. This will include assessment and, if necessary, implementation of improvements to the existing vertical circulation, platform capacity, lighting, ventilation system, fire suppressant system, and way-finding will be assessed in cooperation with BART during final design of the station connections. the emergency ventilation system shall be designed and operating procedures written/revised and tested to ensure that the UMS and Powell Street station emergency ventilation systems do not adversely affect each other during an emergency event or system test.

Cumulative Impacts

The cumulative impacts would be the same as described above for Alternative 2.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Operation Impacts

The operation impacts would be the same as described above for Alternative ~~2~~ 3A.

Cumulative Impacts

The cumulative impacts would be the same as described above for Alternative 2.

Mitigation Measures

No mitigation measures would be required.

5.3.4 PARKS AND RECREATIONAL FACILITIES

Alternative 1 - No Project/TSM

No impacts to parks and recreational facilities would result from the No Project/TSM Alternative. However, access and parking for these facilities may moderately be impaired because of the increase in Corridor roadway congestion causing travel delays and increasing parking demand along the streets adjacent to parks.

Alternative 2 - Enhanced EIS/EIR Alignment

Operation Impacts

Parks and recreational facilities, such as Yerba Buena Gardens, would not be displaced nor would land be acquired for the construction of Enhanced EIS/EIR Alignment. However, Union Square Station entries, elevators, and vent shafts would be located at the east edge of the Union Square plaza, taking about 1,517 square feet of the 112,256 square foot plaza (1.35 percent), displacing 29 of 985 parking spaces in the garage below, but providing direct and convenient transit access to the park (see Chapter 10.0, Section 4(f) Report). This alternative could result in additional pedestrian traffic through the park to access the station entry.

At the Chinatown Station, secondary access to the station would be provided via Hang Ah Alley, an alleyway under the jurisdiction of the Recreation and Parks Department. While pedestrian traffic would increase on Hang Ah and Pagoda Alleys, which provide secondary access to Willie “Woo Woo” Wong Playground (primary access is from Sacramento Street), there would be no reduction in the alley or playground areas. Public access to the parks and recreational facilities near station locations for the Enhanced EIS/EIR Alignment would be improved.

The use of Union Square plaza and Hang Ah Alley for station access facilities would require a Section 4(f) determination of impact on the parks and recreational resources by the Recreation and Parks Department. If the Recreation and Parks Department does not make a “de minimis” finding, the Section 4(f) report would be subject to review by the Department of Interior.

Cumulative Impacts

No other proposed projects were identified in the Study Area that would impact the same parks and recreational facilities, so no additional cumulative impacts were identified for this alternative.

Mitigation Measures

To reduce the impacts of additional pedestrian traffic on Hang Ah and Pagoda Alleys, the secondary access to the Chinatown Station could be eliminated.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Operation Impacts

The operation impacts would be the same as described above for Alternative 2.

Cumulative Impacts

No additional cumulative impacts were identified for this alternative.

Mitigation Measures

Mitigation measures would be the same as described above for Alternative 2.

Alternative 3 - Central Subway Fourth/Stockton Alignment Option B (Modified LPA)

Operation Impacts

The Union Square Station entries and elevators located at the east and southeastern edge of the Union Square plaza, would take about 1,690 square feet of the park, or 1.51 percent, (compared with 1.35 percent for Alternatives 2 and 3A), displacing parking spaces below, but providing direct and convenient transit access to the park. The vent shafts in this alternative have been located at the Ellis/O'Farrell Garage. Pedestrian access to the station entry would be from Geary Street, and would not result in increased pedestrian traffic through the plaza. Public access to the parks and recreational facilities near station locations for Central Subway Fourth/Stockton Alignment Option B would be improved. There would be no impacts to Willie "Woo Woo" Wong playground or to Hang Ah Alley for this alternative.

The use of Union Square plaza for station access would require a Section 4(f) determination of impact on the parks and recreational resources by the Recreation and Parks Department. ~~If t~~The Recreation and Parks Department ~~does not make a~~ has concurred with the "de minimis" finding~~,~~ for this alternative, which satisfies the Section 4(f) ~~report would be subject to review by the Department of Interior~~ review requirements (see Appendix J).

Cumulative Impacts

No additional cumulative impacts were identified for this alternative.

Mitigation Measures

Mitigation measures would be the same as described above for Alternative 2 and 3A.

5.4 CULTURAL RESOURCES

5.4.1 INTRODUCTION

In the context of a federally reviewed and permitted project, the significance of architectural and archaeological resources is measured with reference to the evaluation criteria of the National Register of Historic Places (NRHP). 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 which possess integrity of location, design, setting, materials, workmanship, feeling, and association, and which

- are associated with events that have made a significant contribution to the broad patterns of our history; or
- are associated with the lives of persons significant in our past; or
- 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
- have yielded, or may be likely to yield, information important in prehistory or history (36 CFR 60.4).

The criteria are essential to evaluation of NRHP 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 National Historic Preservation Act of 1966 (NHPA). All projects in California undergoing environmental review must also address the cultural resources requirements of CEQA, with resources evaluated under the California Register of Historical Resources (CRHR) criteria, which are similar to those of the NRHP. Under CEQA, if a project would cause a substantial adverse change in the significance of an historical resource or archaeological resource as defined in Section 15064.5 of CEQA, it may have a significant effect on the environment.

In addition, cultural resources are subject to guidelines established by Section 4(f) of the U.S. Department of Transportation Act (USC 1653(f) (refer to Chapter 10.0, Section 4(f) Evaluation). Taking of cultural resources for implementation of the Central Subway would be an adverse impact requiring consultation with the U.S. Department of Transportation, U.S. Department of Interior, San Francisco Historic Preservation Officer, and SHPO.

5.4.2 PREHISTORIC AND HISTORICAL ARCHAEOLOGICAL RESOURCE IMPACTS

The methods used to identify known and potential archaeological resources within the Central Subway APE are described in Section 4.4. Archaeological impacts and mitigation measures are generally construction-related and are discussed in Section 6.7. The prehistoric and historical archaeological resources that may be affected by the Project construction are also described in Section 6.7 and Section 7.3.3.

Alternative 1 – No Project/TSM

No subsurface disturbance would take place with operation of the No Project/TSM Alternative. No impacts to prehistoric or historical archaeological resources would occur with this alternative.

Alternative 2 – Central Subway Enhanced EIS/EIR Alignment

<u>Operation Impacts</u>

Because operation of the proposed light rail system for Alternative 2 will not involve subsurface disturbance, no impacts to archaeological resources are anticipated.

<u>Cumulative Impacts</u>

No cumulative impacts to archaeological resources would occur.

<u>Mitigation Measures</u>

No mitigation measures would be required.

Alternative 3 – Central Subway Fourth/Stockton Alignment Option A (LPA)

<u>Operation Impacts</u>

No operation impacts on archaeological resources are anticipated.

<u>Cumulative Impacts</u>

No cumulative impacts to archaeological resources would occur.

<u>Mitigation Measures</u>

No mitigation measures would be required.

Alternative 3 – Central Subway Fourth/Stockton Alignment Option B (Modified LPA)

Operation Impacts

No operation impacts on archaeological resources would be expected to occur.

Cumulative Impacts

No cumulative impacts to archaeological resources would occur.

Mitigation Measures

No mitigation measures would be required.

5.4.3 HISTORIC ARCHITECTURAL RESOURCE IMPACTS

An impact to historic architectural resources would result from acquiring, demolishing, or altering the integrity of individual architectural properties within the APE for the project, or altering a property that is a contributor to a historic district, or a district that is eligible for listing on the NRHP or CRHR.[4]

Historic architectural resources described in Section 4.4 of this SEIS/SEIR and identified in the Project APE for Alternatives 2, 3A, and 3B include buildings, structures or objects that qualify as either individual buildings that appear eligible for the NRHP or CRHR or as contributing elements to a NRHP-eligible or CRHR-eligible historic district. The Project crosses through eight listed or proposed historic districts and one local conservation district, including the South End Historic District, Rincon Point/South Beach Historic Industrial Warehouse District, South Park Historic District, Kearny-Market-Mason-Sutter Conservation District, Lower Nob Hill Apartment Hotel District (part of the larger CRHR listed San Francisco Apartment Hotel District), Chinatown Historic District, North Beach Historic District, Washington Square Historic District, and Powell Street Shops Historic District. The South End Historic District is a City of San Francisco-identified Article 10 historic district and the Kearny-Market-Mason-Sutter (KMMS) District is a locally-identified Article 11 conservation district. Their boundaries are larger and more inclusive than the NRHP and CRHR boundaries. For that reason, there is an overlap of the local South End Historic District and the Rincon Point/South Beach Historic Industrial Warehouse District, which is on the CRHR.

In this section, potential impacts to historic properties in each alternative are discussed first and then impacts to contributors of the NRHP, CRHR, and local historic districts. It should be noted that although the Lower Nob Hill Apartment Hotel District is included within the Study Area, it is not located within an

[4] NRHP – National Register of Historical Places; CRHP – California Register of Historic Places.

area proposed for stations or portals. As a result, no impacts to the historic buildings in this district would result from the Project.

Alternative 1 – No Project/TSM

The No Project/TSM Alternative would not result in adverse effects to historic architectural resources, given that the Alternative does not include new rail operations.

Alternative 2 – Enhanced EIS/EIR Alignment

Operation Impacts

During operation of the Central Subway along the Enhanced EIS/EIR Alignment, vibrations from passenger trains would not constitute an adverse effect to historic properties, as indicated in the Noise and Vibration Impact Analysis (Section 5.12). There would not be substantial visual impacts to historic architectural resources because most of the Central Subway would be underground, and the surface tracks on Third and Fourth Streets – in addition to the tunnel portals – would be in the center of the existing streets and would be visually compatible with existing street features.

In the Market Street Station area, the escalators and stairs would be in the sidewalk area, with the elevators positioned next to them, on the southwest corner of Market and Third streets. Their placement next to the street would not create visual impacts to 703-705 Market Street and the other neighboring historic buildings. The ventilation shaft ductbanks, extending 26 feet above the roofline of the Ellis/O'Farrell parking garage, would not visually detract from any of the historic buildings in the area because they would be located at the back end of the roof.

In the Union Square Station area, the Stockton Street station entry, station vents along the eastern side of Union Square, and two elevators north of the northern-most vent shaft would not constitute substantial impacts to the historic character of the KMMS conservation district, or to the park, which was substantially altered in 2002. (See also Visual Impacts, Section 5.3.3 and Chapter 10.0, Section 4(f) Evaluation.) No significant changes to the historic use of the NRHP-eligible subterranean Union Square garage are proposed. The two additional station entries are located in the sidewalk area next to Stockton Street at either side of Maiden Lane, in front of 218-222 Stockton Street and 234-240 Stockton Street, both NRHP-eligible properties. The station entries would not constitute a substantial impact to these historic buildings in the KMMS District. Although Union Station features would be visible from historic buildings on Maiden Lane, they would blend with the existing landscape features of the recently renovated plaza and would not adversely affect the KMMS District.

A Negative Declaration (Case # 98.257E), prepared for the Union Square Improvement Project in 1998, described Union Square's historic importance as "significant because of its relationship to surrounding buildings and the urban setting, its history as one of San Francisco's first public squares, and the successful integration of an underground garage, which was the first of its kind in the world," and not "from its internal configuration or landscape features." Extensive physical alterations to Union Square occurred in 2002, including the replacement of the grass lawns and nearly all existing park features with concrete terraces, paving, plants, palm trees, buildings, a new café, and a ticket booth.

Because the proposed station entry and elevators and vent shafts would be introduced to a modernized Union Square, which has lost historic integrity, the impacts would not constitute an adverse impact on Union Square or the underground garage. As such, modifications to Union Square that conform to its present physical character would not adversely impact buildings within the KMMS Conservation District, many of them NRHP-eligible properties.

As discussed under Construction Impacts (Chapter 6.7), in the Chinatown Station area, where a new Muni station building would replace an existing historic building, the potential for adverse effects to historic architectural resources exists. Demolition of building 814-828 Stockton Street would be considered a significant adverse effect because of the building's status as a contributor to a NRHP-eligible Chinatown district. Removal of the building would create a break in the cohesive grouping of contextually-related buildings and would visually isolate the corner building at 800-810 Stockton Street.

NRHP eligible historic districts are a cohesive grouping of buildings that share a common history, visual appearance, or development. Historic districts can be contiguous or non-contiguous groupings of buildings; in this instance, the Chinatown Historic District is contiguous. Demolition of contributing elements to a NRHP-eligible district constitutes an adverse effect under Section 106 and under the California Environmental Quality Act. Under Criterion A, 814-828 Stockton Street is contextually important for its association with the development of the Chinatown community. This area has been a part of Chinatown since at least the 1880s and has continuously remained a vibrant part of the community. Constructed in 1923, 814-828 Stockton Street is noted for its initial Chinese ownership in the 1920s, use of its basement as a Chinese school, and for housing the World Journal Chinese newspaper during the 1970s and 1980s.

The visual representation of this building is less important than its history. Under Criterion C, there are architectural similarities shared with a large percentage of the Chinatown buildings. The architecture is loosely tied to the significance of the Chinatown Historic District, although it is not exclusive to this part of the City. Most of these buildings conform to two-part commercial block compositions also found in other areas of San Francisco, and they convey Renaissance or Baroque design influences produced by architects whose designs were found throughout the City. Visual differences expressed in Chinatown include bright banners and awnings, and in some cases, Chinese design elements have been infused in the architecture. In this case, although many of its storefronts retain some integrity, the building suffers from integrity issues due to the removal of ornamental elements on the upper portion of the façade.

Mitigation Measures

The design for each of the stations will be reviewed by the Environmental Review Officer, the City Historic Preservation Officer, and a historic architect hired by MTA for compliance with the Secretary of the Interior's Standards based on their compatibility with the character-defining features of each of the districts. New buildings would be designed to reinforce the established character of the historic district and visual continuity of the streetscape and an historic architectural specialist would be consulted during design development.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

Operation Impacts

Operation impacts would be the same as described above for Alternative 2.

Mitigation Measures

The same mitigation measures would apply as those described for Alternative 2.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Operation Impacts

There would not be substantial visual impacts to historic architectural resources from the operation of the Alternative 3B because the surface tracks and tunnel portals would be located in the center of existing streets south of Market Street and in subway north of Bryant Street and would not detract from the historic context of the buildings.

In the Chinatown Station area, where a new Muni station building would replace an existing historic building, there is the potential for visual impacts to the historic context of architectural resources in Block 211. Demolition of building 933-949 Stockton Street would be considered a significant adverse effect because of the building's status as a contributor to a NRHP-eligible district, and its removal would create a break in the cohesive grouping of important buildings within the block and the neighboring block on the west side of Stockton Street.

The placement of a station entry along the Geary Street side of the recently renovated Union Square would not impact the historic context or use of the Square and underground garage. Impacts will be further minimized for this alternative because the emergency vents would be placed inside an air well in the Ellis/O'Farrell garage.

Mitigation Measures

Mitigation measures would be the same for Alternative 3B as those described above for Alternative 3A. The mitigation measures identified for 814-828 Stockton Street under Alternative 2 would also apply to 933-949 Stockton Street for this alternative.

5.5 VISUAL AND AESTHETIC RESOURCES

5.5.1 INTRODUCTION

Visual impacts were identified by comparing plan and profile drawings, visual simulations and shadow analysis for the proposed facilities with photographs and descriptions of the existing setting. Field visits were conducted at sites where proposed Central Subway structures might cast shadows, alter the scale or visual context of the surrounding landscape or distract from visual resources that distinguish landscapes in the project viewshed. Examples of such visual changes were created using computer simulation techniques at three locations: the tunnel portal at Third and Brannan Streets, station entries at Union Square and in Chinatown. The visual simulations offer the reader an impression of the scale of the proposed facility relative to the surrounding visual features in the existing landscape. These simulations are not to be assumed to show how the future buildings may actually be configured. Other visual changes are described in the text.

5.5.2 IMPACT CRITERIA

The following criteria for identifying potentially significant impacts to visual and aesthetic resources were used to assess the Project impacts. Would the Project:

- Have a substantial adverse effect on a scenic vista?
- Substantially damage scenic resources, including, but not limited to trees, degrade, or obstruct publicly accessible views and resources?
- Substantially degrade the existing visual character or quality of the site and its surroundings?
- Substantially contrast with the scale or visual context of the surrounding landscape?
- Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

In San Francisco, a project is determined to have a significant shadow effect if it were to result in a substantial new shadow on public open space under the jurisdiction of the Recreation and Park Commission during the one hour before sunrise to one hour before sunset at any time of the year, or if shadows were cast so as to obscure direct sunlight on certain downtown sidewalks.

5.5.3 VISUAL IMPACTS

Using the criteria described above, and the visual simulations and shadow analysis, visual impacts are described below for each alternative.

Alternative 1 - No Project/TSM

The No Project/TSM Alternative would not alter or change the existing landscape. Therefore, no visual impacts would occur.

Alternative 2 - Enhanced EIS/EIR Alignment

Operation Impacts

For the Enhanced EIS/EIR Alignment, the subway would begin at tunnel portal locations, in the center of the street, between Brannan and Bryant Streets on Third and Fourth Streets. The wide streets are surrounded by commercial and live/work, and industrial structures, parking facilities and signage. The portals would introduce a new visual element in the streetscape as presented by the computer simulation of a tunnel at Third Street (see Figure 5-1). The visual impact of the portal on Fourth Street would be similar. The portals would be visible to motorists and pedestrians and adjacent live/work properties but would not significantly detract from the dominant features of existing buildings, street trees, and Moscone Center because the portal walls would rise less than three feet from the street. The portal would be visible from the historic Hotel Utah on Fourth and Bryant Streets, but would not detract from the existing landscape setting or character-defining features for the hotel.

A surface station with a side platform would be located on Third Street, just north of King Street, across from the ballpark. The surface platform on Third Street and tracks and overhead catenaries for surface alignments along Third and Fourth Streets would be visually compatible with existing transit features in the surrounding landscape.

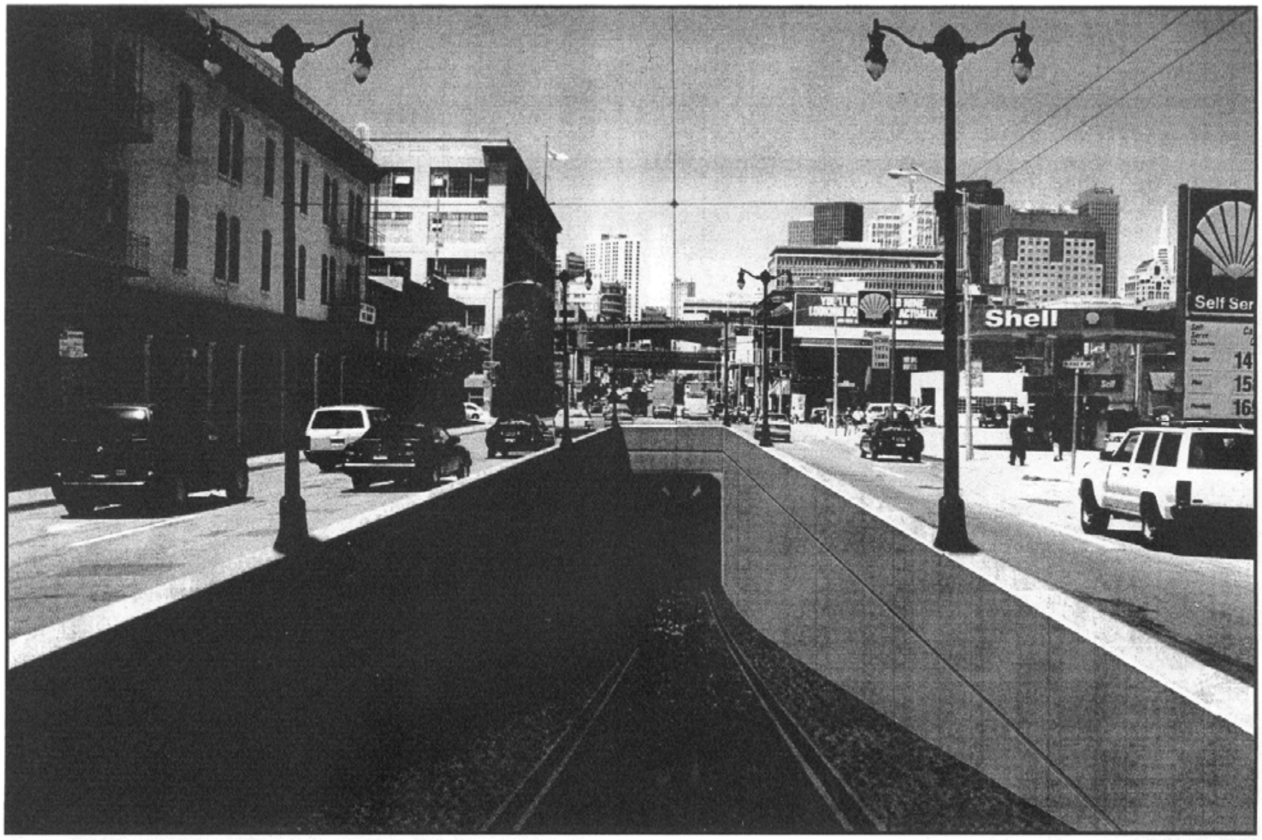
The Enhanced SEIS/SEIR Station entries at Moscone, Market Street, and Union Square would be located in pedestrian alleyways or in sidewalks where escalators and stairs would be protected with low-walls. Entrances at these stations may be designed with canopy covers, as shown in the simulations.

The Moscone Station entrance (escalators and stairs) would be in Tehama Pedestrian Way next to retail bays on the north side of the Moscone Garage (see Figure 5-2). Two elevators would be located at street level at the northwest corner of the garage. Two ventilation shaft ductbanks would extend east of Third Street under Clementina Street, rising along the southeast exterior of the Moscone Convention Center Garage to a height 16 feet above the garage roof. Neither the station entry, nor the ventilation shafts would detract from existing landscape features in scale, color or visual context of the existing landscape, nor would these features substantially degrade the existing visual character or quality of the area. There are no public parks near the vent shaft where shadows would be a concern.

FIGURE 5-1

TUNNEL ALTERNATIVE AT THIRD/BRYANT - VISUAL SIMULATION

ALTERNATIVE 2



Source: 1998 EIS/EIR

If the siphon and pumping station were selected as the mitigation for the North Point trunk sewer line relocation (refer to Section 5.6), two approximately eight-foot high utility cabinets would be installed in the sidewalk on the east and west sides of the Mission and Third Street intersection. These cabinets, which would house pumping and ventilation equipment, would have an exterior design that conforms to existing kiosks in the Yerba Buena Gardens area. The new utility cabinets would be visible to pedestrians. However, these new features would be unobtrusive compared with the surrounding densely-developed mid- and high-rise buildings. The remainder of the siphon facilities would be underground.

For the Market Street Station, the main street entrances (escalators and stairs) would be located in the sidewalk area on the south side of Market Street just west and east of Third Street (see Figure 5-3). Two

FIGURE 5-2

MOSCONE GARAGE - SIMULATION OF STATION ENTRY

ALTERNATIVE 2

Source: Kwan Henmi

elevators would be located on the southwest corner of Market and Third Streets next to the escalators and stairs. A subsurface pedestrian connection would be provided between the Market Street Station and the BART/Muni Metro Montgomery Station and would have no surface visual impacts. Two ventilation shaft ductbanks would extend east of Third Street under Stevenson Street, rising at the northeast interior corner of a private garage (Hearst) to a height 26 feet above the roofline. The design features of the Market Street Station would be compatible with existing landscape features in this Downtown location. The vent shaft would not cast shadows on any public park.

FIGURE 5-3

MARKET STREET STATION ENTRY SIMULATION

ALTERNATIVE 2

For Union Square Station, the main pedestrian entry would be located on the eastern edge of the Union Square plaza, in a stairway leading to the plaza, near the Plaza café. It would include escalators and stairs (and possible canopy), rising from the sidewalk level at Stockton Street to the plaza entrance. Two elevators would be located north of the northern-most vent shaft with access from the sidewalk on Stockton Street (Figure 5-4). Additional station entries would be located in sidewalk bulb-outs north (stairs) and south (escalators) of Maiden Lane. Two vent shafts would be integrated into the plaza terrace between the plaza café and the sidewalk on the west side of Stockton Street. Vent shafts would be located on either side of the escalators and stairs. The vent shafts would be about 11 feet high, but would not rise above the plaza because of their location on the terraced eastern edge of the park. These station features would be visible from Maiden Lane and the sidewalk on the east side of Stockton Street, but would not significantly distract from the Union Square landscape character in the foreground that was renovated in 2002, or from the dominant features of surrounding retail buildings and hotels that are the dominant character defining features that characterize the historic Union Square landscape. Union Square is considered historic as an open space, which would not change. The designs shown in the visual simulations are representative only and final design would undergo design review to ensure that the

FIGURE 5-4

UNION SQUARE STATION ENTRY SIMULATION

ALTERNATIVES 2 AND 3A

Source: Kwan Henmi

Project features not distract from the existing features of the park and Historic District. Because of their location and height, the vent shafts would not cast shadows on Union Square Park.

The Chinatown Stations would be centered on Clay Street at Stockton Street, and would have a mezzanine and ~~(~~concourse~~)~~ level and one platform level. The main pedestrian entrance would be in a building that Muni would construct on Stockton Street near Sacramento Street to accommodate escalators, stairs, two elevators, and two emergency ventilation shafts (see Figure 5-5). The Muni facility would require only one story, however, for the purposes of this analysis it is assumed that a structure 40-foot in height would be constructed on this parcel. The maximum allowable height for this property is 65-feet, but Muni would restrict the building height to 40 feet to meet the height constraints of

Proposition K and minimize casting shadows on the Willy “Woo Woo” Wong Playground located to the east of the station property.

FIGURE 5-5

CHINATOWN STATION ENTRY SIMULATION

ALTERNATIVES 2 AND 3A

Source: Kwan Henmi

The vent shafts would rise to a height 10 feet above the development roofline (or 50 feet above ground level) on the southeast end of the parcel near Pagoda Alley. This station would be visible from Willie "Woo Woo" Wong Playground and Hang Ah Alley, but because the station building would replace an existing building of similar scale, and would be visually compatible in scale with surrounding buildings, it would not substantially degrade or obstruct publicly accessible views or vistas and would not degrade the existing visual character or quality of the site and its surroundings (see Figure 5-6). This visual assessment focuses on scenic resources, and visual character, unlike the previous Historic Architectural

FIGURE 5-6

CHINATOWN STATION SIMULATION VIEWED FROM PAGODA ALLEY

ALTERNATIVES 2 AND 3A

Source: Kwan Henmi

Resource section, Section 5.1.1, that assessed changes to historic character-defining features in the Chinatown Historic District. These two are not mutually exclusive, but use different criteria in the assessment of impacts. There would be some minor shading of the playground tennis courts as shown in the shadow analysis during some months of the year and some times of the day, however, this shading would not be substantial in the context of existing shading from adjacent four- to six-story buildings surrounding the Playground (see Figure 5-7). Existing shadows on the playground would increase by 3 percent in March, 1 percent in June, 4 percent in September, and 3 percent in December. Similarly, the station building viewed from Stockton Street would not distract from adjacent buildings in terms of building scale or substantially degrade the existing visual character or quality of the area.

<u>Cumulative Impacts</u>

Because no other major projects have been identified in the station Study Area for Alternative 2, no cumulative visual impacts have been identified.

<u>Mitigation Measures</u>

Architectural treatment of the station escalator canopy, elevator exterior treatment and vent shaft exterior finish at Union Square would be developed in consultation with the Recreation and Parks Department, the Planning Department and the Union Square business associations. Exterior treatment of the Chinatown Station and vent shaft would be developed in consultation with the Planning Department, architectural historians, the City Historic Preservation Officer, and the Chinatown community during preliminary and final design.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

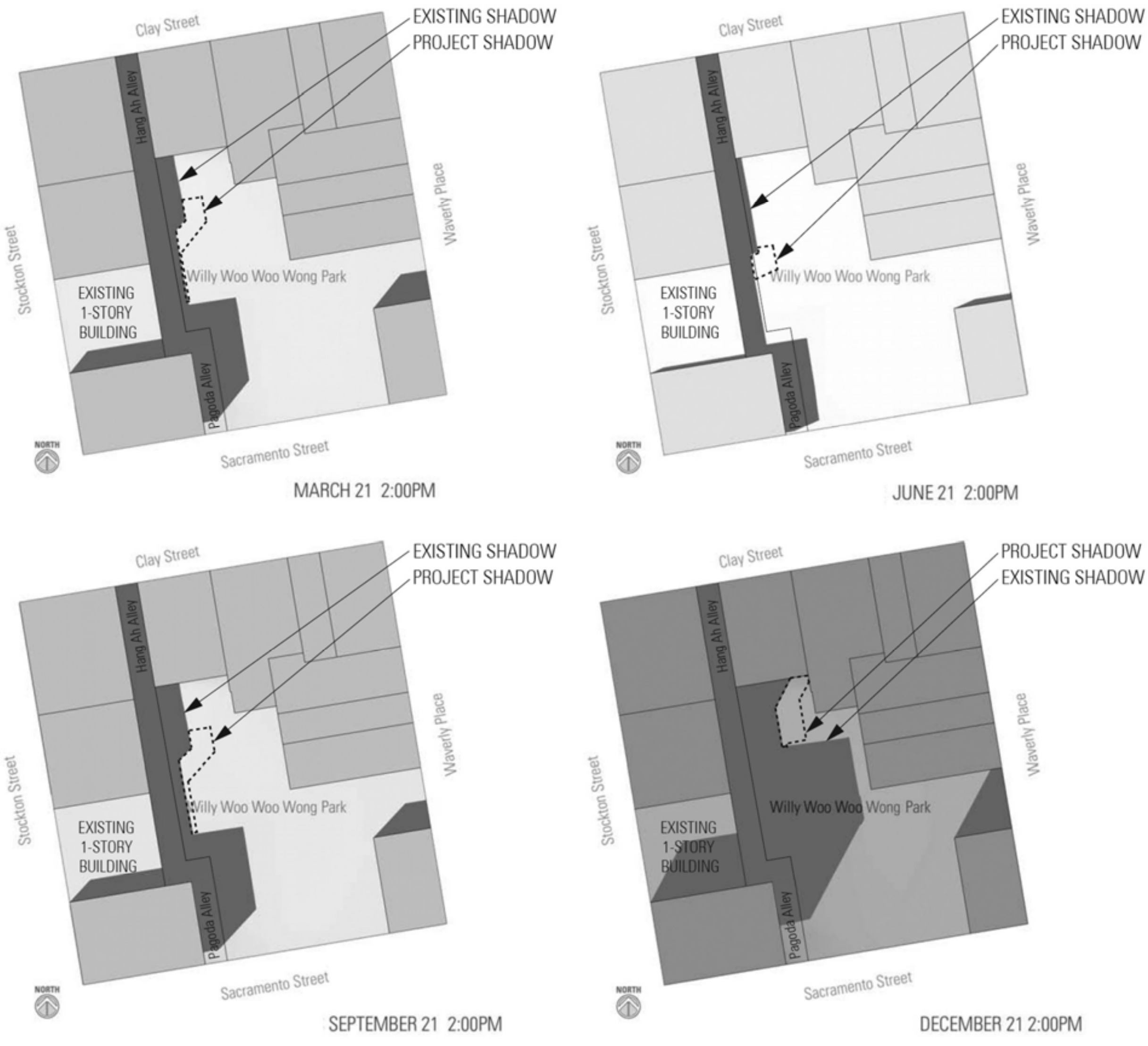
<u>Operation Impacts</u>

For Fourth/Stockton Alignment Option A, the subway would begin at the portal location in the center of Fourth Street between Townsend and Brannan Streets. The street is bordered by commercial, live/work, industrial structures, parking facilities, and signage. The tunnel portal would introduce a new visual element in the streetscape as represented in the computer simulation of Fourth Street at this location (see Figure 5-8**,** refer to Figure 4-8 for existing conditions). The portal would be visible by motorists and pedestrians and adjacent properties, but would not detract from other dominant features because the portal walls would rise less than three feet from the street. Unlike Alternative 2, this alternative would not have a tunnel portal or surface alignment on Third Street, further reducing the visual presence of the light rail features in the South of Market neighborhood.

FIGURE 5-7

SHADOWS ON WILLY "WOO WOO" WONG PLAYGROUND

ALTERNATIVES 2 AND 3A



Source: Kwan Kenmi

The same as for Alternative 2, Fourth/Stockton Alignment Option A station entries at the Union Square/Market Street Station would be located in pedestrian areas or in sidewalks where escalators and stairs would be protected with low walls. Elevator entrances at these stations may be protected by canopy covers. At Moscone and Chinatown Stations, the stairs, escalators and elevators would be located in off-street buildings. As with Alternative 2 above, these new features would blend with the surrounding landscape features in the South of Market and Downtown area.

FIGURE 5-8: FOURTH STREET PORTAL SIMULATION

ALTERNATIVE 3A

Plan

Simulation Looking South

Simulation Looking North

Source: PB Wong
Not to scale

The Moscone Station entries (escalators, stairs, and elevators) would be located entirely within an off-street property that Muni would acquire, currently the site of a gas station west of Moscone Center at 266 Fourth Street (see Figure 5-9). The Muni facility would require only one story and would house two ventilation shafts. The station entry would be located in a 40-foot high building with a setback of 85-feet for the vent shaft tower as permitted under existing zoning. The vent shafts would rise 26 feet above the 40-foot roofline on the north end of the parcel or to a height of 66 feet. An additional stair set would be located in the sidewalk on the west side of Fourth Street just north of Howard Street and on the south side of Howard Street just west of Fourth Street**.** A third elevator would be located directly across the street on the east side of Fourth Street near the corner of Howard Street. Neither the station entry, nor the ventilation shafts would detract from existing landscape features dominated by Moscone Center buildings in scale, color or context.

The same as Alternative 2 described above, the station entry at Union Square for Alternative 3A would be located on the eastern edges of the Union Square plaza, centered within the stairs leading to the plaza, near the existing café. The station entry would include escalators and stairs, rising from the sidewalk level at Stockton Street to the plaza entrance. Additional entries would be located in sidewalk bulb-outs on the east side of Stockton Street, north (stairs) and south (escalators) of Maiden Lane. Two vent shafts would be integrated into the plaza terrace between the plaza café and the sidewalk on the west side of Stockton Street. Vent shafts would be located on either side of the escalators and stairs. The vent shafts would be about 11 feet high, but would not rise above the plaza because of their location on the terrace grade. Two elevators would be located south of the southern-most vent shaft with access from the sidewalk on Stockton Street. The same as Alternative 2 above, the Central Subway features would be compatible with design features of the plaza and would not detract from the open-space and landscape features of Union Square or the dominant features of surrounding retail buildings and hotels and Historic KMMS District.

The same as for Alternative 2 above, the Chinatown Station entrance for Alternative 3A would be located on the east side of Stockton Street between Sacramento and Clay Streets in a new facility replacing an existing two-story building. The building above the new station would be limited to ~~less than~~ 40 feet tall to reduce possible shadows on the playground and tennis courts (Willie “Woo Woo” Wong Playground) to the east of the station ~~al~~location. The shadow analysis for this location is shown in Figure 5-7 above). Though the station would be visible from viewing points within the playground and alley, it would be compatible with the surrounding buildings and would not substantially damage, degrade or obstruct publicly accessible views or vistas from the park or cast significant shadows on park uses. The same as

FIGURE 5-9

MOSCONE STATION ENTRANCE SIMULATION

ALTERNATIVES 3A AND 3B

Source: Kwan Henmi

Alternative 2 described above, the proposed station in Chinatown for Alternative 3A would not detract from the dominant features or visual character or quality along Stockton Street in the Chinatown Historic District.

Cumulative Impacts

No other projects have been identified that would effect the visual character of the station areas. No cumulative visual impacts have been identified.

Mitigation Measures

Mitigation measures would be the same as identified above for Alternative 2.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Operation Impacts

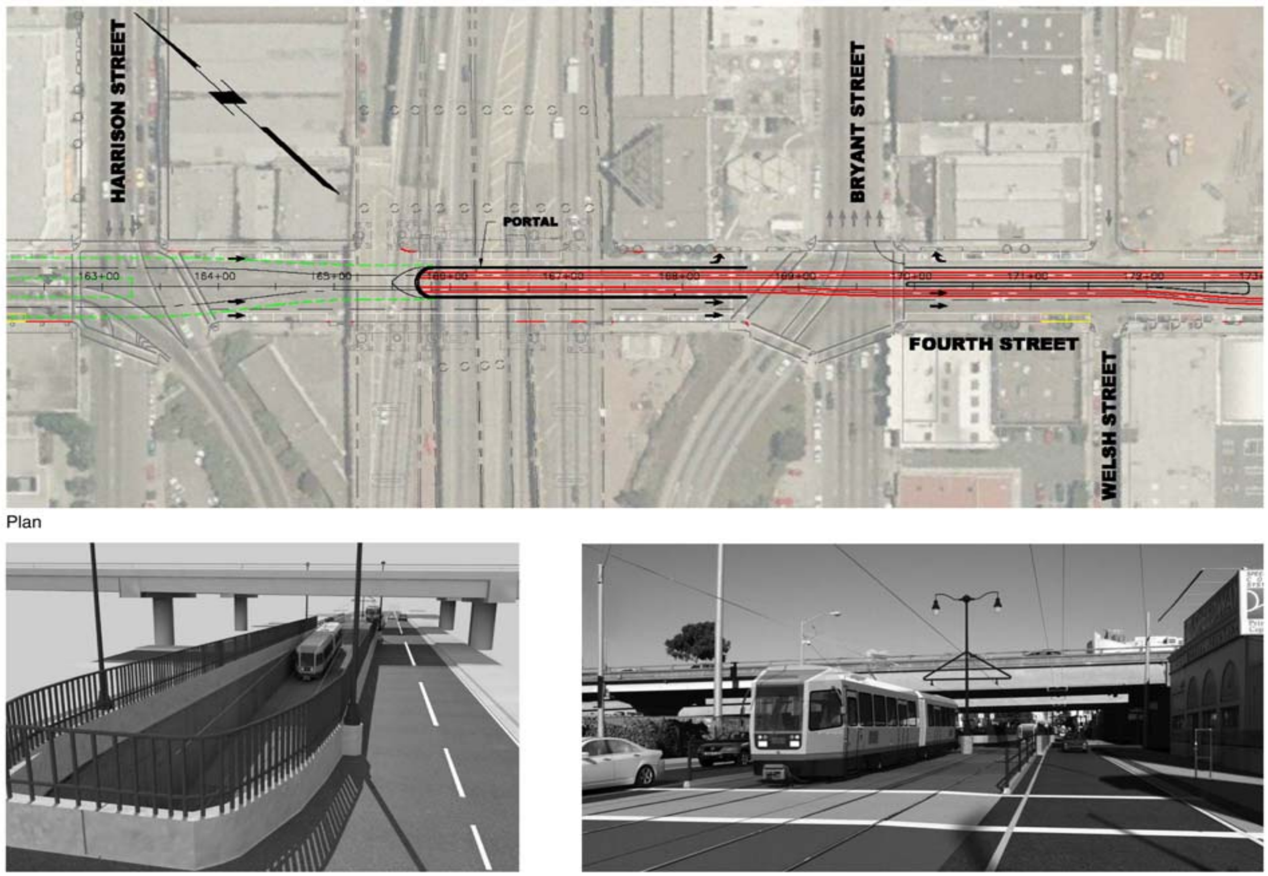
In Fourth/Stockton Alignment Option B, the operation impacts would be the same as those described for Alternative 3A, except the portal would be located between Bryant and Harrison Streets (see Figure 5-10, refer to Figure 4-6 for existing conditions). The location of the Union Square/Market Street and Chinatown Stations would also vary as noted below.

A combined Union Square/Market Street Station would be located under Stockton Street between Geary and Market Streets, with an underground platform centered on O'Farrell Street. At the north end of the station the main entrance would be located at the southeast corner of Union Square on Geary Street just west of Stockton Street. The entry would include escalators and stairs. This station entry design is different from Fourth/Stockton Alignment Option A described above and would not be visible from Maiden Lane. The station entry would be located within the terraced edge of the Plaza and would be visible from some vantage points along the sidewalks on Geary Street. Two elevators would be located on the western edge of Union Square in the terraced level along Stockton Street near the corner at Geary Street. A second set of stairs would be located in the sidewalk on the north side of Geary Street, just east of Stockton Street, behind an existing Muni bus stop. Two emergency ventilation ducts would extend west of Stockton Street under Ellis Street, rising inside the air-well of the Ellis/O'Farrell Garage to a height of 26 feet above the garage roof. The same as Fourth/Stockton Alignment Option A above, the Option B station features would be designed to blend with existing architectural features of Union Square and would not detract from the dominant features of the surrounding landscape (see Figure 5-11). Because the vent shafts would not be located along the western edge of Union Square as in Alternative 2 and 3A, the visual impacts to the Park would be less than the other alternatives. The station entry would not be visible from Maiden Lane.

The access to the Chinatown Station for Fourth/Stockton Alignment Option B would be located on the west side of Stockton Street between Washington and ~~Jackson~~ Clay Streets (see Figures 5-12 and 5-13). The underground station platform would extend to Jackson Street. It would not be visible from Willie "Woo Woo" Wong Playground on the east of Stockton Street. This underground station would have a mezzanine and ~~(~~concourse~~)~~ and one platform level for north and southbound trains. The main pedestrian entrance would be in a building that Muni would construct on the west side of Stockton Street at the corner of Washington Street to accommodate escalators, stairs, two elevators, and two emergency ventilation shafts. This station location is adjacent to Gordon Lau elementary school playground (not a public park) and would be across from the Mandarin Tower, one of the tallest buildings in Chinatown. The Muni facility would require only one story. For the purposes of this analysis it is

FIGURE 5-10: FOURTH STREET PORTAL SIMULATION

ALTERNATIVE 3B



Plan

Simulation Looking South

Simulation Looking North

Source: PB/Wong
Not to scale
Revised 1/08

FIGURE 5-11

UNION SQUARE STATION GEARY STREET ENTRY SIMULATION

ALTERNATIVE 3B

Source: Kwan Henmi

assumed to be part of a 65-foot high building as permitted under existing zoning. The vent shafts would rise 26 feet above the development roofline on the southwest end of the parcel. The proposed station and vent shafts would be compatible in scale with existing architectural features in the surrounding landscape and would not substantially degrade the existing visual character or quality of the area (not including the historic character-defining features discussed in Section 5.1.1).

Cumulative Impacts

No cumulative visual impacts have been identified.

Mitigation Measures

Mitigation measures would be the same as identified under Alternative 2.

FIGURE 5-12

CHINATOWN STATION STOCKTON STREET ENTRY SIMULATION

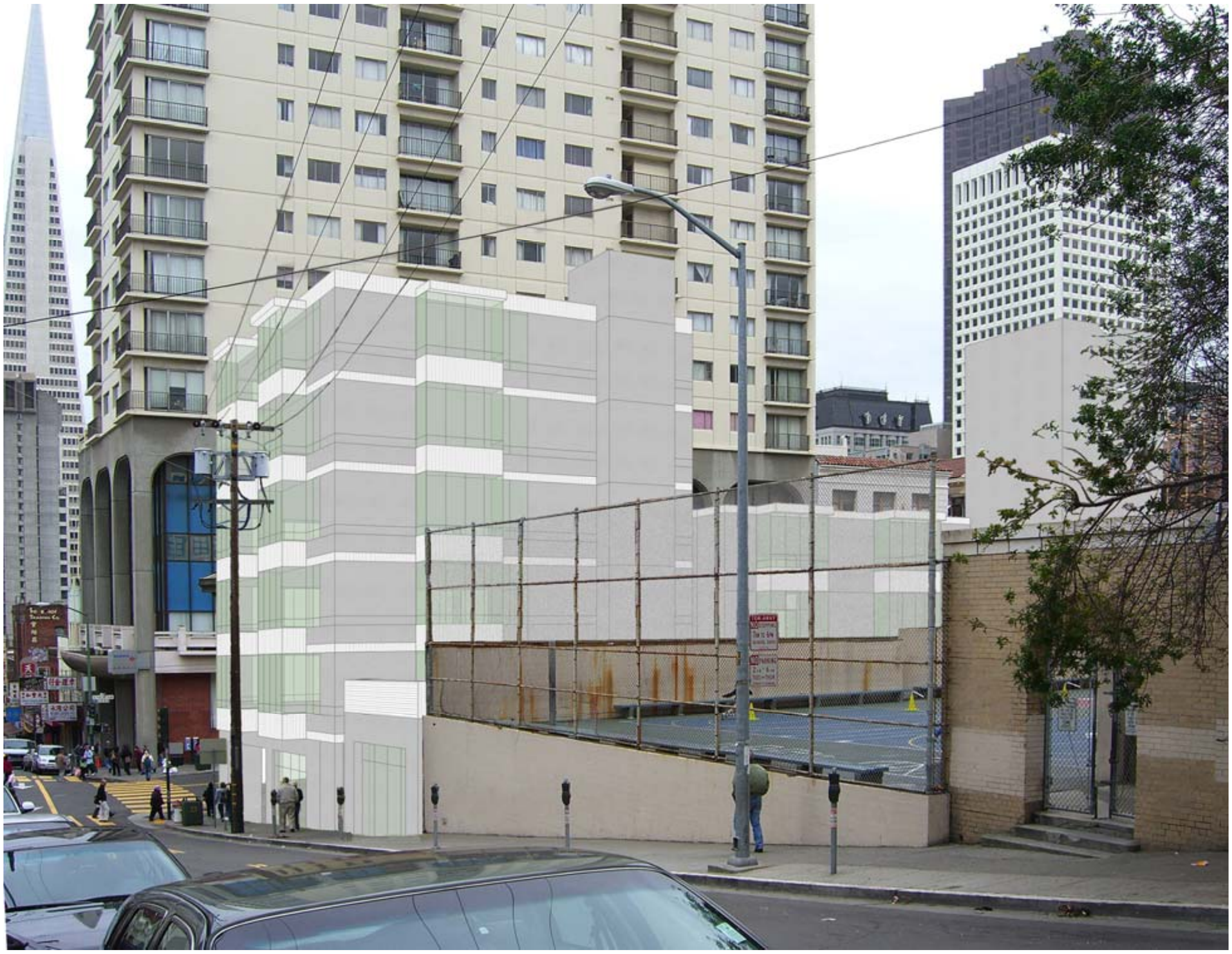
ALTERNATIVE 3B

Source: Kwan Henmi

FIGURE 5-13

CHINATOWN STATION SIMULATION LOOKING EAST FROM WASHINGTON STREET

ALTERNATIVE 3B



Source: Kwan Henmi

5.6 UTILITIES AND ENERGY

5.6.1 INTRODUCTION

The following section describes the impacts and mitigation measures for major subsurface and above-ground utilities. Conceptual plan drawings showing the location of the proposed facilities for the Central Subway Alternatives were used to identify impacts on existing utilities listed in Section 4.6. In addition, energy considerations for Central Subway Alternatives are summarized below.

A Project is considered to have an adverse impact on utilities if it would conflict with waste water treatment requirements of the Bay Area Regional Water Quality Control Board (BARWQCB) or require construction of new storm water drainage facilities or if there were not sufficient water, wastewater treatment, or landfill facilities available to serve the Project needs. Energy impacts would occur if the Project would encourage activities that result in large amounts of fuel, water, or energy or use of these resources in a wasteful manner.

The traction power substations for the Central Subway would be located underground in the Moscone and Chinatown Stations and would not be visible to the general public. The design of these facilities would be integrated into the non-public areas of the stations.

5.6.2 IMPACTS TO MAJOR UTILITIES

Alternative 1 - No Project/TSM

The No Project/TSM Alternative would not require modifications to utility lines in the Central Subway Corridor. No utility impacts would occur.

Alternative 2 - Enhanced EIS/EIR Alignment

<u>Operation Impacts</u>

No operation impacts have been identified in association with the siting of the traction power substations.

<u>Cumulative Impacts</u>

No cumulative impacts have been identified.

<u>Mitigation Measures</u>

No mitigation measures would be required.

Alternative 3 - Central Subway Fourth/Stockton Alignment Option A (LPA)

Operation Impacts

No operation impacts have been identified.

Cumulative Impacts

No cumulative impacts have been identified.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Central Subway Fourth/Stockton Alignment Option B (Modified LPA)

Construction Impacts

Operation Impacts

No operation impacts have been identified.

Cumulative Impacts

No cumulative impacts have been identified.

Mitigation Measures

No mitigation measures would be required.

5.6.3 ENERGY IMPACTS

The estimated energy consumption under each Alternative is summarized in Table 5-2. The formula used to calculate energy is stipulated by FTA. Since the formula does not consider articulated buses or light rail vehicles, the British Thermal Units (BTUs) represented in the table are approximate.

Alternative 1 – No Project/TSM

The No Project/TSM Alternative would result in increased diesel fuel and electric power consumption when compared to the current conditions as a result of growth in travel demand. Without the rail investment proposed in the Build Alternatives, more auto trips would occur resulting in higher energy consumption.

TABLE 5-2

ESTIMATED CHANGE IN 2030 REGIONAL ENERGY CONSUMPTION BETWEEN THE NO PROJECT/TSM ALTERNATIVE AND THE CENTRAL SUBWAY ALTERNATIVES

	BTUs (millions)	Change in BTU/Year (millions)		
Technology/Fuel Type	**No Project/TSM**	**Central Subway Enhanced EIS/EIR**	**Central Subway Fourth/Stockton Option A**	**Central Subway Fourth/Stockton Option B**
Passenger Vehicle	1,215,286	-2,688	-1,677	-3,345
Heavy-Duty Vehicle	0	0	0	0
Diesel Bus	7,583	-1,231	-1,231	-1,231
Electric Bus	6,850	-469	-469	-469
Electric Light Rail	10,965	4,372	3,620	3,996
Total	**1,240,683**	**-16**	**243**	**-1,049**

Note: Based on Vehicle Miles Traveled multiplied by an energy consumption factor for each technology/fuel type, and compared to the No Project/TSM Alternative. In accordance with FTA guidance, the No Project/TSM Alternative serves as the baseline for calculations.

Source: VMT – San Francisco Model, March 2007; Energy consumption factors - Oak Ridge National Laboratory, *Transportation Energy Book: Edition 16*, 1996.

Alternative 2 – Enhanced EIS/EIR Alignment

Operation Impacts

Implementation of the Enhanced EIS/EIR Alignment would require electric power to operate the light rail line. Muni’s traction power distribution system would be expanded as a part of the construction of the Project for this purpose. The electrical energy for the Enhanced EIS/EIR Alignment would be generated at the City’s Hetch Hetchy hydroelectric (clean-burning fuel) facility. Table 5-3 indicates that the Enhanced EIS/EIR Alignment would consume 16 million fewer total BTUs per year of energy than the No Project/TSM Alternative.

Additionally, the Enhanced EIS/EIR Alignment would reduce the consumption of fossil fuel for autos and diesel buses when compared to the No Project/TSM Alternative.

No additional Hetch Hetchy generating or transmission capacity would be necessary to accommodate the Enhanced EIS/EIR Alternative. The Enhanced EIS/EIR Alignment would not result in energy impacts.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Operation Impacts

As with the Alternative 2, implementation of the Fourth/Stockton Alignment Option A would require expansion of Muni's traction power distribution system. Table 5-3 indicates that the Fourth/Stockton Alignment Option A would consume slightly more, 243 million total BTUs per year of energy, than the No Project/TSM Alternative. The Fourth/Stockton Alignment Option A would reduce the consumption of fossil fuel for autos and diesel buses when compared to the No Project/TSM Alternative, but not to the same extent as under Alternatives 2 or 3B. Under this alternative, the increase in energy consumption associated with the increased operation of light rail vehicles would not be offset by the reduction in passenger vehicle use, as this alternative has the lowest transit ridership.

Though some additional BTU's would be consumed by Alternative 3A, no additional Hetch Hetchy generating or transmission capacity would be necessary to accommodate for this small amount. Fuel consumption by power construction equipment also could be accommodated with existing energy resources. Therefore, the Fourth/Stockton Alignment Option A would not result in significant energy impacts to meet power demands.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Operation Impacts

As with Alternative 2 and 3A, implementation of the Fourth/Stockton Alignment Option B would require expansion of Muni's traction power distribution system. Table 5-3 indicates that the Central Subway Fourth/Stockton Alignment Option B would consume 1,049 million fewer total BTUs per year of energy than the No Project/TSM Alternative. Additionally, the Central Subway Fourth/Stockton Alignment Option B would reduce the consumption of fossil fuel for autos and diesel buses, as this alternative would generate the highest ridership on the new rail line (more than 10,000 additional riders than either Alternative 2 or 3A).

No additional Hetch Hetchy generating or transmission capacity would be necessary. Fuel consumption by power construction equipment also could be accommodated with existing energy resources. Therefore, the Central Subway Fourth/Stockton Alignment Option B would not result in significant energy impacts to meet power demands.

Mitigation Measures

No mitigation measures would be required.

5.7 GEOLOGY AND SEISMICITY

5.7.1 INTRODUCTION

Implementation of the Central Subway would be considered to have an adverse effect relating to geology, soils, and seismicity if it would: expose people or structures to major geological hazards, create or exacerbate geologic instability, or result in substantial soil erosion, loss of topsoil, or substantially change a unique geologic or physical feature.

5.7.2 EXPOSURE OF CONSTRUCTION WORKERS AND/OR THE PUBLIC TO GEOLOGIC HAZARDS AND POTENTIAL DAMAGE TO PROJECT COMPONENTS

Alternative 1 - No Project/TSM

The No Project/TSM Alternative would not be expected to result in adverse effects on geology or soils, and would not result in increased hazards associated with seismic activity. The No Project/TSM Alternative does not include new construction, and therefore would not expose new structures, or the users of new structures, to geologic hazards or soil erosion.

Alternative 2 - Enhanced EIS/EIR Alignment

Operation Impacts

The alignment does not cross any known active faults, and therefore rupture of tunnels resulting from displacement along a fault is not likely to occur. The tunnels would be subjected to “extremely high” levels of groundshaking. However, the tunnels would be designed to withstand effects from the design earthquake on the San Andreas Fault (Magnitude ~7). No identifiable damage to the BART/Muni Metro subway was caused by the Loma Prieta earthquake in 1989.[5] The Enhanced EIS/EIR Alignment would be designed and built to current seismic standards to withstand the design earthquake, which would reduce potential Project impacts.

Cumulative Impacts

Other Projects (e.g., public transportation, commercial, and residential Projects) would also be constructed and operated in this seismically active region. While the population of San Francisco and the region is projected to grow in the future and therefore additional people would be potentially exposed to hazards during a major seismic event, the Project would be built to current seismic standards to minimize the potential safety impact on the general population. Therefore implementation of the Enhanced EIS/EIR Alignment would not result in a cumulative impact.

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[5] Ramirez, Robert, Track Superintendent, Cable Car and Rail Systems, Municipal Railway (Muni), City and County of San Francisco, personal communication with BASELINE, 11 July, 1997.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA) and Option B (Modified LPA)

Operation Impacts

Operation impacts would be the same as described above for Alternative 2.

Cumulative Impacts

Cumulative impacts would be the same as described above for Alternative 2.

Mitigation Measures

No mitigation measures would be required.

5.7.3 DAMAGE TO EXISTING AND FUTURE IMPROVEMENTS FROM SETTLEMENT OR INSTABILITY OF SUBSURFACE MATERIALS

Alternative 1 - No Project/TSM

The No Project/TSM Alternative would not be expected to result in substantial impacts to geology, soils, and seismicity. The No Project/TSM Alternative does not include new construction, and therefore would not expose new structures, or the users of new structures, to geologic hazards.

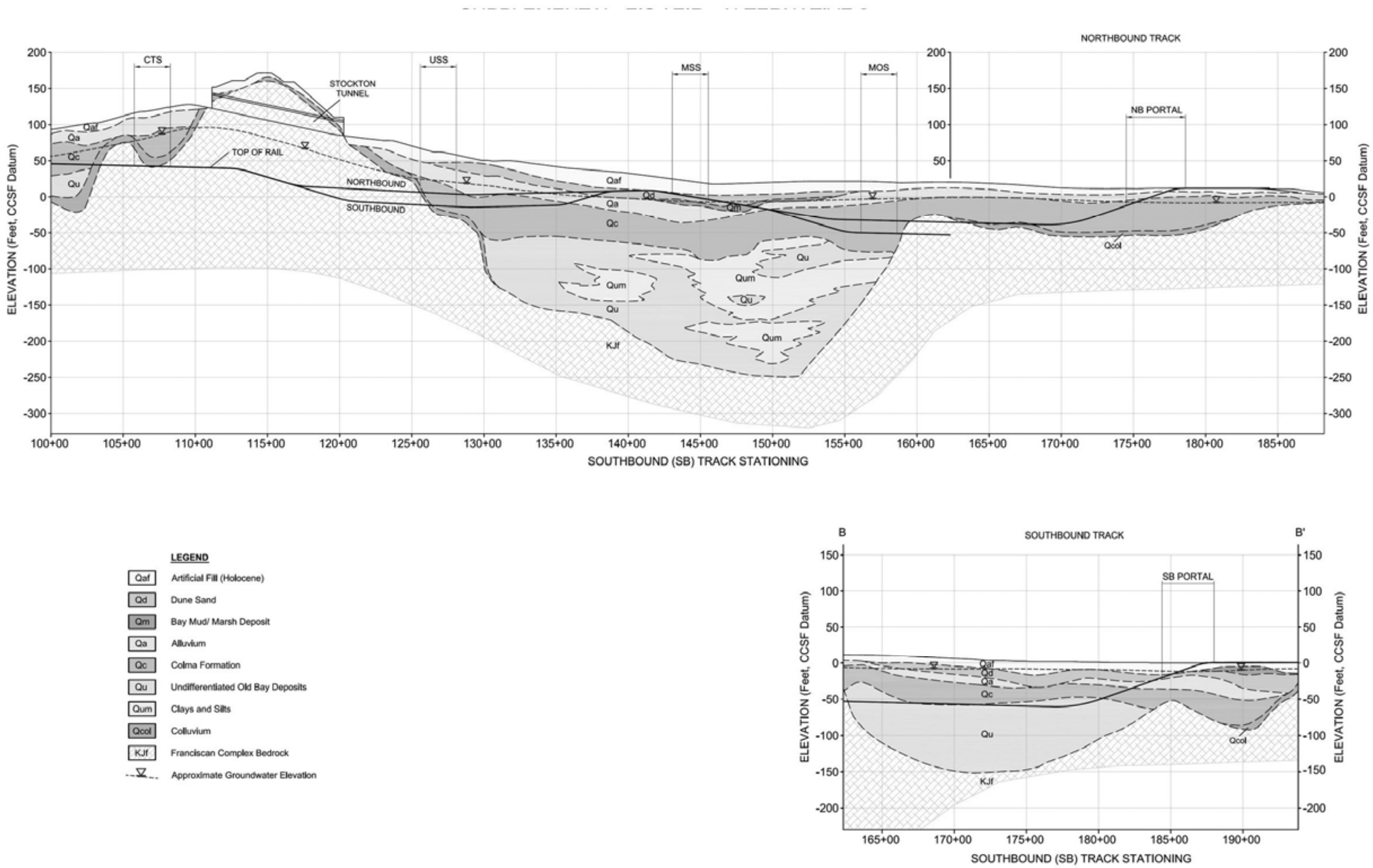
Alternative 2 - Enhanced EIS/EIR Alignment

Operation Impacts

Portions of this alignment (Third and Fourth Streets between King and Brannan Streets) would consist of light rail track placed on existing road surfaces, and therefore would not be expected to result in significant settlement related to instability of geologic materials. The remainder of this alignment would consist of subway tunnels under existing City streets. Based on geologic profile as shown on Figure 5-14, the subway tunnels would be constructed in geologic materials consisting of artificial fill, dune sand, Bay Mud, and Alluvium. Operational effects on the stability of geologic materials around the tunnels would not be expected since the reinforced tunnel lining would be placed against the exposed material upon excavation, limiting the expansion or contraction potential of the sediments.

FIGURE 5-14

GEOLOGIC PROFILE FOR ALTERNATIVE 2



Source: Geomatrix
Not to Scale

Cumulative Impacts

Settlement and geologic instability of subsurface materials is a site-specific condition that would not result in cumulative impacts.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Operation Impacts

A portion of this alignment (Fourth Street between King and Townsend Streets) would consist of light rail track placed on existing road surface, and therefore would not be expected to result in significant settlement related to instability of geologic materials. The remainder of this alignment would consist of subway tunnels under existing city streets. Based on the geologic profile shown in Figure 5-15, the subway tunnels would be constructed in geologic materials consisting of artificial fill, dune sand, Bay Mud, dense Colma Sand, and Bedrock. Operational effects on the stability of geologic materials around the tunnels would not be expected since the reinforced tunnel lining would be placed against the exposed material upon excavation, limiting the expansion or contraction potential of the sediments.

Cumulative Impacts

Settlement and geologic instability of subsurface materials is a site-specific condition that would not result in cumulative impacts.

Mitigation Measures

No mitigation measures would be required.

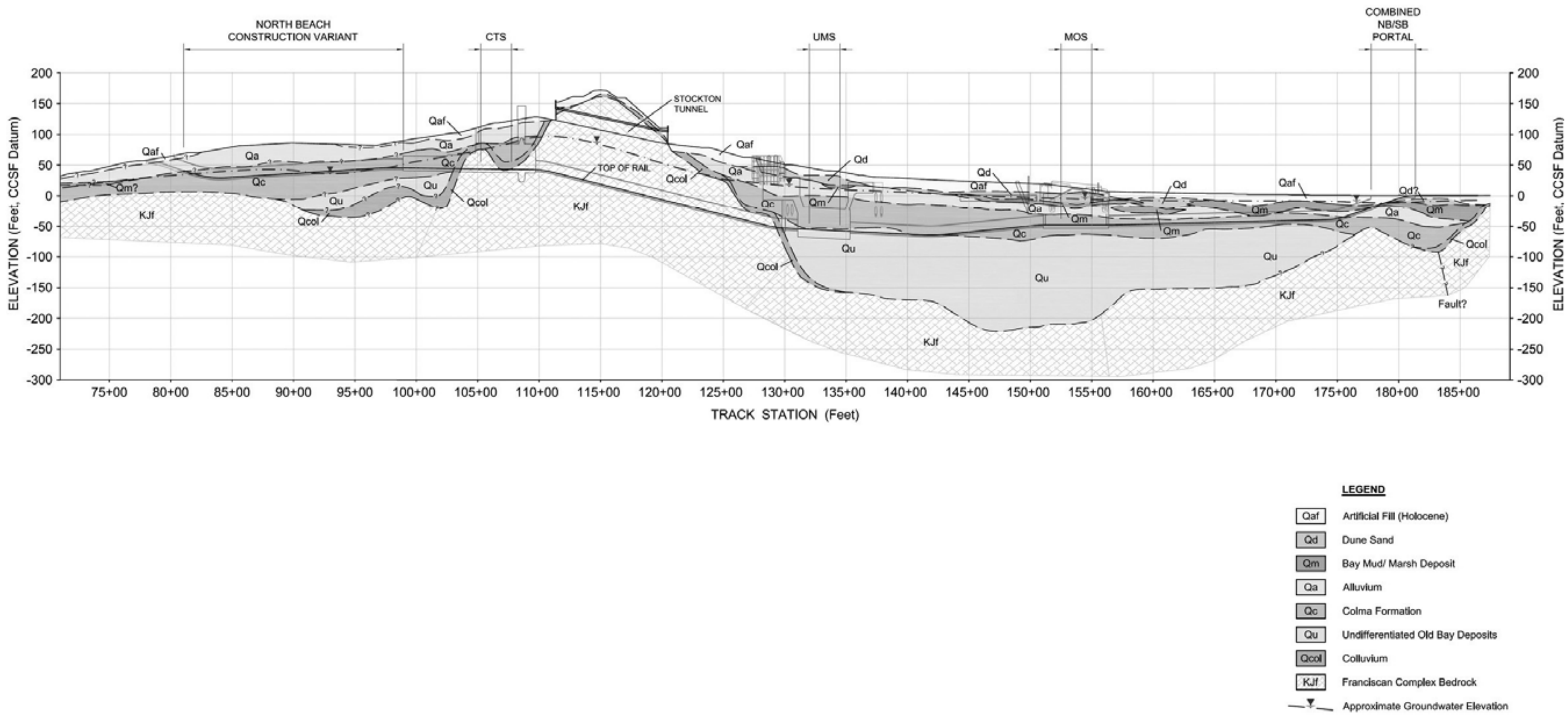
Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Operation Impacts

A portion of this alignment (Fourth Street between King and Bryant Streets) would consist of light rail track placed on existing road surface, and therefore would not be expected to result in significant settlement related to instability of geologic materials. The remainder of this alignment would consist of subway tunnels under existing City streets. Based on data obtained from soil borings along the alignment, the subway tunnels would be constructed in geologic materials consisting of artificial fill, dune sand, Bay Mud, and Alluvium (see Figure 5-16). Operational effects on the stability of geologic materials

FIGURE 5-15

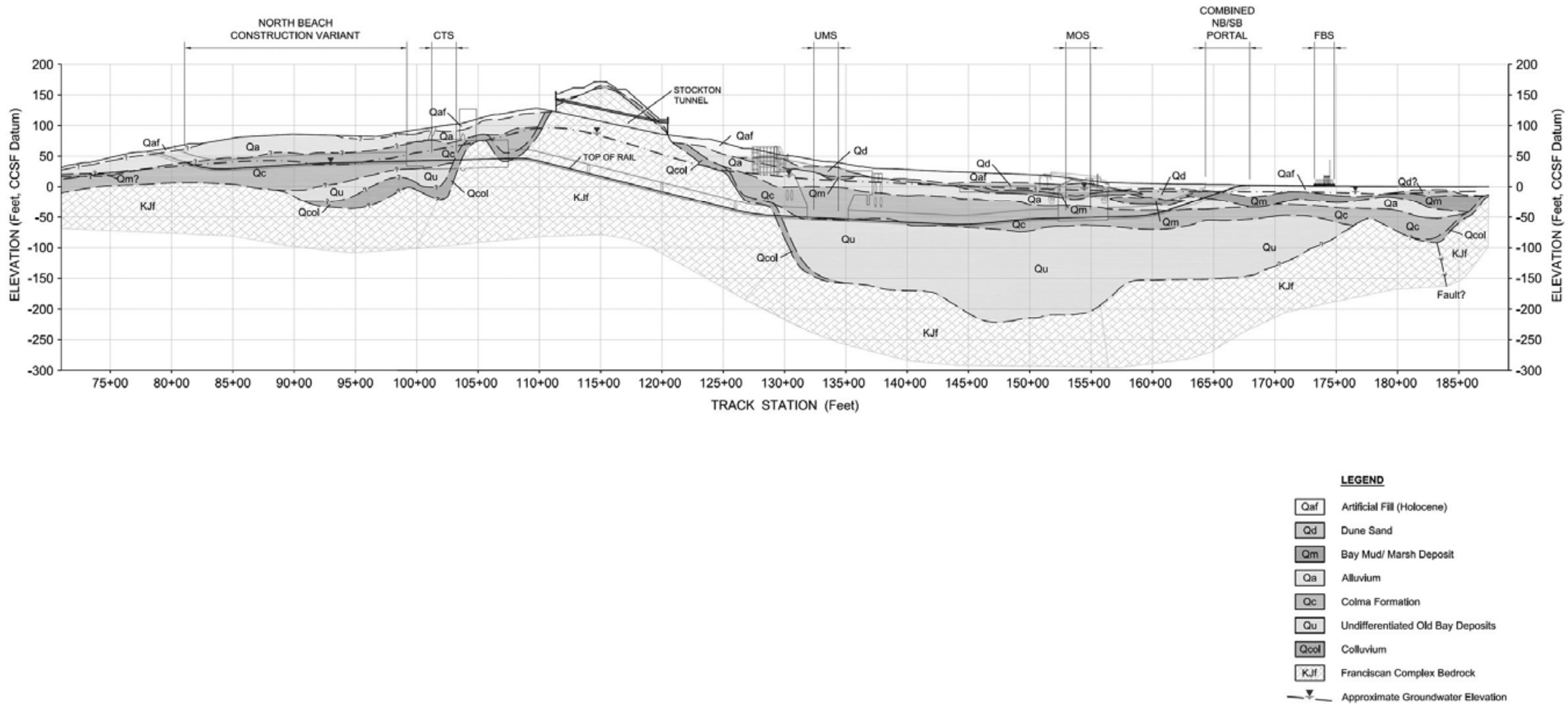
GEOLOGIC PROFILE FOR FOURTH/STOCKTON ALTERNATIVE OPTION A



Source: Geomatrix
Not to Scale

FIGURE 5-16

GEOLOGIC PROFILE FOR FOURTH/STOCKTON ALTERNATIVE OPTION B



Source: Geomatrix
Not to Scale

around the tunnels would not be expected since the reinforced tunnel lining would be placed against the exposed material upon excavation, limiting the expansion or contraction potential of the sediments.

Cumulative Impacts

Settlement and geologic instability of subsurface materials are site-specific conditions that would not result in cumulative impacts.

Mitigation Measures

No mitigation measures would be required.

5.8 HYDROLOGY AND WATER QUALITY

5.8.1 INTRODUCTION

Implementation of the Project would be considered to have an effect on hydrology or water quality if it would: violate any water quality standards or waste discharge requirements; expose people or structures to substantial new or increased flooding; result in the substantial degradation of surface or groundwater quality; substantially interfere with groundwater recharge; deplete groundwater supplies; substantially alter the existing drainage pattern of the site or area; or create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems.

5.8.2 FLOODING

Alternative 1 - No Project/TSM

Implementation of the No Project/TSM Alternative would not be expected to result in adverse flooding effects. This alternative does not include facilities in flood-prone areas and, therefore, would not expose people or structures to new flooding hazards.

Alternative 2 - Enhanced EIS/EIR Alignment

<u>Operation Impacts</u>

The alignment for the Enhanced EIS/EIR Alignment is at elevations above 100-year tides or tsunami events. Implementation of this alternative would not result in flooding impacts.

<u>Cumulative Impacts</u>

The Enhanced EIS/EIR Alignment is outside the 100-year high tide or tsunami impact area and therefore would not contribute to cumulative impacts.

<u>Mitigation Measures</u>

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

<u>Operation and Cumulative Impacts</u>

Operation and Cumulative impacts would be the same as described for Alternative 2 above.

<u>Mitigation Measures</u>

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Operation and Cumulative Impacts

Operation and Cumulative impacts would be the same as described for Alternative 2 above.

Mitigation Measures

No mitigation measures would be required.

5.8.3 WATER QUALITY

Alternative 1 - No Project/TSM

Implementation of the No Project/TSM Alternative would not be expected to result in adverse effects from increases in storm water runoff.

Alternative 2 - Enhanced EIS/EIR Alignment

Operation Impacts

Operation of the Enhanced EIS/EIR Alignment would result in the potential discharge of contaminants to the environment that could be transported by runoff to the City's combined storm and sanitary sewer system. The primary pollutants associated with operation of a light rail system include heavy metals, solvents, and petroleum hydrocarbons. Metals enter the environment in several ways, such as through dust or grit produced from metal-on-metal (light rail vehicles on track) wear and spillage of materials containing metals (e.g. lubricants and waste oil).

Drainage conveyance structures already exist along the Enhanced EIS/EIR Alignment. All storm water runoff from the alignment would be directed toward the City's combined storm and sanitary sewer system. The City's combined storm and sanitary sewer system, which collects and treats storm water, is operated in accordance with existing NPDES permits. The collection and treatment of storm water by the combined sewer system is an appropriate method of reducing the potential adverse effects of urban runoff on receiving waters.

Based on the high water table conditions and permeable soils, along with inflows of groundwater to the Powell Street Station, measures, such as horizontal wells, to encourage lateral groundwater flow past the Union Square Station will be incorporated into the project design if determined necessary based on hydrologic modeling.

Covering pervious surfaces, such as landscaped areas and exposed soil, with pavement or other impervious cover reduces the infiltration of water to the subsurface and increases surface runoff. The

Enhanced EIS/EIR Alignment would result in the construction of a light rail line with a portion constructed on existing roadway surfaces and the majority of the facility located underground; therefore no net increase in impervious surfaces would be expected. Construction of the Enhanced EIS/EIR Alignment would not be expected to materially increase storm water runoff volume.

Cumulative Impacts

Increases in pollutant load resulting from construction of the Enhanced EIS/EIR Alignment, in conjunction with increases in pollutant load resulting from other projects, could result in cumulative impacts. Under existing programs and procedures, the operators of the City's treatment plants are required to manage inputs to the combined sewer system. Applications for industrial discharge permits, if required for any of the cumulative projects, would be reviewed by the Public Utilities Commission to confirm that the treatment plants could accommodate the increased load prior to project approval. Therefore, potential operational cumulative effects associated with storm water runoff would be reduced by existing programs. However, there is heightened public interest in the issue of cumulative increases in flows to the City's combined storm and sanitary sewer system, and the resulting potential for increases in the volume and duration of overflow events during wet weather. Several major projects near the Study Area including the Mission Bay development, residential towers on Rincon Hill, and proposed Transbay Redevelopment Plan could result in increased flows to the City's combined storm and sanitary sewer system. Given the required industrial discharge permits for these other proposed projects and total flows to the system's Southeast Water Pollution Control Plant, which treats wastewater from the eastern portion of the City, it is expected that any increase in flows resulting from the Enhanced EIS/EIR Alignment would be within City guideline and standards.

In accordance with San Francisco Ordinance 19-92, Sections 118 and 123, a contractor would prepare and implement a SWPPP. The SWPPP would include Best Management Practices (BMPs) designed to reduce potential adverse effects on surface water quality and off-site sedimentation throughout the construction phase of the Project. Specific measures shall be included in the SWPPP to ensure that runoff from the construction sites does not drain directly to the Bay. The SWPPP would include:

- Construction Storm Water Management Controls. These controls would include practices to minimize the contact of construction materials, equipment, and maintenance supplies (e.g., fuels, lubricants, paints, solvents, adhesives) with storm water. The SWPPP would specify properly designed centralized storage areas that would keep these materials out of the rain. Spill cleanup materials (e.g. rags, absorbent materials, and secondary containment) would be kept at the work site when handling chemicals.

An important component of the storm water quality protection effort is knowledge of the SWPPP by the site supervisors and workers. To educate on-site personnel and maintain awareness of the importance of storm water quality protection, site supervisors would conduct regular tailgate meetings to discuss pollution prevention. The frequency of the meetings and required personnel attendance list would be specified in the SWPPP.

The SWPPP would specify a monitoring program to be implemented by the construction site supervisor, and would include both dry and wet weather inspections. City personnel shall conduct regular inspections to ensure compliance with the SWPPP; an accepted standard procedure.

- Erosion and Sediment Control. BMPs designed to reduce erosion of exposed soil may include, but are not limited to: soil stabilization controls, watering for dust control, perimeter silt fences, placement of straw wattles, and sediment basins. The potential for erosion is generally increased if grading is performed during the rainy season as disturbed soil can be exposed to rainfall and storm runoff. If grading must be conducted during the rainy season, the primary BMPs selected shall focus on erosion control, that is, keeping sediment in-place. End-of-pipe sediment control measures (e.g., basins and traps) shall be used only as secondary measures. Entry and egress from the construction site shall be carefully controlled to minimize off-site tracking of sediment. Vehicle and equipment washdown facilities shall be designed to be accessible and functional during both dry and wet conditions. Additional sources of information regarding BMPs are the California Storm Water Municipal and Construction Activity BMP Handbooks.[6]

<u>Mitigation Measures</u>

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

<u>Operation Impacts</u>

Operation impacts would be the same as those described for Alternative 2. During operation, runoff would be collected from drainage facilities incorporated into the design of the tunnels. Drainage would be conveyed to the City's combined storm and sanitary sewer system and storm water facilities. Design measures to address groundwater flow <u>to the Powell Street BART/Muni Metro Station</u> would be incorporated into the Union Square/Market Street Station.

<u>Cumulative Impacts</u>

Cumulative impacts would be the same as described above for Alternative 2.

[6] California Stormwater Quality Association (CASQA). *Stormwater Best Management Practice Handbooks,* 2003.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Operation Impacts

Operation impacts would be the same as those described for Alternative 2. During operation, runoff would be collected from drainage facilities incorporated into the design of the tunnels. Drainage would be conveyed to the City's combined sewer and storm water facilities. Design measures to address groundwater flow to the Powell Street BART/Muni Metro Station would be incorporated into the Union Square/Market Street Station.

Cumulative Impacts

Cumulative impacts would be the same as described above for Alternative 2.

Mitigation Measures

No mitigation measures would be required.

5.8.4 GROUNDWATER RECHARGE

Alternative 1 - No Project/TSM

Implementation of the No Project/TSM Alternative would not interfere with groundwater recharge.

All Build Alternatives

Operation Impacts

Implementation of this alternative would not result in significant impacts to groundwater recharge.

Cumulative Impacts

No substantial amount of water would be recharged into the groundwater therefore this alternative would not contribute to cumulative impacts.

Mitigation Measures

No mitigation measures would be required.

5.9 BIOLOGICAL AND WETLAND RESOURCES

5.9.1 INTRODUCTION

Under CEQA implementation of the Project would be considered to have an adverse effect on biological or wetland resources if it would result in disturbance of critical habitat (including wetlands) or affect special-status species. Removal of landscaping is also considered since trees and shrubbery provide wildlife habitat. No special status species or wetlands were found in the Study Area.

5.9.2 IMPACTS

Alternative 1 - No Project /TSM

Implementation of the No Project/TSM Alternative would not result in effects to critical habitat, special-status species, or removal of existing landscaping. Therefore, implementation of this alternative would not result in impacts.

Alternative 2 - Central Subway Enhanced EIS/EIR Alignment

<u>Operation Impacts</u>

Operation of the Enhanced EIS/EIR Alignment would not result in biological or wetland impacts, since no vegetation or wildlife would be affected.

<u>Cumulative Impacts</u>

No impacts to biological and wetland resources have been identified for the Enhanced EIS/EIR Alignment; therefore, there would be no cumulative impact from operation of the light rail.

<u>Mitigation Measures</u>

No mitigation measures would be required.

Alternative 3 - Central Subway Fourth/Stockton Alignment Option A (LPA) and Option B (Modified LPA)

<u>Operation Impacts</u>

Operation of Fourth/Stockton Alignment Option A would not result in biological or wetland impacts, since no vegetation or wildlife would be affected.

<u>Cumulative Impacts</u>

No impacts to biological and wetland resources have been identified from operation of the Fourth/Stockton Alignment Option A; therefore, there would be no cumulative impact from operation of the light rail.

Mitigation Measures

No mitigation measures would be required.

5.10 HAZARDOUS MATERIALS

5.10.1 INTRODUCTION

Implementation of the alternatives would be considered to have an effect on the environment and public health if the transport, use, production or disposal of materials would pose a hazard to people, animal, or plant populations in the area affected or if the Project would emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school or be located on a listed hazardous materials site pursuant to Government Code 659625 or Article 20 of the San Francisco Health code or degradation of water quality based on regulatory threshold and maximum contaminant levels. Additional detailed information on hazardous materials is included in the background technical file available for review by appointment at the Planning Department, 1650 Mission Street, San Francisco.

5.10.2 EXPOSURE OF SITE WORKERS AND PUBLIC TO HAZARDOUS MATERIALS

Alternative 1 - No Project/TSM

The No Project/TSM Alternative would not introduce additional hazardous materials into the Study Area, require new construction, require hazardous materials handling, nor result in increased exposure to the public or to the environment. Therefore, implementation of this alternative would not result in adverse effects associated with hazardous materials.

Alternative 2 – Enhanced EIS/EIR Alignment

<u>Operation Impacts</u>

Operation of the Central Subway Enhanced EIS/EIR Alignment would include the use, handling, and storage of hazardous materials. Degreasers, lubricants, cleaning solutions, solvents, paints, and miscellaneous petroleum products may be used for maintenance activities. In addition, maintenance of the light rail utility corridors may expose workers to hazardous materials if future excavation were to extend beyond the limits of excavation during construction.

Site workers exposed to potentially contaminated soils during light rail repair and maintenance and to hazardous materials during the use, handling, or storage of these materials may be adversely affected. In addition, an accidental release of hazardous materials could occur at the maintenance facility, which could potentially affect the environment (soil, surface water, and groundwater).

State regulations have been established to ensure generally safe workplaces and employee work practices. The California General Industry Safety Order requires all employers in California to prepare and implement the following plans and programs:

- Emergency Action Plan. The Plan designates employee responsibilities, evacuation procedures and routes, alarm systems, and training procedures.
- Fire Prevention Plan. The Plan identifies potential hazard areas, persons responsible for maintenance of fire prevention equipment or systems, fire prevention housekeeping procedures, and fire hazard training procedures.
- Injury and Illness Prevention Program. The Plan identifies safe practices for each job category, methods for informing workers of hazards, and procedures for correcting identified hazards.

Preparation and implementation of the plans, programs, and requirements identified above as well as those mentioned in Section 5.8, Hydrology and Water Quality would meet City requirements for workers, the public, and the environment.

Cumulative Impacts

The City's combined storm and sanitary sewer system could potentially be affected if dewatered groundwater from planned or ongoing Projects, in addition to the Enhanced EIS/EIR Alignment, were to discharge into the City's system. Excessive discharge could potentially exceed the system's capacity.

Procurement of a BWWD permit would be required prior to discharging into the combined sewer system; the permit requires identification of total estimated volume and duration of proposed discharge. Therefore, the City would only allow discharges that would be within the capacity of the system. If contaminant levels in the groundwater exceeded the BWWD permit levels, treatment of the groundwater could be required prior to discharge. Therefore, potential cumulative construction effects associated with dewatered groundwater would be avoided with implementation of the existing requirements established by the City.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

<u>Operation Impacts</u>

Operation impacts would be the same as described above for Alternative 2.

<u>Cumulative Impacts</u>

Cumulative impacts would be the same as those described above for Alternative 2.

<u>Mitigation Measures</u>

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

<u>Operation Impacts</u>

Operation impacts would be the same as described above for Alternative 2.

<u>Cumulative Impacts</u>

Cumulative impacts would be the same as those described above for Alternative 2.

<u>Mitigation Measures</u>

No mitigation measures would be required.

5.11 AIR QUALITY

5.11.1 INTRODUCTION

Implementation of the alternatives would be considered to have an effect on air quality if construction and/or operational effects would result in: violations of ambient air quality standards, contribution to an existing or Projected air quality violation, or exposure of sensitive receptors to substantial pollutant concentrations. A Project impact resulting from construction operations would be considered significant if feasible BAAQMD construction control measures listed in the BAAQMD CEQA Guidelines were not incorporated into the design of any of the alternatives.[7]

Since publication of the 1998 EIS/EIR, approaches and analysis tools for evaluating air quality have changed. The changes in methodological approaches are outlined below:

- Construction emissions vary substantially from day-to-day, depending on the level of activity, the specific type of construction operations and the prevailing weather in the case of dust emissions. The BAAQMD does not recommend quantification of construction emissions. As a result, attempts were not made in this document to estimate construction emissions. Rather the discussion is based on feasible control measures that are being incorporated into the Project.
- The current approved motor vehicle emission factor model is EMFAC2002, which is an update to the EMFAC7G model used for the 1998 EIS/EIR.
- Since most of California is in attainment for CO, a Transportation Project-Level Carbon Monoxide Protocol (the Protocol) was developed by Caltrans and the Institute of Transportation Studies at the University of California, Davis (December 1997) to provide procedures for evaluating potential impacts without having to do dispersion modeling.[8] The Protocol includes three potential tests: a qualitative analysis based on decision flowcharts, a quantitative screening analysis and a dispersion modeling analysis. The goal of the decision flowcharts is to prescreen Project data to determine if the Project would cause CO violations of standards without actually running the model. If results from the first test are not conclusive, then the next test is conducted.

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7 BAAQMD CEQA Guidelines for Assessing Impacts of Projects and Plans, December 1999.

8 California Department of Transportation and the Institute of Transportation Studies at the University of California, Davis, December, 1997.

5.11.2 SIGNFICANCE THRESHOLDS

BAAQMD has developed project operation thresholds of significance for CO, ROG, NO_x, and PM_{10} (Table 5-3).[9] Estimated CO, ROG, NO_x, and/or PM_{10} emissions generated from project operations would be considered significant if any project emissions were to exceed BAAQMD thresholds.[10]

TABLE 5-3

GENERAL THRESHOLDS OF SIGNIFICANCE

FOR PROJECT OPERATIONS

Pollutant	Threshold of Significance
CO	550 lb/day and 20 ppm (1-hour) 9 ppm (8-hour)
ROG	80 lb/day
NOx	80 lb/day
PM_{10}	80 lb/day

Notes: ppm = parts per million.
lb/day = pounds per day.
CO = carbon monoxide
ROG = reactive organic gases
NOx = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in diameter (also includes $PM_{2.5}$)

Source: Bay Area Air Quality Management District, CEQA Guidelines Assessing the Air Quality Impacts of Projects and Plans, December 1999.

Projects that result in a modification to the forecasted total vehicle miles traveled (VMT) in a region have the potential of altering mobile source-related regional emissions in that area. Regional emissions of CO, ROG, NO_x, and PM_{10} have been estimated for existing conditions in 2006 and for 2030 for all alternatives. Emission factors for $PM_{2.5}$ are not included in current approved emission factor models, so $PM_{2.5}$ emissions were not calculated. Particulate matter from fuel-combustion sources is primarily composed of $PM_{2.5}$. Therefore, the $PM_{2.5}$ fraction of PM_{10} emissions is estimated as approximately 99 percent. Emissions were estimated based on the forecasted VMT, and composite emission factors obtained from the EMFAC2002 (for motor vehicles) and URBEMIS2002 (for re-entrained dust) models developed by CARB.

The 2030 No Project/TSM conditions were compared to existing conditions (2006) to identify any air quality issues that would occur if the proposed Project were not built. It should be noted that the 2030 No

9 The BAAQMD has not developed a specific threshold for $PM_{2.5}$.
10 Thresholds of significance for construction-related emissions have not been developed by BAAQMD.

Project/TSM conditions reflect development, growth, and infrastructure improvements that have been accounted for in regional planning documents.

Due to the nature of air quality, it is more appropriate to evaluate Project impacts based on the net difference in future conditions (i.e., how the proposed Project would affect future traffic patterns that already consider regional growth) than to compare to existing conditions. This type of analysis also allows for changes in vehicle technology and fuels that may occur over the years to be removed from the comparison. As a result, the No Project/TSM Alternative emission estimates (Table 5-4) serve as the baseline emissions against which to evaluate potential impacts for the other alternatives. The net differences were then compared to BAAQMD significance thresholds.

TABLE 5-4

ESTIMATED 2030 REGIONAL EMISSIONS

GENERATED FROM VEHICULAR TRAFFIC (POUNDS PER DAY)

	Emissions				Emission Reduction (Compared to No Project / TSM Alternative)			
Alternative	**CO**	**ROG**	**NO_x**	**PM_{10}**	**CO**	**ROG**	**NO_x**	**PM_{10}**
Existing Conditions 2006	33,795	3,405	4,225	445	N/A	N/A	N/A	N/A
No Project/TSM	7,212	640	606	755	0	0	0	0
Enhanced EIS/EIR [1]	7,196	639	605	754	16	1	1	1
Fourth/Stockton Option A	7,202	640	605	754	10	0	1	1
Fourth/Stockton Option B	7,193	639	605	753	19	1	1	2

Notes: [1] Emissions based on VMT data and emission factors from the EMFAC2002 and URBEMIS2002 models. VMT data provided by the San Francisco Model, January 2007.

CO = Carbon Monoxide
ROG = Reactive organic gases.
NOx = Nitrogen oxides.
PM_{10} = Particulate matter less than ten microns in diameter (includes $PM_{2.5}$) .
N/A = not applicable

The traffic analysis for the Project, and thus the air quality analysis, concentrated on five intersections (Third/King, Fourth/King, Fourth/Harrison, Sixth/Brannan, and Fourth/Bryant). These intersections were chosen because they are representative of the key intersections that would be affected by implementation of the Project. It is recognized that the entire Study Area experiences traffic congestion and that many of the intersections in the area operate at poor Level of Service (LOS). The five intersections chosen, particularly the Sixth/Brannan, represent the highest traffic volumes and greatest delays in the Study Area. Table 5-5 summarizes the peak hour traffic volumes and LOS for each intersection on which the air quality analysis is based.

TABLE 5-5

2030 PEAK HOUR TRAFFIC VOLUMES AND LEVEL OF SERVICE FOR STUDY INTERSECTIONS

Intersection	**No Project**		**Enhanced EIS/EIR**		**Fourth/Stockton Option A**		**Fourth/Stockton Option B Mixed Flow***		**Fourth/Stockton Option B Semi-Exclusive***	
	Traffic Volume	LOS	Traffic Volume	LOS	Traffic Volume	LOS	Traffic	LOS	Traffic Volume	LOS
Third/King	6,490	F	6,540	F	6,770	F	6,570	F	6,900	F
Fourth/King	5,430	F	5,420	F	5,550	F	5,510	F	5,570	F
Fourth/Bryant	2,920	C	2,970	B	2,960	D	2,800	D	2,550	D
Fourth/Harrison	4,450	E	4,450	D	4,370	E	4,250	F	4,200	F
Sixth/Brannan	6,960	F	7,070	F	6,960	F	7,000	F	6,990	F

* Under the Fourth/Stockton Option B Alternative, two sub-options are being considered. On Fourth Street, the light rail vehicles would operate in one of two lane configurations: semi-exclusive or mixed-flow. In a semi-exclusive operation, trains are physically separated from adjacent traffic except at intersections. In a mixed-flow operation, trains and other vehicles share a trackway that is embedded in the street.

5.11.3 AIR POLLUTANT EMISSIONS

Alternative 1 - No Project/TSM

Operation Impacts

Regional Emissions. Although development in San Francisco Bay Area would result in an increase in VMT in the future compared to 2006 conditions (refer to Table 4-15), CO, ROG and NO_x emissions would be less in 2030. The emission factor model assumes that between 2006 and 2030 older motor vehicles would be replaced with cleaner vehicles and approved emission reduction programs would be implemented resulting in lower CO, ROG, and NO_x emissions per vehicle. The lower emissions from new vehicles and the emission reduction programs would have less impact on PM_{10} emission factors because vehicles emit PM_{10} not only from exhaust; but also from tire wear, brake wear and re-entrained dust from the motor vehicle traveling over dusty roads. In contrast, PM_{10} emissions from vehicles are expected to increase with population growth.

Localized CO Analysis. There has not been a violation of CO standards in San Francisco since 1988.[11] This is attributable to more efficient motor vehicle controls and the introduction of cleaner fuels. Therefore, it is assumed that the Study Area intersections under a No Project/TSM condition in 2030 would not violate CO standards.

Mitigation Measures

No mitigation measures would be required.

Alternative 2 - Enhanced EIS/EIR Alignment

Operation Impacts

Regional Emissions. Implementation of the Enhanced EIS/EIR Alignment would result in a net reduction of daily VMT of about 1,390, compared to the No Project/TSM Alternative. The reduction in VMT would consequently reduce regional emissions very slightly, compared to the No Project/TSM Alternative (refer to Table 5-4). The reduction for most pollutants, with the exception of CO, would be about a pound per day. CO emissions are reduced by 16 pounds per day.

Localized CO Analysis. A CO analysis of the alternative was conducted following guidance provided in the Transportation Project-Level Carbon Monoxide Protocol developed to assess the CO impacts from changes in traffic patterns and congestion in the Study Area.[12]

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[11] California Air Resources Board, the California Almanac of Emissions and Air Quality – 2006 Edition, April 2006.
[12] California Department of Transportation and the Institute of Transportation Studies at the University of California, Davis, December, 1997.

To determine if the proposed Project is likely to worsen air quality compared to a No Project/TSM for the same analysis year, the following questions must be answered:

- Does the proposed Project substantially increase (greater than two percent) the number of vehicles operating in cold start mode (starting a vehicle with a cold engine)?
- Does the proposed Project substantially increase traffic volumes (i.e., increases greater than five percent)?
- Does the proposed Project worsen traffic flow (i.e., any reduction in average travel speed within a range of 3 to 50 miles per hour for uninterrupted roadways or increase in average delay for intersections)?

The nature of the Project would not result in a substantial increase in cold start vehicles. The Project would reduce the overall number of motor vehicle trips in the Study Area and therefore would reduce the number of vehicles operating in cold start mode.

Two roadway segments (King Street westbound between Third Street and Fourth Street and Brannan Street eastbound between Fifth Street and Third Street) would have increases in traffic volume greater than five percent. The Enhanced EIS/EIR Alignment would increase the average delay at some of the intersections selected for analysis. Because of these two issues, there is the potential for the Enhanced EIS/EIR Alignment to worsen air quality.

The Protocol requires a determination as to whether or not the Project could result in higher CO concentrations than those that currently exist in the Bay Area Air Basin, which is an attainment/maintenance area. Since the Bay Area Air Basin currently meets ambient CO standards, no transportation facility operating within it creates a CO violation. The assumption is that if a current intersection in an attainment area were modeled, the results would show concentrations less than ambient standards. If it is determined that a Project-affected intersection is no worse than an existing intersection, the proposed Project is considered acceptable (i.e., would not violate any CO standard or contribute substantially to any existing or projected CO standard) and no further analysis is needed.

As required by the Protocol, a comparative analysis was conducted for the Study Area intersections that operate at LOS E or F or become E or F due to Project implementation (refer to Table 5-6). These intersections under the Enhanced EIS/EIR Alignment include Third/King, Fourth/King, and Sixth/Brannan.

The comparative analysis evaluates receptor locations, roadway geometry, traffic volumes, meteorology, percentage of vehicles in cold start mode, percentage of heavy-duty gas trucks, average delay, and background CO concentrations.

The Foothill Boulevard/Mission Boulevard intersection in Hayward was chosen for comparative purposes.[13] This intersection is well known for having traffic congestion and high traffic volumes. The peak hour traffic volume in 2005 was 13,600 vehicles.[14] The Foothill Boulevard/Mission Boulevard intersection was also chosen because it is similar in climate, CO background levels, and existing peak hour traffic counts were readily available from the Traffic and Vehicle Data Systems Unit portion of Caltrans' website.

The Enhanced EIS/EIR Alignment passes the comparative intersection test outlined in the Protocol because the Study Area intersections were found to have lower traffic volumes and better meteorological conditions than the Foothill/Mission intersection. Receptor locations, roadway geometry, average delay, percent of vehicles in cold start mode, percent of heavy-duty gas trucks, and background CO concentrations are similar.

The Enhanced EIS/EIR Alignment would satisfy transportation conformity requirements. The proposed Project is included in current conforming regional transportation plans (the *Transportation 2030 Plan* and the *2005 Transportation Improvement Program*). Completion of the localized CO impact analysis indicates that CO concentrations would not cause or contribute to violations of ambient air standards. Therefore, the Enhanced EIS/EIR Alignment is found to be in conformance.

Odors. It is expected that the Enhanced EIS/EIR Alignment would not generate odor emissions. The BAAQMD has developed a list of the types of facilities known to emit objectionable odors. This list does not include light rail facilities like the Central Subway.

<u>Cumulative Impacts</u>

An increase in Project-related short-term construction emissions in addition to emissions from other Projects in the Bay Area may result in cumulative effects to air quality for the Enhanced EIS/EIR Alignment. However, construction activities are subject to control measures established by BAAQMD to reduce impacts from the Project.

[13] Caltrans often uses this as a comparative intersection for their air quality analyses.
[14] California Department of Transportation, 2005 All Traffic on the California State Highway System, Traffic and Vehicle Data Systems Unit, www.dot.ca.gov/hg/traffops/saferesr/trfdata/2005all.htm

Generally, if operation of a Project results in an increase of a pollutant above a significance threshold, then it would also be considered to contribute substantially to the cumulative effect. The Enhanced EIS/EIR Alignment does not exceed BAAQMD significance thresholds for criteria pollutants; rather emissions for each pollutant are slightly lower than the No Project/TSM Alternative.

All planned development and growth has been included in the assumptions used to generate the traffic data. Consequently, cumulative development is implicitly included in the air quality analysis because it made direct use of traffic volume data and assessed air emissions based on cumulative future traffic conditions. Project emissions of criteria pollutants would not exceed thresholds when compounded with other cumulative emissions.

Climate Change/Greenhouse Gas Impacts. An individual Project does not generate enough greenhouse gas emissions to substantially influence global climate change. Climate change is a cumulative impact. However, changes to CO_2 emissions from the Project were estimated (Table 5-6). CO_2 emissions are expected to increase between 2006 and 2030 due to an increase in VMT. While motor vehicles are expected to be less polluting in the future, the improvement is not enough to offset the projected increase in VMT. Since more than 80 percent of the total amount of greenhouse gases is CO_2, changes to CO_2 emissions is an indicator of impacts from all greenhouse gases.[15]

TABLE 5-6

ESTIMATED CARBON DIOXIDE EMISSIONS FOR EXISTING CONDITONS (2006) AND 2030 GENERATED BY VEHICULAR TRAFFIC (pounds per day)

Alternative	CO_2 Emissions	Emission Reduction (Compared to No Project/TSM Alternative)
Existing Conditions 2006	1,122,045	N/A
No Project/TSM	1,322,866	0
Enhanced EIS/EIR	1,319,940	-2,926
Fourth/Stockton Option A	1,321,039	-1,827
Fourth/Stockton Option B	1,319,224	-3,641
N/A = not applicable		

Implementation of the Enhanced EIS/EIR Alignment would result in relatively small changes in greenhouse gases. During construction, Alternative 2 would increase greenhouse gases due to emissions generated by construction equipment. Once the alternative is operational, there would be an overall reduction in greenhouse gases. This is due to the fact that the reduction in motor vehicle miles traveled

15 Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2*005, November 2006.

caused by the Project results in a bigger reduction in greenhouse gases than the increase in greenhouse gases generated by the electricity used to power the light rail trains.

There are currently no published thresholds of significance for measuring the impact of global climate change from a Project. However, it can be noted that the Central Subway Project does not conflict with the greenhouse gas reduction strategies listed in Executive Order S-3-05 and the Climate Action Plan for San Francisco. In accordance with these documents, the Central Subway Project will include measures to reduce idling of diesel-fueled construction equipment and vehicles. It will also encourage the use of public transit as an alternative to driving by expanding light rail service. The Project would also be consistent with City policy for Transit-Oriented Development because the Chinatown Station would include space for future housing development above the station.

<u>Mitigation Measures</u>

No mitigation measures would be required.

Alternative 3 - Central Subway Fourth/Stockton Alignment A (LPA)

<u>Operation Impacts</u>

Regional Emissions. Implementation of the Fourth/Stockton Alignment Option A would result in a net reduction of daily VMT of about 870, compared to the No Project/TSM Alternative. The reduction in VMT would consequently reduce regional emissions very slightly, compared to the No Project/TSM Alternative (refer to Table 5-4). The reduction for most pollutants, with the exception of CO, would be one pound per day or less. CO emissions are reduced by 10 pounds per day.

Localized CO Analysis. A CO analysis of the Fourth/Stockton Alignment Option A was conducted following the same methodology as described under Alternative 2. Seven roadway segments would have increases in traffic volume greater than five percent. The Fourth/Stockton Alignment Option A would increase the average delay at all of the intersections selected for analysis. Because of these two issues, there is the potential for the Fourth/Stockton Alignment Option A to worsen air quality.

As required by the Protocol, a comparative analysis was conducted for the Study Area intersections that operate at LOS E or F or become E or F due to Project implementation (refer to Table 5-6). These intersections under the Fourth/Stockton Alignment Option A include Third/King, Fourth/King, Fourth/Harrison, and Sixth/Brannan.

The Fourth/Stockton Alignment Option A passes the comparative intersection test outlined in the Protocol because the Study Area intersections were found to have lower traffic volumes and better meteorological conditions than the Foothill/Mission intersection. Receptor locations, roadway geometry, average delay, percent of vehicles in cold start mode, percent of heavy-duty gas trucks, and background CO concentrations are pretty similar.

Like Alternative 2, the Fourth/Stockton Alignment Option A would satisfy transportation conformity requirements.

Odors. As identified under Alternative 2, it is expected that the Fourth/Stockton Alignment Option A would not generate odor emissions.

Cumulative Impacts

The cumulative impacts including greenhouse gas impacts for the Fourth/Stockton Alignment Option A would be the same as those identified under Alternative 2.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Central Subway Fourth/Stockton Alignment B (Modified LPA)

Operation Impacts

Regional Emissions. Implementation of the Fourth/Stockton Alignment Option B would result in a net reduction of daily VMT of about 1,730, compared to the No Project/TSM Alternative. The reduction in VMT would consequently reduce regional emissions very slightly, compared to the No Project/TSM Alternative (refer to Table 5-4). The reduction for most pollutants, with the exception of CO, would be one to two pounds per day. CO emissions are reduced by 19 pounds per day.

Localized CO Analysis. A CO analysis of the Fourth/Stockton Alignment Option B was conducted following the same methodology as described under Alternative 2.

Nine roadway segments would have increases in traffic volume greater than five percent if the Fourth/Stockton Alignment Option B Alternative with a mixed flow lane configuration is chosen. The number of roadway segments with traffic volume increases of greater than five percent increases to eleven if a semi-exclusive lane configuration is chosen. The Fourth/Stockton Alignment Option B with either the mixed flow or semi-exclusive lane configuration would increase the average delay at all of the intersections selected for analysis. Because of these two issues, there is the potential for the Fourth/Stockton Alignment Option B to worsen air quality.

As required by the Protocol, a comparative analysis was conducted for the Study Area intersections that operate at LOS E or F or become E or F due to Project implementation (refer to Table 5-5). These intersections under the Fourth/Stockton Alignment Option B include Third/King, Fourth/King, Fourth/Harrison, and Sixth/Brannan.

The Fourth/Stockton Alignment Option B passes the comparative intersection test outlined in the Protocol because the Study Area intersections were found to have lower traffic volumes and better meteorological conditions than the Foothill/Mission intersection. Receptor locations, roadway geometry, average delay, percent of vehicles in cold start mode, percent of heavy-duty gas trucks, and background CO concentrations are pretty similar.

Like Alternatives 2 and 3A, the Fourth/Stockton Alignment Option B would satisfy transportation conformity requirements.

Odors. As identified under the Enhanced EIS/EIR Alignment, it is expected that the Fourth/Stockton Alignment Option B would not generate odor emissions.

Cumulative Impacts

The cumulative impacts including greenhouse gas effects for the Fourth/Stockton Alignment Option B would be the same as those identified under Alternative 2.

Mitigation Measures

No mitigation measures would be required.

5.12 NOISE AND VIBRATION

5.12.1 INTRODUCTION

The FTA criteria for noise and vibration are described in Section 4.12. In addition to the FTA criteria, the following noise and vibration criteria used by the San Francisco Planning Department are also applicable.

An adverse impact would occur if the Project would substantially increase the ambient noise levels above levels common and accepted in urban areas resulting in the exposure of people to noise levels in excess of local noise ordinance established standards and affect the use of enjoyment of nearby areas. A noise increase of 10 db is perceived as a doubling of noise, and is generally considered substantial. An adverse impact would also occur if the Project were to expose people to existing excessive ambient noise levels in the Project vicinity.

For vibration, an adverse impact would occur if the Project would expose people to excessive and intrusive ground-borne vibration or a ground-borne noise level substantially affecting adjacent land uses. A vibration level of 75 VdB is generally considered intrusive for residential land uses.

5.12.2 IMPACTS

No Project/TSM Alternative

The principal source of future noise levels under the No Project/TSM Alternative would be increased traffic movements on the local arterials in the Study Area. In general, a doubling of the traffic activity would be required for the noise levels to increase by 3 dBA; the point at which most listeners detect the change. Changes in traffic volumes and speeds are also subject to the existing roadway capacities. Increases in traffic volume would result in reduced speeds along streets with limited capacity.

Traffic noise modeling was conducted at receivers along Third and Fourth Streets where the proposed LRT would operate at-grade. As shown in Table 5-7, changes from the existing PM peak hour noise levels to projected levels in the year 2030 would range from 0.6 dB at the Avalon Yerba Buena Apartments (Site C) to 2.2 dB at the Beacon Condominiums (Site A). As these increases would not reach 3 dBA, no noise impacts from increased traffic are anticipated under the No Project/TSM Alternative. Although all rubber-tired transit vehicles and vehicular traffic can cause ground-borne vibration, the vibration is not usually perceptible because of the vibration is isolated to the roadway surface. Therefore, vibration impacts are also not anticipated.

TABLE 5-7

PROJECT TRAFFIC NOISE LEVELS

Receiver	Building	Existing Noise Level-Leq(h) (dBA)		2030 PM Peak Hour Traffic Noise Levels – Leq(h) (dBA)				
		Measured	Modeled PM Peak Hour	No Project/ TSM Alt.	Alt. 2 Enhanced EIS/EIR	Alt. 3 Option A	Alt. 3 Option B Mixed-Flow	Alt. Option B Semi-Exclusive
A	Third Street side of the Beacon Condominiums	70.0	71.0	73.2	73.1	N/A	N/A	N/A
A	Fourth Street side of the Beacon Condominiums	71.7	72.5	74.7	74.2	73.7	74.2	73.7
1	The Palms Condominiums on Fourth Street	70.1	69.9	71.7	71.7	71.7	70.1	69.7
B	Hotel Utah on Fourth Street at Bryant Street	74.2	76.1	77.7	77.7	78.1	76.5	77.2
C	Avalon Yerba Buena Apartments on Fourth Street at Harrison Street	74.7	78.1	78.7	78.7	78.6	78.4	78.3

N/A – Not Applicable. Third Street is not affected under the Alternative 3 alignment.

Source: PB/Wong, 2007

Alternative 2 - Enhanced EIS/EIR Alignment

Under this alternative LRT operations would occur at-grade along Third and Fourth Streets. The northbound at-grade alignment on Third Street would extend from King Street to Freelon Street and the southbound alignment on Fourth Street from King Street to South Park. The southbound alignment would then extend underground along Third Street to Harrison Street, Harrison to Fourth Street where it connects with the northbound alignment. Both northbound and southbound alignments continue on Third Street through Market Street and along Stockton Street to the termini at Jackson Street.

<u>Operation Impacts</u>

Traffic Noise. Under this alternative, Fourth Street would be one-way in the southern direction Townsend Street. Between Townsend and King Streets, Fourth Street would maintain three southbound lanes and two northbound lanes. Traffic noise levels under this alternative are expected to be the same or lower than the No Project/TSM Alternative (refer to Table 5-7).

LRT Noise. At-grade operations would result in both wayside noise from train passby and the use of on-board warning devices that are sounded as the vehicles enter the stations and at grade crossings. These on-board warning devices consist of a gong, bells, and horn that are used during various degrees of necessity. In general, either the gong or bells are used when the LRT vehicles enter a station to alert passengers on the platforms of oncoming vehicles. Since there are no at-grade crossings with gates as part of this alignment, warning horns would only be used in an emergency and are not included in the noise analysis. The reference levels for the different on-board warning devices are 75 dBA for the gong and 95 dBA for the bells at a distance of 10 feet.

Where the alignment is located in an underground subway section, airborne noise levels from train operations would not be audible. Potential noise impacts at the closest representative residential receivers located along the at-grade alignment have been identified as: no impact, moderate impact, or severe impact, in accordance with FTA Noise Impact Criteria (see Table 5-8). There are no moderate or severe noise impacts expected under this alternative.

LRT Ground-borne Noise and Vibration. Table 5-9 shows the estimated ground vibration levels for those building structures along the at-grade and underground sections of the alignment. Table 5-10 presents the projected interior ground-borne noise levels for those building structures along the underground subway section of the alignment. The FTA vibration criteria used to determine both ground-borne noise and vibration impacts is based on frequent events of 70 or more train passbys per day. Ground-borne noise impacts are limited to the underground subway segments. Vibration impacts would be limited to interior land use activities and would not be perceptible for outdoor land uses such as parks and recreation facilities. The ground-borne noise and vibration analysis includes the increased vibration levels at receivers close to the crossover trackwork under Stockton Street between Washington and Clay Streets. The FTA vibration criteria of 72 VdB would be exceeded at one residential building, 570 Fourth Street at Freelon Alley (second and third floor apartments over a first floor restaurant). The FTA ground-borne noise criteria of 35 dBA would be exceeded at two residential buildings at 527 and 529 Third Street (apartments and lofts located over ground floor commercial spaces). During final engineering design, vibration propagation will be conducted at 570 Fourth Street and 527/529 Third Street to confirm the predicted impact and finalize the mitigation measures.

Vent Shafts and Traction Power Substations. Vent shafts are planned at the following locations: Moscone, Market Street, Union Square, and Chinatown Stations. Potential noise levels at these locations would be from the passby of underground trains transmitting through the vent shaft to the street and the testing and operation of the emergency ventilation fans. Traction power substations (TPSS) are planned to be integrated as part of the underground station design at Moscone and Chinatown Stations. The vent shafts would be designed to meet the noise level limits of the San Francisco Noise Ordinance. No adverse impacts are anticipated since these facilities would be designed to comply with the San Francisco Noise Ordinance.

TABLE 5-8

PROJECT NOISE LEVELS AT BUILDING STRUCTURES ALONG THE AT-GRADE ALIGNMENT

Receiver	Street that Alignment Follows	Building	Number of Buildings	FTA Noise Sensitive Category (1,2,3)	Train Speed (mph)	Distance of Trackwork to Receiver (feet)	Existing Noise Level- Ldn (dBA)	Alternative 2		Alternative 3 – Option A		Alternative 3 – Option B	
								Project Generated Noise-Ldn (dBA)	FTA Level of Noise Impact	Project Generated Noise-Ldn (dBA)	FTA Level of Noise Impact	Project Generated Noise-Ldn (dBA)	FTA Level of Noise Impact
A	Third Street	Beacon Condominiums	1	2	25	40	70.0	61	no impact	N/A	N/A	N/A	N/A
A	Fourth Street	Beacon Condominiums	1	2	25	37	71.7	62	no impact	N/A	no impact	62	no impact
1	Fourth Street	The Palms Condominiums	1	2	25	42	70.1	62	no impact	62	no impact	62	no impact
B	Fourth Street	Hotel Utah at Bryant Street	1	2	25	44	74.2	N/A	N/A	N/A	N/A	61	no impact

N/A – At these locations the Alternative is underground and would have no impact on noise levels.

Source: PB/Wong, 2007

TABLE 5-9

SUMMARY OF INTERIOR GROUND VIBRATION ESTIMATES – ALTERNATIVE 2

Street Location	Type of Building Structures	Horizontal Distance to Track (feet)	Tunnel Depth	Train Speed (mph)	FTA Vibration Criteria (VdB)	Wood Frame Buildings		Concrete & Steel Buildings	
						Number of Buildings	Predicted Vibration Levels (VdB)	Number of Buildings	Predicted Vibration Levels (VdB)
Stockton Street from Jackson to Washington Streets	Multi-family residential and hotels	18	40 to 50	45	72	3	62	0	--
	Institutional	18	50 to 60	45	75	0	--	1	54
Stockton Street from Washington to Clay Streets	Multi-family residential and hotels	18	50 to 60	45	72	2	59	1	48
Stockton Street just south of Washington Street	Multi-family residential and hotels	18	60 to 70	25	72	1	58	1	50
	Institutional	18	60 to 70	25	75	0	--	2	50

TABLE 5-9 (CONT.)

SUMMARY OF INTERIOR GROUND VIBRATION ESTIMATES – ALTERNATIVE 2

Street Location	Type of Building Structures	Horizontal Distance to Track (feet)	Tunnel Depth	Train Speed (mph)	FTA Vibration Criteria (VdB)	Wood Frame Buildings		Concrete & Steel Buildings	
Stockton Street from Clay to Geary Streets	Multi-family residential and hotels	18	>70	45	72	25	53	3	42
	Institutional	18	>70	45	75	0	--	3	<49
Geary Street from Stockton Street to Market Street	Multi-family residential and hotels	5	>70	45	72	0	--	1	<47
Third Street from Market to Minna Streets	Multi-family residential and hotels	25	>70	45	72	0	--	1	<45
Third Street between Minna and Howard Streets	Yerba Buena Auditorium	50	>70	45	65 to 72	0	--	1	52
Third Street and Mission Street[1]	Multi-family residential and hotels	25	>70	25	72	0	--	2	<54
Third Street from Minna to Clementina Streets	Multi-family residential and hotels	25	60 to 70	45	72	0	--	1	49
Third Street from Clementina to Folsom Streets	Multi-family residential and hotels	25	60	45	72	0	--	1	49
Third Street from Folsom to Harrison Streets	Multi-family residential and hotels	5	60	45	72	1	55	0	--
Harrison Street at Fourth Street	SBC Building	5	60	45	65	0	--	1	55
Harrison Street from Fourth to Third Street	Multi-family residential and hotels	25	50 to 60	45	72	0	--	3	50
	Multi-family residential and hotels	35	40 to 50	45	72	3	56	1	55
	Multi-family residential and hotels	35	30 to 40	45	72	2	56	1	50
	Multi-family residential and hotels	25	20 to 30	45	72	1	66	0	--
	Multi-family residential and hotels	25	10 to 20	25	72	0	--	1	62
Third Street from Harrison to King Streets	Multi-family residential and hotels	25	0 to 10	25	72	0	--	4	61
Fourth Street from Harrison to Brannan Streets	Multi-family residential and hotels	25	0 to 10	25	72	1	**75**[2]	2	71
Fourth Street from Brannan to King Streets	Multi-family residential and hotels	25	0	25	72	2	71	1	70

1 Special trackwork was assessed at this location.

2 Interior vibration levels are estimated to exceed the FTA criterion at 570 Fourth Street at Freelon Alley, 2nd and Third floor apartments over a 1st floor restaurant.

Source: PB/Wong, 2007

TABLE 5-10

SUMMARY OF INTERIOR GROUND-BORNE NOISE ESTIMATES – ALTERNATIVE 2

Street Location	Type of Building Structures	Horizontal Distance to Track (feet)	Tunnel Depth	Train Speed (mph)	FTA Vibration Criteria (dBA)	Wood Frame Buildings: Number of Buildings	Wood Frame Buildings: Predicted Vibration Levels (dBA)	Concrete & Steel Buildings: Number of Buildings	Concrete & Steel Buildings: Predicted Vibration Levels (dBA)
Stockton Street from Jackson to Washington Streets	Multi-family residential and hotels	18	40 to 50	45	35	3	34	0	--
	Institutional	18	50 to 60	45	40	0	--	1	29
Stockton Street from Washington to Clay Streets	Multi-family residential and hotels	18	50 to 60	45	35	2	32	1	29
Stockton Street just south of Washington Street	Multi-family residential and hotels	18	60 to 70	25	35	1	35	1	32
	Institutional	18	60 to 70	25	40	0	--	2	34
Stockton Street from Clay to Geary Streets	Multi-family residential and hotels	18	>70	45	35	25	28	3	<25
	Institutional	18	>70	45	40	0	--	3	25
Geary Street from Stockton to Market Streets	Multi-family residential and hotels	5	>70	45	35	0	--	1	<32
Third Street from Market to Minna Streets	Multi-family residential and hotels	25	>70	45	35	0	--	1	<28
Third Street between Minna and Howard Streets	Yerba Buena Auditorium	50	>70	45	<30	0	--	1	25
Third Street and Mission Street[1]	Multi-family residential and hotels	25	>70	25	35	0	--	2	33
Third Street from Minna to Clementina Streets	Multi-family residential and hotels	25	60 to 70	45	35	0	--	1	31
Third Street from Clementina to Folsom Streets	Multi-family residential and hotels	25	60	45	35	0	--	1	26
Third Street from Folsom to Harrison Streets	Multi-family residential and hotels	5	60	45	35	1	<34	0	--
Harrison Street at Fourth Street	SBC Building	5	60	45	40	0	--	1	26
Harrison Street from Fourth to Third Streets	Multi-family residential and hotels	25	50 to 60	45	35	0	--	3	28
	Multi-family residential and hotels	35	40 to 50	45	35	3	33	1	34
	Multi-family residential and hotels	35	10 to 40	45	35	2	35	1	32
Third Street from Harrison to Freelon Streets	Multi-family residential and hotels	25	0 to 10	25	35	0	--	0	--
Fourth Street from Harrison to Freelon Streets	Multi-family residential and hotels	25	0 to 10	25	35	1	**33-37**[2]	1	**33-37**[2]

[1] Special trackwork was assessed at this location.
[2] Interior ground-borne noise levels are estimated to exceed the FTA criterion at 527 and 529 Third Streets.
Source: PB/Wong, 2007

Cumulative Impacts

As the Enhanced EIS/EIR would exceed the FTA vibration and ground-born noise criteria, it would contribute to cumulative vibration and noise impacts, though the contribution would not be considered substantial.

Mitigation Measures

No mitigation would be required for wayside noise occurring as a result of the operation of the light rail service. Measures for the abatement of noise levels from the vent shafts and TPSS will be determined during preliminary and final design. Noise control measures used to meet the San Francisco Noise Ordinance will include enclosing TPSS in masonry structures with sound-rated doors or gates and providing sound attenuation on all ventilation openings of any ancillary facility buildings.

There are several operational measures that can be taken to assure that noise and vibration levels related to light rail operation remain at the levels Projected in the analysis. Table 5-11 provides a list of measures that could be performed on a regular basis and identifies the benefit that each of the measures would provide. Purchasing quiet light rail vehicles is another important step in minimizing noise impacts.

TABLE 5-11

OPERATIONAL MITIGATION MEASURES

Operational Measure	System Benefit
Rail Grinding and Replacement	As rails wear, both noise levels from light rail by-passes and vibration levels can increase. By grinding down or replacing worn rail, noise, and vibration levels will remain at the initial operating levels. Rail grinding or replacement is normally performed every three to five years.
Wheel Truing and Replacement	Wheel truing is a method of grinding down flat spots (commonly called “wheel flats”) on the light rail’s wheels. Flat spots occur primarily because of hard braking. When flat spots occur they can cause increases in both the noise and vibration levels produced by the light rail vehicles.
Vehicle Maintenance	Vehicle maintenance includes performing scheduled and general maintenance on items such as air conditioning units, bearings, wheel skirts, and other mechanical units on the light rail vehicles. Keeping the mechanical system on the light rail vehicles in top condition will also help to control noise and vibration levels.
Operator Training	Operators will be trained to maintain light rail travel speeds at those speeds given in the operation plan and to avoid “hard-braking” whenever possible. As stated, “hard-braking” can cause wheel flats and may also damage track. Furthermore, by training operators to identify potential wheel flats and other mechanical problems with the trains, proper maintenance can be performed in a more timely manner.

During final engineering design, vibration propagation testing will be conducted at 570 Fourth Street and 527/529 Third Street to confirm the predicted impact and finalize the mitigation measures. Where vibration impacts are confirmed, they will be reduced to meet the FTA criteria using one of the trackwork design measures described below, in addition to the operation measures presented in Table 5-12**.**

TABLE 5-12

SUMMARY OF INTERIOR GROUND VIBRATION ESTIMATES – ALTERNATIVE 3

Street Location	Type of Building Structures	Horizontal Distance to Track (feet)	Tunnel Depth	Train Speed (mph)	FTA Vibration Criteria (VdB)	Wood Frame Buildings		Concrete & Steel Buildings	
						Number of Buildings	Predicted Vibration Levels (VdB)	Number of Buildings	Predicted Vibration Levels (VdB)
Stockton Street from Jackson Street to Washington Street	Multi-family residential and hotels	18	40 to 50	45	72	3	62	0	--
	Institutional	18	50 to 60	45	75	0	--	1	54
Stockton Street from Washington Street to Clay Street	Multi-family residential and hotels	18	50 to 60	45	72	2	59	1	48
Stockton Street just south of Washington Street[1]	Multi-family residential and hotels	18	60 to 70	25	72	1	58	1	50
	Institutional	18	60 to 70	25	75	0	--	2	50
Stockton Street from Clay Street to Market Street	Multi-family residential and hotels	18	>70	45	72	25	53	3	42
	Institutional	18	>70	45	75	0	--	3	<49
Fourth Street from Market Street to Minna Street	Multi-family residential and hotels	25	>70	45	72	0	--	1	<45
Fourth Street between Minna Street and Howard Street	Yerba Buena Auditorium	50	>70	45	65 to 72	0	--	1	52
Fourth Street from Minna Street to Clementina Street	Multi-family residential and hotels	25	60 to 70	45	72	0	--	1	49
Fourth Street from Clementina Street to Folsom Street	Multi-family residential and hotels	25	60	45	72	0	--	1	49
Fourth Street from Folsom Street to Harrison Street	Multi-family residential and hotels	5	60	45	72	1	55	0	--
Fourth Street at Harrison	SBC Building	5	60	45	65	0	--	1	55
Fourth Street from Harrison Street to Brannan Street[3]	Multi-family residential and hotels	25	0 to 60	25	72	1	**75**[2]	3	70

1 Special trackwork was assessed at this location.

2 Interior vibration levels are estimated to exceed the FTA criterion at 570 Fourth Street at Freelon Alley, 2nd and Third floor apartments over a 1st floor restaurant.

3 Option A ends at Brannan Street and Option B ends at Bryant Street.

Source: PB/Wong, 2007

- High resilience (soft) direct fixation fasteners for embedded track and in underground subway tunnels; or
- Ballast mat for ballast and tie track.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Operation Impacts

Traffic Noise. Fourth/Stockton Alignment Option A would keep Fourth Street as a one-way street in the southern direction to Townsend Street. Between Townsend and King Street, Fourth Street would maintain three southbound lanes and two northbound lanes. Traffic noise levels under this alternative are expected to be lower than the No Project/TSM Alternative at the Beacon Condominiums (Site A) and the Avalon Yerba Buena Apartments (Site C), no change at the Palms Condominiums (Site 1), and 0.4 dB higher at the Hotel Utah (Site B) (refer to Table 5-8).

LRT Noise. The LRT noise impacts would be similar to those described under Alternative 2. The Hotel Utah would not be expected to experience noise impacts from the Project.

LRT Ground-borne Noise and Vibration. Table 5-13 shows the estimated ground vibration levels for those building structures along the at-grade and underground sections of the alignment. Table 5-16 presents the projected ground-borne noise levels for those building structures along the underground subway section of the Fourth/Stockton Alignment Option A. Ground-borne noise impacts are limited to the underground subway segments. Vibration impacts would be limited to interior land use activities and would not be perceptible for outdoor land uses such as parks and recreation facilities. The FTA vibration criteria of 72 VdB would be exceeded at one residential building, 570 Fourth Street at Freelon Alley (second and third floor apartments over a first floor restaurant). The FTA ground-borne noise criteria would not be exceeded at any of the buildings along this alignment. During final engineering design, vibration propagation testing will be conducted at 570 Fourth Street to confirm the predicted impact and finalize the mitigation measures.

Vent Shafts and Traction Power Substations. The impacts would be the same as described for Alternative 2.

Mitigation Measures

The mitigation measures would be the same as described for Alternative 2.

TABLE 5-13

SUMMARY OF INTERIOR GROUND-BORNE NOISE ESTIMATES – ALTERNATIVE 3

Street Location	Type of Building Structures	Horizontal Distance to Track (feet)	Tunnel Depth (feet)	Train Speed (mph)	FTA Vibration Criteria (dBA)	Wood Frame Buildings		Concrete & Steel Buildings	
						Number of Buildings	Predicted Vibration Levels (dBA)	Number of Buildings	Predicted Vibration Levels (dBA)
Stockton Street from Jackson to Washington Streets	Multi-family residential and hotels	18	40 to 50	45	35	3	34	0	--
	Institutional	18	50 to 60	45	40	0	--	1	29
Stockton Street from Washington to Clay Streets	Multi-family residential and hotels	18	50 to 60	45	35	2	32	1	32
Stockton Street just south of Washington Street[1]	Multi-family residential and hotels	18	60 to 70	25	35	1	35	1	32
	Institutional	18	60 to 70	25	75	0	--	2	34
Stockton Street from Clay to Geary Streets	Multi-family residential and hotels	18	>70	45	35	25	28	3	<25
	Institutional	18	>70	45	75	0	--	3	25
Geary Street from Stockton to Market Streets	Multi-family residential and hotels	5	>70	45	35	0	--	1	<32
Fourth Street from Market to Minna Streets	Multi-family residential and hotels	25	>70	45	35	0	--	1	<28
Fourth Street between Minna and Howard Streets	Yerba Buena Auditorium	50	>70	45	<30	0	--	1	25
Fourth Street from Minna to Clementina Streets	Multi-family residential and hotels	25	>70	25	35	0	--	2	33
Fourth Street from Clementina to Folsom Streets	Multi-family residential and hotels	25	60 to 70	45	35	0	--	1	31
Fourth Street from Folsom to Harrison Streets	Multi-family residential and hotels	25	60	45	35	0	--	1	26
Fourth Street at Harrison	SBC Building	5	60	45	35	1	<34	0	--
Fourth Street from Harrison to Brannan Streets[2]	Multi-family residential and hotels	5	60	45	40	0	--	1	26

[1] Special trackwork was assessed at this location.

[2] Option A ends at Brannan Street and Option B ends at Bryant Street.

Source: PB/Wong, 2007

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Operation Impacts

Traffic Noise. Traffic noise has been analyzed for the mixed-flow and semi-exclusive suboptions:

- **Option B Mixed Flow -** Under this option, Fourth Street would become a two-way street between King Street and Bryant Street, with two southbound lanes and two northbound lanes. Peak hour traffic noise are expected to range from 0.3 dB lower at the Avalon Yerba Buena Apartments (Site C) to 1.6 dB lower levels at the Palms Condominiums (Site 1) then the No Project/TSM Alternative (refer to Table 5-8).
- **Option B Semi Exclusive -** Under this option, Fourth Street would become a two-way street between King Street and Bryant Street, with two southbound lanes and one northbound lane. Peak hour traffic noise would be lower than Option B Mixed Flow and would range from 0.4 dB lower at the Avalon Yerba Buena Apartments (Site C) to 2.0 dB lower at the Palms Condominiums (Site 1) then the No Project/TSM Alternative (refer to Table 5-8).

LRT Noise. The LRT noise impacts would be the same as described under Alternatives 2 and 3A.

LRT Ground-borne Noise and Vibration. The impacts would be the same as those described under Alternative 3A.

Vent Shafts and Traction Power Substations. The location of the vent shafts and TPSS are the same under Alternative 3B, except the Union Square/Market Street Station vent shaft would be located in the Ellis/O’Farrell parking garage. The vent shafts would be designed to meet the noise level limits of the San Francisco Noise Ordinance. No adverse impacts are anticipated since these facilities would be designed to comply with the San Francisco Noise Ordinance.

Cumulative Impacts

As the Fourth/Stockton Alignment Option B would exceed FTA vibration criteria at one location, this alternative would contribute to cumulative vibration impacts, but not at a substantial level.

Mitigation Measures

Mitigation measures would be the same as those identified for Alternative 2.

6.0 CENTRAL SUBWAY CONSTRUCTION METHODS, IMPACTS, AND MITIGATION MEASURES

This chapter of the SEIS/SEIR describes the construction techniques and schedules for building the Central Subway. The locations along the alignment where each of the construction methods would be used and how each of the methods are incorporated into construction of various Project elements are also described. Because the construction schedule would extend for 5.5 to 6 years, with an additional six months of pre-revenue testing, and temporary disruption around portals and stations represent the majority of impacts for the Project, this section has been created as a separate chapter to discuss impacts and mitigation measures related to construction for each environmental topic.

Temporary impacts from construction of the Central Subway Project are described for each Build Alternative and design option starting in Section 6.3. The impacts discussion is organized by environmental topic in the same order as in Chapters ~~3.0~~ 4.0 and 5.0. No construction impacts would occur for Alternative 1, No Project/TSM because no project-related construction is proposed. Therefore, Alternative 1 will not be discussed further in this chapter.

6.1 PROPOSED CONSTRUCTION METHODS

The Central Subway requires a number of underground structures, including guideway tunnels, stations, tail tracks, rail crossovers, and emergency cross-passages. These structures would be constructed in a variety of geologic conditions, ranging from rock to soft ground, and would be located adjacent to existing structures and utilities that are sensitive to ground movements. Available geologic information for the alternative Central Subway alignments indicates the tunnels would encounter highly variable conditions ranging from saturated sand, silt and clays to weathered and highly fractured sandstone and siltstone bedrock of the Franciscan Formation. Mixed-face conditions (i.e., rock and soil in the excavation face) are expected where the tunnels transition into and out of the bedrock. To deal with the different alignment and profile options and the varying geologic and groundwater conditions, several different tunnel construction methods are being considered, including excavation by Tunnel Boring Machine (TBM), cut-and-cover (C&C), and sequential excavation methods (SEM). Another method, referred to as the Special Excavation Method (SXM), was introduced in the 1998 FEIS/FEIR.

Some of these excavation and ground support methods require the use of ground modification methods, such as dewatering, deep soil mixing, ground freezing, jet grouting, permeation grouting, compaction grouting, and compensation grouting. Each of these construction methods is described below for the Central Subway Alternatives.

6.1.1 TUNNEL BORING MACHINE (TBM) (ALTERNATIVE 3 - FOURTH/STOCKTON ALIGNMENT, OPTIONS A AND B)

A TBM consists of a rotating cutterhead within a cylindrical steel shell that is pushed forward along the axis of the tunnel while excavating the ground through the cutterhead. The steel shield supports the excavated ground as required until the preliminary or final tunnel lining is built in the rear of the shield. The shield is propelled using hydraulic jacks that thrust against the erected tunnel lining system. The TBM is used in conjunction with a prefabricated ground support system, which most commonly consists of pre-cast concrete segments that are bolted and gasketed to form a watertight lining.

Pressure-face TBMs that are capable of exerting a balancing pressure against the tunnel face are used to control excavation rates and groundwater inflow, as well as to maintain stability of the tunnel face. The two most common types of pressurized-face TBMs are earth pressure balance (EPB) machines and slurry shields. Figure 6-1 shows a typical EPB TBM. For the expected high groundwater and variable geologic conditions, both EPB and slurry machines would be well suited for construction of the Central Subway running tunnels.

After completion of TBM excavation and installation of the lining, the temporary rail is removed, the invert is cleaned, and a flat invert for the permanent rail fixation and a raised walkway are usually constructed as reinforced, cast-in-place concrete. The invert contains embedded pipes and inlets for track drainage. Placement of invert concrete does not require a form, and can be placed continuously.

6.1.2 CUT-AND-COVER (C&C) (ALTERNATIVE 2 – ENHANCED EIS/EIS ALIGNMENT AND ALTERNATIVE 3 - FOURTH/STOCKTON ALIGNMENT, OPTIONS A AND B)

The cut-and-cover method involves construction of a box frame structure within a trench excavation that is subsequently backfilled. In urban settings the cut-and-cover method requires utility relocation, traffic re-routing, and creates construction impacts in the form of noise, dust, and traffic, transit and business access disruption.

Decking can be placed over the cut immediately following the first lift of excavation to reduce traffic disruption. The decking is removed and the surface restored at the end of construction. Figure 6-2 illustrates the placement of concrete decking on a cut-and-cover subway station. Temporary excavation support walls (or shoring) are installed before significant excavation commences. These walls must be supported with internal struts or tiebacks as the excavation is deepened to avoid instability and control settlement at the sides of the cut. Depending upon the depth of excavation and the ground conditions the following methods of shoring would be used:

FIGURE 6-1

EARTH PRESSURE BALANCE TUNNEL BORING MACHINE

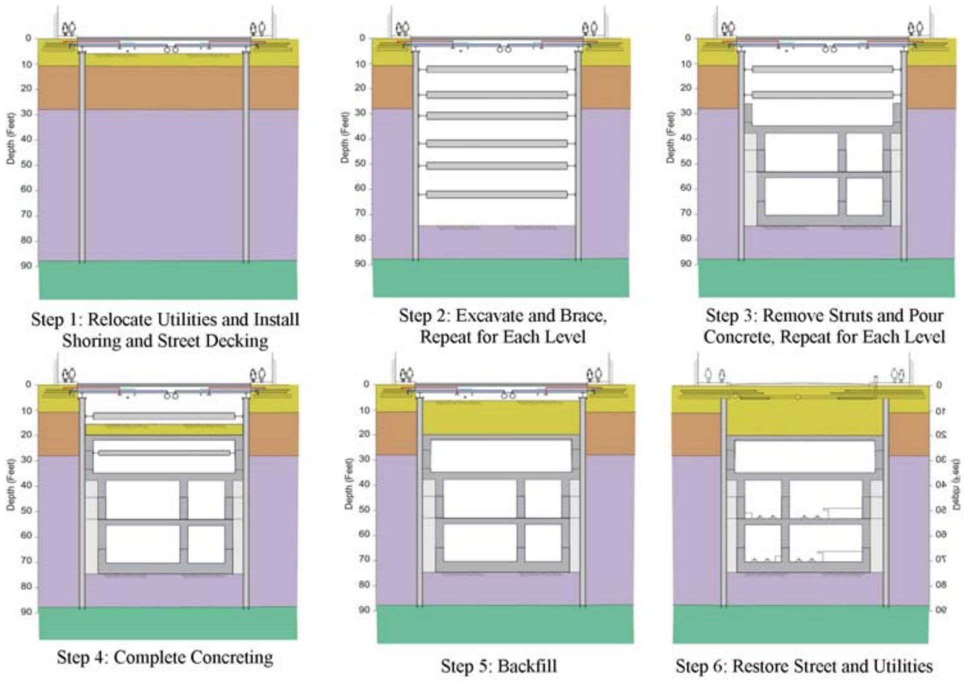
Source: PB/Wong

- Cased secant piles - Cased secant piles are non-driven piles that can be used for ground support in soft ground and hard ground. Secant pile walls are formed by constructing interlocked concrete piles reinforced with either steel rebar or beams. Used extensively in dense population areas due to the minimal disturbance they cause to adjacent structures, secant pile walls are commonly used for shafts and stations in saturated soil conditions. The steel reinforcement in the form of reinforcing bar or wide-flange sections can be dropped or vibrated into place.

- Soldier pile and lagging walls - Soldier pile wall construction is feasible in unsaturated or dewatered soils with sufficient stand-up time to allow some soil exposure prior to placement of lagging walls to hold back soils. This method of construction can cause difficulties during excavation in loose sands that tend to ravel or soft clays that fast ravel or squeeze. Soldier pile and lagging support is not watertight and requires dewatering below the groundwater table. This construction method would be most applicable where compressible materials such as Bay Mud are not present since dewatering can generate excessive settlement adjacent to the walls.

FIGURE 6-2

CUT-AND-COVER TUNNEL CONSTRUCTION



Source: PB/Wong

- Sheet pile walls - Sheet pile walls are watertight and do not require dewatering, although they cannot be driven where obstructions or hard materials are present in the soil profile. Sheet piles can be driven to depths up to approximately 60 feet in dense sands and up to approximately 85 feet in soft to medium clays. A disadvantage of this method is that it is not adaptable to utility crossings. Like soldier pile and lagging walls, sheet pile walls would most likely be employed at the south end of the Central Subway alignment, where utility crossings do not preclude its use.
- Diaphragm slurry walls - Several types of diaphragm slurry walls are applicable to construction of the subway section of the Project. Diaphragm walls have been constructed in virtually all soil types, but mainly in soft to medium stiff clays, saturated silts, and saturated, loose silty or clayey sands. These walls provide a watertight support system like sheet pile walls and, in addition, provide greater wall stiffness, which helps to control settlement. Construction of diaphragm walls also has the advantage of causing much less noise and vibration than driving sheet pile walls. Diaphragm slurry walls are

sometimes used as permanent walls within the cut. As with sheet pile walls, diaphragm walls are not adaptable to utility crossings since all utilities crossed by the wall must be relocated.

- Soil-cement-mixed walls – Continuous soil-cement walls are installed underground using mechanical soil-mixing technology for the purposes of excavation support, ground water control and containment of contaminated soil. The equipment for this purpose usually has multiple shaft augers to install a panel element consisting of multiple overlapped soil-cement columns. The panels overlap each other to form continuous soil-cement walls. A recent development uses large trench cutting equipment equipped with the chainsaw-like cutter, which moves horizontally while cutting and mixing in-situ soil with cement grout to form seamless soil-cement walls. A narrow trench is excavated under bentonite slurry. The excavation is completed to the final trench depth with the slurry acting as a stabilizing agent to keep the walls of the trench from collapsing. Once the excavation of the trench has progressed to some point clear of the starting point, it is backfilled with a blended mixture of soil, bentonite slurry, dry bentonite and cement. Backfill is placed in the trench after the excavation is completed by forming a slope of the mixed material that slumps down and displaces the liquid slurry forward. The excavation proceeds at the same rate as backfilling, so that the distance between the excavator and the backfill placement point remains relatively constant.

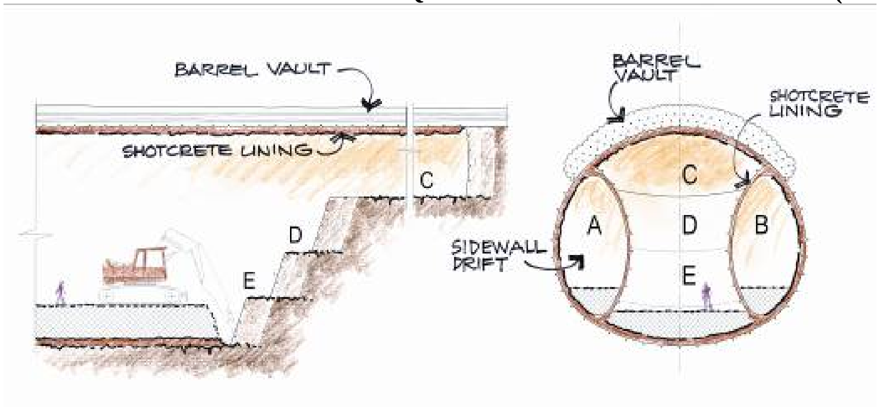
Some form of internal bracing or tiebacks is required with each of the wall types discussed above. Internal bracing is the most commonly used support for narrow cut-and-cover excavations. An alternative to internal bracing support is the use of tiebacks. Tiebacks may be feasible for some elements of cut-and-cover construction on the Central Subway, but have several disadvantages. Tiebacks may require additional right-of-way to extend anchors beyond the excavation line, which may not be possible where basements exist, and they generally are not economical for excavations less than 60 feet wide.

6.1.3 SEQUENTIAL EXCAVATION METHOD (SEM) - (ALTERNATIVE 2 – ENHANCED EIS/EIR ALIGNMENT AND ALTERNATIVE 3 - FOURTH/STOCKTON ALIGNMENT, OPTIONS A AND B)

The sequential excavation method (SEM, also known as NATM or New Austrian Tunneling Method) is a mined method of tunnel construction used worldwide for small to large openings in a variety of ground types ranging from rock to soil. The objective of the method is to control deformations and thereby mobilize and maximize the self supporting capacity of the surrounding rock or soil. The tunnel excavation is carried out in increments (headings or rounds) in numerical sequence (as shown in Figure 6-3), which are supported with sprayed concrete immediately after exposure, followed by installation of additional steel and shotcrete support elements until a safe stable opening is created. SEM provides a

FIGURE 6-3

TUNNEL CONSTRUCTION USING SEQUENTIAL EXCAVATION METHOD (SEM)



Source: PB/Wong

high degree of flexibility during construction and makes it possible to control virtually all kinds of ground conditions, thereby greatly reducing the risks of construction.

After completion of the excavation and initial support, a waterproofing system is installed between the initial and the final lining. The final lining, which can be either reinforced cast-in-place concrete or reinforced shotcrete, is then installed.

6.1.4 SPECIAL EXCAVATION METHOD (SXM) (ALTERNATIVE 2 - ENHANCED EIS/EIR ALIGNMENT)

The Special Excavation Method (SXM) illustrated in Figure 6-4 is a hybrid tunnel construction approach for a shallow tunnel profile developed by Dames & Moore for the 1998 FEIS/FEIR.[1] SXM combines elements of conventional cut-and-cover with mining procedures with the objective of reducing the surface impacts associated with conventional cut-and-cover. An underground box is constructed to form an enclosure around the permanent underground structures. Soil confined within the limits of the box is excavated by mined methods, followed by installation of a cast-in-place final lining for the guideway.

The SXM method of construction requires continuous installation of ground support walls (shoring) using deep cement-soil mixing methods followed by installation of subsurface jet-grouted slabs above and below the guideway tunnels between the shoring, excavation of the contained soil between the jet grouted slabs and the shoring followed by construction of the cast-in-place permanent guideway structure.

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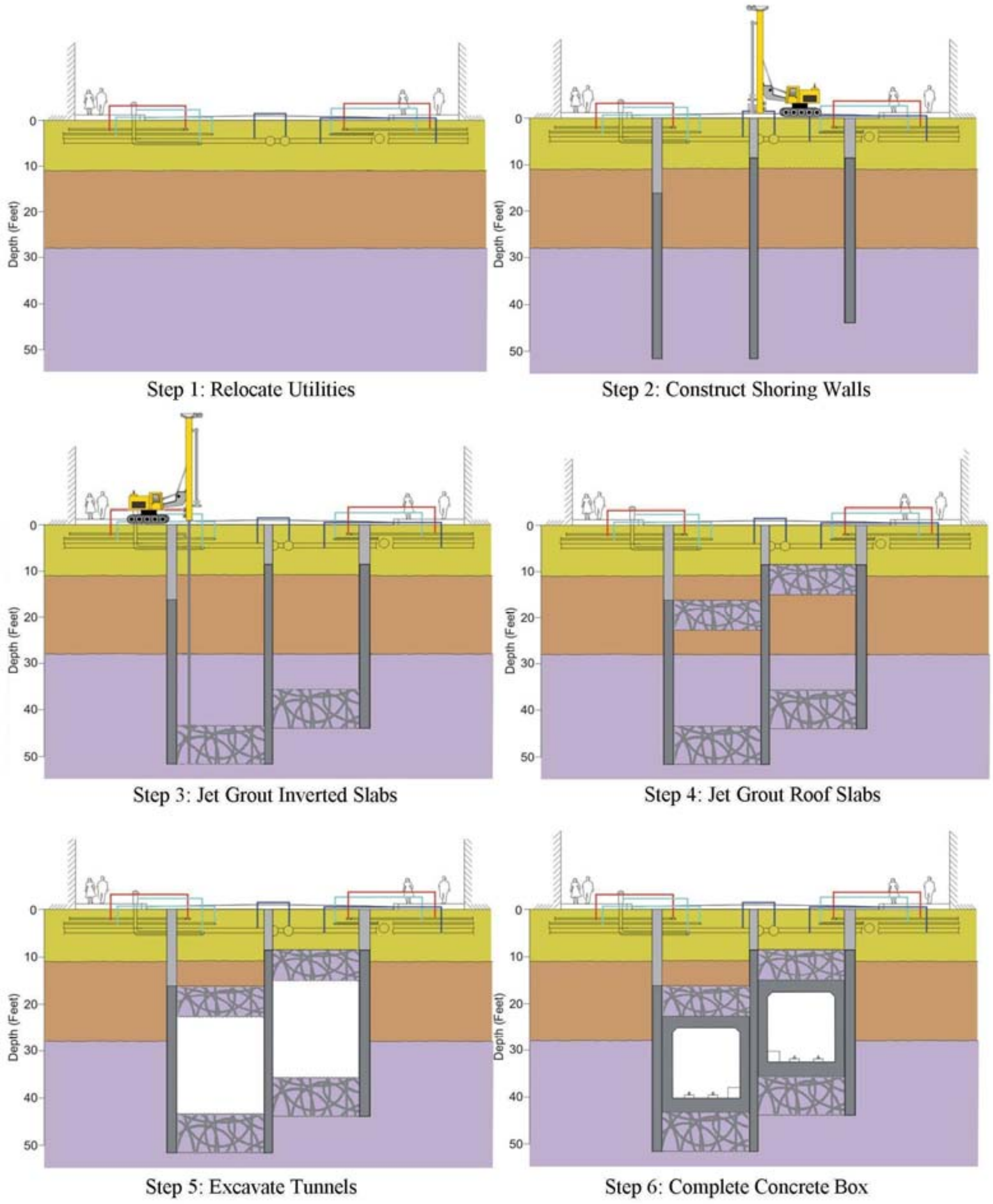
[1] Dames & Moore, *Special Excavation Methods for Central* Subway, August 20, 1997.

FIGURE 6-4

SPECIAL EXCAVATION METHOD (SXM) CONCEPT DEVELOPED FOR THE 1998 FEIS/FEIR



Source: Dames & Moore, *Special Excavation Methods for Central Subway*, August 20, 1997

Installation of large-section, closely spaced, steel support beams and plates would be required to support the roof of the excavation beneath the jet grouted slab. Heavy construction vehicles would be required to deliver these support elements to various locations along the alignment between the portals and Union Square Station. Storage of construction materials would require temporary elimination of curb side parking.

SXM does not eliminate surface disruption to the same extent that mined or bored methods do. Construction of the soil-cement walls would require numerous utility relocations along the entire length of the walls, which run continuously down the streets. Heavy construction equipment would be required to mix the soil in-place to construct the walls and to install the steel soldier piles. In addition, the soil-cement process results in construction debris on the street surface, which must be contained and cleaned continuously.

6.2 DESCRIPTION OF CONSTRUCTION METHODS FOR BUILD ALTERNATIVES

6.2.1 ENHANCED EIS/EIR ALIGNMENT – ALTERNATIVE 2

Construction of the Enhanced EIS/EIR Alignment would be accomplished using a combination of SEM, SXM and cut-and-cover techniques described in Section 6.1. A summary of construction methods for the Enhanced EIS/EIR Alignment and the time-frame for performing the activities are presented in Table 6-1 and Figure 6-5.

Guideway Construction and Staging Areas – Alternative 2

A single tunnel structure would be constructed south of Moscone Station on Third and Fourth Streets using SXM methods. The Third Street structure would extend from the northbound portal to Third and Harrison Streets and the single-tunnel structure on Fourth Street would extend approximately 2,500 feet between the southbound portal and the point where it would join the northbound guideway at Third and Harrison Streets. The segment between Moscone Station and Union Square Station would require several transitions from vertically stacked to side-by-side tunnel. The SXM construction method would be used for the stacked tunnels and cut-and-cover methods for the side-by-side shallow portion at Market Street. The segment from Moscone Station to the Market Street Station covers a distance of 950 feet and transitions from a vertically stacked arrangement at Moscone Station to a side-by-side cut-and-cover configuration at Market Street Station. The segment from Market Street Station to Union Square Station via Kearny and Geary is approximately 1,450 feet long and would be constructed using SXM.

The line segment between Union Square Station and Chinatown Station would be mined by SEM as a tall cavern, approximately 40 feet high, to accommodate vertically stacked guideway tunnels starting in the

TABLE 6-1

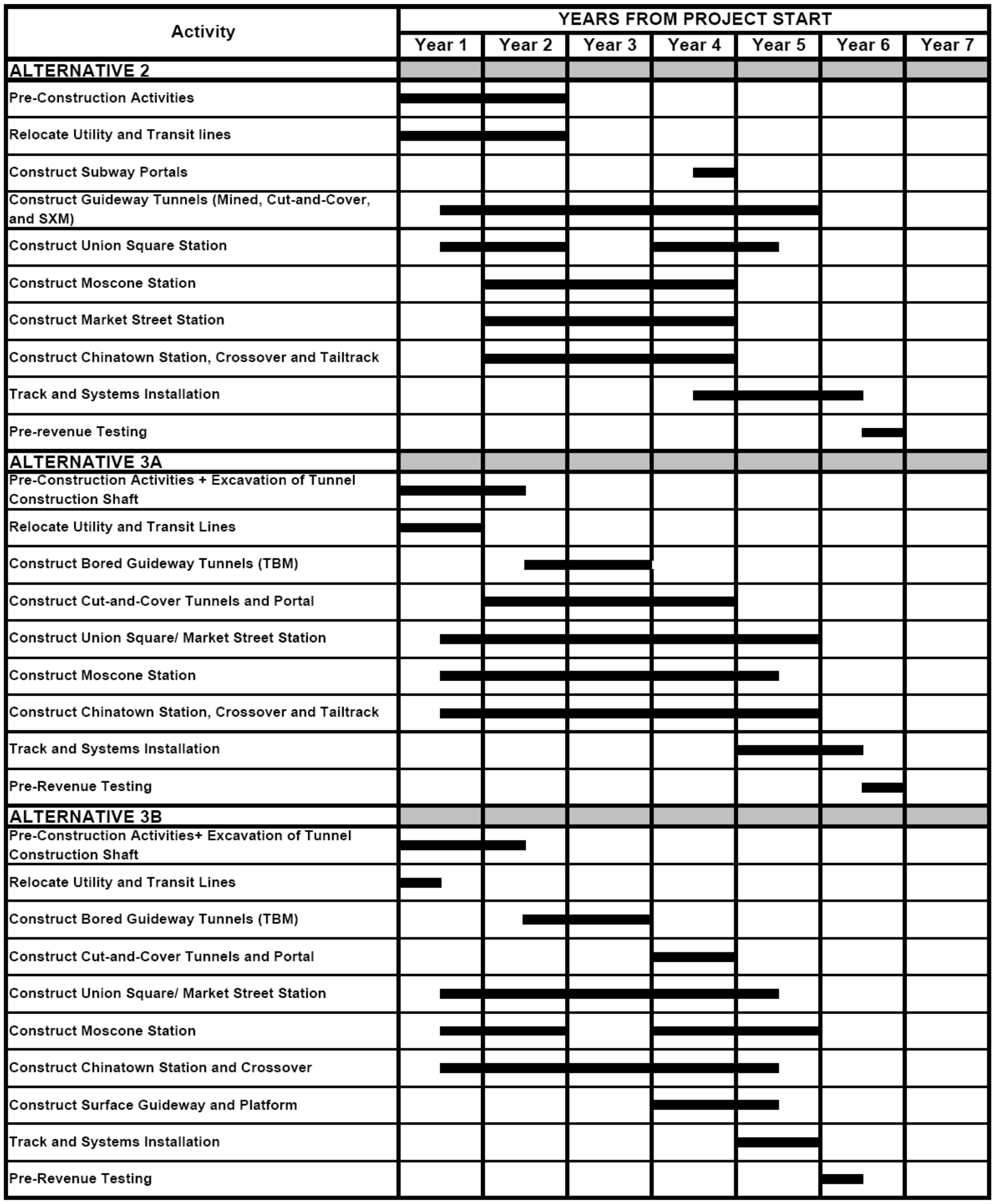
SUMMARY OF GUIDEWAY CONSTRUCTION METHODS

Alternatives	Between Portals and King Street	Between Portals and Moscone	Between Moscone and Union Square	Between Union Square and Chinatown	North of Chinatown	North Beach Construction Variant
Alternative 2	At-Grade Surface	Special Excavation Method (SXM)	Special Excavation Method (SXM), Cut-and-cover (C&C)	Mined Sequential Excavation Method (SEM)	Mined Sequential Excavation Method (SEM)	NA

	Between Brannan and King Streets		Between Portal and Brannan St		Between Portal and Moscone	Between Moscone and Union Square/Market Street	Between Union Square/Market Street and Chinatown	North of Chinatown	North Beach Construction Variant
	NB	**SB**	**NB**	**SB**					
Alternative 3A	U-box and At-Grade Surface		Cut-and-cover		Mined Tunnel Boring Machine (TBM)	Mined (TBM)	Mined (TBM)	Mined (SEM or TBM)	Mined (TBM)
Alternative 3B	At-Grade Surface		U-Box and At-Grade Surface		Mined (TBM)	Mined (TBM)	Mined (SEM and TBM)	Mined (SEM or TBM)	Mined (TBM)

FIGURE 6-5

CONSTRUCTION DURATIONS FOR ALTERNATIVES 2, 3A AND 3B



Source: PB/Wong

vicinity of the Union Square Station and would transition to a side-by-side configuration, approximately 35 feet wide, over the 1,530-foot distance to Chinatown Station. Excavation of this segment would commence at Union Square Station below Sutter Street and proceed north to Chinatown Station. Excavated spoils would be hauled away from the Union Square Station. The line segment north of Chinatown Station, comprised of the tail tracks and crossover, would consist of a twin-track tunnel approximately 35 feet wide by 575 feet long that would be mined from the Chinatown Station.

Stations Construction and Staging Areas – Alternative 2

Moscone Station, on Third Street between Howard and Folsom Streets, would be decked cut-and-cover construction staged from a primary off-street construction access shaft on Clementina Street. See Figure 6-6 for approximate area of surface disruption during construction. Cut-and-cover excavation of Moscone Station would require one lane of Third Street, to the south of Clementina Street and north of Tehama Street, to be temporarily closed to traffic for the duration of station construction (approximately 36 months) maintaining access to the Moscone Center Garage. Although access to the truck ramps leading to the loading docks underneath the Moscone Convention Center and vehicle access to the Moscone Garage would be impacted during the shoring and decking stages. Pedestrian access along Third Street between Howard and Folsom Streets and on Tehama Street would require protective cover for the entire duration of station construction.

Market Street Station, on Third Street south of Market Street, would also be decked cut-and-cover construction staged from a principal construction access shaft on Stevenson Street (see Figure 6-7). Cut- and cover methods would be used to construct a pedestrian connection tunnel from the Market Street Station to the BART/Muni Metro Montgomery Street Subway Station in the Market Street sidewalk.

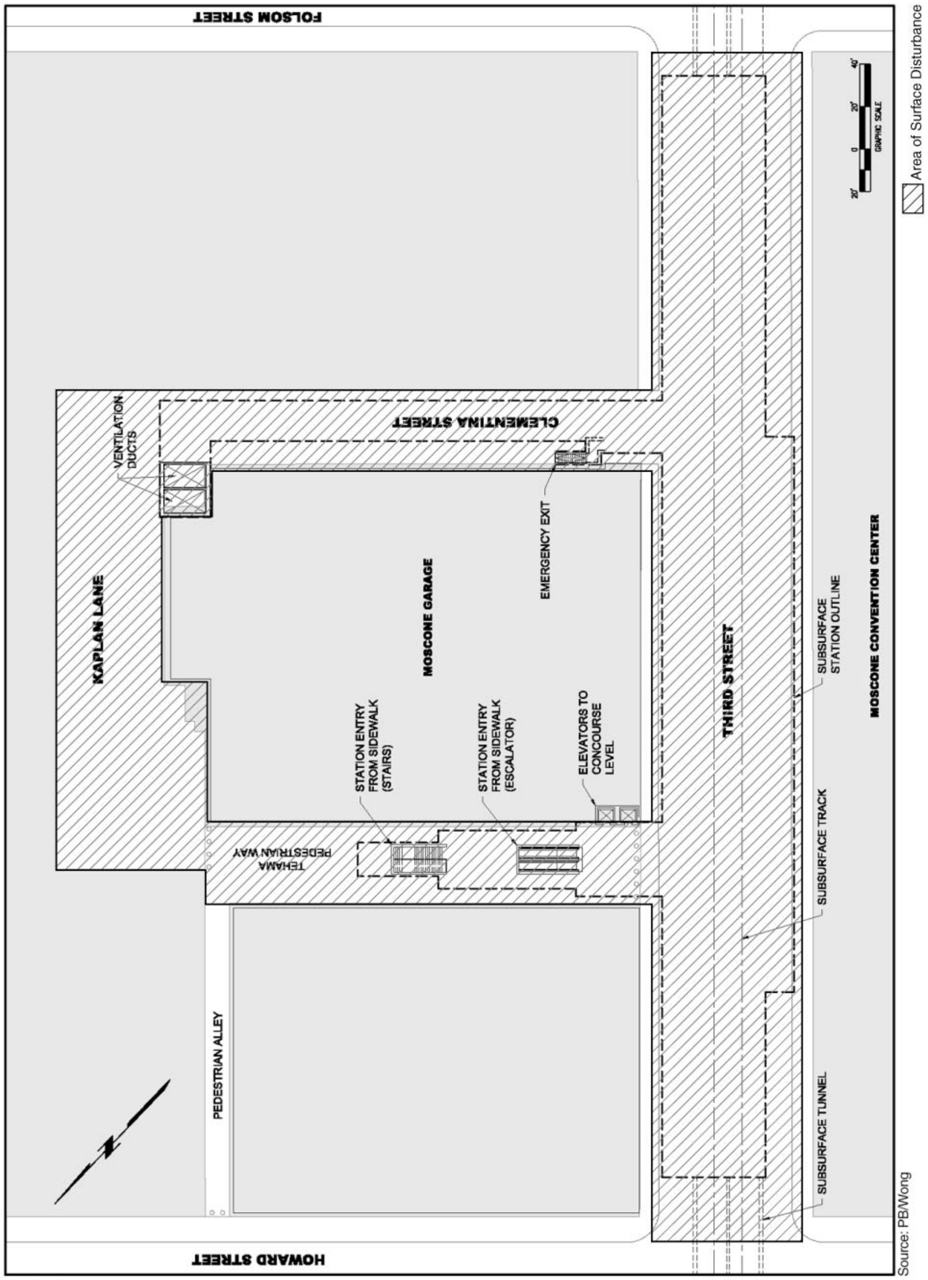
Union Square Station would be constructed on Stockton Street between Post and Geary Streets using decked cut-and-cover methods (see Figure 6-8). Staging areas for construction would occupy the westerly sidewalk and traffic lanes on Stockton Street east of Union Square between Post and Geary Streets.

Chinatown Station would be mined using SEM methods for the platform cavern, crossover and tail track tunnel; all staged from the off-street station access shaft (see Figure 6-9). This shaft would be decked over and used as a headhouse for access to subsurface excavation and for spoils removal. It would later be fitted out as the station entrance. All station structural work, architectural finishes, and mechanical systems would be installed from the surface through the same off-street headhouse shaft. Stockton Street would be used to access the station construction site for hauling materials, equipment, and spoils.

FIGURE 6-6

ALTERNATIVE 2 – MOSCONE STATION

AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION

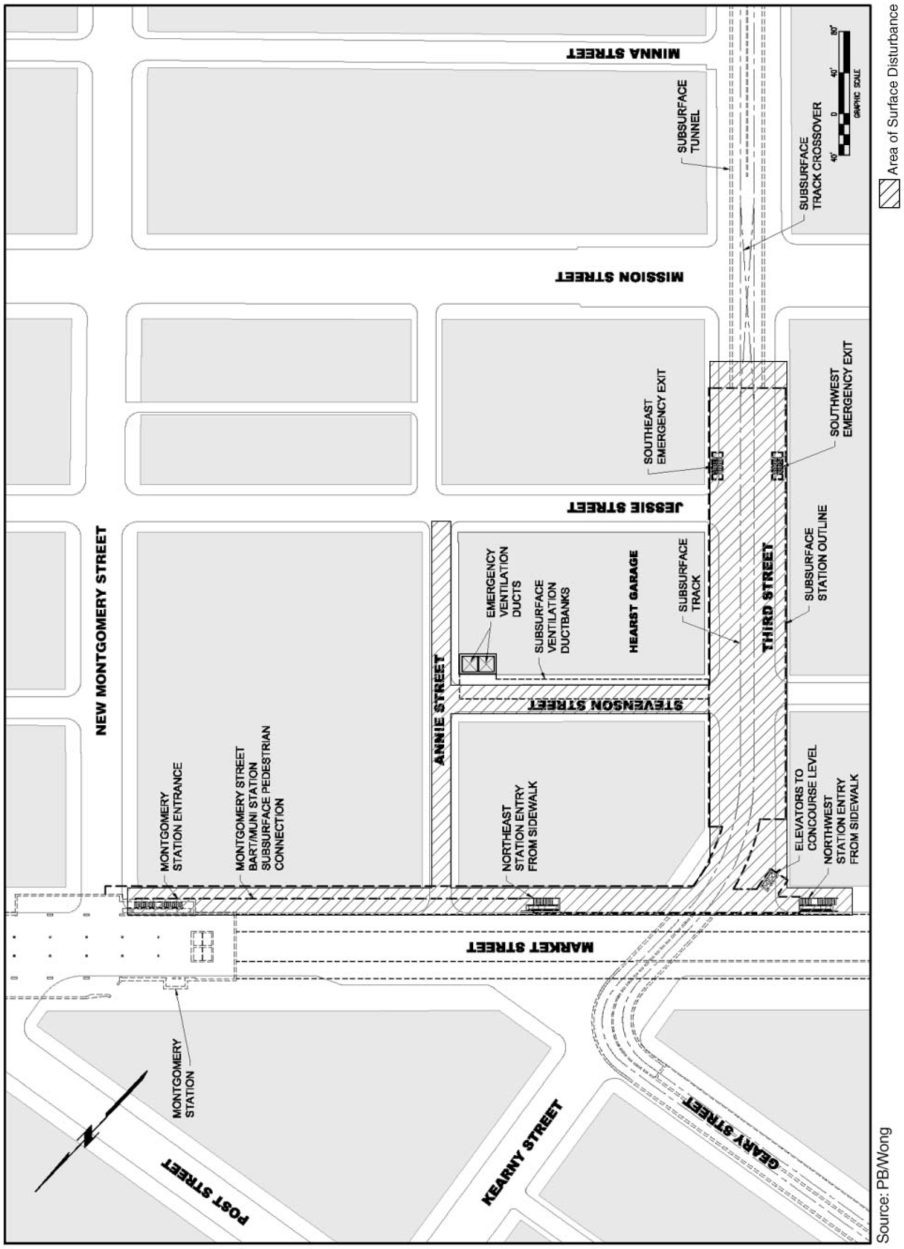


ALT-2 MOS

FIGURE 6-7

ALT. 2 MARKET STREET STATION

AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION

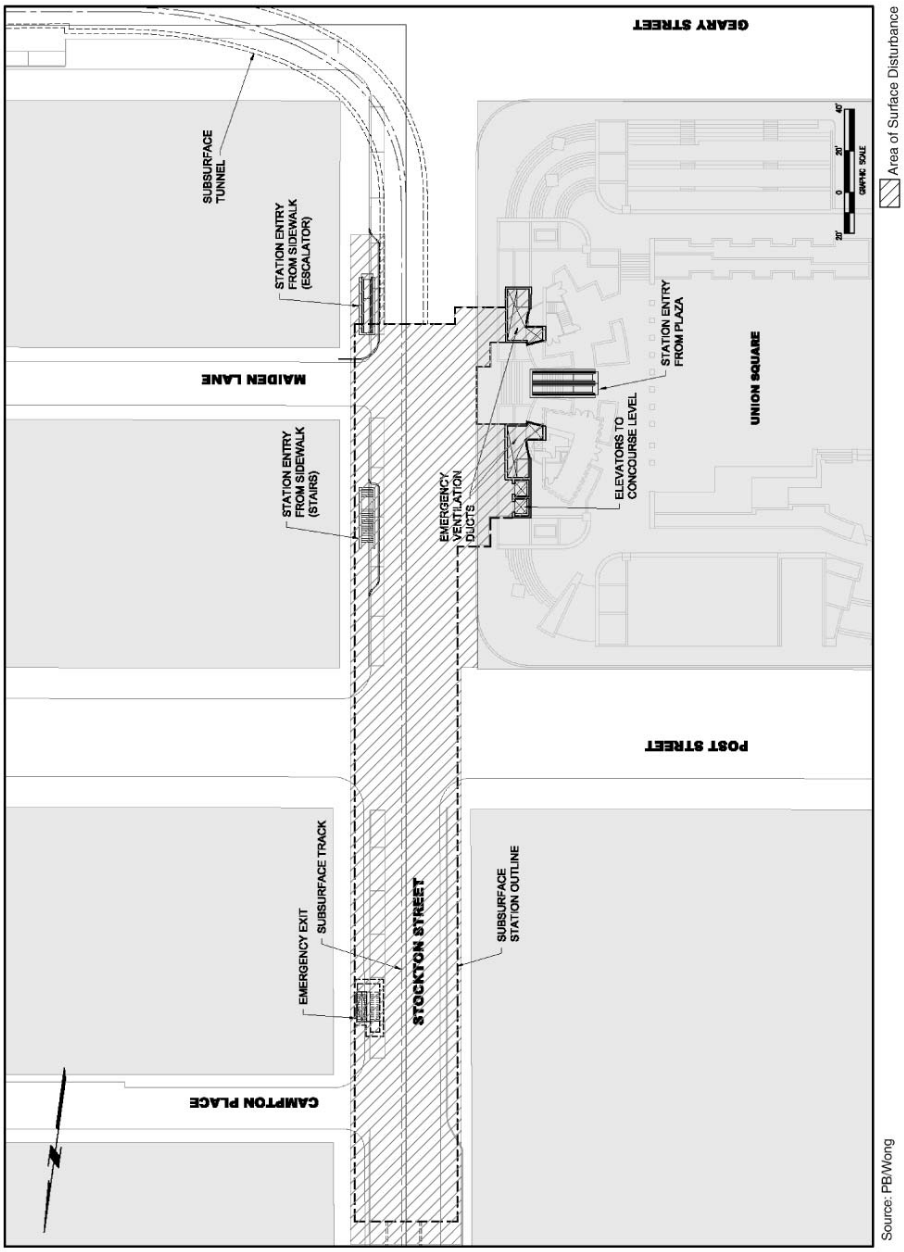


ALT-2 MSS

FIGURE 6-8

ALT. 2 UNION SQUARE STATION

AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION

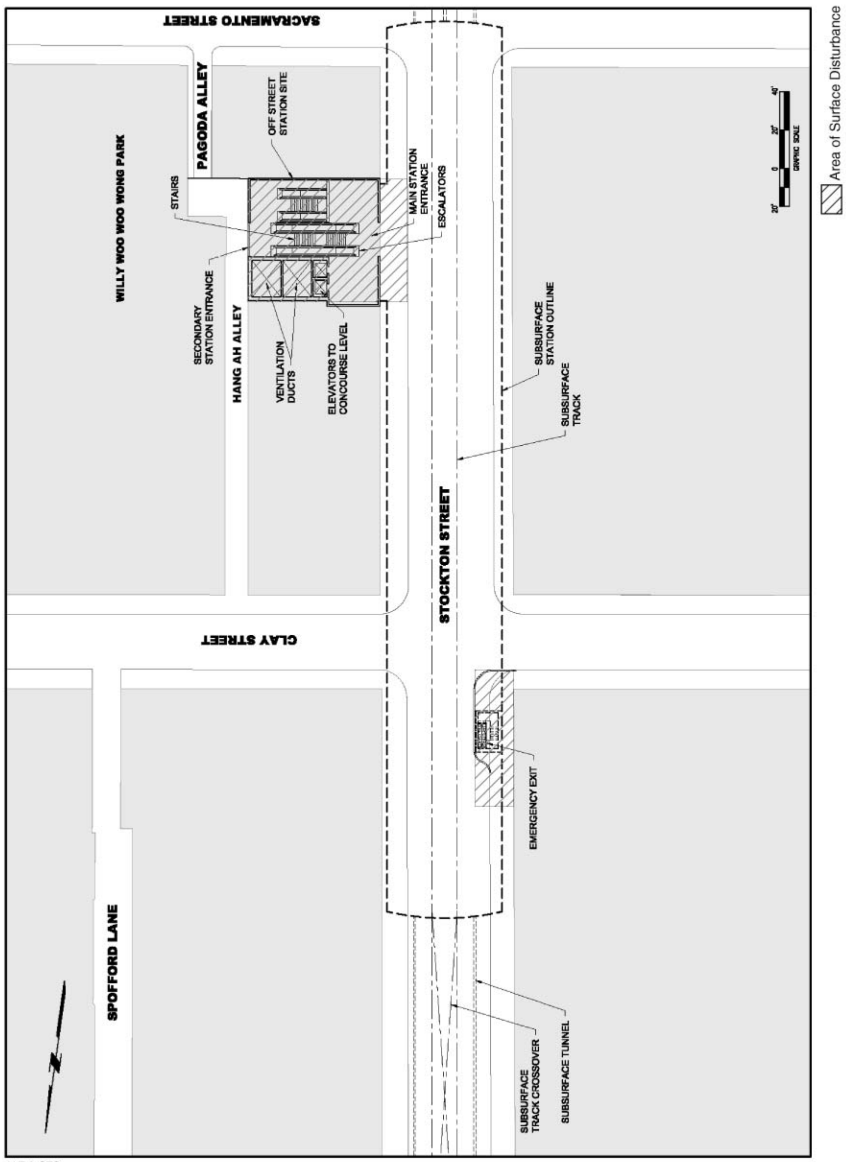


ALT-2 USS

FIGURE 6-9

ALT. 2 CHINATOWN STATION

AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION



ALT-2 CTS

Utility Relocations – Alternative 2

The SXM method of construction requires relocation of all utilities ahead of the guideway construction and/or placement of utilities in utility corridors where feasible–an effort that will take about 24 months (see Figure 6-5). Utility relocation for the subway would occur on Fourth Street, between Brannan and Harrison Streets; on Harrison Street, between Third and Fourth Streets; on Third Street, between Brannan and Market Streets; along Geary Street, between Market, Kearny, and Stockton Streets; and on Stockton Street between Geary and Sutter Streets.

At Mission and Third Streets, the subway profile conflicts with the 8-foot diameter North Point Main sewer line, which carries storm drain runoff and sanitary sewer flows. Several options are possible, including abandoning or rerouting the sewer line or installing a siphon and pump station to force the effluent under the subway. All options would occur within the public right-of-way. Installation of the siphon or rerouting the sewer line would require the longest pre-construction period, up to approximately 18 months. Curb parking in each block requiring utility diversions would need to be temporarily eliminated to accommodate traffic flow.

Cut-and-cover excavation of Market Station would require one lane of Third Street, from Stevenson Street to Jessie Street, to be closed to traffic for the duration of station construction (about 36 months). This would impact, though not entirely eliminate, access to Stevenson Street and the Hearst Parking Garage. Pedestrian access along both sidewalks on Third Street between Mission and Market Streets would require protective cover for the entire duration of station construction.

Cut-and-cover excavation of Union Square would require two lanes of Stockton Street, from Post Street to just south of Maiden Lane, to be closed to traffic for the duration of station construction (48 months). Access to the Union Square Parking Garage on Geary Street would not be obstructed. Pedestrian access along the west sidewalk on Stockton Street between Geary and Post Street would be closed for the entire duration of station construction.

Spoils Handling – Alternative 2

Guideway excavation would proceed in a northerly direction from the portals south of Bryant Street towards Union Square. As guideway excavation proceeded, muck would be transported through the constructed portions of the guideway to each portal before being hauled off-site for permanent disposal. <u>The south portal on Fourth Street would be the primary truck loading site. Trucks carrying materials from the portal site would be routed directly to the I-80 freeway for disposal sites to be determined by the contractor. Truck travelling east on I-80 would travel south on Fourth Street, west on Brannan Street, and</u>

north on Fifth Street to the I-80 eastbound on-ramp. Trucks travelling westbound on I-80 (southbound) would travel south on Fourth Street, east on Brannan Street, north on Third Street, and west on Harrison Street to the I-80 westbound on-ramp. The southbound trucks from the Third Street portal would follow this same route. The trucks from the Third Street portal going east on I-80 would continue west on Harrison Street, turning south on Fifth Street to the I-80 eastbound on-ramp.

Spoils from excavation of the Chinatown Station, the crossover cavern and the tail track tunnels would be removed by way of the Chinatown Station access shaft and hauled off-site for disposal. Trucks from Chinatown would travel on Stockton Street to eastbound Broadway, south on Battery Street, and continuing south on First Street to the I-80 eastbound freeway-ramp or continuing west on Harrison Street to the I-80 westbound on ramp.

Spoils generated from excavation of the Union Square Station and the guideway tunnels north of Union Square would be hauled to the surface at Union Square and hauled off-site for disposal. Trucks from the Union Square Station construction site would travel south on Stockton Street continuing on Fourth Street to the I-80 eastbound on-ramp or turning west on Harrison Street and south on Fifth Street to the I-80 eastbound on-ramp.

Spoils generated from excavation of Market Street Station and Moscone Station would be hauled to the surface at Stevenson and Clementina Streets, respectively, before being hauled off-site for permanent disposal. An estimated 524,000 cubic yards of spoils would be disposed of for Alternative 2, resulting in approximately 8 truck trips per day during the 4.5 year construction for the guideway and 8 to 10 daily truck trips from each station during the station excavation periods. Trucks from the Moscone and Market Street Stations construction sites would travel south on Fourth Street to the I-80 eastbound on-ramp or take Fourth Street, west on Harrison, and south on Fifth Street to the I-80 westbound on-ramp.

Construction Sequencing and Duration – Alternative 2

The 1998 FEIS/FEIR staged the subway construction in two phases, the south of Market Street segment first followed by the north segment from Market Street to Chinatown. For the Enhanced EIS/EIR Alignment, it is assumed that construction of both segments would be done concurrently thereby significantly reducing the overall construction schedule. Construction of the Enhanced EIS/EIR Alignment would be accomplished in a single phase. Refer to Figure 6-5 for a summary of construction activities and the schedule.

Because of the intensity of utility relocations required to enable construction of the guideway tunnels and station by SXM and cut-and-cover methods between Brannan and Post Streets, the first 24 months of the Enhanced EIS/EIR Alignment would be devoted to pre-construction activities and relocation of impacted utility lines, and trolley bus routes on Fourth, Third, Harrison, Market, and Geary Streets. At Mission and Third Streets, the guideway alignment would require relocation of the eight-foot North Point sewer line which carries storm drain runoff and sanitary flows or installation of a siphon.

The subsequent 40 months would focus on construction of the portals on Third and Fourth Streets, the cut-and-cover stations at Moscone and Market Street, and the guideway tunnels between these points. Following diversion of utilities and transit lines, Fourth Street between Brannan and Harrison Streets, Harrison Street between Fourth and Third Streets, and Third Street between Brannan and Market Streets would require at least two lanes closures plus temporary loss of curb parking for installation of the jet grouted slabs above and below the guideway tunnels and for installation of the soil cement or secant pile ground support walls. Sequential lane closures of Market, Kearny, and Geary Streets would be required to allow the cut-and-cover and SXM sections of the guideway tunnel to be constructed between Moscone Station and Union Square Station.

The SXM method would require sequential movement of construction activities, block by block. When the jet grouting installation in one block is completed, the drilling rigs and grouting equipment would be moved to the next block and the piling rigs and soil cement placement equipment would move in behind it. The work would be staged to coordinate both sets of activities. The closure of at least two lanes for any two consecutive blocks on Third Street between Harrison Street and Market Street would be required for periods of at least four months.

The construction of the Union Square Station would start six months in advance of the Moscone and Market Street Stations. A typical sequence of activities for the construction of the Union Square station and the estimated durations of the activities is presented in Figure 6-10. Excavation of the guideway tunnels between the Union Square and Chinatown Stations would commence north from the Union Square Station box using SEM. Spoils from excavation of this segment of the guideway tunnels would be hauled off-site from Union Square.

Excavation, ground support and structural elements for guideway tunnels and stations for the Enhanced EIS/EIR Alignment would require approximately 66 months (5.5 years) to complete (refer to Figure 6-5).

6.2.2 FOURTH/STOCKTON ALIGNMENT OPTION A – ALTERNATIVE 3A

Construction of the Fourth/Stockton Alignment Option A would be accomplished using a combination of SEM, TBM and cut-and-cover techniques as described in Section 6.1.2. A summary of construction methods and schedule for this alternative are presented in Table 6-1 and Figure 6-5.

Guideway Construction and Staging Areas – Alternative 3A

The majority of the subway segment between the portal at Fourth and Brannan Streets and Chinatown Station would be constructed by TBM as twin, approximately 20-foot diameter, single-track bores. The segment north of Chinatown Station would consist of a crossover and twin tail tracks in a single SEM cavern that would extend approximately 600 feet north of the station cavern.

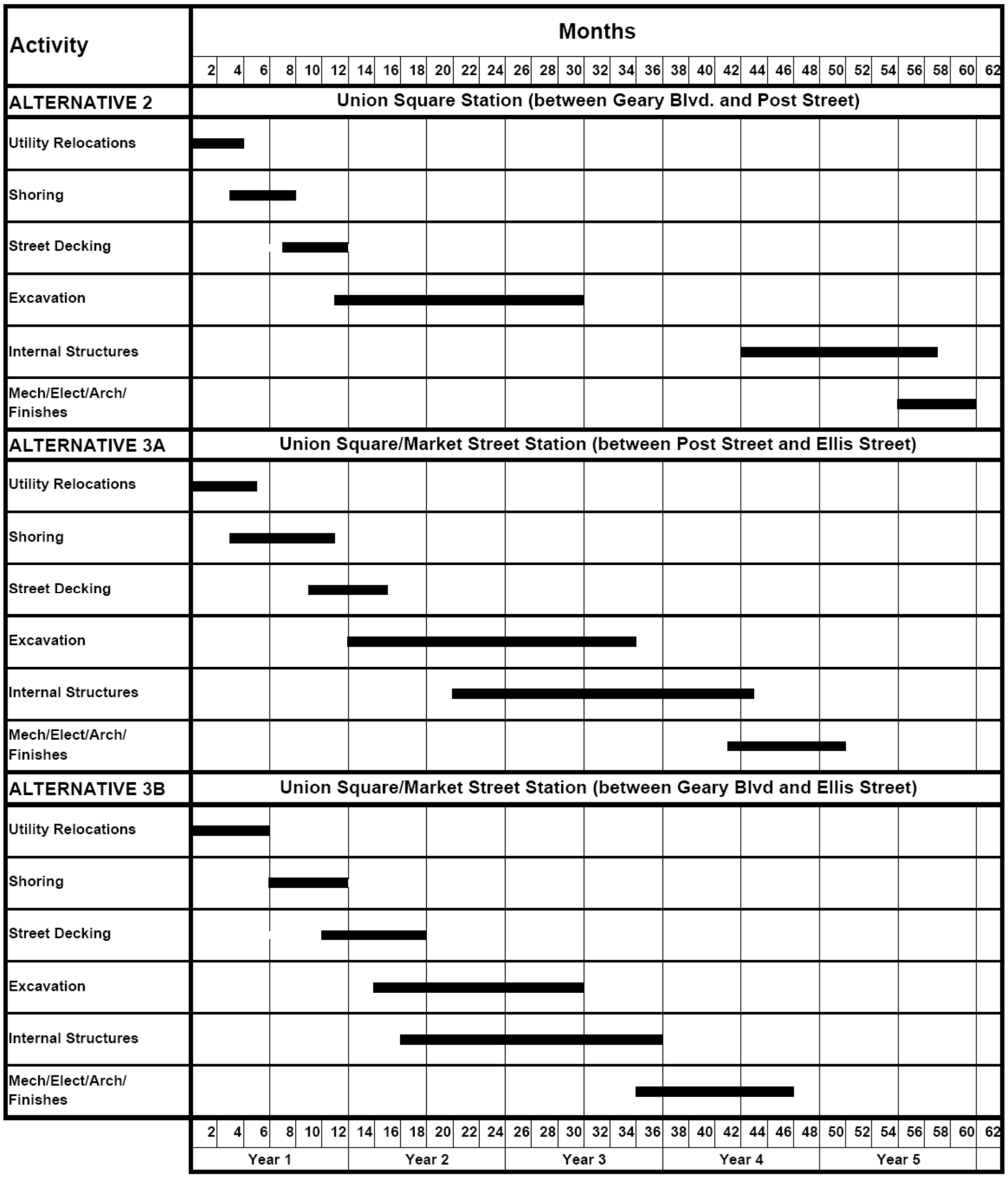
The Fourth/Stockton Alignment Option A could be constructed using one or two TBMs. As originally conceived, the construction method proposed for this alternative used a single TBM launched at the tunnel construction shaft located on Fourth Street adjacent to the I-80 Freeway and recovered from the off-street access shaft at Chinatown Station. After completing the northbound guideway tunnel, the TBM would be transported back to the tunnel construction shaft and re-launched to excavate the southbound guideway tunnel. If two TBMs were to be used, both machines would be launched from the tunnel construction shaft.

The tunnel construction shaft would be located on Fourth Street ~~between~~ , just south of Perry Street, between Harrison and Bryant Streets. The guideway tunnel construction staging areas would occupy the area beneath I-80, to the west of Fourth Street.

FIGURE 6-10

CONSTRUCTION ACTIVITIES AND DURATIONS

FOR UNION SQUARE AND UNION SQUARE/MARKET STREET STATIONS



Source: PB/Wong

Cut-and-cover methods would be used for construction of the approximately 1,100 foot subway segment between the tunnel construction shaft and the portal. Staging areas for the cut-and-cover tunnel would consist of decked-over portions of the street and would generally follow construction as it proceeded south from the tunnel construction shaft.

If the North Beach Construction Variant is adopted, the tail track would be constructed by the extended TBM tunnel and would include a mined cross passage; otherwise it would be mined as a single, twin-track cavern using SEM.

For support of TBM tunnel construction, the I-80 tunnel construction shaft, including the cut-and-cover TBM launch box immediately north of the shaft, would be the primary staging area. For the North Beach Construction Variant, the TBM retrieval shaft located on Columbus Avenue would be used periodically for night time delivery and removal of materials.

Stations Construction and Staging Areas – Alternative 3A

Moscone Station would be decked cut-and-cover construction located on Fourth Street between Howard and Folsom Streets with station entrances north of Howard Street. See Figure 6-11 for approximate area of surface disturbance during station construction. Construction of Moscone Station would require two lanes of Fourth Street to be closed to traffic for approximately 15 months for installation of the shoring and decking. Although not entirely eliminated, access to the truck ramps leading onto Fourth Street from the Moscone Convention Center loading docks would be temporarily disrupted during placement of shoring and decking for the Moscone Station. Pedestrian access along the west side of Fourth Street between Howard and Folsom Streets would be impacted during installation of shoring.

~~Clementina Street and the adjacent~~ The lot at the southwest corner of Clementina and Fourth Streets (14,800 square feet) presently occupied by a gas station would serve as the staging area for the Moscone Station and the temporary construction shaft.

Union Square/Market Street Station would be a combination of decked cut-and-cover construction and an SEM mined cavern located on Stockton Street between Geary Boulevard and Market Street (see Figure 6-12). The cut-and-cover sections of Union Square/Market Street Station would require at least two lanes of Stockton Street to be closed to traffic for approximately 10-12 months for installation of shoring and decking. Ellis Street would be reduced to one lane of traffic to accommodate the construction staging area. Pedestrian access along both sidewalks on Stockton Street between Geary Street and Market Streets would require protective cover for the entire duration of secant pile shoring installation.

FIGURE 6-11

ALT. 3A MOSCONE STATION

AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION

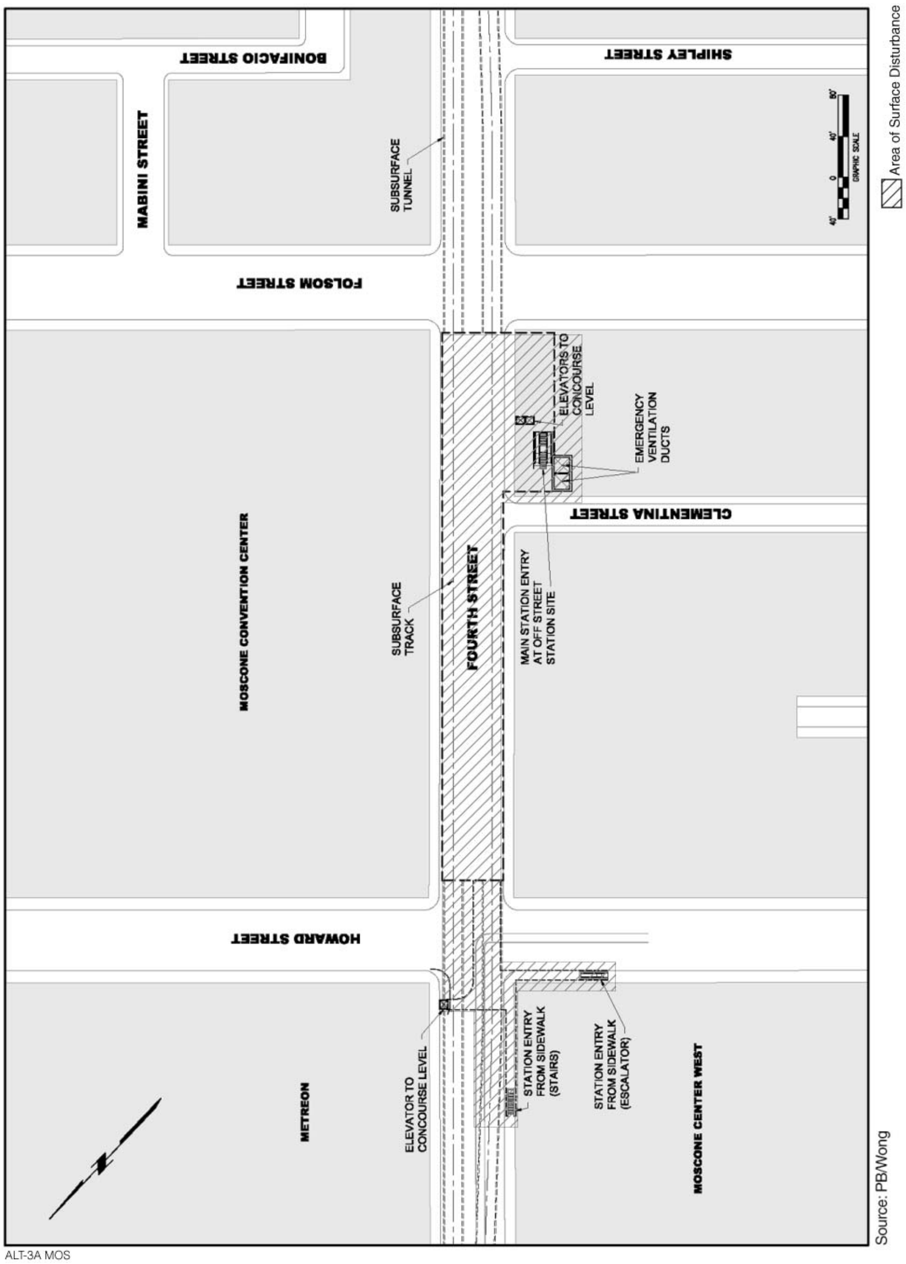
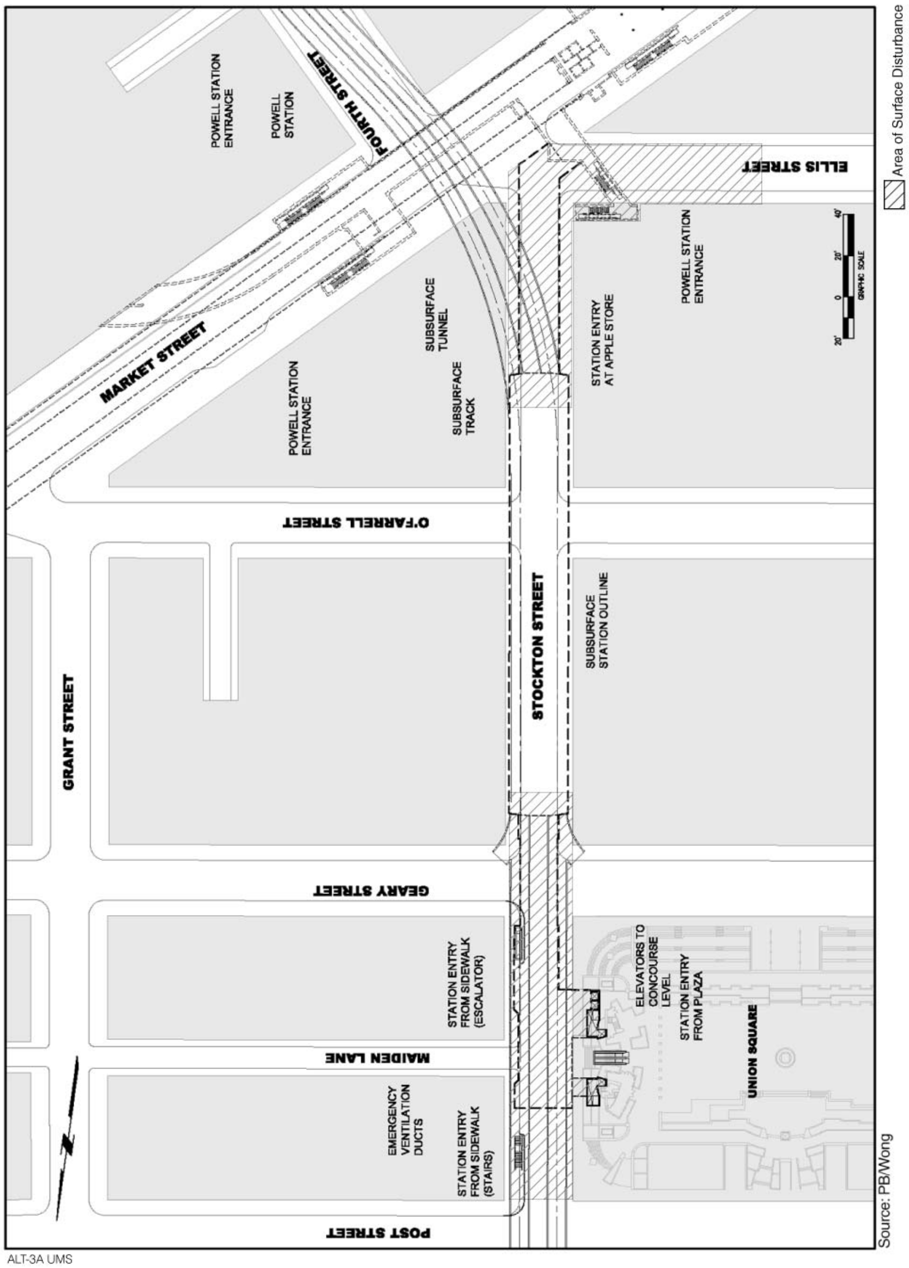


FIGURE 6-12

ALT. 3A UNION SQUARE/MARKET STREET STATION

AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION



Union Square/Market Street Station would require two primary staging areas, one on Ellis Street (4,400 square feet) for the South Concourse and one on Stockton Street (7,600 square feet) adjacent to Union Square, which would support construction of the North Concourse. The westerly sidewalk and traffic lanes on Stockton Street between Post and Geary Streets would be closed for about 36 months. Other temporary closures of Stockton Street would be required and would be done at night when possible. Construction of the north and south cavern access shafts would require the temporary use of at least two lanes of Stockton Street and would need to accommodate a crane and trucks for muck hauling. After construction of the shaft, intermittent use of Stockton Street would be needed for removal of the microtunneling machines that would be used for the platform cavern pipe canopy.

The Chinatown Station would be a mined excavation. SEM methods would be used for excavation of the platform cavern, crossover and tail track tunnels, and all operations would be conducted from the off-street station access shaft (see Figure 6-13). This shaft would be decked over and used as a headhouse for access to subsurface excavation and for spoils removal. It would later be fitted out as the station entrance. All station structural work, architectural finishes, and mechanical systems would be installed from the surface through the same off-street headhouse shaft. Stockton Street would be used to access the station construction site for hauling materials, equipment, and spoils. A construction barrier wall on the eastside of the site, about 20 to 30 feet high, would protect the adjacent alley and playground (Willie “Woo Woo” Wong) from construction noise, dust, and visual disturbance.

The off-street portion of the station access/headhouse shaft would be partially decked over and used as a staging area (approximately 4,700 square feet). A crane would be required for station and shaft excavation and construction. Curb parking on Stockton Street would be used to accommodate trucks. Temporary (one to two weeks) use of a higher capacity crane would be required to hoist the TBMs if they are retrieved through the Chinatown access shaft.

Utility Relocations – Alternative 3A

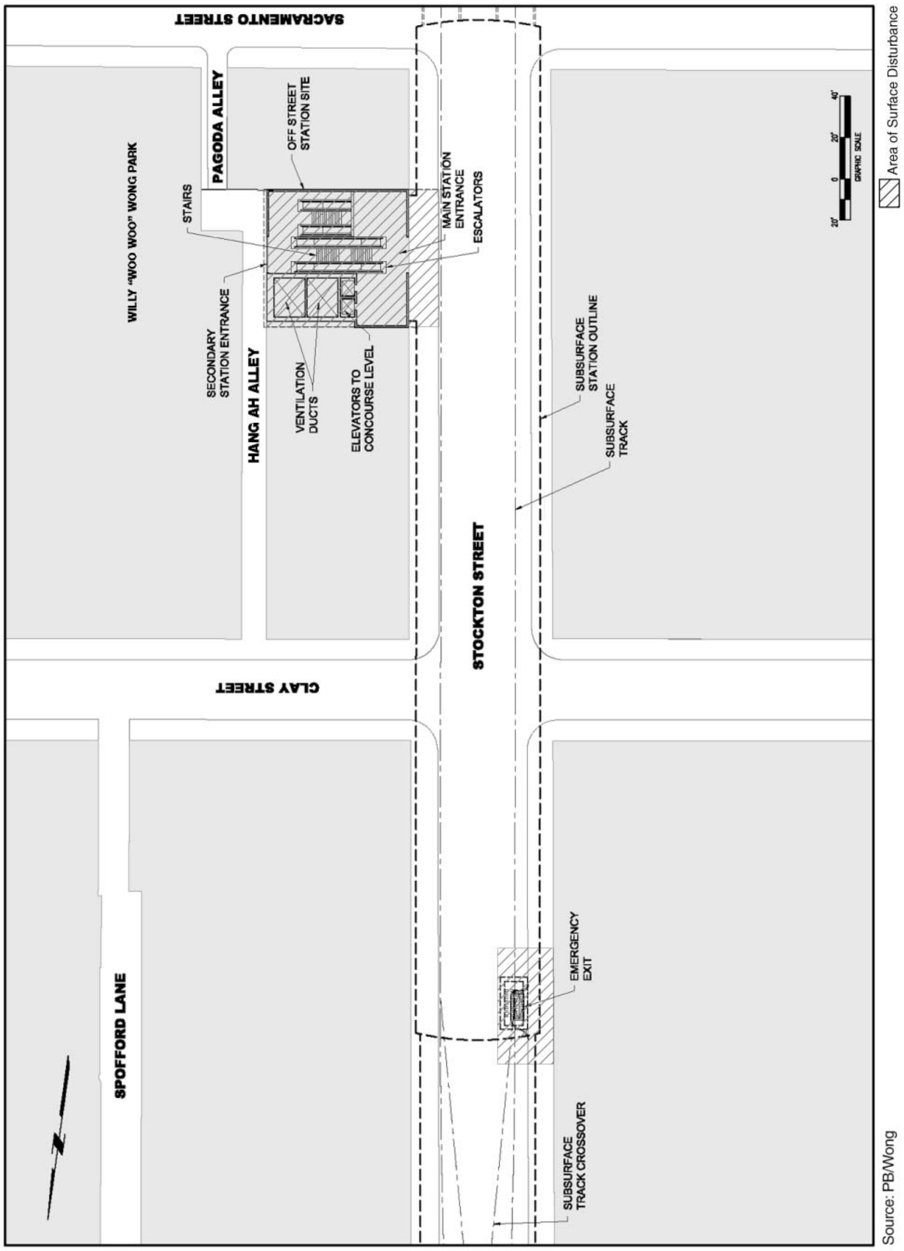
Relocation of utilities ahead of station construction would be required on Stockton Street between Post Street and Market Street; on Fourth Street between Howard and Folsom Streets; and on Fourth Street between Harrison and Townsend Streets for the construction shaft, the cut-and-cover construction south of the tunnel construction shaft and the portal. These utility relocations would take about 12 months.

Curb parking in each block along the utility diversions would be eliminated during this work to accommodate traffic flow around the work area.

FIGURE 6-13

ALT. 3A CHINATOWN STATION

AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION



ALT-3A CTS

Spoils Handling – Alternative 3A

Tunnel excavation by TBM would proceed in a northerly direction from the tunnel construction shaft towards the Chinatown Station. Muck produced by the TBMs would be transported through the tunnels back to the tunnel construction shaft and stockpiled before being hauled off-site for permanent disposal. Spoils generated from the excavation of each of the stations, Moscone Station, Union Square/ Market Street Station and Chinatown Station, the crossover cavern and the tail track tunnels would be hauled to the surface through off-street shafts at each of the station locations before being hauled off-site for permanent disposal. Spoils generated from excavation of the segment between the tunnel construction shaft and the portal by cut-and-cover method would be loaded when excavated as the construction progressed and hauled off-site for permanent disposal. An estimated 489,000 cubic yards of spoils would be disposed of for Alternative 3A, resulting in approximately 18 truck trips per day during the 2.5-year guideway excavation period; 13 daily truck trips during the 2.0-year excavation period for the Moscone Station; and about 7 trips per day during the Union Square/Market Street Station (3.0 years) and Chinatown Station (2.5 years) excavation periods.

The south portal on Fourth Street would be the primary truck loading site. Trucks carrying materials from the portal site would be routed directly to the I-80 freeway for disposal sites to be determined by the contractor. Trucks travelling east on I-80 would travel south on Fourth Street, west on Brannan Street, and north on Fifth Street to the I-80 eastbound on-ramp. Trucks travelling westbound on I-80 (southbound) would travel south on Fourth Street, east on Brannan Street, north on Third Street, and west on Harrison Street to the I-80 westbound on-ramp. Trucks from the from the Moscone Street Station construction site would travel south on Fourth Street to the I-80 eastbound on-ramp or continue west on Harrison Street and south on Fifth Street to the I-80 westbound on-ramp. Trucks from the Union Square/Market Street Station construction site would travel south on Fourth Street then follow the same route south as the trucks from the Moscone Station. Trucks from Chinatown would travel on Stockton Street to eastbound Broadway, south on Battery Street, and continuing south on First Street to the I-80 eastbound freeway-ramp or continuing west on Harrison Street to the I-80 westbound on ramp.

If the North Beach Tunnel Construction Variant is adopted, spoils generated from excavation of the TBM retrieval shaft on Columbus Avenue would be hauled to the surface at the shaft location before being hauled off-site for permanent disposal. An estimated 3,200 cubic yards of spoils would be removed at the retrieval shaft on Columbus Avenue resulting in an estimated five truck trips per day during the six-month long excavation period. Approximately 20 truck trips would be required to remove the tunnel boring machines.

Eastbound trucks hauling debris from the TBM extraction pit would go southeast on Columbus Avenue, east on Washington Street, south on Battery Street, and continue south on First Street to the I-80 eastbound on-ramp. Southbound trucks would follow the same route continuing west on Harrison Street to the I-80 westbound on-ramp.

Construction Sequencing and Durations – Alternative 3A

Construction of the Fourth/Stockton Alignment Option A would be accomplished in a single phase. A summary of construction activities and schedule for this alternative is presented in Figure 6-5.

The first 15 months of the Alternative 3A pre-construction activities would include relocation of existing utility lines and impacted transit services, and excavation of the tunnel construction shaft beneath I-80 between Harrison and Bryant Streets. Procurement, delivery, and assembly of the TBM would take approximately 12 months. Guideway tunnels would commence from the tunnel construction shaft at Fourth and Harrison Streets northward towards the Chinatown Station. The TBM would advance at approximately 30 feet per day. Removal of excavated spoils and delivery of construction materials for the guideway tunnels would primarily occur at the tunnel construction shaft. Station shells at Moscone Station and Union Square/Market Street Station would be excavated down to below track level in advance of the TBM reaching those locations so that the machine can be “walked” through the station and re-launched at its north end. The platform cavern at Chinatown station would be excavated in advance of the TBM reaching that location to enable the machine to be recovered from the off-street access shaft and transported back to the tunnel construction shaft and relaunched to excavate the other guideway tunnel.

Construction of the guideway tunnels would take approximately 40 months using a single TBM. If two TBM were used to excavate the tunnels simultaneously, there would be approximately one month lag between the two machines being launched and the construction duration would be shortened to approximately 18 months (refer to Figure 6-5). At the end of guideway (tunnel) construction the TBM cutterhead would be retrieved through the Chinatown Station headhouse, an approximately one week effort. The trailing sections of the TBM would be pulled back through the tunnel to the construction shaft.

If the North Beach Tunnel Construction Variant is adopted, the TBMs would be "walked" through the SEM mined platform and station caverns at the Chinatown station and re-launched and driven to North Beach and recovered from a shaft located in the middle of Columbus Avenue, rather than from the Chinatown Station headhouse. Retrieval of the TBM would take about one week at this location. TBM tunneling would not require any surface work or lane closures other than at the TBM recovery shaft on Columbus Avenue. The shaft construction on Columbus Avenue is estimated to take approximately six months.

Moscone Station and the construction access shafts at the Union Square/Market Street Station would require temporary lane closures for a period of 10 and 12 months on Fourth Street between Folsom and Howard Streets and on Stockton Street between Ellis and Post Streets for installation of the shoring systems. This would occur before the streets are fully decked over, at which point excavation of the stations would continue underground and spoils or materials would be delivered through access points on Clementina and Ellis Streets and adjacent to Union Square between Post and Geary Streets (refer to Figure 6-10). During installation of the secant piles used for shoring, the sidewalks would be either closed to pedestrians (only on segments that do not provide direct access to adjacent buildings) or protective barriers erected to separate the public from the construction activities. After the decking is completed all lanes would be reopened to traffic, however truck traffic required for hauling of excavated spoils and delivery of construction materials would be necessary at each of these locations for the full duration of construction.

Construction of Chinatown Station and the adjacent cross-over and tail track tunnel would be carried out from an off-street shaft and is scheduled to take approximately 54 months. With the exception of short periods of time when large equipment is being delivered to the station or when the TBMs are being retrieved from the shaft, no lane closures on Stockton Street in Chinatown are planned for construction of the station. However, truck traffic required for hauling of excavated spoils and delivery of construction materials would be necessary for the full duration of construction, occupying the curb-side lane.

6.2.3 FOURTH/STOCKTON ALIGNMENT OPTION B – ALTERNATIVE 3B

Construction of the Fourth/Stockton Alignment Option B would be accomplished using a combination of SEM, TBM and cut-and-cover techniques as described in Section 6.1.2. A summary of construction methods and schedule for this alternative are presented in Table 6-1 and Figure 6-5.

Guideway Construction and Staging Areas – Alternative 3B

The Fourth/Stockton Alignment Option B assumes the use of two TBMs for construction of the guideway tunnels, launched in parallel from the tunnel construction shaft and recovered from the access shaft at Chinatown Station, or, if the North Beach Construction Variant is adopted, from a TBM retrieval shaft located on Columbus Avenue.

The underground guideway segment between Harrison Street and the Chinatown Station would be constructed by TBM as twin, approximately 20-foot diameter, single-track bores. The guideway segment from the Tunnel Construction Shaft to Moscone Station includes approximately 240 feet of twin box cut-and-cover tunnel that is used as part of the tunnel construction shaft for erecting and launching the TBMs. The guideway segment between Moscone Station and Union Square/Market Street Station is approximately 1,800 feet long and includes one mined (SEM) cross passage with a sump pump at the low point in the profile. The segment between Union Square/Market Street and Chinatown Station is approximately 2,500 feet long and includes a mined (SEM) crossover cavern and three mined (SEM) cross passages for emergency egress between the twin bored tunnels.

The guideway segment, which extends 200 feet north beyond the Chinatown Station platform cavern, comprises the tail track tunnels. If the North Beach Construction Variant is included, the construction methods would be the same as described under Alternative 3A.

Stations Construction and Staging Areas – Alternative 3B

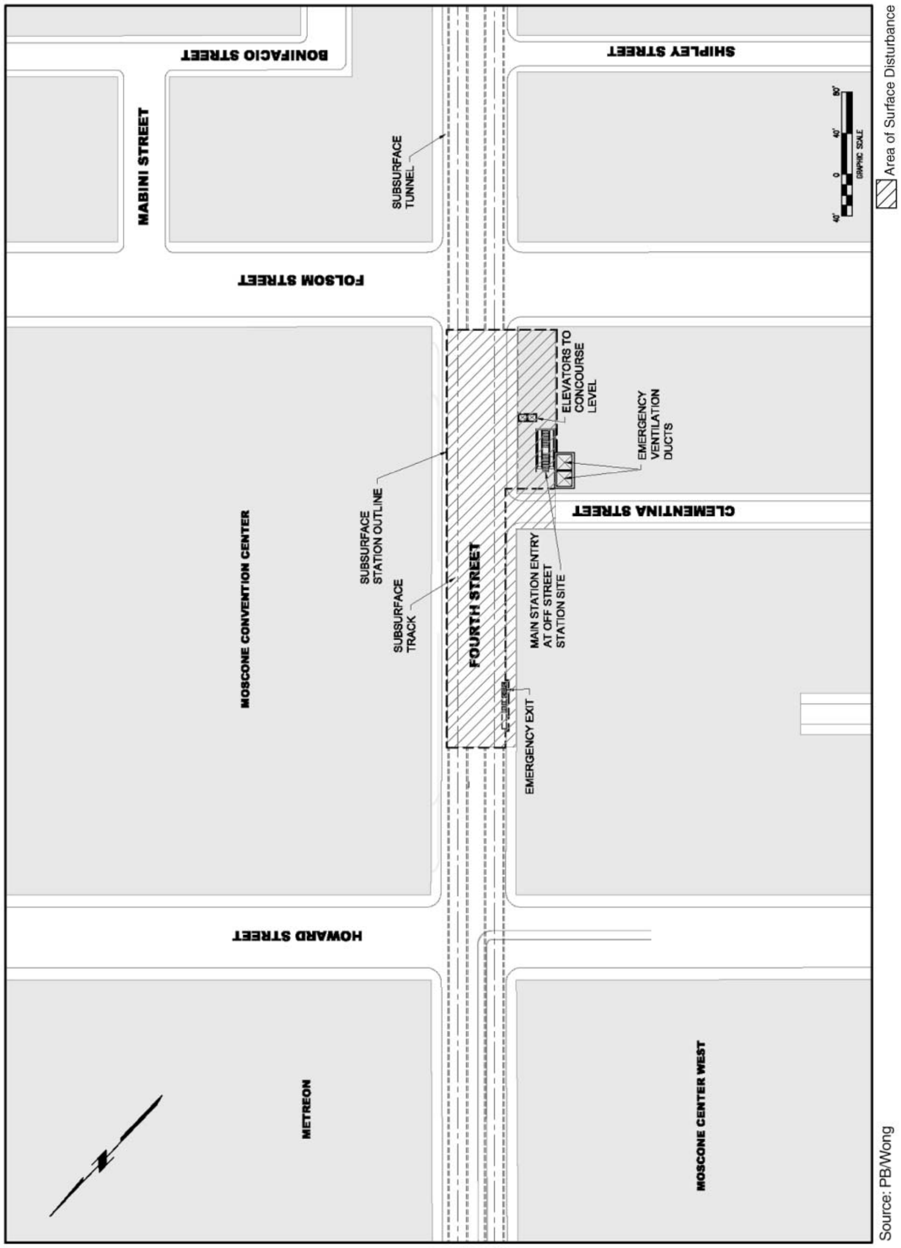
Moscone Station would be located on Fourth Street between Howard and Folsom Streets and also would use a decked cut-and-cover construction approach. See Figure 6-14 for approximate area of surface disturbance during station construction. Clementina Street and the adjacent lot (14,800 square feet) presently occupied by a gas station would serve as the staging area for the Moscone Station and the temporary construction shaft.

Cut-and-cover excavation of Moscone Station would require two lanes of Fourth Street to be closed to traffic for approximately 10 to 12 months for installation of the shoring and decking. Although not entirely eliminated, access to the truck ramps leading onto Fourth Street from the Moscone Convention

FIGURE 6-14

ALT. 3B MOSCONE STATION

AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION



ALT-3B MOS

Center loading docks would be temporarily disrupted during placement of shoring and decking for the Moscone Station. Pedestrian access along the west side of Fourth Street between Howard and Folsom Streets would be impacted during installation of shoring.

Union Square/Market Street Station, located on Stockton Street between Geary and Ellis Streets, would be constructed using a decked cut-and-cover approach for the entire length of the station (refer to Figure 6-15). Union Square/Market Street Station would require at least two lanes of Stockton Street to be closed to traffic for installation of shoring and decking (about 10 to 12 months). During installation of shoring for the platform section of the station, there may be a need to shut down Stockton Street to traffic completely for a period of six to eight months. Ellis Street would be reduced to one lane of traffic to accommodate the construction staging area. Pedestrian access along both sidewalks on Stockton Street between Geary Street and Market Street would require protective cover for the entire duration of secant pile shoring installation.

Two primary staging areas would be required, one on Ellis Street (5,000 square feet) to support construction of the South Concourse, the main platform box, and the emergency vent ducts that extend west under Ellis Street to the Ellis/O'Farrell Garage, and one on Stockton and Geary Streets (8,000 square feet), which would support construction of the North Concourse and the reconstruction of the southeast corner of Union Square to serve as the north station entrance.

The Chinatown Station at Stockton and Washington Streets would be constructed entirely by mined (SEM) methods from an off-street access shaft similar in approach, but different in dimensions and general layout from the Chinatown Station configurations developed for the Enhanced EIS/EIR and Fourth/Stockton, Option A Alternatives (see Figure 6-16). All station headhouse structural work, architectural finishes, and mechanical systems would be installed from the surface through the off-street shaft.

The off-street portion of the station access/headhouse shaft would be partially decked over and used as a staging area (approximately 10,000 square feet). A crane would be required for station and shaft excavation and construction. Curb parking on the west side of Stockton Street would be used to accommodate trucks. Temporary (one to two weeks) use of a higher capacity crane would be required to hoist the TBMs if they are retrieved through the Chinatown access shaft.

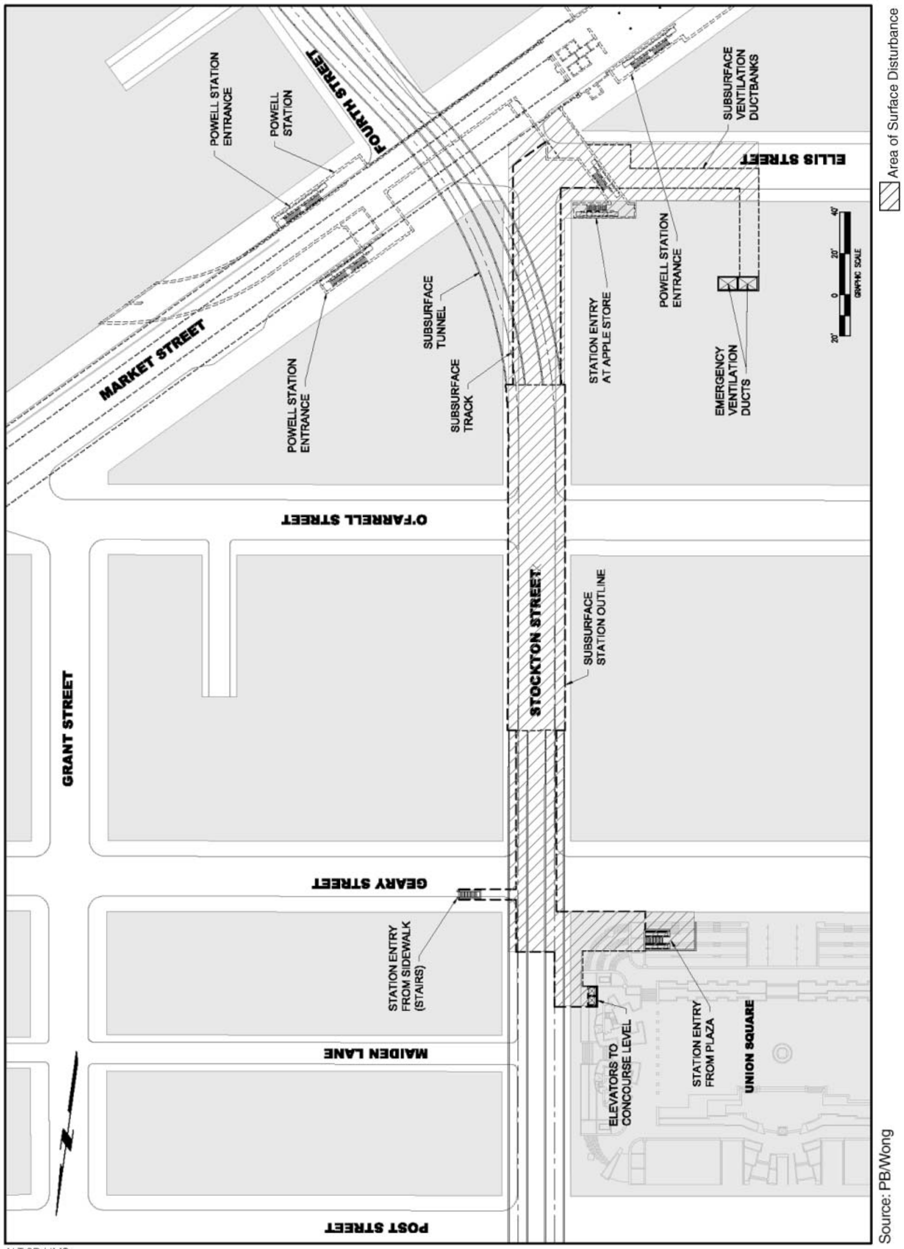
Utility Relocations – Alternative 3B

Relocation of utilities ahead of station construction would be required on Stockton Street between Post Street and Market Street; on Fourth Street between Howard and Folsom Streets; and on Fourth Street

FIGURE 6-15

ALT. 3B UNION SQUARE/MARKET STREET STATION

AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION

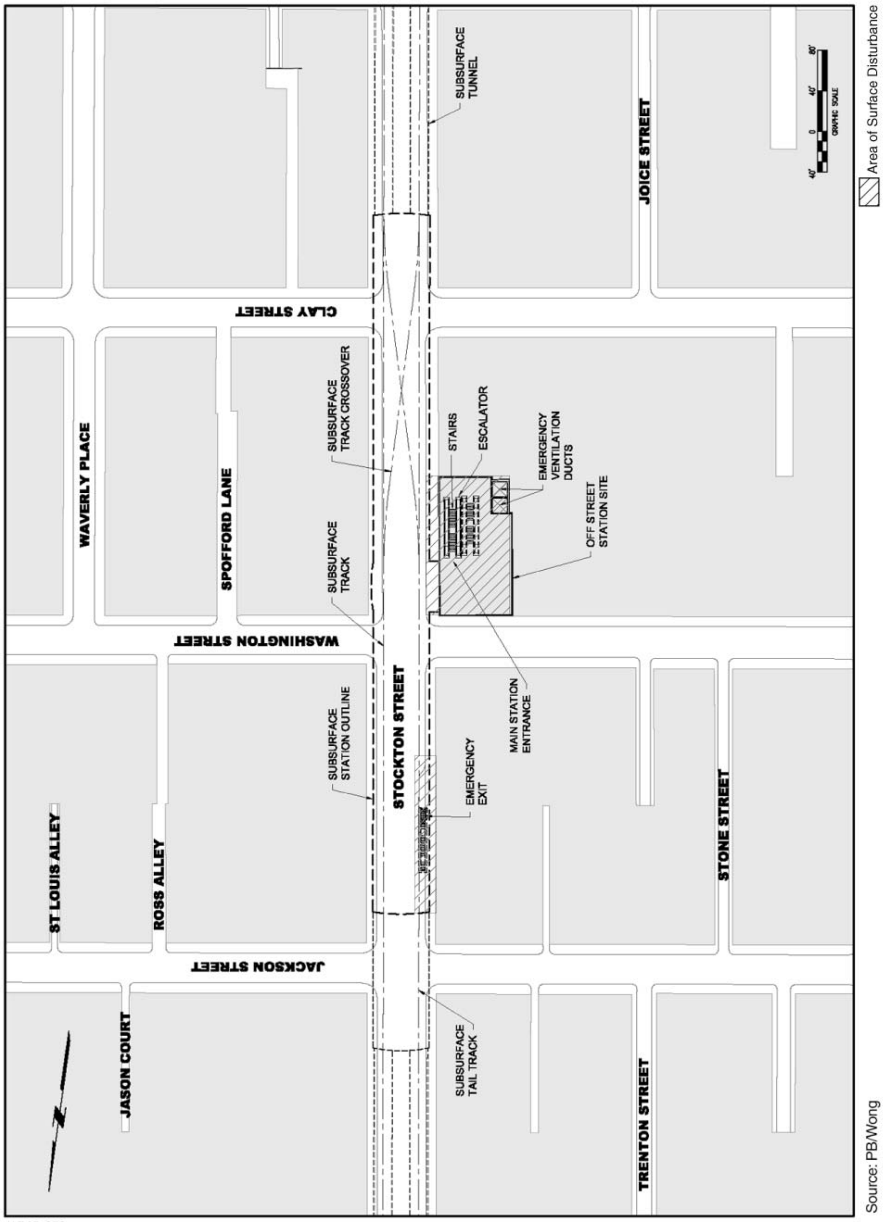


ALT-3B UMS

FIGURE 6-16

ALT. 3B CHINATOWN STATION

AREA OF SURFACE DISTURBANCE DURING CONSTRUCTION



between Harrison and Bryant Streets for the construction shaft and the portal. These utility relocations will take about six months if carried out concurrently in each location. Curb parking in each block impacted by the utility diversions would be temporarily eliminated to accommodate traffic flow.

Spoils Handling – Alternative 3B

Similar to Alternative 3A described above, tunnel excavation by TBM would proceed in a northerly direction from the tunnel construction shaft towards Chinatown Station. Muck produced by the TBMs would be transported through the tunnels back to the tunnel construction shaft at I-80 and Harrison and Bryant Streets and stockpiled before being hauled off-site for permanent disposal. Spoils generated from the excavation of each of the stations, Moscone, Union Square/Market Street and Chinatown, the crossover cavern and the tail track tunnels would generally be hauled to the surface through off-street shafts at each of the station locations before being hauled off-site for permanent disposal. An estimated 637,000 cubic yards of spoils would be generated by Alternative 3B, resulting in an estimated 23 truck trips per day during the 2.0-year excavation period for the guideway; 25 truck trips per day during the 1.0-year excavation period for Moscone Station; 20 daily truck trips during the 2.0-year excavation period of the Union Square/Market Street Station; and 9 daily truck trips during the 2.0-year excavation period for the Chinatown Station.

If the North Beach Tunnel Construction Variant is adopted, spoils generated from excavation of the TBM retrieval shaft on Columbus Avenue would be hauled to the surface at the shaft location before being hauled off-site for permanent disposal. <u>An estimated 3,200 cubic yards of spoils would be removed at the retrieval shaft on Columbus Avenue resulting in an estimated five truck trips per day during the six-month long excavation period. Approximately 20 truck trips would be required to remove the tunnel boring machines.</u>

<u>The haul routes for the portal and the station construction sites would be the same as described for Alternative 3A.</u>

Construction Sequencing and Durations – Alternative 3B

Construction of the Fourth/Stockton Alignment Option B would be accomplished in a single phase. A summary of construction activities and schedule for this alternative are presented in Figure 6-5.

The first 18 months of the Fourth/Stockton Alignment Option B pre-construction activities would include relocation of existing utility lines and impacted transit services, and excavation of the tunnel construction shaft beneath I-80 at Harrison and Bryant Streets. Excavation of the guideway tunnels would commence from the tunnel construction shaft northward towards Chinatown Station and would commence approximately 18 months after start of construction. The TBMs would advance at approximately 30 feet per day. Removal of excavated spoils and delivery of construction materials for the guideway tunnels would occur at the tunnel construction shaft. Two options are possible for sequencing the TBM excavation with the station excavation: 1) the TBMs would be allowed to proceed first followed by the station excavation; or 2) the station shells at Moscone Station and Union/Square Market Street Station would be excavated down to below track level in advance of the TBM reaching those locations so that the TBM could be "walked" through the stations and relaunched. The platform cavern at Chinatown Station would be excavated in advance of the TBM reaching that location to enable the machine to be recovered from the off-street access shaft. Construction of the guideway tunnels with two TBMs would take approximately 18 months. At the end of guideway (tunnel) construction the TBM cutter head would be retrieved through the Chinatown Station headhouse, an approximately one week effort.

If the North Beach Tunnel Construction Variant is adopted, the TBM would be "walked" through the SEM mined platform and station caverns at Chinatown Station, driven to North Beach, and recovered from a shaft located in the middle of Columbus Avenue rather than from the Chinatown Station headhouse. Retrieval of the TBM cutter head would also take about one week at this location. TBM tunneling would not require any surface works or lane closures other than at the TBM recovery shaft on Columbus Avenue. The shaft construction is estimated to take approximately six months.

Moscone Station and Union Square/Market Street Station would require lane closures for 10 to 12 months on Fourth Street between Folsom and Howard Streets and on Stockton Street between Ellis and Geary Streets, respectively. This would occur before the streets are fully decked over, at which point excavation of the stations would continue underground and spoils or materials would be delivered through access points on Clementina and Ellis Streets. During installation of the secant piles used for shoring, the sidewalks would be either closed to pedestrians or protective barrier erected to separate the public from the construction activities. After the decking is completed all lanes would be reopened to traffic, however truck traffic required for hauling of excavated spoils and delivery of construction materials would be necessary at each of these location for the full duration of construction.

The north entrance and station concourse of the Union Square/Market Street Station is located adjacent to Union Square on the corner of Stockton and Geary Streets. Temporary traffic diversions and a lane closure on Geary Street would be required for a period of approximately six months to install the shoring and decking.

Construction of the Chinatown Station, crossover tunnel, and tail track tunnel would be carried out from an off-street shaft and is scheduled to take approximately 48 months. With the exception of short periods of time when large equipment is being delivered to the station or when the TBMs are being retrieved from the shaft, no lane closures on Stockton Street in Chinatown are planned for construction of the station. Truck traffic planned for hauling of excavated spoils and delivery of construction materials would be necessary for the full duration of construction.

6.3 CONSTRUCTION IMPACTS AND MITIGATION FOR TRANSPORTATION

6.3.1 TRANSIT

Alternative 2 – Enhanced EIS/EIR Alignment

This alternative would result in the greatest surface disruption during the construction period due to the nature of the SXM construction methods. This alternative requires a longer and more extensive utility relocation process and a greater degree of construction activity at street level.

Temporary transit impacts (transit delays and rerouting) would occur off and on over an estimated 5.5 year period along King, Third, Fourth, Harrison, Kearny, Geary, and Stockton Streets. During construction of the tunnels between Union Square and the portals between Brannan and Bryant Streets, at least one lane of traffic would be temporarily closed.

During construction at the Moscone and Market Street Stations and at the portals, at least one lane of traffic would need to be temporarily closed on Third and Fourth Streets for approximately 36 months. Congested traffic conditions would occur during both commute and non-commute periods, resulting in potential disruption to the bus routes operating on these streets. During the construction of the crossing of Market Street there would be disruption to the F-Line service requiring bus service to replace the F-Line.

For 12 to 18 months during the 48 month construction period for the Union Square Station, there would be times when only one traffic lane would be open on Stockton Street between Geary and Sutter Streets. For short durations there may be a need to shut down Stockton Street to traffic completely. ~~Although it is not feasible to~~ Temporary re-route~~e~~ing of the 30-Stockton and 45-Union/Stockton electric trolley bus line~~s~~ to alternative streets during the ~~for the entire~~ construction period (six to eight months)~~duration, temporary re-routing of these lines~~ may be required. Also a lane of Geary Street between Stockton and Market Streets, would be closed down for three to six months during the construction period, but bus service would be maintained.

During construction at the Chinatown Station, closure of one lane of traffic on Stockton Street may occur for short periods of time (one to three days) potentially disrupting transit service.

The increased congestion on King, Third, Fourth, Harrison, Kearny, Geary, and Stockton Streets would also lead to disruption of the transit service on these routes, resulting in an adverse impact on transit.

Mitigation Measures

To reduce some of the congestion that would result adjacent to construction of the Enhanced EIS/EIR Alignment, DPT would develop detour routes for non-transit traffic. Use of alternative routes by non-transit vehicles would reduce the level of congestion for all traffic, including buses along streets under construction for the Project. DPT would try to limit traffic along construction routes to transit, local deliveries, and construction vehicles only, with appropriate signing and traffic control personnel.

Re-routing the 30-Stockton and the 45-Union/Stockton trolley coaches would require moving the existing overhead wires to allow the trolley buses to reach lanes not presently served, construction of new overhead wires, or temporary substitution of motor coaches for the trolley coaches; a cost that is included in the project cost estimates. Use of auxiliary power units (APUs) may be feasible for limited lengths traveling downhill on Stockton Street. ~~Moving the overhead wires would add substantial cost to the Project. Given the length of the construction and the length of travel, and the congestion in which the buses would have to maneuver, use of the auxiliary power units (APUs) would not be feasible for the buses to travel off-wire.~~

In general it is preferable to have all buses adhere as close as possible to their existing routes. Muni will monitor the performance of bus lines affected during construction, and if necessary increase the number of buses to provide reliable service. MTA will provide signing related to transit changes in Chinese as well as English. MTA will coordinate with BART to develop public outreach and other programs to minimize impacts to transit riders during construction.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

Transit impacts for the Fourth/Stockton Alignment Option A would be less than for Alternative 2 as the use of a TBM for tunnel excavation would reduce the level of surface disruption. At the tunnel construction shaft, Muni buses would be rerouted to the west side of Fourth Street between Bryant and Harrison Streets during installation of the tunnel construction shaft and cut-and-cover sections between Bryant and Townsend Streets. As road decking is completed, buses would return to the east side of the street. The two west lanes of Fourth Street between Bryant and Harrison Streets would remain closed for the duration of the construction of the guideway tunnels.

Excavation of the construction shaft under the I-80 freeway between Bryant and Harrison Streets would also impact Golden Gate Transit bus operations under Alternative 3A. Buses will use Harrison, Fourth, and Perry Streets to enter the Transbay Terminal mid-day bus storage facility that is proposed for the site between Perry and Stillman Streets, east of Fourth Street. Generally buses would be entering the proposed Transbay Terminal bus layover facility after the morning peak commute period and exiting the site before the afternoon peak commute period (3 p.m.). The reduction in lanes on Fourth Street during the construction period would temporarily affect access to the bus storage facility.

The two westerly lanes of traffic on Fourth Street, between Howard and Folsom Streets, would be closed for approximately four months during installation of the shoring at the Moscone Station. The bus stop at the southwest corner of the Fourth and Howard Streets intersection would need to be temporarily relocated during this period.

At the Union Square/Market Street Station, Stockton Street would be reduced to two lanes between Post and Geary Streets and one lane between Geary and Ellis Streets. Overhead trolley lines for the 30-Stockton and the 45-Union/Stockton lines would need to be ~~removed~~ temporarily relocated for a period of six to eight months to facilitate installation of the shoring and decking. One option would be to reroute the transit lines to Sutter, Mason, and Market Streets. Temporary disruption to BART service could occur during construction.

Construction of a TBM retrieval shaft near Washington Square Park for the North Beach Tunnel Construction Variant would require the temporary relocation of bus stops for the 30-Stockton and 45-Union/Stockton lines, along Columbus Avenue between Union and Powell Streets. This construction approach would require the closure of one side of the street while the shaft is excavated, keeping one travel lane in each direction, and then switching over to the other side of the street to complete the shaft. This shift in traffic lanes may also require the temporary relocation of overhead wires on the 30-Stockton and 45-Union/Stockton to accommodate continued transit operations. This construction activity is estimated to take six months, at which point the shaft would be covered and normal street operations would be restored. If the North Beach Tunnel Construction Variant is not approved, the TBM extraction shaft would be at the Chinatown off-street station site and would last approximately one week. Trucks and cranes would occupy the nearside curb parking lane to haul materials and load the TBM.

Mitigation Measures

Mitigation measures would be same as those proposed under Alternative 2, except as described below. The MTA would continue to coordinate with the TJPA and Golden Gate Bridge, Highway and Transportation District (GGBHTD) to minimize construction impacts on Golden Gate Transit bus operations. MTA would stage excavation shaft construction and utility relocation to maintain access to the bus storage facility by Golden Gate buses and work with GGBHTD to develop bus detour routing plans to ensure continued access. If access to the construction shaft is needed, it would be scheduled so as not to conflict with the periods when buses are entering or exiting the bus storage site.

MTA and BART will prepare and enter into a Station Improvement Coordination Plan to include construction management procedures and processes to address any and all construction and operational impacts resulting from the tunnel boring. MTA will also coordinate with BART to develop bus bridges, if needed, public outreach, and other programs to minimize impacts to transit riders during construction.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Transit impacts would be the same as those described under the Alternative 3A although the overall duration of construction would be shorter by one half year for the Fourth/Stockton Alignment Option B as tunnel construction would be completed more rapidly. Unlike Alternative 3A, the bus stop located at the southwest corner of the Fourth and Howard Streets intersection would remain at its current location throughout the construction period as a result of the reduced length of the Moscone Station. Also, Stockton Street, between Geary and Ellis Streets may need to be closed completely for an estimated six to eight months for installation of the secant piles for the deep cut-and-cover platform section of the station. To shorten the duration in which total closure of Stockton Street to traffic would be required, night time and weekend work would be undertaken.

Mitigation Measures

Mitigation measures would be same as those proposed under Alternative ~~2~~ 3A.

6.3.2 TRAFFIC

Alternative 2 – Enhanced EIS/EIR Alignment

This alternative would result in the greatest surface disruption during the construction period due to the nature of the SXM construction methods. This alternative requires a longer and more extensive utility relocation process and the greater degree of construction activity at street level.

As discussed in Section 6.2, at most times when construction is underway south of Market Street, only two travel lanes would be operational next to the construction areas along Third and Fourth Streets. With only two travel lanes, congested traffic conditions would occur during commute and non-commute periods. Construction would affect surface street operations for up to 36 months. To alleviate congestion along Third and Fourth Streets during construction, the DPT identified potential detour routes (see Figures E-1 and E-2 in Appendix E).

During construction of the subway across Market Street, traffic operations along Market Street could be affected for up to six weeks, following the relocation of utilities. During construction of the subway segment north of Market Street, a lane on Geary Street would be closed for three to six months. For 12 to 18 months, there would be times when Stockton Street, from Geary Street to Sutter Street, would be reduced to one lane and short durations when complete closure may be required. Potential detour routes during construction along these streets are illustrated in Figures E-3 and E-4 (see Appendix E).

During construction of the Chinatown Station closure of one traffic lane, in addition to curb-side parking, would occur along Stockton Street to accommodate loading and unloading of heavy equipment for approximately one to three days at a time.

Removal of spoils and delivery of backfill for this Alternative would generate an estimated 8 truck trips per day during the 4.5 year construction period of the guideway plus an additional 8 to 10 truck trips during the two-year excavation period for each of the four stations.

<u>Mitigation Measures</u>

The construction-related traffic impacts could be alleviated or reduced with the following measures.

To alleviate some of the congestion that would result adjacent to construction of the subway, the DPT has identified potential traffic detours (refer to Figures E-1 through E-4 in Appendix E). Prior to final design, the MTA would select the most appropriate detour routes<u>, working in cooperation with community and business organizations,</u> and develop temporary transportation system management measures along these routes, e.g. additions of turn lanes at key intersections, conversion of parking lanes into peak period travel lanes, etc. Detour routes would be advertised prior to construction in the appropriate media. When detours are initially implemented, traffic control police would monitor critical locations along the detours to promote uncongested traffic flow. All traffic detour measures would be implemented in coordination with other concurrent construction projects, e.g., Mission Bay Redevelopment.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

Traffic impacts would be the same as those described for Alternative 2, except as noted below. Third, Harrison, Kearny, and Geary Streets would not be directly impacted. Potential construction detour routes for the Fourth/Stockton Alignment Option A are shown in Appendix E, Figure E-5 through E-8.

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Two lanes of traffic on Fourth Street, between Howard and Folsom Streets, would be closed for approximately four months during installation of the shoring at Moscone Station. At Union Square/Market Street Station, Stockton Street would be reduced to two lanes between Post and Geary Streets and one lane between Geary and Ellis Streets.

In order to extract the TBM north of the Chinatown Station, an underground shaft would be constructed with a surface opening on Columbus Avenue between Union and Filbert Streets. During the six-month construction period of the shaft and during the approximately one week required for extraction of the machine, the number of traffic lanes on this block of Columbus Avenue would be reduced to just one lane in each direction. The traffic lanes would be shifted away from the construction area, depending on which side of Columbus Avenue is closed. Overhead wires for the 30-Stockton, 41-Union, and 45-Union-Stockton trolley coach service may need to be shifted over one lane during this period to accommodate continued transit operation on these lines. Figure E-8 illustrates the potential detour routes around the construction site.

This Alternative would generate an estimated 18 truck trips per day during the 2.5 year excavation of the guideway, 13 truck trips during the two-year excavation period for the Moscone Station, and 7 truck trips per day for the excavation of the Union Square/Market Street Station (3.0 year construction period) and the Chinatown Station (2.5 year construction period) associated with soils excavation and backfill.

Mitigation Measures

The construction-related mitigation measures would be the same as those described under Alternative 2, except as noted. Muni could implement motor coach service for the 30-Stockton, 41-Union, and 45-Union/Stockton lines if the overhead wires need to be de-energized and removed for the duration of the shaft construction on Columbus Avenue. To alleviate some of the congestion that would result adjacent to construction of the light rail line, the DPT has identified potential traffic detours (refer to Figures E-5 and E-8 in Appendix E).

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Traffic impacts would be the same as those described for Alternative 3A, except as noted below. The overall duration of construction would be shorter by one half year. Construction of the Chinatown Station may require the shifting of the traffic lanes on Stockton Street between Clay and Washington Streets away from the construction site and detouring traffic in the Chinatown area. Potential construction detour routes for the Fourth/Stockton Alignment Option B are shown in Appendix E, Figures E-9 through E-12.

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This alternative would generate an estimated 23 truck trips per day during the 2.0-year excavation period of the guideway, 25 daily truck trips during the 1.0-year excavation period for the Moscone Station, 20 truck trips per day for the 2.0-year excavation period of the Union Square/Market Street Station, and 9 truck trips per day for the 2.0-year excavation period for the Chinatown Station associated with soils excavation and backfill.

Mitigation Measures

Mitigation measures would be the same as those described under Alternative 3A, except that traffic detour routes for this alternative are shown in Appendix E, Figures E-9 through E-12.

6.3.3 FREIGHT AND LOADING

Alternative 2 – Enhanced EIS/EIR Alignment

As discussed previously, during construction of the Enhanced EIS/EIR Alignment, congested traffic conditions would result throughout the day along the roadways under construction. Trucks using the affected streets would be subject to the same delays as passenger traffic.

During construction of the Enhanced EIS/EIR Alignment, when portions of King, Third, Fourth, and Harrison Streets are under construction, parking would not be allowed on either side of the street in the construction zone. This would prohibit the use of curb lanes for parking of trucks to load and unload goods. Trucks would be required to park on nearby side streets, or two or more blocks away where no construction is underway. Similar freight loading impacts would occur north of Market Street during construction along Kearny, Geary, and Stockton Streets. Access to the Moscone Center loading area would be maintained during construction along Third Street between Clementina and Howard Streets.

Construction of the Union Square/Market Street Station would impact loading and freight activities on Stockton Street between Sutter and Geary Streets. Loading and freight would also be affected on Geary Street between Market/Kearny and Stockton Streets due to the guideway tunnel construction. Curb parking would be eliminated along these streets during various stages of construction to accommodate traffic flow around the work area and trucks for equipment and materials delivery and spoils removal.

Freight and loading activities near the Chinatown Station would be impacted, although the direct impacts would only be limited to the east side of Stockton Street between Clay and Sacramento Streets. The demolition of the existing structures and construction of the new station headhouse at this location would require curb space on the east side of Stockton Street to accommodate trucks for equipment and materials delivery and spoils removal.

Mitigation Measures

To alleviate some of the congestion that would result adjacent to construction of the light rail line, the DPT has identified potential traffic detours (refer to Figures E-1 and E-4 in Appendix E).

During construction of the Enhanced EIS/EIR Alignment, a portion of the curb parking lanes remaining open in the construction area, or just upstream or downstream of the construction area, may be converted to short-term loading zones to enable truck loading and unloading and delivery of goods to nearby businesses. Temporary truck loading zones on the side streets may need to be established for the duration of the Project construction to offset any impacts along the streets that are directly affected by construction (Third, Fourth, Harrison, Kearny, Geary, and Stockton Streets).

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Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

As discussed previously, during construction of the Fourth/Stockton Alignment Option A (LPA), congested traffic conditions would result throughout the day along the roadways under construction. Trucks using the affected streets would be subject to the same delays as passenger traffic.

During construction of the Fourth/Stockton Alignment Option A (LPA), when portions of Fourth Street are under construction, parking would not be allowed on either side of the street in the construction zone. This would prohibit the use of curb lanes for parking of trucks to load and unload goods. Trucks would be required to park on nearby side streets, or two or more blocks away where no construction is underway. Similar freight loading impacts would occur during construction along Stockton Street.

Construction of the Union Square/Market Street Station would impact loading and freight activities on Stockton Street between Post and Market Streets and a portion of Ellis Street between Stockton and Powell Streets. Curb parking would be eliminated along these streets during various stages of construction to accommodate traffic flow around the work area and trucks for equipment and materials delivery and spoils removal.

Freight and loading activities near the Chinatown Station would be impacted, although the direct impacts would only be confined to the east side of Stockton Street between Clay and Sacramento Streets. The demolition of the existing structures and construction of the new station head house at this location would require curb space on the east side of Stockton Street to accommodate trucks for equipment and materials delivery and spoils removal.

If the North Beach Tunnel Construction Variant is adopted, construction of the extraction shaft on Columbus Avenue between Powell and Union Streets would have no effect on loading and freight activities as there are no loading zones on this block. However, access to loading and freight zones on Union Street between Stockton and Powell Streets and on Columbus Avenue between Union and Stockton Streets may be impacted due to restrictions in traffic circulation and detours in the area for the duration of the shaft construction.

Mitigation Measures

Mitigation measures would be the same as those described above under Alternative ~~2~~3A, except ~~as noted below~~ Union Street and Columbus Avenue would also be directly impacted by construction and would require converting a portion of curb parking upstream or downstream from construction site to loading and unloading zones for temporary access to businesses. DPT will work with the property and business

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owners on Perry and Stillman Streets to develop temporary detour routes for traffic to maintain access to their properties throughout the construction period.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Freight and loading impacts would be the same as described under Alternative 3A, except as noted below. The construction of the portal under the I-80 freeway would affect the access to Perry and Stillman Streets. Temporary closure of the eastern most lane of Fourth Street between Bryant and Harrison Streets would be required for limited durations to complete the excavation for the portal. Access to the businesses and residences along Perry and Stillman Streets would be maintained at all times during the construction, however, access to the two streets may be limited to Third Street for short periods when the closure of the eastern lane is required.

Cumulative construction impacts would be experienced by businesses and residences bordering the block bounded by Perry, Third, Stillman, and Fourth Streets as a result of three sequential construction projects in the vicinity. The I-80 retrofit project is currently under construction, the construction of the Golden Gate Transit bus storage facility will follow, and the Central Subway Project construction is expected to begin in 2010. While construction and muck removal for the Central Subway Project would be confined to Fourth Street, temporary short-term modifications to traffic circulation and access would likely be required on Perry and Stillman Streets.

Construction of the Union Square/Market Street Station would impact loading and freight activities on Stockton Street between Geary and Ellis Streets and a portion of Ellis Street between Stockton and Powell Streets since the method of construction used would be cut-and-cover. As described in Section 6.2.3, the installation of shoring for the platform section of the station may require Stockton Street to be shut down to traffic completely for a period of six to eight months. In addition, the installation of shoring and decking would also require at least two traffic lanes on Stockton Street to be closed for about 10 to 12 months. During these stretches of construction activity, there would be no access to the loading and freight zones on Stockton Street. Ellis Street would experience similar impacts to loading and freight as it would be reduced to one traffic lane to accommodate the construction staging area.

Freight and loading activities near the Chinatown Station would be impacted, although the direct impacts would only be confined to the southwest corner of Stockton and Washington Streets. The demolition of the existing structures and construction of the new station head house at this corner would require curb space on the west side of Stockton Street and the south side of Washington Street to accommodate trucks.

If the North Beach Tunnel Construction Variant is adopted, construction of the extraction shaft on Columbus Avenue between Powell and Union Streets would have no effect on loading and freight activities as there are no loading zones on this block. However, access to loading and freight zones on Union Street between Stockton and Powell Streets and on Columbus Avenue between Union and Stockton Streets may be impacted due to restrictions in traffic circulation and detours in the area for the duration of the shaft construction.

Mitigation Measures

Mitigation measures would be the same as those described above under Alternative ~~2~~3A, except as noted below. DPT will work with the property and business owners on Perry and Stillman Streets to develop temporary detour routes for traffic to maintain access to their properties throughout the construction period.

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6.3.4 PARKING

Alternative 2 – Enhanced EIS/EIR Alignment

As discussed in Section 6.2, all on-street parking would be prohibited in construction zones. Therefore, substantial curb parking areas would be temporarily removed during construction, placing higher parking demands upstream and downstream of the construction zone, and on nearby streets. Parking spaces that would be permanently lost as a result of the Central Subway Project are discussed in Section 3.2.4. Prior to final design, the SFMTA would select the most appropriate detour routes, working in cooperation with community and business organizations, and develop temporary transportation system management measures along these routes, e.g. additions of turn lanes at key intersections, conversion of parking lanes into peak period travel lanes, etc. The SXM method of construction would require sequential movement of activities block by block along the Corridor. With this sequence of utility diversions, jet grouting, and installation of soil cement walls for shoring of the guideway tunnels, parking on consecutive blocks would be temporarily eliminated throughout the duration of Project construction.

Mitigation Measures

During construction of the Enhanced EIS/EIR Alignment, signs denoting alternative parking areas (e.g., public parking garages) could be placed upstream of and through the construction zones. To improve the accessibility to businesses in the Corridor, it is recommended that retained and added (where applicable) parking spaces be designated for short-term parking and loading, especially in commercial districts. Near commercial establishments, parking turn-over should be encouraged through the use of time limits (e.g., parking meters, signed restrictions, etc.). These improvements would be incorporated into the development of the project’s final plans.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

Parking impacts would be less than those described for Alternative 2 as there would be less surface disruption with this alternative.

Mitigation Measures

The mitigation measures would be the same as those described for Alternative 2.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Parking impacts would less than those described for Alternative 2 as there would be less surface disruption with this alternative.

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Mitigation Measures

Mitigation measures would be the same as described for Alternative 2.

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6.3.5 PEDESTRIANS

Alternative 2 – Enhanced EIS/EIR Alignment

During construction of the Enhanced EIS/EIR Alignment, the sidewalks on both sides of Third, Fourth, Harrison, Market, Kearny, and Geary Streets would remain open, except as noted below.

The following temporary sidewalk closures would be required during construction of Alternative 2 (access to adjacent businesses would be maintained during business hours):

- East side of Third Street, between Folsom and Howard Streets and between Tehama Pedestrian Way and Clementina Street, for construction of Moscone Station;
- Each side of Third Street, between Mission and Market Streets, for construction of the Market Street Station;
- South side of Market Street, between Third and New Montgomery Streets, including Annie and Stevenson Streets for construction of the Market Street Station;
- Each side of Stockton Street, between Sutter and Geary Streets, for construction of the Union Square Station.
- The west sidewalk of Stockton Street, between Sacramento and Clay Streets, would be partially closed during construction of the Chinatown Station.

Pagoda Alley and Hang Ah Alley would remain open to pedestrian use during construction of the Chinatown Station. During construction, all open sidewalks would be at least six feet wide and efforts would be undertaken to retain the full widths during construction. Some pedestrian crossings of the above streets would need to be temporarily closed, but pedestrians would be re-routed through nearby crosswalks or assisted across the street by traffic control personnel. This would increase walking distances for pedestrians during construction.

Mitigation Measures

During excavation of the subway stations, access to all abutting businesses would be maintained either through the existing or a reduced sidewalk area or via temporary access ways, e.g., ramps, planking, etc. Signs would be installed indicated that the businesses are "open during construction." All temporary access ways would be in compliance with the ADA. Temporary pedestrian walkways would be covered to protect pedestrians from noise, dust, and visual annoyances during construction.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

The following sidewalk closures would be required during construction of Alternative 3 (access to adjacent businesses would be maintained during business hours):

- The west side of Fourth Street, temporarily between Howard and Clementina Streets and fully closed between Clementina and Folsom Streets for the construction of the Moscone Station;
- The northwest corner of Howard and Fourth Streets fully closed during construction of station entrances and partially closed during construction of the elevator shaft at Moscone Station.
- The west side of Stockton Street, fully closed between Post and Geary Streets for construction of the Union Square/Market Street Station;
- The east side of Stockton Street, temporarily closed between Post and Geary Streets for construction of the Union Square/Market Street Station;
- Each side of Stockton Street, between Geary and O'Farrell Streets, temporary partial closure (one side at a time) during construction of the Union Square/Market Street north platform cavern access shaft;
- Each side of Stockton Street, between Ellis and O'Farrell Streets, temporary closure (one side at a time) during construction of the Union Square/Market Street south platform cavern access shaft;
- Ellis Street, temporary partial closure on the south side, and fully closed on the north side adjacent to One Stockton Street (the Apple Store), for the Union Square/Market Street Station;

Pagoda Alley and Hang Ah Alley and the sidewalks between Sacramento and Clay Streets, in front of the station access site, would remain open to pedestrian use during construction of the Chinatown Station. Temporary closure of a section of sidewalk would be necessary for construction of the emergency exits on the west side of Stockton Street adjacent to Clay Street. During construction, all open sidewalks would be at least six feet wide and efforts would be undertaken to retain the full widths during construction. Some pedestrian crossings of the above streets would need to be temporarily closed, but pedestrians would be re-routed through nearby crosswalks or facilitated across the street by traffic control personnel. This would increase walking distances for pedestrians during construction.

Mitigation Measures

The mitigation measures would be the same as described for Alternative 2.

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Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

During construction of the Fourth/Stockton Alignment Option B (Modified LPA), the sidewalks on both sides of Fourth Street, and Stockton Street would remain open, except during installation of shoring for the Moscone and Union Square/Market Street subway stations, when only one sidewalk would be open on each side of the station area at a time.

During construction, all open sidewalks would be at least six feet wide and efforts would be undertaken to retain the full widths, whenever possible, during construction. Some pedestrian crossings of the above streets would need to be temporarily closed, but pedestrians would be re-routed through nearby crosswalks or facilitated across the street by traffic control personnel. This would increase walking distances for pedestrians during construction.

Mitigation Measures

The mitigation measures would be the same as described for Alternative 2.

6.3.6 BICYCLES

Alternative 2 – Enhanced EIS/EIR Alignment

During construction of the Enhanced EIS/EIR Alignment, only two travel lanes would be operational next to the construction areas on along Third and Fourth Streets. With only two travel lanes, congested traffic conditions would occur during commute and non-commute periods and bicycle travel in the shared lanes could be challenging. Diversion of traffic onto Second and Fifth Streets may also impact bicycle travel on Bicycle Route #11 and Bicycle Route #19, respectively. During construction along Geary and Stockton Streets, only one travel lane would be maintained at times, temporarily impacting bicycle travel, especially on Bicycle Route #17.

Mitigation Measures

To alleviate or reduce the anticipated impacts, it is recommended that during construction of the Enhanced EIS/EIR Alignment, every effort would be made to retain a wide curb or outside travel lane to facilitate bicycle travel. Where this is not possible, signage should be erected indicating temporary alternative routes for bicyclists. Existing bicycle traffic on Fourth Street could be diverted to Fifth Street. If bicycle lanes are provided, as identified in the San Francisco Bicycle Program's May 2005 Proposition K 5-Year Prioritization Program, this would further facilitate bicycle travel. The same is true for existing bicycle traffic on Third Street diverting to Second Street.

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Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

Construction impacts would be the same as those described under Alternative 2, during installation of shoring at Moscone Station. At Union Square/Market Street Station travel lanes would be reduced to a single lane on Stockton Street, between Post and Ellis Streets. Third, Harrison, Kearny and Geary Streets would not be disrupted by construction.

Mitigation Measures

The mitigation measures would be the same as described for Alternative 2.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Construction impacts at Moscone Station would be the same as described under Alternative 3A. During construction of the Union Square/Market Street, Stockton Street, between Geary and Ellis Streets would be reduced to a single lane and at times, may need to be closed entirely.

Mitigation Measures

The mitigation measures would be the same as described for Alternative 2.

6.3.7 EMERGENCY VEHICLE ACCESS

Alternative 2 – Enhanced EIS/EIR Alignment

It is expected that the emergency access from Fire Station #8 on Bluxome Street and Fire Station #1 on Howard Street would be impacted by the construction along Third and Fourth Street, as discussed in Section 3.2.2. Although two travel lanes would be operational next to the construction areas along Third and Fourth Streets, congested traffic conditions would occur during commute and non-commute periods. Construction in the vicinity of the fire stations would affect surface street operations for 18 to 24 months.

During construction of the North of Market segment, the number of traffic lanes on Geary Street, and then on Stockton Street, would be reduced (see Section 6.3.2). Potential detour routes during construction along these streets are illustrated in Figures E-3 and E-4 (see Appendix E). As with Fire Station #8 on Bluxome Street near Fourth Street, these detour routes for vehicular traffic could be used as alternative emergency access routes for Fire Station #1.

Construction of the Chinatown Station on Stockton Street may require closure of one lane for loading and unloading of heavy equipment, in addition to curbside parking areas. These temporary closures for the duration of the loading and unloading activities could take approximately one to three days. This may affect the access and response times of emergency vehicles from Fire Station #2 (1340 Powell Street between Broadway and Pacific Avenue) if Stockton Street is used in an emergency response.

Mitigation Measures

MTA would require contractors to submit a site specific emergency access response plan as part of compliance with bid specifications. The plan would include fire department and emergency services access to construction areas, maintainability of emergency services such as fire hydrants, and demobilization of plant and equipment impacting access to adjacent properties and buildings. Potential detour routes have been identified, which could be used as alternative emergency access routes, in order to alleviate congestion along Third and Fourth Streets during construction (see Figures E-1 and E-2 in Appendix E).

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

Emergency access impacts would be the same as described under Alternative 2, except as noted below.

Guideway tunnels would be constructed by TBMs so impacted emergency access is limited to parcels on the west side Fourth Street, between Clementina and Howard Streets, and to Moscone Center West, on the northwest corner of Howard and Fourth Streets. During construction of the Union Square/Market Street Station, temporary lane closures would require emergency vehicles to use alternate routes.

If the Tunnel Boring Machine were extracted in North Beach rather than at the Chinatown station, there would be an approximately one less week during which access in Chinatown would be disrupted to extract the TBM.

Mitigation Measures

Mitigation measures would be the same as described under Alternative 2, except proposed construction detour routes are shown in Appendix E, Figures E-5 through E-8.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Emergency access impacts would be the same as described under Alternative 3A, except there would be no impacts to the Moscone Center West on Fourth and Howard Streets for the Moscone Station; no impacts on Stockton Street, between Post Street and Maiden Lane at the Union Square/Market Street Station; and access to property on the west side of Stockton Street, between Jackson and Washington Streets, would be restricted during construction of the Chinatown Station exit.

Mitigation Measures

Mitigation measures would be the same as described under Alternative 2, except proposed construction detour routes are shown in Appendix E, Figures E-9 through E-12.

6.4 CONSTRUCTION IMPACTS AND MITIGATION FOR LAND USE

6.4.1 LAND USE

Alternative 2 - Enhanced EIS/EIR Alignment

Construction of the Enhanced EIS/EIR Alignment would not cause substantial changes in land use or neighborhood character. Temporary construction impacts associated with parking and access to land uses in the Study Area are addressed in Section 6.3, Transportation.

Mitigation Measures

Public information programs, including signage, as well as steps to ensure uninterrupted access to all uses along the Corridor, shall be used to minimize the construction impacts on neighboring land uses.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Construction of the Fourth/Stockton Alignment Option A would not cause any substantial changes in land use, disrupt neighborhood character, or physically divide an existing neighborhood. Parking spaces in the Corridor in the vicinity of the portal and stations, and along the surface segment would be temporarily lost during the construction period. Vehicular and pedestrian access and freight deliveries to buildings in the vicinity of the tunnel portal and stations may be affected during the construction period, but this impact would generally be temporary during the construction period and would not substantially alter the use of properties adjacent to construction activities. (See Chapter 3.0 and Section 6.3, Transportation, for a detailed discussion of parking and access issues that affect land use.)

Mitigation Measures

Mitigation measures would be the same as identified for Alternative 2.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Land use impacts associated with the Fourth/Stockton Alignment Option B would be the same as those described for Fourth/Stockton Alignment Option A except as noted here. The main difference would be a greater area of parking and traffic disruption along Fourth Street due to the longer segment of at-grade railway and construction of a surface station at Fourth and Brannan Streets that would require the use of more street space and require longer periods of surface disruption. These impacts are discussed in Section 6.3.

An amendment of the Planning Code, which prohibits the demolition of residential apartment units in the Chinatown Residential Neighborhood Commercial District, would be required for the Chinatown Station. The impacts would be the same as those discussed in Section 6.5.2, Property Acquisition.

Mitigation Measures

Mitigation measures would be the same as identified for Alternative 2.

6.5 CONSTRUCTION IMPACTS AND MITIGATION FOR SOCIOECONOMICS

6.5.1 SOCIOECONOMICS

Alternative 2 - Enhanced EIS/EIR Alignment

Design and construction of the Enhanced EIS/EIR Alignment would cost an estimated $229 million for professional services and labor and the expenditure of approximately $1,095 million for materials/facilities (refer to Table 5-1). This would provide temporary employment opportunities for the City and/or region and would be considered a beneficial impact.

Mitigation Measures

No substantial adverse impacts on demographic or economic conditions are anticipated from the construction of the Enhanced EIS/EIR Alignment. While beneficial to the City and region in terms of employment opportunities and income, short-term employment impacts are not considered to be substantial. No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Design and construction of Fourth/Stockton Alignment Option A would cost an estimated $202 million for professional services and labor and the expenditure of approximately $908 million for materials/facilities (refer to Table 5-1). As described above for the Enhanced EIS/EIR Alignment, this would be a beneficial impact.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Design and construction of the Central Subway Fourth/Stockton Alignment Option B would cost an estimated $188 million for professional services and labor and the expenditure of approximately $1,026 million for materials/facilities (refer to Table 5-1). As described above for the Enhanced EIS/EIR Alternative, this would be a beneficial impact.

Mitigation Measures

No mitigation measures would be required.

6.5.2 ACQUISITION AND DISPLACEMENT

This section addresses potential impacts related to the acquisition and relocation of businesses or residents as a result of the Project. The federal Uniform Relocation Assistance and Real Property Acquisition

Policies Act of 1970 (Public Law 91-646) and the State of California Relocation Act (Chapter 16, Section 7260 et seq. of the Government Code) contain specific requirements that govern the manner in which a government entity can acquire property for public use. The public entity is required to establish the fair market value of the property before acquisition. Adherence to the state and federal laws is designed to ensure just compensation for all acquired properties, and to minimize adverse impacts on the affected property owners.

The same federal and state laws that govern acquisition also govern relocation. Under these laws MTA would be required to develop a detailed relocation plan designed to minimize impacts on the businesses to be displaced by the Project. The plan would assess the relocation needs of all potential displacees and develop a program that would provide relocation assistance and payments. Minimum relocation payments are set by law, and include moving expenses and search expense payments for businesses. Relocation assistance programs include, at a minimum, referrals to comparable locations for displacees. For displaced on-site service delivery space or dedicated parking, suitable replacement spaces would be identified or a determination made of the viability of the displacee's business without the displaced vehicle access.

The California Code of Civil Procedure (Sections 1230 to 1273) outlines regulations and guidelines governing the exercise of the power of eminent domain to acquire property for a public use. The owner of property acquired by eminent domain is entitled to just compensation for that property. If the power of eminent domain is necessary to acquire property for this Project, all applicable procedures outlined in the civil code will be followed.

For the purpose of this analysis, properties that would need to be acquired for the construction and operation of an alternative are identified. Field surveys were conducted to identify potential acquisitions and displacements, as well as to estimate current employment at potentially affected businesses, based on the type and size of the potentially affected business. Acquisition and displacement impacts are considered significant if an alternative would 1) displace a substantial number of residents; 2) result in the loss of housing units affordable to people with low or moderate incomes; 3) displace businesses unable to relocate to economically viable areas; 4) result in a substantial loss of business clientele; or 5) result in the loss of a substantial number of jobs.

Table 6-2 lists the acquisitions that would be necessary to implement the alternatives. The information contained in this table is discussed in the section below.

TABLE 6-2

ACQUISITION AND RELOCATION REQUIREMENTS

LOCATION	REASON FOR ACQUISITION	ACQUISITION	RELOCATION	ALTERNATIVE
370 Third Street APN 3751-157	Subway alignment	60 square feet (easement underneath building)	No	Alternative 2
425 Fourth Street APN 3762-112	Subway alignment	150 square feet (easement underneath building)	No	Alternative 2
255 Third Street (Moscone Garage) APN 3735-060	Location of vent shafts for Moscone Station	Agreement/easement for placement of vent shafts on the southeast corner of building and elevators under the entrance at northwest corner	No	Alternative 2
Tehama Pedestrian Way	Location for entrance to Moscone Station on Third Street	None	Possible Vendor Relocation	Alternative 2
Hearst Garage 45 Third Street APN 3707-058	Location of vent shafts	Agreement/easement for locating vent shafts inside space in garage (30 parking spaces displaced).	No	Alternative 2
Union Square Garage APN 0308-001	Location of vent shafts and entrance to Union Square Station	Agreement for locating vent shafts and station entry in the Union Square terrace and plaza, (29 parking spaces displaced in Alternatives 2 and 3A; 34 parking spaces displaced in Alternative 3B)	No	Alternative 2 and Alternative 3A, Alternative 3B
814-828 Stockton Street APN 0225-014	Location of vent shafts and entrance to Chinatown Station	4,600 square feet (acquisition entire lot)	Yes	Alternative 2 and Alternative 3A
266 Fourth Street APN3733-093	Location of vent shafts and entrance to Moscone Station on Fourth Street	14,800 square feet (entire gas station lot)	Yes	Alternative 3A Alternative 3B
~~790-798 Market Street~~ ~~APN 0328-002~~	~~Easement~~	~~Market Street tunnel~~	~~No~~	~~Alternative 3A~~ ~~Alternative 3B~~
<u>801 Market Street</u> <u>APN 3705-048</u> <u>(Old Navy)</u>	<u>Subway alignment</u>	<u>1,700 square feet easement underneath the building</u>	<u>No</u>	<u>Alternative 3A</u> <u>Alternative 3B</u>
44 Stockton Street	Subway alignment	5 square feet (Easement A underneath building)	No	Alternative 3A
<u>790-798 Market Street/</u>2 Stockton Street <u>APN 0328-002 and 37052-001 to 004</u> <u>(Virgin Records)</u>	Subway alignment	3,900 square feet <u>easement</u> for Option A and 3,300 square feet <u>easement</u> for Option B (Option A easement area underneath building)	No	Alternative 3A Alternative 3B
BART Entries on Market Street at Powell Station	Access to station	None – Use Agreement	No	Alternative 3A Alter native 3B
123 O'Farrell Street (Ellis/O'Farrell Garage) APN 0327-021	Location of vent shafts	Agreement for locating vent shafts in the parking garage. 24 parking spaces displaced	No	Alternative 3B
933-949 Stockton Street APN 0211-001	Location of vent shafts and entrance to Chinatown Station	10,100 square feet (acquisition of entire lot)	Yes	Alternative 3B
1455 Stockton Street	Subway alignment for North Beach Tunnel Construction Variant	1,400 square feet (easement underneath building)	No	Alternative 3A Alternative 3B
Sidewalk Basements – Various Locations	Station construction at Union Square and on Market Street between Third Street and the Montgomery Station (Alternative 2).	Revocation of permits for use of public right-of-way	No	All Alternatives
Source: PB/Wong, 2007				

Alternative 2 - Enhanced EIS/EIR Alignment

Construction of the Enhanced EIS/EIR Alignment would require securing easements for the Moscone and Market Street Stations and a long-term encroachment permit for the Union Square Station. The entrance to the Moscone Station would be located along a pedestrian corridor (Tehama Street) on the east side of Third Street between Howard and Clementina Streets. Easements would be required at 255 Third Street for the vent shafts at the southeast exterior of the garage, as well as, the installation of two elevators under the canopy entrance at the northwest corner of the garage. This would displace an entrance to the western-most retail bay, but would not require elimination of any parking spaces. At the Market Street Station, the vent shafts would require an easement under Stevenson Street between Third and Annie Streets and the elimination of 30 spaces in the Hearst garage. The Union Square Station entrance and vent shafts would eliminate 29 parking spaces at the Union Square garage. The MTA, which has authority over the Union Square Garage, would need to amend the management and operator agreements for the garage to address the reduction in parking. Union Square is a public park under the jurisdiction of the San Francisco Recreation and Park Department. Compensation for the loss of parking spaces would be required in accord with the Uniform Relocation Act. Use of a portion of this Park would require a long-term encroachment permit and a Section 4(f) approval (see Section 10.0).

Two additional easements would be needed for the subway alignment under buildings at 425 Fourth Street (southeast corner at Harrison) and 370 Third Street (northwest corner at Harrison). Neither easement would affect the use of the buildings. There would be one acquisition in fee of a parcel at 814-848 Stockton Street, between Sacramento and Clay Streets, for the Chinatown Station entrance and vent shafts. This displacement would require the relocation of five small businesses along Stockton Street and five small businesses along Hang Ah Alley with an estimated fewer than 10 employees each~~ and one to two residential units in the second floor of the building~~. As stated in Section 4.2.4, the population in the Chinatown area is predominantly Asian and has a high percentage of low income residents; therefore the residential displacement would likely displace affordable housing units, resulting in an adverse impact.

Utility relocation in sidewalks may require access to or use of existing basements located beneath the sidewalks, particularly in the Union Square area and along Market Street for the pedestrian concourse between Third Street and the Montgomery Station. Property owners with sub-sidewalk basements may be required to vacate this space to make room for relocated utilities. Temporary access to buildings that are identified as susceptible to settlement along the alignment may be required to perform inspections. If settlement of a building is observed during construction, compensation grouting would be injected into the ground beneath these buildings from the street right-of-way.

MTA would follow the provisions of the Uniform Relocation Act and, where applicable, eminent domain law. For the limited amount of acquisition that would occur for any Project alternative, Muni would act in accordance with existing federal and state relocation and acquisition laws to minimize the impact on affected property and business owners and on residents.

Mitigation Measures

No mitigation measures would be required beyond compliance with the Uniform Relocation Act and eminent domain law; however, development of affordable housing units on the Chinatown Station site above the station and ground floor retail where it is compatible with station access could further reduce the adverse impacts of displacement of existing ~~residential units and~~ small businesses in Chinatown.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Construction of Fourth/Stockton Alignment Option A would require use of the Union Square plaza and garage to accommodate station entries and vent shafts resulting in removal of 29 parking spaces in the Union Square garage. MTA would need to authorize the garage use and amend the management and operator agreements to address the reduction in parking, the Recreation and Park Department would need to approve a long-term encroachment permit for the use of the Union Square plaza, and Section 4(f) approval would be required (see Chapter 10.0). Compensation for the loss of parking spaces would be required in accord with the Uniform Relocation Act. Three additional easements would be needed for the subway alignment under private buildings at 2 Stockton Street, 790-798 Market Street, and 44 Stockton Street. None of these easements would affect the use of the buildings. An existing agreement with BART for use of the joint entries at the Powell Street Station would need to be amended to provide additional access to the Union Square/Market Street Station.

Construction of the Fourth/Stockton Alignment Option A would require two acquisitions in fee. The first acquisition would be a parcel with a gas station at the northwest corner of Fourth and Folsom Streets (266 Fourth Street), required for the Moscone Station main entrance and vent shafts. The second would be a parcel at 814-828 Stockton Street, between Sacramento and Clay Streets, required for the Chinatown Station entry and vent shafts. The Stockton Street parcel acquisition would require the relocation of 10 small Chinatown businesses~~ and one to two residential uses above the businesses. The residential displacement would likely displace affordable housing units and would result in adverse impacts to low income residents.~~

Utility relocation in sidewalks may require access to or use of existing basements located beneath the sidewalks, particularly in the Union Square area. Property owners with sub-sidewalk basements may be required to vacate this space to make room for relocated utilities. Temporary access to buildings along the alignment that are identified as susceptible to settlement may be required to perform inspections. If settlement of a building is observed during construction, compensation grouting would be injected into the ground beneath these buildings from the street right-of-way.

The North Beach Tunnel Construction Variant would require an easement under a parcel at 1455 Stockton Street to accommodate the tunnel alignment.

~~Muni~~ MTA would follow the provisions of the Uniform Relocation Act and, where applicable, eminent domain laws. MTA would act in accordance with existing federal and state relocation and acquisition laws to minimize the impact on affected property and business owners and residents.

Mitigation Measures

No mitigation measures would be required beyond compliance with the Uniform Relocation Act and eminent domain law; however, redevelopment of affordable housing units on the Chinatown Station site above the station and ground floor retail where it is compatible with station access could further reduce the adverse impacts of displacement of existing residential units and small businesses in Chinatown.

Alternative 3 - Central Subway Fourth/Stockton Alignment Option B (Modified LPA)

Construction of Central Subway Fourth/Stockton Alignment Option B would require use of Union Square plaza and Union Square Garage for station entries and vents resulting in removal of 34 parking spaces and use of the Ellis/O'Farrell Garage resulting in the removal of 24 parking spaces. As with Option 3A, this would require MTA to amend the parking management and operator agreements in both the Union Square and Ellis/O'Farrell garages. Compensation for the loss of parking spaces would be required in accord with the Uniform Relocation Act. The Department of Recreation and Parks would need to authorize ~~a long-term encroachment permit for the~~ use of Union Square plaza ~~and a Section 4(f) approval would also be required~~. Additional easements would be needed for the subway alignment under private buildings at 790-798 Market Street and at 2 Stockton Street. These easements would not affect the use of these buildings. An agreement for use of the BART entries on Market Street would need to be negotiated to provide additional access to the Union Square/Market Street Station. The BART entry (escalator and stairs) at One Stockton Street (in the Apple Store) at Ellis Street would need to be closed temporarily during construction and may need to be expanded to meet BART's request. There would be two acquisitions in fee. The first acquisition would be a parcel occupied by a gas station at 266 Fourth Street, required for the Moscone Station entry and vent shafts. The second would be a parcel at 933-949 Stockton Street, between Washington and Jackson Streets, required for the Chinatown Station entry and vent shafts. These displacements would require the relocation of eight businesses (seven at the Chinatown property) plus 17 residential units located above the Chinatown businesses. The Chinatown area is predominantly Asian and has a high percentage of low income residents; therefore the residential displacement of 17 housing units would have adverse impacts. An amendment to the San Francisco Planning Code would be required for the demolition of the residential apartment units at this station site and the mitigation measures would be the same as those proposed for acquisition of the parcels.

Utility relocation in sidewalks may require access to or use of existing basements located beneath the sidewalks, particularly in the Union Square area. Property owners with sub-sidewalk basements may be required to vacate this space to make room for relocated utilities. Temporary access to buildings along the alignment that are identified as susceptible to settlement may be required to perform inspections. If settlement of a building is observed during construction, compensation grouting would be injected into the ground beneath these buildings from the street right-of-way.

The North Beach Tunnel Construction Variant would require an easement under a parcel at 1455 Stockton Street to accommodate the tunnel alignment.

MTA would follow the provisions of the Uniform Relocation Act and, where applicable, eminent domain law. MTA would act in accordance with existing federal and state relocation and acquisition laws to minimize the impact on affected property owners, businesses, and residents.

Mitigation Measures

No mitigation measures would be required beyond compliance with the Uniform Relocation Act and eminent domain law; however, redevelopment of affordable housing units on the Chinatown Station site above the station and ground floor retail could further reduce the adverse impacts of displacement of existing residential units and small businesses in Chinatown. MTA will provide rental or property leasing assistance to impacted businesses in addition to the relocation costs.

6.5.3 ENVIRONMENTAL JUSTICE FINDINGS

All Build Alternatives

Construction staging areas would be located at tunnel portals and station locations along the Central Subway Corridor. Construction impacts, including traffic disruption, loss of on-street parking, noise, and dust would occur along the entire alignment, primarily in the areas around the tunnel portals and stations. These temporary impacts would not disproportionably impact low-income populations or neighborhoods.

6.6 CONSTRUCTION IMPACTS AND MITIGATION FOR COMMUNITY FACILITIES AND SERVICES

6.6.1 PUBLIC AND COMMUNITY FACILITIES

Alternative 2 - Enhanced EIS/EIR Alignment

Construction of the Enhanced EIS/EIR Alignment would temporarily affect vehicular access and on-street parking for the public facilities along Third Street during construction of the tunnels, portal, and the Moscone and Market Street Stations**.** Construction of the Union Square Station would temporarily affect pedestrian access along the eastern edge of Union Square plaza as this sidewalk (west side of Stockton Street) would be closed off during construction. There is the potential for construction-related noise and dust impacts for the Chinatown station on the Willie "Woo Woo" Wong Playground, which is located behind the building that would be removed to accommodate the Chinatown Station on Stockton Street. These impacts will lessen after the existing building is demolished and the excavated construction shaft is decked over at the station entrance site. In addition, there would also be temporary impacts to the vehicular access to community facilities (including the Post Office on the west side of Stockton Street) along Stockton Street near the Chinatown Station entrance. During various stages of the station construction, it is likely that portions of the street would have restricted vehicular access and the west sidewalk of Stockton Street would be closed during the station construction. Construction activities also would temporarily increase noise and dust in these areas.

Mitigation Measures

In the vicinity of each station and along Third and Fourth Streets, alternative vehicular and pedestrian circulation patterns that permit continued access to community and public facilities in these locations during construction would be developed and clearly identified during final design, in consultation with Department of Parking and Traffic (DPT) staff. Conditions of approval would be part of the permit process for construction of the Union Square Station, which would require a portion of the plaza and underground parking. The facilities and access to the plaza would remain open for public use. Noise limits will be included in the construction specifications to ensure that the construction is in compliance with City regulations. A temporary noise wall would be constructed east of the construction site in Chinatown to minimize impacts to the adjacent alley and Willie "Woo Woo" Wong Playground from construction noise and dust. Public access to the playground would not be affected.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Construction impacts for the Central Subway Fourth/Stockton Alignment Option A would be less than those identified for Alternative 2 as Third, Harrison, Kearny, and Geary Streets, east of Stockton Street, would not be disrupted.

Mitigation Measures

The mitigation measures would be the same as described above for Alternative 2.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Construction of Fourth/Stockton Alignment Option B would be the same as those discussed above for Alternative 3A, however, no impacts to Willie “Woo Woo” Wong Playground would occur with this alternative. Rather, temporary construction-related noise and dust impacts would occur at the Gordon Lau Elementary School (located immediately west of the 933-949 Stockton Street Chinatown station site) during construction. Vehicular access and on-street parking for the public facilities along Fourth Street in the Moscone Center/Yerba Buena Gardens area would be disrupted during construction of the Moscone Station. Construction of the entrance to the Union Square/Market Street Station would temporarily affect pedestrian use and access along the eastern edge and southeastern corner of Union Square plaza, as this sidewalk would be closed off during construction. There would also be temporary impacts to the vehicular access to community facilities located across the street from the proposed station entrance for the Chinatown Station along Stockton Street. During various stages of the station construction, portions of the street would have restricted vehicular access, as described in Section 6.3, Transportation.

Mitigation Measures

Mitigation measures would be the same as described above for Alternative 2 and 3A, however, a temporary noise wall would not be required at Willie “Woo Woo” Wong Playground.

6.6.2 POLICE, FIRE, AND EMERGENCY SERVICES

Alternative 2 - Enhanced EIS/EIR Alignment

Staging areas are often subject to vandalism and crime. The proposed general staging areas for the Enhanced EIS/EIR Alignment would be located on the west side of Fourth Street north of Bryant Street. This site would be used for the duration of the Project construction effort. Secondary staging areas would be located near subway station sites: Clementina and Kaplan Streets at Moscone Station, Stevenson and Annie Streets at Market Street Station, the west side of Stockton at Union Square Station, and the off-street site at the Chinatown Station. Staging areas would be fenced and secured by Muni contractors and would not affect existing police services. Emergency access and circulation would be maintained on streets leading to construction sites. Reduction in traffic lanes or detours along Third, Fourth, Harrison, Kearny, Geary, and Stockton Streets could temporarily impact emergency service response times during construction. (Refer to Section 6.3.7 for a more detailed discussion of construction impacts on emergency services.)

Mitigation Measures

During construction of above grade segments and stations it may be desirable to have a uniformed traffic control officer, paid for by Muni, at construction sites to facilitate traffic flow during peak use periods, This would not impact police services throughout the City.

Alternative 3 - Central Subway Fourth/Stockton Alignment Option A(LPA)

Construction impacts would be the same as described above for Alternative 2, except that lane closures during construction would not occur on King, Third, Harrison, Kearny, or Geary Streets.

Mitigation Measures

Mitigation measures would be the same as described above for Alternative 2.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Construction impacts would be the same as described above for Alternatives 2 and 3A, except the off-street site at the Chinatown Station would be located at 933-949 Stockton Street.

Mitigation Measures

Mitigation measures would be the same as described above for Alternative 2 and 3A.

6.6.3 PARKS AND RECREATION FACILITIES

Alternative 2 - Enhanced EIS/EIR Alignment

Cut-and-cover station construction and guideway, tunnel construction using the special excavation method (SXM) along Third Street would temporarily affect traffic and pedestrian circulation at Yerba Buena Gardens. Because the public plaza is set back from the street and because much of the excavation work would occur underground, construction noise, vibration, and dust would be limited to installation of shoring and would not be expected to affect the use of this area. Union Square is located adjacent to the proposed excavation for the Union Square Station. The sidewalk on the eastern edge of the plaza (on Stockton Street between Post and Geary Streets) would be closed for station construction and would serve as the principal work shaft site for the station. In addition, the middle stairs along the eastern edge of the Union Square plaza would be closed to construct the station entries and vent shafts. Noise, dust, and vibration would temporarily affect the use of the eastern portion of the plaza. (See also Chapter 10.0, Section 4(f) Report.) Construction at the Chinatown Station would not affect access to Pagoda Alley, Hang Ah Alley or to the Willy "Woo Woo" Wong Playground located to the east of the off-street station site. Access to the construction site would be provided via Stockton Street. Noise, dust, and vibration would be minimized through provision of a noise buffer wall between the Playground and the construction site.

Mitigation Measures

For construction-related impacts to parks, recreational, or other public facilities, noise and vibration would be controlled by use of temporary construction walls along sidewalks and by muffling construction equipment. Excessive idling of construction equipment would be controlled as a way of minimizing temporary increases in emissions. In addition, construction activities will adhere to the guidelines provided in the San Francisco Noise Ordinance. To control dust and particulate matter, construction crews would spray water or use dust palliatives in construction areas and cover dump truck loads with canvas or tarps. Access to parklands and public facilities would be maintained during construction. Construction activities (above-ground) at the Union Square Station would be scheduled to minimize disruption to the plaza during peak holiday periods. A temporary noise wall would be constructed east of the construction site in Chinatown to minimize impacts to the adjacent alley and Willie "Woo Woo" Wong Playground from construction noise and dust. Public access to the playground would not be affected.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Construction impacts due to cut-and-cover station construction on Fourth and Stockton Streets would be the same as described along Third Street for Alternative 2 above. However, the use of the TBM methods for guideway tunnel construction would result in substantially less impact to the surface than is required for the near surface excavation method.

The North Beach Tunnel Construction Variant would require the excavation of the tunnel shaft within Columbus Avenue adjacent to the western edge of Washington Square Park. No work would occur within the park, although there would be temporary affects to park users due to noise, dust, and vibration.

Mitigation Measures

Mitigation measures would be the same as described above for Alternative 2.

Alternative 3 - Central Subway Fourth/Stockton Alignment Option B (Modified LPA)

The construction impacts would be the same as those described above for Alternatives 3A, except there would be no impacts to Willie "Woo Woo" Wong Playground. There would be temporary noise, vibration, and dust impacts during construction at the school playground at Gordon Lau Elementary School.

Mitigation Measures

Mitigation measures would be the same as described above for Alternative 2; however, a temporary noise wall would not be required at Willie “Woo Woo” Wong Playground.

6.7 CONSTRUCTION IMPACTS AND MITIGATION FOR CULTURAL RESOURCES

6.7.1 PREHISTORIC AND HISTORICAL ARCHAEOLOGICAL RESOURCES

Alternative 2 – Central Subway Enhanced EIS/EIR Alignment

Prehistoric Archaeological Resources. The prehistoric CA-SFR-2 may be impacted as a result of construction trenching in two of the Alternative 2 sections: on Third Street, between Folsom and Harrison Streets; and on Third Street, between Harrison and Bryant Streets. Based on the range and quantity of cultural materials that are documented from CA-SFR-2, and the presence of human remains, the site appears potentially eligible for inclusion on the NRHP/ CRHR under Criterion D/4. It is not certain that deposits associated with CA-SFR-2 extend into the project's vertical Area of Potential Effect (APE). (Refer to Figure 5-14, Geology.)

As a result of the geoarchaeological analysis summarized in Section 4.4 of this SEIS/SEIR and described in detail in the Historic Context Archaeological Survey Report (HCASR) (ASC 2007), at least 14 locations have been identified as sensitive for the presence of prehistoric archaeological resources along the Alternative 2 alignment. These locations, from south to north, are as follows:

- Construction Reaches 6 and 5, south of Market Street between King and Folsom Streets along Third Street, have two locations that are highly sensitive;
- Moscone Station is highly sensitive;
- Reach 4, between Howard and Mission Streets along Third Street, has two locations that are highly sensitive;
- Market Street Station has varying sensitivity (two highly sensitive locations and one of low sensitivity) depending on depth;
- Reach 3, between Mission Street and Geary/Stockton Street, has two locations that are highly sensitive;
- Union Street Station has varying sensitivity (one moderately sensitive area and one highly sensitive area) depending on depth;
- Reach 2, between Post and Clay Streets along Stockton Street, has one highly sensitive location;
- Chinatown Station has one location of varying sensitivity (one moderately and one highly sensitive area), depending on depth;
- Reach 1, between Washington Street and Columbus Avenue and Union Street, has one location of high sensitivity.

No specific evidence confirms that subsurface prehistoric cultural deposits are present at these locations; the sensitivity assessments are based on preliminary geoarchaeological research.

Historical Archaeological Resources. Construction of Alternative 2 would not affect known historical archaeological resources. The block-by-block historic overview, developed in the HCASR to predict areas of potential historical archaeological sensitivity, identified six locations at which previously unrecorded archaeological resources might be encountered. The locations, from south to north, are as follows:

- The Third Street Portal is moderately sensitive for the presence of early historic refuse deposits in fill (1840s-1850s);
- Market Street Station is highly sensitive for the presence of archaeological features and/or sheet refuse (1840s-1850s);
- Union Square Station is moderately sensitive for early historic refuse deposits in fill (1840s-1850s);
- Chinatown Station headhouse is highly sensitive for buried architectural remains, archaeological features, and/or sheet refuse (1840s-1906);
- Two locations of Chinatown Station emergency stairs are highly sensitive for buried architectural remains, archaeological features, and/or sheet refuse (1840s-1906).

Among the specific resources indicated by the block-by-block overview are: potential caches of artifacts, as well as isolated objects within the Gold Rush era fill layer at the northbound portal on Third Street; historic tent pads and artifacts at the Market Street Station that may have been buried during filling of the Third Street roadway prior to 1854; and artifact caches dating prior to 1854 where the roadway was filled to grade at Union Square Station. At Chinatown Station, potential finds are artifact-filled features dating to the Gold Rush era or earlier, prior to street paving at the Chinatown Station Emergency Stairs; and architectural remains and archaeological features, dating up to and including 1906, beneath the modern sidewalks (based on an 1850s photograph), including basement room or niche extensions and tunnels of the type reported in San Francisco's Chinatown and found elsewhere in California. Also possible are garden features, as well as artifact caches and architectural deposits, from the Gold Rush or earlier up to 1906, at the Chinatown Station headhouse location.

Mitigation Measures

The Central Subway Project is subject to Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations at 36 CFR 800. These regulations are carried out through a detailed set of procedures—known as the Section 106 Process—for the assessment and treatment of Project impacts on important resources. As part of Section 106 Process compliance for the Third Street Light Rail Project; Muni, FTA, SHPO, and the Advisory Council on Historic Preservation signed a Programmatic Agreement (PA) in 1999. The PA identified the steps to be taken to mitigate potential adverse effects of the Project on important archaeological resources (Appendix C).

FTA has initiated Section 106 consultation with the State Historic Preservation Officer concerning the Phase 2 Central Subway Project. This process will lead to the negotiation of a new PA that will specify in detail how important archaeological resources within the current APE shall be treated. Mitigation measures that are included in the present document will likely be complemented by additional treatments required by the PA.

Specific strategies for the treatment of legally important archaeological resources are presented in the Secretary of the Interior's "Standards and Guidelines for Archaeological Documentation" (48 FR 44734-44737). Mitigation programs for addressing potential impacts would be prepared within that context, based on specific finds, circumstances, and the resources' potential eligibility to the NRHP and CRHR.

Two principal strategies for the mitigation of adverse Project effects on important resources are available: avoidance or data recovery through archaeological excavation. Avoidance of resources would be difficult, if not impossible, due to engineering constraints, and it is prudent to assume that data recovery will be the measure required by the PA. Specific field methodologies will be developed for specific resources within the context of a Research Design and Treatment Plan; the PA will require this document. All archaeological work on NRHP- and CRHR-eligible and potentially eligible properties shall be conducted in accordance with "Treatment of Archaeological Properties: A Handbook" (ACHP 1990) and "Archaeology and Historic Preservation: the Secretary of the Interior's Standards and Guidelines" (48 FR 44716-44742). Investigations shall be performed under the supervision of professionals whose education and experience meet or exceed the Secretary of the Interior's "Professional Qualifications Standards" (48 FR 44738-44739).

The Project Sponsor (MTA) shall, in consultation with a qualified archaeologist, ensure that all State and federal laws and regulations regarding Native American concerns are strictly enforced. Prior to construction, the Project Sponsor or representative shall initiate consultation with a representative of the Native American group having traditional authority over the Study Area; the goal of this consultation will be to come to agreement on protocols to be followed if prehistoric resources are discovered. A consultant from this Native American group shall be solicited and, if possible, engaged to monitor all prehistoric archaeological testing and excavation. If human remains are encountered during either construction or archaeological excavation, State Health and Safety Code Section 7050.5 shall be applied. This regulation states that no further disturbance shall occur until the County Coroner has made the necessary findings as to origin and disposition pursuant to Public Resources Code 5097.88.

Despite high potential for archaeological resources within the project APE, it is not certain that resources will be affected or where this may occur. Engineering and other logistical concerns constrain most forms of pre-construction archaeological testing. However, limited subsurface testing using a push sampling device—such as a Geoprobe sampler—may be feasible for determining whether archaeological deposits are present within the horizontal and vertical APE in certain especially sensitive locations identified in the Project HCASR. A field program of geoarchaeological exploration, conducted in conjunction with Project-related geotechnical investigations as described in the Project HCASR, may help refine subsurface sensitivity assessments and rule out unproductive geologic units. The feasibility and scope of this program shall be determined through consultation between the MTA, the Environmental Review Officer of the City and County of San Francisco, and the consulting archaeologist. The program may be conducted once a preferred alignment has been identified. The goal of the study shall be to determine the presence or absence of prehistoric cultural deposits, site boundaries (within the APE) and potential for project impacts to resources; if the presence of archaeological deposits is substantiated, the program may be expanded to determine depositional integrity, cultural complexity, and potential NRHP/CRHR eligibility.

During construction, archaeological monitoring is warranted within those sections identified as moderately to highly sensitive for prehistoric and historical archaeological deposits, as identified in the HCASR and through pre-construction exploration, and as determined through consultation with the consulting archaeologist. Identified resources shall be evaluated and treated in accordance with the requirements of the PA.

In addition to mitigation specified in the PA, measures listed below consist of Standard Archaeological Mitigation Measure III adopted by the City and County of San Francisco’s Major Environmental Analysis Section, some of which are similar to those previously described.

Based on a reasonable presumption that archeological resources may be present within the Project site, the following measures shall be undertaken to avoid any potentially significant adverse effect from the proposed Project on buried or submerged historical resources. The Project Sponsor shall retain the services of a qualified archeological consultant having expertise in California prehistoric and urban historical archeology. The archeological consultant shall undertake an archeological testing program as specified herein. In addition, the consultant shall be available to conduct an archeological monitoring and/or data recovery program if required pursuant to this measure. The archeological consultant's work shall be conducted in accordance with this measure at the direction of the Environmental Review Officer (ERO). All plans and reports prepared by the consultant as specified herein shall be submitted first and directly to the ERO for review and comment, and shall be considered draft reports subject to revision until final approval by the ERO. Archeological monitoring and/or data recovery programs required by this measure could suspend construction of the Project for up to a maximum of four weeks. At the direction of the ERO, the suspension of construction can be extended beyond four weeks only if such a suspension is the only feasible means to reduce to a less-than-significant level potential effects on a significant archeological resource as defined in CEQA Guidelines Sect. 15064.5 (a)(c).

Archeological Testing Program. The archeological consultant shall prepare and submit to the ERO for review and approval an archeological testing plan (ATP). The archeological testing program shall be conducted in accordance with the approved ATP. The ATP shall identify the property types of the expected archeological resource(s) that potentially could be adversely affected by the proposed Project, the testing method to be used, and the locations recommended for testing. The purpose of the archeological testing program will be to determine to the extent possible the presence or absence of archeological resources and to identify and to evaluate whether any archeological resource encountered on the site constitutes an historical resource under CEQA.

At the completion of the archeological testing program, the archeological consultant shall submit a written report of the findings to the ERO. If based on the archeological testing program the archeological consultant finds that significant archeological resources may be present, the ERO in consultation with the archeological consultant shall determine if additional measures are warranted. Additional measures that may be undertaken include additional archeological testing, archeological monitoring, and/or an archeological data recovery program. If the ERO determines that a significant archeological resource is present and that the resource could be adversely affected by the proposed Project, at the discretion of the Project Sponsor either:

- The proposed Project shall be re-designed so as to avoid any adverse effect on the significant archeological resource; or
- A data recovery program shall be implemented, unless the ERO determines that the archeological resource is of greater interpretive than research significance and that interpretive use of the resource is feasible.

Archeological Monitoring Program. If the ERO in consultation with the archeological consultant determines that an archeological monitoring program shall be implemented the archeological monitoring program shall minimally include the following provisions:

- The archeological consultant, Project Sponsor, and ERO shall meet and consult on the scope of the AMP reasonably prior to any Project-related soils disturbing activities commencing. The ERO in consultation with the archeological consultant shall determine what Project activities shall be archeologically monitored. In most cases, any soils-disturbing activities, such as demolition, foundation removal, excavation, grading, utilities installation, foundation work, driving of piles (foundation, shoring, etc.), site remediation, etc., shall require archeological monitoring because of the risk these activities pose to potential archaeological resources and to their depositional context;
- The archeological consultant shall advise all Project contractors to be on the alert for evidence of the presence of the expected resource(s), of how to identify the evidence of the expected resource(s), and of the appropriate protocol in the event of apparent discovery of an archeological resource;
- The archeological monitor(s) shall be present on the Project site according to a schedule agreed upon by the archeological consultant and the ERO until the ERO has, in consultation with Project archeological consultant, determined that Project construction activities could have no effects on significant archeological deposits;
- The archeological monitor shall record and be authorized to collect soil samples and artifactual/ecofactual material as warranted for analysis;
- If an intact archeological deposit is encountered, all soils-disturbing activities in the vicinity of the deposit shall cease. The archeological monitor shall be empowered to temporarily redirect demolition/excavation/pile driving/construction activities and equipment until the deposit is evaluated. If in the case of pile driving activity (foundation, shoring, etc.), the archeological monitor has cause to believe that the pile driving activity may affect an archeological resource, the pile driving activity shall be terminated until an appropriate evaluation of the resource has been made in consultation with the ERO. The archeological consultant shall immediately notify the ERO of the encountered archeological deposit. The archeological consultant shall make a reasonable effort to assess the identity, integrity, and significance of the encountered archeological deposit, and present the findings of this assessment to the ERO.

Whether or not significant archeological resources are encountered, the archeological consultant shall submit a written report of the findings of the monitoring program to the ERO.

Archeological Data Recovery Program. The archeological data recovery program shall be conducted in accord with an archeological data recovery plan (ADRP). The archeological consultant, Project Sponsor, and ERO shall meet and consult on the scope of the ADRP prior to preparation of a draft ADRP. The archeological consultant shall submit a draft ADRP to the ERO. The ADRP shall identify how the proposed data recovery program will preserve the significant information the archeological resource is expected to contain. That is, the ADRP will identify what scientific/historical research questions are applicable to the expected resource, what data classes the resource is expected to possess, and how the expected data classes would address the applicable research questions. Data recovery, in general, should be limited to the portions of the historical property that could be adversely affected by the proposed project. Destructive data recovery methods shall not be applied to portions of the archeological resources if nondestructive methods are practical.

The scope of the ADRP shall include the following elements:

- *Field Methods and Procedures*. Descriptions of proposed field strategies, procedures, and operations.
- *Cataloguing and Laboratory Analysis*. Description of selected cataloguing system and artifact analysis procedures.
- *Discard and Deaccession Policy*. Description of and rationale for field and post-field discard and deaccession policies.
- *Interpretive Program*. Consideration of an on-site/off-site public interpretive program during the course of the archeological data recovery program.
- *Security Measures*. Recommended security measures to protect the archeological resource from vandalism, looting, and non-intentionally damaging activities.
- *Final Report*. Description of proposed report format and distribution of results.
- *Curation*. Description of the procedures and recommendations for the curation of any recovered data having potential research value, identification of appropriate curation facilities, and a summary of the accession policies of the curation facilities.

Human Remains and Associated or Unassociated Funerary Objects. The treatment of human remains and of associated or unassociated funerary objects discovered during any soils disturbing activity shall comply with applicable State and Federal laws. This shall include immediate notification of the Coroner of the City and County of San Francisco and in the event of the Coroner's determination that the human remains are Native American remains, notification of the California State Native American Heritage

Commission (NAHC) who shall appoint a Most Likely Descendant (MLD) (Pub. Res. Code Sec. 5097.98). The archeological consultant, Project Sponsor, and MLD shall make all reasonable efforts to develop an agreement for the treatment of, with appropriate dignity, human remains and associated or unassociated funerary objects (CEQA Guidelines. Sec. 15064.5(d)). The agreement should take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated or unassociated funerary objects.

Final Archeological Resources Report. The archeological consultant shall submit a Draft Final Archeological Resources Report (FARR) to the ERO that evaluates the historical significance of any discovered archeological resource and describes the archeological and historical research methods employed in the archeological testing/monitoring/data recovery program(s) undertaken. Information that may put at risk any archeological resource shall be provided in a separate removable insert within the final report.

Once approved by the ERO, copies of the FARR shall be distributed as follows: California Archaeological Site Survey Northwest Information Center (NWIC) shall receive one (1) copy and the ERO shall receive a copy of the transmittal of the FARR to the NWIC. The Major Environmental Analysis division of the San Francisco Planning Department shall receive three copies of the FARR (one copy will be in PDF OCR converted searchable text format) along with copies of any formal site recordation forms (CA DPR 523 series) and/or documentation for nomination to the National Register of Historic Places/California Register of Historical Resources. In instances of high public interest in or the high interpretive value of the resource, the ERO may require a different final report content, format, and distribution than that presented above.

Alternative 3 – Central Subway Fourth/Stockton Alignment Option A (LPA)

Prehistoric Archaeological Resources. No construction impacts would affect known prehistoric resources within Alternative 3A. As a result of geoarchaeological analysis, described in detail in the HCASR (ASC 2007) and in Section 4.4 of this SEIS/SEIR, at least six locations of prehistoric archaeological sensitivity were identified in the Alternative 3A alignment. These locations, from south to north, are as follows:

- South of Market Street (in construction Reaches 6 and 5, King Street to I-80 overpass) has one location of varying sensitivity (one highly sensitive zone and one low), depending on depth;
- Reach 4, I-80 overpass to Folsom Street along Fourth Street, has one location of varying sensitivity (one highly sensitive zone and one low), depending on depth;

- Moscone Station has varying sensitivity (two moderately to highly sensitive zones and one low), depending on depth;
- Union Square/Market Street Station is highly sensitive;
- Chinatown Station is moderately to highly sensitive, depending on depth;
- Reach 1, Washington Street to Columbus Avenue and Union Street, has one highly sensitive location.

No specific evidence confirms that subsurface prehistoric cultural deposits are present; the sensitivity assessments are based on preliminary geoarchaeological research.

Historical Archaeological Resources. One known historical archaeological resource may be affected by Project activities within this alternative. CA-SFR-137H consists of the buried remains of a historic city block (bounded by Fourth, Fifth, Harrison, and Bryant Streets, and intermediate streets). The location will be used for a construction yard. Resources include the archaeological remains of residential and commercial buildings, 1906 earthquake/fire debris, intact ground surfaces, and hollow-filled features from the 1870s. The site is eligible to the NRHP/ CRHR under Criterion D/4.

The block-by-block historic overview, developed in the HCASR to predict areas of potential historical archaeological sensitivity, identified 15 locations at which archaeological resources may be encountered in the Alternative 3A alignment. The locations, from south to north, and their potential affected property types include the following:

- The Fourth Street Portal is moderately sensitive for the presence of early historic refuse deposits in fill, which may also contain watercraft remains (1840s-1850s);
- Moscone Station is highly sensitive for buried architectural remains, archaeological features, and/or sheet refuse (1850s-1906);
- Union Square/Market Street Station has one location that is moderately sensitive for historic refuse deposits in fill (1840s-1850s), and one location highly sensitive for archaeological features, buried architectural remains, and/or sheet refuse (1850s-1860s);
- Union Square Station stairs location is moderately sensitive for early historic refuse deposits in fill (1840s-1854);
- Chinatown Station headhouse is highly sensitive for buried architectural remains, archaeological features, and/or sheet refuse (1840s-1906);

- The two Chinatown Station emergency stair locations are each highly sensitive for buried architectural remains, archaeological features, and/or sheet refuse (1840s-1906);
- The Tunnel has five locations that are highly sensitive for the presence of cisterns (1850s) and one location that is highly sensitive for wells and the artifacts they contain (1840s-1875);
- The TBM Retrieval Pit is moderately sensitive for the presence of historical archaeological park remains (1840s-1873).

Among the specific resources indicated by the block-by-block overview are artifact-rich fill and the remains of small watercraft from the 1840s to 1860s at the Fourth Street portal, within former marshlands and Mission Bay. Moscone Station headhouse construction may encounter archaeological deposits associated with commercial buildings and residences dating from the 1850s to 1906. At the Union Square/Market Street Station, a variety of deposits may be associated with a building constructed between 1852 and 1857 within the alignment of Stockton Street between O'Farrell and Ellis Streets, and sheet refuse and/or artifact caches below or within fill placed prior to 1854 at the intersection of Stockton, Ellis, and Market Streets. The Chinatown Station area has several potential resources: the Station headhouse may contain garden features, artifact caches, and architectural deposits; the Chinatown Station emergency stairs location may contain artifact-filled features dating to the Gold Rush era or earlier, prior to street paving; and beneath modern sidewalks may be architectural remains and archaeological features dating up to 1906, including basement room or niche extensions and tunnels of the type reported in San Francisco's Chinatown and found elsewhere in California. Where Columbus Avenue cuts through City Block 117, tunneling may encounter wells backfilled with domestic or commercial artifacts between the Gold Rush and about 1873. Cisterns dating to the 1850s and extending to more than 20 feet below the surface may be present within Stockton Street at the intersections of Green, Vallejo, Broadway, Pacific, and Washington Streets; remnants may survive even if they were replaced. The TBM retrieval shaft in Columbus Avenue is within the former boundary of Washington Square created in 1848 and modified in 1873 when Columbus Avenue cut through it; deposits associated with the park may be present beneath the roadway.

<u>Mitigation Measures</u>

Mitigation measures would be the same as described for Alternative 2.

Alternative 3 – Central Subway Fourth/Stockton Alignment Option B (Modified LPA)

Prehistoric Archaeological Resources. Construction would not affect known prehistoric resources within Alternative 3B. As a result of geoarchaeological analysis described in detail in the HCASR (ASC

2007) and summarized in Section 4.4 of this SEIS/SEIR, at least six locations of prehistoric archaeological sensitivity were identified of the Alternative 3B alignment. These locations, from south to north, are as follows:

- Reach 4, I-80 overpass to Folsom Street along Fourth Street, has both surface and subsurface components (both components are highly sensitive);
- The Moscone Station has varying sensitivity (one highly sensitive zone, one moderately to highly sensitive, and one low), depending on depth;
- Reach 3, Howard Street to Market Street along Fourth Street, has a surface component that is highly sensitive;
- Union Square/Market Street Station is highly sensitive;
- The Chinatown Station has one location that is moderately to highly sensitive;
- Reach 1, Washington Street to Columbus Avenue and Union Street, is highly sensitive.

No specific evidence confirms that subsurface prehistoric cultural deposits are present; the sensitivity assessments are based on preliminary geoarchaeological research.

Historical Archaeological Resources. One known historical archaeological resource is within Alternative 3B. CA-SFR-137H consists of buried remains of a historic City block (bounded by Fourth, Fifth, Harrison, and Bryant streets, and intermediate streets). The location would be used for a construction yard. Resources include remains of residential and commercial buildings, 1906 earthquake/fire debris, intact ground surfaces, and hollow-filled features from 1870s. The site is eligible to the NRHP/ CRHR under Criterion D/4.

The block-by-block historic overview, developed in the HCASR to predict areas of potential historical archaeological sensitivity identified 13 locations where archaeological resources may be encountered in the Alternative 3B alignment. The locations, from south to north, and their potential affected resources include the following:

- Fourth Street—Moscone Station, Utilities relocation, and the Fourth Street Portal—is moderately sensitive for the presence of 1840s to 1860s refuse deposits in fill;
- Moscone Station is highly sensitive for the presence of buried architectural remains, archaeological features, and sheet refuse (1840s-1906);

- Union Square/Market Street Station has one location that is moderately sensitive for the presence of early historic refuse deposits in fill (1840s-1850s), for both station construction and utilities relocation, and one location that is highly sensitive for the presence of buried architectural remains, archaeological features, and/or sheet refuse (1850s-1860s);
- Chinatown Station headhouse is highly sensitive for the presence of buried architectural remains, archaeological features, and/or sheet refuse (1840s-1906);
- Chinatown Station emergency stairs have one location that is highly sensitive for the presence of buried architectural remains, archaeological features, and/or sheet refuse (1840s-1906);
- The Tunnel has five locations that are highly sensitive for the presence of cisterns and the artifacts they contain (1850s), and one location that is highly sensitive for the presence of wells (1840s-1875) and their associated artifacts;
- The TBM Retrieval Pit is moderately sensitive for the presence of historical archaeological park remains (1840s-1873).

Among the potential specific resources indicated by the block-by-block overview are artifact-rich fill at the Fourth Street portal, within former marshlands and Mission Bay. Moscone Station may encounter archaeological deposits associated with commercial buildings and residences dating from the 1850s to 1906. A variety of deposits may be present at the Union Square/Market Street Station, associated with a building constructed between 1852 and 1857 within the alignment of Stockton Street between O'Farrell and Ellis Streets, and sheet refuse and/or artifact caches below or within fill placed prior to 1854 at the intersection of Stockton, Ellis, and Market Streets. The Chinatown Station headhouse may contain garden features, artifact caches, and architectural remains; the Chinatown Station emergency stairs location may contain artifact-filled features dating to the Gold Rush era or earlier, prior to street paving; and beneath modern sidewalks may be architectural remains and archaeological features dating up to and including 1906, including basement room or niche extensions and tunnels of the type reported in San Francisco's Chinatown and found elsewhere in California. Where Columbus Avenue cuts through City Block 117, tunneling may encounter wells backfilled with domestic or commercial artifacts between the Gold Rush and about 1873. Cisterns containing artifacts dating to the 1850s and extending to more than 20 feet below the surface may be present within Stockton Street at the intersections of Green, Vallejo, Broadway, Pacific, and Washington Streets; remnants may survive even if they were replaced. The TBM retrieval shaft in Columbus Avenue is within the original boundary of Washington Square as laid out in 1848 and until Columbus Avenue cut through it in about 1873; deposits associated with the park may be present beneath the roadway.

Mitigation Measures

Mitigation measures would be the same as described above for Alternative 2.

6.7.2 HISTORICAL ARCHITECTURAL RESOURCES

In this section, impacts to buildings proposed for demolition and removal during construction are discussed first, followed by potential impacts to historic properties in each alternative, and then impacts to contributors of the NRHP, CRHR, and local historic districts. It should be noted that although the Lower Nob Hill Apartment Hotel District is included within the Study Area, it is not located within an area proposed for stations or portals. As a result, no impacts to the historic buildings in this district would result from the Project.

Alternative 2 – Enhanced EIS/EIR Alignment

One historic architectural resource located in the Chinatown Historic District would be demolished and replaced by a new Muni station building during construction of the Enhanced EIS/EIR Alignment (there are 371 contributing buildings in the Chinatown Historic District). The building at 814-828 Stockton Street (Assessor's Parcel No. 225-014) was identified as a Class 3D contributor to the NRHP-eligible and CRHR-listed Chinatown Historic District during the Corbett et al. (1997) study for the Third Street Light Rail EIS/EIR in 1998 (see Figure 6-17). Demolition of contributing elements to a NRHP-eligible district

FIGURE 6-17

814-828 STOCKTON STREET PROPOSED FOR DEMOLITION

UNDER ALTERNATIVES 2 AND 3A

Source: PB/Wong

constitutes an adverse effect under Section 106 of the National Historic Preservation Act of 1966 and under the California Environmental Quality Act. Within Block 225, each of the three remaining buildings on the east side of Stockton Street, is also contributing elements to the historic district, as are properties on the west side of the street. Proposed demolition of the building on the east side of Stockton Street would create a visual break in this cohesive grouping of related buildings that are contextually important to the Chinatown Historic District. The colorful awnings and signage demarcating the store fronts along Stockton Street, each contribute to the cohesive unit of buildings along this block between Sacramento and Clay Streets. Removal of this building with its character-defining features and history of use by businesses (Chinese school and newspaper) important to the Chinese community would adversely affect the Historic District.

In addition to the Chinatown Station, significant historic architectural resources identified in the APE (see Denardo et al. 2007) for this Alternative would be temporarily affected by the visual presence of construction equipment and could have vibration effects from construction of the Enhanced EIS/EIR Alignment. Construction-related activities could result in ground shifts (settlement) that would affect adjacent properties determined as eligible for listing on the NRHP. The areas most prone to settlement effects would be where cut-and-cover construction methods are implemented, including the station areas and portals. This construction method involves a trench excavation using secant pile ground-supporting walls and construction of a box frame structure. Equipment for this process would include heavy construction vehicles, 80-foot high augers and cranes for a period of approximately two to six months. Settlement would be stabilized after the supporting walls have been installed. (See also: Section 6.15, Noise and Vibration.)

Some of the historic architectural resources are contributors to NRHP-eligible districts crossed by this Alternative, others are individual properties that are NRHP-eligible on their own merit (see Appendix F). These are described below.

Northbound Portal and Third Street Surface Tracks. Six historic buildings, including 660-670 Third Street, 689-699 Third Street, 679-685 Third Street, 665 Third Street, 625 Third Street, and 601 Third Street, were identified as NRHP-eligible contributors to the South End Historic District. Each has the potential for temporary vibration and visual impacts from construction of the Third Street surface tracks under Alternative 2, depending on the fragility of the building. Two additional historic architectural resources, 566-586 Third Street and 500 Third Street, are outside of the historic district but are individually eligible for the NRHP. Expected effects would be limited to minor architectural damage. No structural damage is expected. Visual impacts would be limited to the duration of construction.

Southbound Portal and Fourth Street Surface Tracks. One historic architectural resource at 508-514 Fourth Street, in the southbound tunnel portal area along Fourth Street, has the potential for temporary vibration impacts during construction and visual impacts from the presence of construction equipment. The building is not in a historic district, but is eligible for an individual listing on the NRHP.

Market Street Station. In the Market Street Station area for Alternative 2, there are five significant historic architectural resources. Due to the depth of the construction at this location there is little potential for impacts from ground-borne vibration during construction of the station. None of the resources are associated with a historic district, but all are individually NRHP-listed or -eligible. 700-706 Mission Street and 703-705 Market Street (26 Third Street) front Third Street on the west side of the proposed Market Street Station. Three more historic architectural resources, including 17-29 Third Street, 691-699 Market Street, and 673-687 Market Street, are all individually NRHP-eligible, and each is on the east side of Third Street. Two are in the first parcel next to the proposed station, and the third is in the second row.

Union Square Station. In the Union Square Station area, there are eight significant historic architectural resources. Due to the depth of the construction at this location there is little potential for impacts from vibration during construction of the station. All eight properties are within the boundaries of the KMMS Conservation District, and each is also eligible for listing on the NRHP as an individual property. They include 218-222 Stockton Street, 234-240 Stockton Street, 275-299 Post Street, 278-298 Post Street, 177-179 Maiden Lane, 259 Post Street, and 272 Post Street; they comprise four properties fronting the station and another three in the second row. The presence of construction activities would temporarily affect the historic visual character of the block, but would not affect individual properties.

The eighth property, Union Square (the plaza and the underground parking garage) serves as the heart of the KMMS Conservation District. Union Square is eligible for listing on the NRHP as an individual property and it is listed as California State Landmark No. 623. As with the other properties, it would have little potential for impacts from vibration during deep station excavation and tunneling. The visual presence of construction equipment and traffic barriers and signage would temporarily affect the Union Square landscape, but would not be considered a significant adverse affect because of the temporary nature of the disturbance. (See also Section 5.3.3 Visual Impacts.) Union Square is a City park, and is therefore subject to Section 4(f) analysis and approval (See Chapter 10.0).

Chinatown Station. In the Chinatown Station area, there are nine significant historic architectural resources, in addition to the station buildings at 814-828 Stockton Street. Due to the depth of the construction at this location there is little potential for vibration impacts from construction of the station, including eight properties that front the proposed station and one in the second row. They include 801-

805 Stockton Street, 800-810 Stockton Street, 809-815 Stockton Street, 827-829 Stockton Street, 830-848 Stockton Street, 833-841 Stockton Street, 843 Stockton Street, 850-898 Stockton Street and 857-865 Clay Street. Each of these properties is eligible for listing on the NRHP as a contributing element of the Chinatown Historic District. Temporary construction-related impacts to this cohesive group of buildings in this historic district would primarily be related to visual disturbance from construction activities.

Mitigation Measures

Ground-borne vibration levels are generally not expected to impact historic buildings structural integrity, however, older buildings built with less stringent building codes (such as in the Chinatown area) would be more susceptible to minor architectural damage (trim, window casings, brick chimneys) during construction activities.

Potential effects of vibration during construction would be greatly reduced by pre-drilling for pile installation in areas that would employ secant piles with ground-supporting walls in the cut-and-cover technology. Vibration monitoring in historic districts adjacent to tunnel portals and stations will be specified in construction documents to ensure that historic properties do not sustain damage during construction. A mitigation monitoring plan to ensure that vibration impacts to historic buildings would be mitigated would include the following:

1. The contractor will be responsible for the protection of vibration-sensitive historic building structures that are within 200 feet of any construction activity, including unreinforced masonry buildings.

2. The maximum peak particle vibration (PPV) velocity level, in any direction, at any of these historic structures should not exceed 0.12 inches/second for any length of time.

3. ~~The contractor~~ An independent Environmental Compliance Monitor (ECM) will be retained by SFMTA to monitor construction to make sure that environmental conditions are met. The ECM will be required to perform periodic vibration monitoring at the closest structure to ground disturbing construction activities, such as tunneling and station excavation, using approved seismographs.

4. If at any time the construction activity exceeds this level, that activity will immediately be halted until such time as an alternative construction method can be identified that would result in lower vibration levels.

5. The ECM will conduct a training program at the start of construction to educate the Contractor and consultants about the sensitivity of historic structures to construction related vibration.

In compliance with the Secretary of the Interior's Standards for the Treatment of Historic Properties, an adverse effect is found when an undertaking alters, either directly or indirectly, the character-defining features of a NRHP-eligible property. However, adverse impacts can be reduced through rehabilitation, context-sensitive designs, and measures to record and preserve for posterity the history of the building and its uses.

Because demolition of the building at 814-828 Stockton Street under the Alternative 2, Enhanced EIR/EIS Alternative would constitute an adverse effect to a contributing property in the Chinatown Historic District, the following mitigation measures to reduce adverse effects are proposed:

1. Partial preservation of 814-828 Stockton Street, through rehabilitation, in compliance with the Secretary of the Interior's Standards, and reuse of the building as the Chinatown Station.

2. Include expertise of an architectural historian in design development of station to develop a design culturally appropriate to the Chinatown community.

3. Salvage of the significant architectural features from 814-828 Stockton Street to be used as an educational exhibit inside the new station or utilized for the repair and rehabilitation of other historic buildings. The architectural elements will be disassembled in a manner that minimizes damage.

4. In consultation with the City, FTA, and SHPO, develop a permanent interpretive display for public use on the entire route, perhaps to be placed within the subway cars or on the walls of the subway stations. This interpretive display would include details about the demolished buildings as well as historic information about the buildings, historic districts, neighborhoods, important individuals, and businesses surrounding the alignments that the Central Subway will pass through. Prior to preparing the display, a qualified historian will perform contextual research regarding the role of the building in the events for which it is significant, and conduct oral history interviews. This approach would impart knowledge of the history of the City to the general public.

Although this would not be considered ~~a~~ mitigation to a less-than-significant effect ~~measure~~, if the historic building at 814-828 Stockton Street is demolished, then it would be standard practice to perform Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) documentation. Because it is presently uncertain who the architect was for 814-828 Stockton Street, attempts should be made to obtain the original drawings, if available. The level of documentation will be prescribed through consultation with the City Historic Preservation Officer, FTA, and SHPO for conservation.

Alternative 3 – Fourth/Stockton Alignment Option A (LPA)

Construction of Alternative 3A would have the same impacts as described above for Alternative 2 because the building identified for the Chinatown Station is the same building as described for Alternative

2 (814-828 Stockton Street), except for the North Beach Construction Variant. The areas where cut-and-cover methods would be implemented, including the station areas, tunnel portals, and the Tunnel Boring

Machine extraction shaft in North Beach could result in minor architectural damage (not structural damage)to historic buildings near the station.

Significant historic architectural resources were identified in the APE that could be affected by construction of Alternative 3A (see Denardo et al. 2007). Some of the historic architectural resources are contributors to NRHP-eligible districts, while others are individual properties that are NRHP-eligible on their own merit (see Appendix F). The properties and potential impacts are described below.

Northbound/Southbound Portal. The NB/SB tunnel portal construction area on Fourth Street includes one significant historic building at 601 Fourth Street. The building is eligible for an individual listing on the NRHP. Temporary visual impacts from the presence of construction equipment would be limited to the duration of construction and would not adversely affect this property.

Union Square/Market Street Station. In the Union Square/Market Street Station area, fourteen significant historic architectural resources have the potential for temporary impacts from ground-borne vibration from construction equipment and activities. Each of the properties is within the boundaries of the KMMS Conservation District, and each is eligible for listing on the NRHP as an individual property. They include 233 Geary Street, 101 Stockton Street, 150 Stockton Street, 160-170 Geary Street, 218-222 Stockton Street, 234-240 Stockton Street, 275-299 Post Street, 177-179 Maiden Lane, 259 Post Street, 760 Market Street/35 O'Farrell Street (Phelan Building, Landmark No. 156), 2 Stockton Street, 77-81 O'Farrell Street, and 79 O'Farrell Street (formerly 46-68 Stockton/77-79 O'Farrell). Nine of the buildings front the station and four are in the second row.

As described above for Alternative 2, Union Square, including the underground parking garage, is eligible for listing on the NRHP as an individual property in addition to being included in the KMMS Conservation District. Along the eastern end of the Union Square plaza there would be a pedestrian entry within the stairs leading to the plaza. It would consist of escalators, stairs, with the possibly of an overhead canopy. Two vent shafts, with heights of 11 feet, would be positioned within the plaza terrace below the plaza café. These alterations would not constitute substantial adverse impacts to the historic character of the KMMS conservation district, or to Union Square, which was renovated in 2002.

Chinatown Station. Demolition of the building at 814-828 for the proposed Chinatown Station is the same as that described above for Alternative 2. Impacts in the Chinatown Historic District would be the same as those described above for Alternative 2.

Tunnel Boring Machine Extraction Shaft. Under the North Beach Construction Variant, an extraction shaft would be located in the middle lanes of Columbus Avenue at the north end of the alignment to allow for removal of the Tunnel Boring Machine (TBM). The construction would be similar to the cut-and-cover method. Of the properties in the impact area, Washington Square Park and the associated Washington Square Park Triangle are the only resources in close proximity to the extraction shaft. Washington Square Park is listed as locally significant -- both individually as San Francisco's Landmark No. 226, and as a contributor to a proposed historic district. There would be no vibration impacts to the park and visual impacts would be limited to the duration of construction and would not substantially impact park use or historic integrity.

Five additional properties, considered contributors to the proposed Washington Square Historic District, are located within 200 feet of the extraction shaft. The buildings include 1636-1656 Powell Street, 575-579 Columbus Street, 1731-1741 Powell Street, 1717-1719 Powell Street, and 1701-1711 Powell Street. Because of the distances from the extraction shaft and the temporary nature of construction activity, there would not be vibration impacts to any of the historic buildings.

Mitigation Measures

The same mitigation measures would apply as those described for Alternative 2.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

One historic architectural resource (out of 14 historic buildings in the block and 371 contributing buildings in the Chinatown Historic District) located in the Chinatown Station area would be demolished and replaced by a new Muni station building during construction of the Alternative 3B. The building at 933-949 Stockton Street (Block 211) was identified as a Class 3D contributor to the NRHP-eligible Chinatown Historic District during the Corbett et al. (1997) study (see Figure 6-18). Demolition of contributing elements to a NRHP-eligible district constitutes an adverse effect under Section 106 and under the California Environmental Quality Act. Demolition and removal of the proposed building would create a visual break in the cohesive grouping of related buildings. Also within Block 211, eight additional buildings on the west side of Stockton Street are also contributing elements to the Chinatown Historic District, and significant properties are on the adjacent block (Block 192) fronting Washington Street. The high rise building (Mandarin Tower) on the east side of Stockton Street, directly across from 933-949 Stockton Street, in Block 210, is not historic and by its dominant presence has altered the visual continuity of this block of Chinatown.

The proposed station location at 933-949 Stockton Street and the buildings surrounding it are contextually linked through their association with the development of the Chinatown community. The building lies within an area known to be a part of Chinatown since at least the 1880s and has continuously remained a vibrant part of the community. Designed by S. H. Woodruff and erected in 1906, 933-949 Stockton

FIGURE 6-18

933-949 STOCKTON STREET PROPOSED FOR DEMOLITION

UNDER ALTERNATIVE 3B

Source: Garcia and Associates

Street served the immediate need for lodging and shop space by Chinese merchants in the aftermath of ~~a~~ the 1906 natural disaster. 933-949 Stockton Street conforms to the two-part commercial block composition also found in other areas of San Francisco. Its character-defining features include the Renaissance/Baroque design elements that include swags over the windows, metal cornice, and scored stucco walls.

Within the block (Block 211), the three remaining buildings on the west side of Stockton Street are also contributing elements to the historic district, and other important buildings are nearby, including the Commodore School, the Chinese Methodist Episcopal Church, Presbyterian Church in Chinatown, and the Gum Moon Residence. Removal of the building at 933-949 Stockton Street for construction of a Muni station would break up the continuity of contextually and architecturally linked buildings and would adversely affect the NRHP eligible historic district.

In addition to the station, construction of the Alternative 3B also has the potential for ground settlement near other stations and near the tunnel portals caused by construction-related activities could result in localized ground shifts that would affect historic architecture. The areas most prone to settlement would be where cut-and-cover methods are implemented, including the station areas, tunnel portals, and extraction shaft. The same construction methods described for Enhanced EIS/EIR Alignment would also apply to Alternative 3B at stations and tunnel portals.

Significant historic architectural resources were identified in each potential impact area that could be affected by the Project (see Denardo et al. 2007). Some of the historic architectural resources are contributors to NRHP-eligible districts, while others are individual properties that are NRHP-eligible on their own merit (see Appendix F). These are described below.

Bryant/Brannan Station. The Bryant/Brannan Surface Station on Fourth Street would be adjacent to two historic architectural resources that have the potential for minor architectural damage from vibration during construction at 500-504 Fourth and 508-514 Fourth. Each of these buildings is eligible for an individual listing on the NRHP. This minor temporary effect would not adversely effect the properties or District. The design of the surface platform at Bryant and Brannan Streets would be compatible with existing Muni stations south of Market Street and would not adversely affect the visual character of the Historic District or individual historic properties.

Union Square/Market Street Station. Under Alternative 3B, the station entry is proposed for the southeast side of Union Square, along Geary Street, rather than along Stockton Street. In the Union Square/Market Street Station area, approximately eight significant historic architectural properties have the potential for minor architectural damage from construction-related vibration during station excavation operations, including seven properties (six buildings and Union Square) fronting the station and one property in the second row. This temporary impact would not result in a significant adverse effect to the individual properties or to the historic district and would not affect the historic use of the park or garage

All eight properties are within the boundaries of the KMMS Conservation District, and each is eligible for listing on the NRHP as an individual property. They include 233 Geary Street, 101 Stockton Street, 760 Market Street/35 O'Farrell Street (Phelan Building, Landmark No. 156), 2 Stockton Street, 77-81 O'Farrell Street, 79 O'Farrell Street (formerly 46-68 Stockton/77-79 O'Farrell), 150 Stockton Street and 333 Post Street (Union Square). All of these properties are in the first row fronting Stockton Street except for 760 Market/35 O'Farrell Street, which is in the second row. No significant adverse effects to historic properties would result from construction of Alternative 3B, though temporary construction-related visual and vibration effects have been noted.

Chinatown Station. In addition to the building identified for demolition for the station, other historic properties in the APE have been analyzed for potential impacts. The proposed station for Alternative 3B differs from that of Alternatives 2 and 3A. Rather than mid-block along the east side of Stockton Street, the station location for this alternative would be at the corner of Stockton Street and Washington Street, a block north of the other alternatives. In the Chinatown Station area for this alternative, there are fourteen significant historic architectural resources that have the potential for construction-related impacts. They include seven properties that front the proposed station, six in the second row, and one in the third row. In addition, the Washington Street Street Lights are a significant historic architectural resource that could be impacted by temporary ground-borne vibrations and other construction equipment and activities at the Chinatown Station site for this alternative. Each of these properties is eligible for listing on the NRHP as a contributing element of the Chinatown Historic District and one is eligible for listing on the NRHP as an individual property (940 Washington Street).

There are six buildings in the same block as the station (Block 211), and include three that front Stockton Street (901-907 Stockton Street, 913-917 Stockton Street, and 925 Stockton Street), two in the second row (910-914 Clay Street and 950 Clay Street), and one in the third row (916-918 Clay Street), which is two buildings away from the station. Chinatown Historic District contributing buildings across Stockton Street include 930 Stockton Street in the first row, and 868-870 Clay Street, 31-37 Spofford Alley, and 867-869 Washington Street in the second row. Across Washington Street from the building at 933-949 Stockton Street proposed for demolition, there are two buildings in the first row (1003-1011 Stockton Street and 940 Washington Street), and one contributing building (1013-1017 Stockton Street) in the second row. As indicated above, 940 Washington Street appears to be eligible for listing on the NRHP as an individual property.

Other than the property proposed for demolition at 933-949 Stockton Street, temporary construction-related vibration and visual impacts would not have significant adverse effects to historic properties or the historic Chinatown District.

Tunnel Boring Machine Extraction Shaft. Impacts for the North Beach Construction Variant for Alternative 3B would be the same as those described above for Alternative 3A and would not have the potential for adverse effects to historic properties.

<u>Mitigation Measures</u>

Mitigation measures would be the same for Alternative 3B as those described above for Alternative 3A. The mitigation measures identified for 814-828 Stockton Street under Alternative 2 would also apply to 933-949 Stockton Street for this alternative.

To ensure that the historic Street Lights are not impacted by vibration and construction equipment, the Contractor will implement a mitigation plan to ensure that vibration impacts to the historic lights would include the following:

1. The contractor will be responsible for the protection of vibration-sensitive historic street lights that are within 50 feet of any construction activity.

2. The plan would include temporary removal and storage of glass globes during construction in a specific area and installation of construction barriers adjacent to the light poles.

Although this should not be considered ~~a~~ mitigation to a less-than-significant effect ~~measure~~, if the historic building at 933-949 Stockton Street is demolished, then it would be standard practice to perform Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) documentation. It is known that S. H. Woodruff was the architect for 933-949 Stockton Street; attempts should be made to obtain the original drawings, if available. The level of documentation will be prescribed through consultation with the City Historic Preservation Officer, FTA, and SHPO.

6.8 CONSTRUCTION IMPACTS AND MITIGATION MEASURES FOR VISUAL AND AESTHETIC RESOURCES

Alternative 2 - Enhanced EIS/EIR Alignment

Heavy equipment (augers, cranes, drilling rigs, backhoe, and excavators) would be transported to the site from the staging area, located under the I-80 elevated freeway structure near Fourth and Bryant Streets. Use of the staging area would be consistent with previous uses for construction in the area and would not have visual impacts. In those sections of the Enhanced EIS/EIR Alignment having cut-and-cover construction, 80-foot high augers and cranes, k-rails and construction safety barriers would temporarily change the streetscape along Third and Fourth Streets, in the South of Market area. Similar equipment would also be used at the tunnel portals and at station locations for excavation and to construct retaining walls. The presence of construction equipment in this rapidly developing area of the City (South of Market) has been common over the past several years and would not distract from the dominant building features that line Third and Fourth Streets. The temporary presence of construction equipment at the Moscone, Union Square, and Chinatown station locations would be highly visible from these heavily used areas and would temporarily degrade and obstruct public views of these landscapes. Night lighting at construction sites would be directed at the work site and shaded to prevent glare to adjacent residential units. Trees would not be removed during construction for this alternative.

<u>Mitigation Measures</u>

Though no significant adverse visual impacts have been identified, improvement measures to minimize potential visual contrasts of Project features with surrounding landscape features include: use of screening around staging areas and excavation sites during construction and directional shading of night lights to minimize glare to residential buildings. Excavated materials would be hauled off daily, rather than stored on-site.

In visually sensitive landscapes, like historic Union Square and Chinatown, use of temporary screening or physical barriers (noise walls) around the station construction sites is suggested to further reduce temporary visual effects during construction.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Construction equipment for this alternative would be the same as that described for Alternative 2 above and would have temporary construction-related visual effects. Since this alternative would not use Third Street, construction-related impacts would be concentrated on Fourth Street, south of Market Street, where tunneling equipment would enter the underground work area. Temporary screening of the work area would be used to control dust and minimize views of construction equipment and construction materials. Excavated materials would be hauled off daily rather than stored on-site. The same as Alternative 2 above, the temporary presence of construction equipment at the Moscone, Union Square, Market Street, and Chinatown station locations would be highly visible and would temporarily effect public views of these visual resources.

The North Beach Tunnel Construction Variant includes a temporary excavation shaft at Columbus Avenue, north of Union Street, and adjacent to Washington Square Park, that would be used for the removal of Tunnel Boring Machines and other construction equipment and supplies. The presence of heavy construction equipment, with associated noise and dust effects would have temporary construction-related visual impacts because it would be visible from the west side of the park and adjacent sidewalks. This would result in temporary visual and aesthetic impacts that could affect the scenic vistas from of the park for the duration of construction.

If the North Beach Tunnel Construction Variant is not approved, the excavation shaft during construction would be at the Chinatown Station described above. Temporary construction-related impacts described for the station above would occur.

Mitigation Measures

The mitigation measures would be the same as described for Alternative 2.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Construction-related visual impacts for this alternative would be the same as those described for Alternative 2 and Alternative 3A above. Temporary screening of the work area would be used to control dust and minimize views of construction equipment and debris. Excavated materials would be hauled off daily, rather than stored on-site.

The North Beach Tunnel Construction Variant described above for Fourth/Stockton Alignment Option A, could also be part of the Fourth/Stockton Alignment Option B and would have the same impacts. The excavation shaft at Columbus Avenue, north of Union Street, and adjacent to Washington Square Park, would have temporary construction-related visual impacts because it would be visible from the west side of the park and adjacent sidewalks.

If the North Beach Tunnel Construction Variant is not approved, the excavation shaft would be at the Chinatown Station site described above and impacts would be the same as those described for the station.

Mitigation Measures

The mitigation measures would be the same as described for Alternative 2.

6.9 CONSTRUCTION IMPACTS AND MITIGATION FOR UTILITIES AND ENERGY

6.9.1 UTILITIES

Alternative 2 - Enhanced EIS/EIR Alignment

The Enhanced EIS/EIR Alignment proposes the use of Special Excavation Method (SXM) for the transit tunnels between stations. The construction of SXM soil-cement walls would require the relocation of sub-surface utilities located parallel to and beneath the walls. Utilities above the guideway tunnels that are sensitive to ground movement or are densely congested would need to be relocated to allow the jet grouting operations to take place. The crossing of Market Street is one area where utilities are particularly congested. The SXM construction approach is described more fully in Section 6.1.4**.**

The Enhanced EIS/EIR Alignment would utilize decked cut-and-cover construction for Union Square Station, Market Street Station, Moscone Station, and portals on Third and Fourth Streets between Bryant and Brannan Streets. Cut-and-cover construction would require relocation of all utilities within the cut-and-cover footprint. Service laterals between the walls and utilities in street crossings intercepted by these walls would also be affected by both cut-and-cover construction and SXM construction.

In addition to the general impacts described above, construction at the Market Street Station on Third Street would displace a 96-inch North Point trunk sewer line, which would cross the Enhanced EIS/EIR Alignment at Mission Street. The relocation of this sewer trunkline would be critical because of the size and the importance of this sewer facility. In order to maintain the function and capacity of the North Point sewer line, the sewer could be diverted under the subway at Third and Mission Streets. If this approach were implemented by Muni as a condition of Project construction, an underground siphon and pumping station would be installed to force the effluent to flow under the subway. During dry weather, a low-flow pipe would divert effluent from the existing sewer line into the pump station's wet well vault located below the subway under the Mission/Third Streets intersection. The pumps would force the effluent to continue to move from west to east passing through the siphon into the existing trunk sewer line. Pumping action would be controlled to prevent the pooling and standing of water in the siphon. During storm events, effluent would flow through the siphon by hydraulic pressure. Resources required to operate and maintain this facility would be identified during design. Alternatively, the sewer line could be rerouted by Muni south along Fourth Street to Folsom Street, east on Folsom to Second Street, and north on Second to Mission Street. To minimize traffic impacts, the sewer would be rerouted using tunneling construction procedures**.** Utilities in areas where SXM is used would be relocated to utility corridors located between the soil-cement walls and property line. Joint trenches would be constructed to maximize the use of the limited space between the new work and adjacent properties.

Utilities at cut-and-cover station locations would be relocated to a utility corridor within or adjacent to the station structure. Utilities and service laterals intercepted as a result of installation of soil-cement walls would be connected to temporary or permanent utility mains installed between the new work and adjacent properties or routed around the new work to tie into existing mains.

There would be minimal impacts to utilities at the Chinatown Station, which would be mined 25 to 35 feet below the surface. Utilities located in the street or sidewalk above would not be disturbed. The entrance to this station would be in a private parcel that Muni would acquire. A construction shaft would be excavated at this entry site for access to the underground station. Construction activities would not affect public or private utilities except for private parcel connections to main utility lines. There would be minimal impact to some utilities (see Section 4.6) at a sidewalk bulb-out that would be the site of an emergency stairway.

Utility relocation would require street and sidewalk excavations that would impact traffic and pedestrian flow in the areas adjacent to the relocation activities. These areas would include station and tunnel segments mentioned above. Utility relocation in sidewalks may require access to or use of existing basements located beneath the sidewalks. Property owners with sub-sidewalk basements may be required to vacate these basements to make room for relocated utilities.

Utilities located beneath surface trackway would require relocation, strengthening or protection.

Utility service disruptions would likely occur for short periods of time when new relocated utilities are tied into the existing utility systems. As indicated in Section 6.2, utility relocation would occur over an 24-month period for the Enhanced EIS/EIR Alignment.

<u>Mitigation Measures</u>

Utility relocation coordination would take place during detailed design in consultation with the utility agencies and the design team and would be phased to ensure that pedestrian and vehicular traffic flows are maintained. No further mitigation would be required. All utilities would be properly relocated and service would be restored as part of the Project.

Alternative 3 - Central Subway Fourth/Stockton Alignment Option A (LPA)

TBMs would be used to construct the guideway tunnels between the stations. This construction methodology would not require those utilities above the TBM tunnels to be relocated. If the North Beach Construction Variant is adopted, utilities on Columbus Avenue, between Union and Filbert Streets, would need to be diverted to facilitate construction for the TBM retrieval shaft.

Alternative 3A will utilize cut-and-cover construction for Moscone Station, Union Square/Market Street Station, and the portal on Fourth Street between Townsend and Brannan Streets, as well as at emergency stairways at all the stations. The construction of retaining walls (either secant pile or slurry wall construction) at these cut-and-cover locations would require numerous utility relocations. Service laterals intercepted by the retaining walls, and utilities in street crossings intercepted by these walls, would also be affected.

The same as described for Alternative 2 above, there would be minimal impacts to utilities at the Chinatown Station, which would be mined 25 to 35 feet below the surface.

Temporary and permanent surface penetrations, such as construction shafts, portals, station entrances (stairs, escalators, elevators) and emergency stairways, would require rerouting of utilities that cross those penetrations. Utility relocation would require street and sidewalk excavations that will temporarily impact traffic and pedestrian flow in the areas adjacent to the relocation activities. Utility relocation in sidewalks may require access to existing basements located beneath the sidewalks. Property owners with sub-sidewalk basements may be required to vacate these basements to make room for relocated utilities.

Utilities located beneath surface trackway would require relocation, strengthening or protection.

Cut-and-cover construction would provide temporary decking installed after initial excavation to such a depth that spoils can be removed from a construction shaft. Some utilities could be suspended from this temporary decking. Other utilities would be relocated to utility corridors located between the retaining walls and property line. Joint trenches would be constructed to maximize the use of the limited space between the new work and adjacent properties. Utilities and service laterals intercepted as a result of installation of the retaining walls (secant piles or slurry walls) would be connected to temporary or permanent utility mains installed between the new work and adjacent properties or routed around the new work to tie into existing mains.

Utility service disruptions would likely occur for short periods of time when new relocated utilities are tied into the existing utility systems. Utilities affected by construction of the Central Subway Fourth/Stockton Alignment Option A are described in Section 4.6. As indicated in Section 6.2, utility relocation would commence in advance of heavy civil construction work for the guideway and stations and would occur over a six month period for the Central Subway Fourth/Stockton Alignment Option A.

Mitigation Measures

Mitigation measures would be the same as identified above under Alternative 2.

Alternative 3 - Central Subway Fourth/Stockton Alignment Option B (Modified LPA)

The utility impacts for Alternative 3B would be the same as for Alternative 3A, except as noted below.

Cut-and-cover construction methodology would require excavation from the surface, thereby affecting all utilities within the cut-and-cover area. Service laterals to adjacent properties would be cut by retaining wall construction. Temporary and permanent surface penetrations, such as construction shafts, portals, station entrances (stairs, escalators, elevators) and emergency stairways, would require rerouting of utilities that cross those penetrations.

Utility relocation would require street and sidewalk excavations that would impact traffic and pedestrian flow in the areas adjacent to the relocation activities. Utility relocation in sidewalks may require access to existing basements located beneath the sidewalks. Property owners with sub-sidewalk basements may be required to vacate these basements to make room for relocated utilities.

Utilities located beneath surface trackway would require the relocation, strengthening or protection.

Cut-and-cover construction at station locations would provide temporary decking installed after initial excavation to such a depth that spoils can be removed from a construction shaft. Some utilities could be suspended from this temporary decking. Other utilities would be relocated to utility corridors located between the retaining walls and property line. Joint trenches would be constructed to maximize the use of the limited space between the new work and adjacent properties. Utilities and service laterals intercepted as a result of installation of the retaining walls would be tied into temporary or permanent utility mains installed between the new work and adjacent properties or routed around the new work to tie into existing mains.

Utility service disruptions would likely occur for short periods of time when new relocated utilities are tied into the existing utility systems. Utilities affected by construction of the Central Subway Fourth/Stockton Alignment Option B are described in Section 4.6. As indicated in Section 6.2, utility relocation would occur over a six month period for the Central Subway Fourth/Stockton Alignment Option B.

<u>Mitigation Measures</u>

The mitigation measures would be the same as described for Alternative 2.

6.9.2 ENERGY

Alternative 2 – Enhanced EIS/EIR Alignment

Fuel consumption associated with operation of construction vehicles and machinery would occur during the construction phase. Fuel consumption to power construction equipment could be accommodated with existing energy resources. This temporary consumption of energy would not result in an energy impact.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Construction impacts would be the same as described for Alternative 2 above.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Construction impacts would be the same as described for Alternative 2 above.

Mitigation Measures

No mitigation measures would be required.

6.10 CONSTUCTION IMPACTS AND MITIGATION FOR GEOLOGY AND SEISMICITY

6.10.1 GEOLOGIC HAZARDS

Alternative 2 - Enhanced EIS/EIR Alignment

During construction of the Enhanced EIS/EIR Alignment, an earthquake could occur. The associated groundshaking could affect the areas under construction and the safety and health of the construction workers. Construction of underground tunnels, shafts, and excavations will be conducted in accordance with all applicable federal, state and local codes and practices. The federal regulations are included in Part 1926, Section 800 of Title 29 of the Code of Federal regulations (29 CFR 1926.800) which is administered by the Occupational Safety and Health Administration (OSHA) and covers the safety and health of underground workers. California regulations are documented in Title 8 of the California Code of Regulations and are enforced by Cal/OSHA.

Muni would require contractors to submit a site-specific earthquake preparedness and emergency response plan as part of compliance with bid specifications. The plan would include specification by an emergency coordinator/team, provisions for emergency power and communication, evacuation procedures, and post-earthquake safety inspection. As part of the MTA's procedures and guidelines, Muni has developed a working document that covers earthquake preparedness and post-earthquake inspection/ repair procedures.

<u>Mitigation Measures</u>

No mitigation measures would be required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA) and Option B (Modified LPA)

Construction impacts would be the same as described above for Alternative 2.

<u>Mitigation Measures</u>

No mitigation measures would be required.

6.10.2 SETTLEMENT OR INSTABILITY OF SUBSURFACE MATERIALS

Alternative 2 - Enhanced EIS/EIR Alignment

This alternative includes installation of subway tunnels and stations with off-street entries and vent shafts on Third, Fourth, and Harrison Streets (north of Brannan Street), connecting under Market Street and along Kearny and Geary Streets to Stockton Street and continuing north to Clay Street. South of Brannan Street, tracks would be constructed on the surface of Third and Fourth Streets. Unless considered during the design, excavation of the tunnel and stations (either through mining or cut-and-cover) through the developed Downtown area could result in potential settlement of geologic materials surrounding the excavation during construction. Under Alternative 2, construction of the tunnels over the upper pair of Market Street tunnels (Muni) would be expected to reduce ground loads acting on the tunnel lining, resulting in an upward ovaling distortion similar to that experienced on the BART tunnels during the Muni Metro turnarounds. Limited dewatering of the cut-and-cover areas would reduce potential settlement of water bearing subsurface layers. Construction-period settlements could cause damage to existing building foundations, subsurface utilities, and surface improvements (e.g., sidewalks and roadways).

Based on preliminary geotechnical investigations of subsurface materials along the alignment, tunneling would encounter a variety of geologic materials, including artificial fill, dune sand, Bay Mud, undifferentiated Old Bay deposits, colluvium, dense sand (Colma Sand) and bedrock (see Figure 5-14).[2] Preliminary geotechnical reports prepared for the mined and cut-and-cover tunneling portions of the Project include recommendations for management of potential construction-period settlements.[3,4] Site specific designs to limit potential construction-period settlements would be addressed in detail in the design-level geotechnical analyses that would be prepared for the Project. These analyses would include detailed evaluations of the site-specific geotechnical properties of the subsurface materials; building-by-building evaluations of foundations that may be affected by excavation; special excavation shoring designs; and other measures designed to avoid or minimize the potential adverse effects of settlement. The geotechnical design of the excavations (cut-and-cover and mined tunnels) would consider site preparation and excavation and support using concrete diaphragm walls, or similar technology (refer to Section 1 for discussion of construction excavation and support methods) designed to minimize potential construction related settlements resulting from unstable soft sediments. Potential construction impacts to existing and future structures along the Corridor of the Enhanced EIS/EIR Alignment may expose structures to geologic hazards (settlement).

<u>Mitigation Measures</u>

Provisions such as concrete diaphragm walls to support the excavation and instrumentation to monitor settlement and deformation would be used to ensure that structures adjacent to tunnel alignments are not affected by adjacent and nearby excavations. These provisions would be incorporated into the Project design, preliminary and final engineering, and construction specifications for the Project. However,

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[2] Geomatrix Consultants, Inc. *Geotechnical Data Report and Geologic Profile*, Geotechnical Investigations Phase 1A, Rev 1, 27 February 2004

[3] Haley and Aldrich, Inc. *Final Report on Central Subway Mined Tunnels/Stations for the Muni Third Street Light Rail Project, San Francisco, California*, February, 1997.

[4] Dames & Moore. *Geotechnical Engineering Recommendations, Central Subway Cut-and-Cover Construction for the Third Street Light Rail Project*, 12 March 1997.

despite the best efforts of a contractor to minimize ground movements associated with underground construction, surface settlement is a constant concern in urban environments. To address this concern, tunnel construction methods that minimize ground movement will be used on this Alternative including, structurally stiff shoring systems, Sequential Excavation Method's (SEM) ground improvement techniques such as compensation grouting and jet grouting and underpinning. Because SEM advances the tunnel in small increments, the excavation can be supported in a sequential fashion. With a rigorous geomechanical instrumentation program accompanying SEM, the underground excavation can be closely monitored for movement before settlements propagates to the surface. If advance settlement trends are observed, grouting or underpinning can be employed to arrest the movement before surface structures are affected.

Proposed measures for further managing and limiting the expected deformations of the existing BART/Muni Metro subway tunnels include: (1) rigorous continuous automated monitoring of the distortions and uplift/settlement movements experienced by the Market Street tunnels as the new tunnel construction approaches and (2) prior placement of compensation grouting pipes between the Market Street tunnels and the new bored tunnels to allow immediate injection of cement grout to replace ground losses caused by the tunneling should the deformations being continuously measured in the BART tunnels exceed pre-established action thresholds.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

This alternative includes installation of subway tunnels and stations and off-street entries and vent shafts on Fourth Street between Townsend and Market Streets and on Stockton Street between Market and Jackson Streets. South of Townsend Street on Fourth Street, the light rail construction would be at the surface. Excavation of the tunnel and stations (by TBM, SEM, or cut-and-cover methods) through the developed Downtown area could result in settlement of geologic materials surrounding the tunnel excavation during construction. Under Alternative 3A, the new bored Central Subway tunnels would pass approximately five to ten feet beneath the BART tunnels resulting in a slight downward deformation of the overlying BART and Muni tunnels. Tunneling would be done using state-of-the-art pressurized face TBMs that, in combination with proper operation, minimize ground loss and consequent settlement effects. Proposed construction methods would involve limited dewatering of the cut-and-cover areas to reduce potential settlement of water bearing soil layers (aquifer materials). Construction-period settlements could cause potential damage to existing building foundations, subsurface utilities, and surface improvements (e.g., sidewalks and roadways). Tunnel construction could also result in the potential displacement of BART structures.

A geologic profile for the Fourth/Stockton Alignment Option A is presented in Figure 5-15. Settlement-related construction impacts would be the same as described above for Alternative 2.

Mitigation Measures

Mitigation measures would be the same as described above for Alternative 2, except subway tunnels for Alternative 3A would be constructed using pressurized face TBM tunneling methods.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

This segment includes installation of subway tunnels and stations and off-street entries and vent shafts on Fourth Street between Bryant and Market Streets, and on Stockton Street between Market and Jackson Streets. South of Bryant Street, on Fourth Street, the light rail construction would be at the surface. Excavation of the tunnel and stations (by TBM, SEM, or cut-and-cover methods) through the developed Downtown area could result in settlement of geologic materials surrounding the tunnel excavation during construction. Under Alternative 3B, the new bored Central Subway tunnels would pass approximately five to ten feet beneath the BART tunnels resulting in a slight downward deformation of the overlying BART and Muni tunnels. Tunneling would be done using state-of-the-art pressurized face TBMs that, in combination with proper operation, minimize ground loss and consequent settlement effects. Proposed construction methods would involve limited dewatering of the cut-and-cover areas to reduce potential settlement of water bearing soil layers. Construction-period settlements could cause damage to existing building foundations, subsurface utilities, and surface improvements (e.g., sidewalks and roadways). Tunnel construction could also result in the potential displacement of BART structures.

Based on preliminary and subsequent geotechnical investigations of subsurface materials along the Corridor, tunneling would encounter a variety of geologic materials, including artificial fill, dune sand, Bay Mud, undifferentiated Old Bay deposits, dense sand (Colma Sand) and bedrock (refer to Figure 5-16).[5, 6] Preliminary geotechnical reports prepared for the mined and cut-and-cover tunneling portions of the Project include recommendations for management of potential construction-period settlements.[7.8]

Similar to impacts described for Alternative 2, the construction impacts of the Fourth/Stockton Alignment Option B from settlement along the Corridor may expose structures to geologic hazards.

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5 Geomatrix Consultants, Inc. *Addendum to Geotechnical Data Report and Geologic Profile for the Fourth/Stockton Alignment*, Geotechnical Investigations, Rev 0, 30 March 2005.

6 Geomatrix Consultants, Inc. *Geotechnical Data Report and Geologic Profile for the Fourth/Stockton Alignment*, Geotechnical Investigations, Phase 1B, Rev 0. 1 May 2006.

7 PB/Wong, Working Paper, *Recommended Tunnel Construction Methods Study*, Rev. 0, March 2004.

8 PB/Wong, Fourth Street Addendum to *Effects of NCS Underground Construction on Existing Structures*, Rev. 0, March 2005.

Mitigation Measures

The mitigation measures would be the same as described for Alternatives 2 and 3A.

6.11 CONSTRUCTION IMPACTS AND MITIGATION FOR HYDROLOGY

6.11.1 FLOODING

Alternative 2 - Enhanced EIS/EIR Alignment

Based on an evaluation of existing surface elevations (all elevations equal to or greater than 0 feet SFCD), the Enhanced EIS/EIR Alignment would not be expected to be affected by 100-year high tides or tsunami events. Where construction of the underground guideway and station structures occurs below the water table in permeable soil and/or rock, the subsurface groundwater flow regime in the immediate vicinity of the structures would be altered. All permanent structural elements would be detailed to achieve an essentially watertight structure that does not require long-term, continued dewatering. Local groundwater flow patterns would be altered where jet grouting, secant piles, diaphragm walls and other soil improvement and permanent, impermeable shoring elements are left in place.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA) and Option B (Modified LPA)

Construction, Operation and Cumulative impacts would be the same as described for Alternative 2 above.

<u>Mitigation Measures</u>

No mitigation measures are required.

6.11.2 WATER QUALITY

Alternative 2 - Enhanced EIS/EIR Alignment

The Enhanced EIS/EIR Alignment would include approximately 1.5 miles of tunneling. Construction of portals, access shafts to the tunnels, stations, and station entrances would require excavation and transportation of an estimated 524,000 cubic yards of soil and dewatering activities. (See also Section 5.10, Hazardous Materials) These activities would result in exposure of soil to erosion by runoff. During the construction phase, it is possible for storm water runoff to mobilize sediments toward the Bay or the City's combined storm and sanitary sewer system. The accumulation of sediment could result in blockage of flows, potentially resulting in localized ponding or flooding.

Some local dewatering would be conducted during construction of the deep stations and station accesses. The construction method for the deep excavations would incorporate watertight concrete diaphragm walls with a base slab. Dewatering would be used locally to control minor leakage through the walls prior to constructing the base slab once the excavation reaches full depth. For further discussion of the construction excavation and support method, see Chapter 6.2.

The high water table and permeable soil conditions, along with the existing inflow of groundwater at the Powell Street Station, require special design considerations to address the potential for groundwater at the Union Square Station and the potential for impacting groundwater flows to the Powell Street Station. Shoring at the Union Square Station will be designed to be watertight so as not to rely on extensive dewatering. The station structures will be fully waterproofed with membrane systems. A design requirement stipulating that the Union Square Station construction not alter the existing groundwater in the vicinity of the Powell Street Station will also be adopted.

The potential for chemical releases is present at most construction sites. Once released, substances such as fuels, oils, paints, and solvents could be transported to nearby surface waterways and/or groundwater in storm water runoff, wash water, and dust control water, potentially reducing the quality of the receiving waters or causing operational difficulty at the wastewater treatment plant.

The Central Subway Corridor is subject to the SF Public Utilities Commission (SFPUC) regulations (Ordinance 19-92, Sections 118 and 123). These regulations require a Storm Water Pollution Prevention Plan (SWPPP) to be submitted to the SFPUC, Water Pollution Control Division for review.[9] No additional mitigation for control of construction period runoff would be necessary, because the implementation of the SWPPP meet City requirements for control of storm water.

In accordance with San Francisco Ordinance 19-92, Sections 118 and 123, a contractor would prepare and implement a SWPPP. The SWPPP would include Best Management Practices (BMPs) designed to reduce potential adverse effects on surface water quality and off-site sedimentation throughout the construction phase of the Project. Specific measures shall be included in the SWPPP to ensure that runoff from the construction sites does not drain directly to the Bay. The SWPPP would include:

- Construction Storm Water Management Controls. These controls would include practices to minimize the contact of construction materials, equipment, and maintenance supplies (e.g., fuels, lubricants, paints, solvents, adhesives) with storm water. The SWPPP would specify properly designed centralized storage areas that would keep these materials out of the rain. Spill cleanup materials (e.g. rags, absorbent materials, and secondary containment) would be kept at the work site when handling chemicals.

  An important component of the storm water quality protection effort is knowledge of the SWPPP by the site supervisors and workers. To educate on-site personnel and maintain awareness of the importance of storm water quality protection, site supervisors would conduct regular tailgate meetings

9 Franza, Tom. Water Pollution Control Division, Public Utilities Commission. Personal communication with BASELINE, July 15, 1997.

to discuss pollution prevention. The frequency of the meetings and required personnel attendance list would be specified in the SWPPP.

The SWPPP would specify a monitoring program to be implemented by the construction site supervisor, and would include both dry and wet weather inspections. City personnel shall conduct regular inspections to ensure compliance with the SWPPP; an accepted standard procedure.

- Erosion and Sediment Control. BMPs designed to reduce erosion of exposed soil may include, but are not limited to: soil stabilization controls, watering for dust control, perimeter silt fences, placement of straw wattles, and sediment basins. The potential for erosion is generally increased if grading is performed during the rainy season as disturbed soil can be exposed to rainfall and storm runoff. If grading must be conducted during the rainy season, the primary BMPs selected shall focus on erosion control that is keeping sediment in-place. End-of-pipe sediment control measures (e.g., basins and traps) shall be used only as secondary measures. Entry and egress from the construction site shall be carefully controlled to minimize off-site tracking of sediment. Vehicle and equipment washdown facilities shall be designed to be accessible and functional during both dry and wet conditions. Additional sources of information regarding BMPs are the California Storm Water Municipal and Construction Activity BMP Handbooks.[10]

<u>Mitigation Measures</u>

No mitigation measures are required.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

The Fourth/Stockton Alignment Option A would include approximately 1.5 miles of tunneling and excavation for stations and access to stations. Construction of portals, access shafts to the tunnels, stations, and station entrances would require excavation and transportation of an estimated 489,000 cubic yards of soil, and dewatering activities. These activities would result in exposure of soil to erosion by runoff. During the construction phase, it is possible for storm water runoff to mobilize sediments toward the Bay or the City's combined storm and sanitary sewer system. The accumulation of sediment could result in blockage of flows, potentially resulting in localized ponding or flooding.

Construction impacts would be the same as described above for Alternative 2. The strategies outlined for controlling groundwater at the Union Square Station would apply to the Union Square/Market Street Station.

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[10] California Stormwater Quality Association (CASQA). *Stormwater Best Management Practice Handbooks,* 2003.

Mitigation Measures

No mitigation measures are required.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

The Fourth/Stockton Alignment Option B would include approximately 1.2 miles of tunneling. Construction of portals, access shafts to the tunnels, stations, and station entrances would require excavation and transportation an estimated 637,000 cubic yards of soil, and dewatering activities. These activities would result in exposure of soil to erosion by runoff. During the construction phase, it is possible for storm water runoff to mobilize sediments toward the Bay or the City's combined storm and sanitary sewer system. The accumulation of sediment could result in blockage of flows, potentially resulting in localized ponding or flooding.

Construction impacts would be the same as described above for Alternative 2. The strategies outlined for controlling groundwater at the Union Square Station would apply to the Union Square/Market Street Station.

All Build Alternatives

No substantial amount of water would be recharged into the groundwater during construction.

Mitigation Measures

No mitigation measures are required.

6.12 CONSTRUCTION IMPACTS AND MITIGATION FOR BIOLOGICAL AND WETLAND RESOURCES

Alternative 2 - Central Subway Enhanced EIS/EIR Alignment

Construction of the Enhanced EIS/EIR Alignment may result in the removal of small existing street trees along Fourth, Third, Stockton Streets along surface segments and at station entrances.

Mitigation Measures

Any street trees removed or damaged as part of construction would be replaced along the street at a 1:1 ratio.

Alternative 3 - Central Subway Fourth/Stockton Alignment Option A (LPA) and Option B (Modified LPA)

Construction of Fourth/Stockton Alignment Option A could result in the removal of small existing street trees along the surface segment of Fourth Street and at station entries on Fourth and Stockton Streets. No wetlands would be affected. During construction of the North Beach Tunnel Variant for removal of the tunnel boring machine at Columbus Avenue and Union Street, adjacent to Washington Square Park, exposure of roots of mature trees could occur.

Mitigation Measures

Any street trees removed or damaged as part of construction would be replaced along the street at a 1:1 ratio. A certified arborist would be present during construction of the Columbus Avenue TBM retrieval shaft to monitor protection of tree roots during excavation (2-3 weeks).

6.13 CONSTRUCTION IMPACTS AND MITIGATION FOR HAZARDOUS MATERIALS

Alternative 2 – Enhanced EIS/EIR Alignment

Construction activities for this alternative would disturb soils along the alignment in some areas at a depth of up to 80 feet. See Section 6.1 for details of the construction techniques.

Construction activities for the surface segment of the Central Subway Enhanced EIS/EIR Alignment include excavation of an estimated 524,000 cubic yards of soil for the construction of the surface light rail tracks and associated utility trenches.

Previous subsurface soil investigations, historic and current land uses, and known fill areas were described in Section 4.10 to assess the quality of subsurface soils that would be disturbed during construction. The evaluation indicated the potential for hazardous materials to be present in soils that would be excavated during the construction of the surface light rail tracks, utility trenches, maintenance facility, and portions of the subway. Potential contaminants include metals, volatile organic compounds (VOCs), semi-VOCs including polynuclear aromatic hydrocarbons (PNAs), total petroleum hydrocarbons, and friable asbestos from serpentine fragments.

Construction of the Enhanced EIS/EIR Alignment may expose site workers and the public to soils potentially containing hazardous materials. Hazardous materials may be present at concentrations that could adversely affect the health of site workers and the public and could possibly render the soils a hazardous waste, once excavated. Possible routes of exposure to site workers include absorption through exposed skin, inhalation of dust or vapors, and ingestion. The public could be exposed to contaminants through inhalation of dust or vapors generated from excavation activities carried beyond the construction zone. Ingestion and dermal contact of contaminants could also affect exposure to the public, if access to the construction zone were not restricted.

Excavated soils generated during construction activities would be transported for off-site disposal at landfills. For Alternative 2, an estimated 35,000 cubic yards of spoils would need disposal at a Class I facility. Improper handling of contaminated soils could result in an adverse effect to the public and the environment during transportation. In addition, disposal at a landfill would be an indirect effect of the Central Subway Enhanced EIS/EIR Alignment since the capacity and life of the landfill(s) would be reduced, potentially requiring the need for additional development of disposal facilities within the State in the future.

During excavation activities, site workers may encounter unanticipated subsurface structures containing hazardous materials such as underground pipelines, underground storage tanks (USTs), and buried drums.

The hazardous materials could pose a health and safety hazard to site workers and the public during excavation and/or activities related to the removal of underground structures. In addition, the environment may also be adversely affected if the hazardous materials were accidentally released.

Diesel-powered equipment would likely be used for soil excavation, tunneling, and other construction activities. This equipment may be serviced and fueled on-site with substances such as lubricants, diesel fuel, antifreeze, motor oils, degreasing agents, and other hazardous materials. Improper management, including an accidental chemical release, of these materials could pose a health and safety hazard to workers, the public, and the environment.

Measures to avoid adverse effects caused by the presence of hazardous materials during construction are required by Article 20 of the San Francisco Municipal Code. Areas on the Bay side of the 1851 high tide line are subject to compliance with Article 20 requirements if more than 50 cubic yards of soil are evacuated (refer to Chapter 4.0, Figure 4-11).

As indicated in Section 4.10, Hazardous Materials, the requirements of Article 20, administered by the San Francisco Department of Public Health, include:

- Preparation of a Site History Report;
- Collection and analysis of soil samples in accordance with an approved work plan;[11]
- Preparation of a Soils Analysis Report; and
- Preparation of a Site Mitigation Report.

The Site Mitigation Report would include measures to be undertaken during Project construction to protect site workers, the public, and the environment. The Site Mitigation Report would include: 1) determination of whether hazardous materials in soil are causing, or likely to cause, significant environmental or health and safety risks, and if so, 2) recommended measures to mitigate the significant risks; and 3) certification statement confirming that either no mitigation is required or the mitigation measures identified in the report, when completed, will mitigate the risks to the environment or health and safety. As a result, compliance with Article 20 would mitigate the potential effect of exposing soils containing hazardous materials to site workers, the public, and the environment to a less-than-significant level for that portion of the study area located within the boundaries of Article 20 and portions of segments within its jurisdiction.

[11] Section 1002 of Article 20 identifies the analytical requirements for the soil samples.

For the segments located outside of Article 20 jurisdiction, implementation of mitigation measures similar to those required by Article 20 would be needed to reduce the potential exposure effects of soils containing hazardous materials to site workers and the public (see Mitigation Measures below).

Groundwater levels in the study area have been reported to range between 1 and 50 feet below ground surface (bgs). Construction of the Enhanced EIS/EIR Alignment would require excavation below the groundwater level along portions of the alignment. Shoring and structural lining methods that limit water ingress are proposed throughout the alignment. As a result, localized dewatering would be needed to lower the groundwater within the excavation areas during construction. Dewatered groundwater may be disposed either to the San Francisco Bay or the San Francisco Department of Public Works combined sewer system.

Water generated from dewatering activities cannot be discharged directly to the San Francisco Bay without a permit or approval from the Regional Water Quality Control Board (RWQCB). The RWQCB reviews requests on a case-by-case basis to determine if the discharge is acceptable. Groundwater quality data would need to be collected and evaluated to determine the potential pollutant loading and impact to the Bay. Thresholds identified in the San Francisco Bay Basin Water Quality Control Plan may be used to evaluate the water quality data. It is unlikely that the RWQCB would permit this type of discharge.

Alternatively, if generated water were to be discharged to the City's combined storm and sanitary sewer system, a Batch Industrial Wastewater Discharge permit would need to be obtained from the San Francisco Public Utilities Commission, Bureau of Environmental Regulation and Management (BERM) prior to discharge. The permit application must identify the total estimated volume and duration of proposed discharge and contain water quality data representative of the groundwater effluent. The groundwater quality data would be reviewed to confirm that it would meet the Batch Wastewater Discharge (BWWD) threshold limits. Threshold limits for direct discharge into the Bay are typically more stringent than the BWWD threshold limits. For the purposes of this analysis, previously collected groundwater quality data were compared to the BWWD threshold limits. Section 4.10, Hazardous Materials, provides a discussion of the groundwater quality data collected throughout the Study Area.

Previously collected groundwater quality data indicate the potential for dewatered effluent throughout portions of the alignment to contain elevated metals, VOCs, petroleum hydrocarbons, and oil and grease concentrations. These contaminants were found at levels greater than the BWWD threshold limits in several areas. If dewatered discharge were to contain contaminant concentrations exceeding threshold limits, then direct discharge to the combined sewer system would not be allowed. However, the discharge could be pretreated to reduce contaminant concentrations to acceptable levels; treatment may include gravity separation or filtration to remove sediment in the water, and/or aeration or carbon treatment for removal of volatile compounds. These specific measures will be included in the dewatering groundwater management protocol. If the treated water met the threshold limits, then discharge would be allowed into the combined sewer system provided other requirements were satisfied, including adequate sediment control; Section 4.8, Hydrology and Water Quality, discusses sediment control measures. Compliance with the dewatered groundwater disposal requirements would meet City requirements.

Dewatering during construction could result in preferential groundwater flow toward the alignment; this would be an indirect effect of the Enhanced EIS/EIR Alignment. As a result, the direction and rate of groundwater flow and corresponding contaminants from areas outside the alignment could migrate toward the alignment, causing an increase in contaminant concentrations in dewatered groundwater.

The health of construction workers and the public who may be exposed to contaminated groundwater during dewatering activities could potentially be affected. Possible exposure routes to both site workers and the public could include skin absorption and incidental ingestion.

<u>Mitigation Measures</u>

Subsurface conditions throughout the alignment may vary significantly. Based on existing soil quality data, historic and current land use, and areas of known fill, hazardous substances could be encountered in soil excavated during construction of the Enhanced EIS/EIR Alignment.

As indicated above, most of the measures needed to mitigate against these effects are required by Article 20 for those portions of the Enhanced EIS/EIR Alignment bayward of the 1851 high tide line. However, for those portions not subject to Article 20, similar measures would be necessary to mitigate against the identified adverse effects. The Article 20 requirements are described below, and the items already completed are noted as appropriate:

- <u>Site History Report</u>. A series of technical reports have been prepared consistent with the requirement of an Article 20 Site History Report. Reports were prepared during the period of 1997 through 2006 as modifications were made to the Alignment. [12, 13, 14, 15, 16] Past land uses in the Study Area along Columbus Avenue, Stockton Street, and Fourth Street have been densely packed residential,

[12] No. 96.218E, Hazardous Materials Technical Report, Baseline Environmental Consulting, June, 1997.

[13] Phase I Environmental Site Assessment and Site History Report, Central Subway Alignment, San Francisco, California, Revision 1, Geomatrix Consultants, Inc., December 18, 2003.

[14] Addendum to Phase I Environmental Site Assessment and Site History Report, Task 1.02-03, Hazardous Material Investigations, Revision 0, Geomatrix Consultants, Inc., April 1, 2005.

[15] Phase II Hazardous Materials Investigation Report, for the Fourth/Stockton Alignment, Task 1.02-03, Hazardous Material Investigations, Revision 0, Geomatrix Consultants, Inc., May 18, 2006.

[16] Addendum No. 2 to Phase I Environmental Site Assessment and Site History Report, Task 1.02-03, Hazardous Material Investigations, Revision 0b, Geomatrix Consultants, Inc., February 9, 2007.

commercial and industrial structures including a large number of shops and factories. Commercial uses identified include retail shops and hotels. Industrial uses included machine shops, paint shops, metal shop, auto body and paint shop, blacksmith shop, printing shop, plating works, tin shop, dyeing and cleaning shop, millinery, sheet metal shop, oil and gas facility, lithography, electroplating works, metal and iron works, oil and gas operation, gas and electric company steam plant, furniture varnishing and finishing, drug factory, iron and bronze works, electroplating works, welding shop, printing shop, iron works, insecticide manufacture, plastic products manufacture, and lighting equipment manufacture.

- Soil Quality Investigation. The purpose of the soil quality investigation is to: 1) identify potential contaminants which site workers, the public, and the environment could be exposed to during construction; and 2) classify waste stream(s) of excavated soils to ensure proper soil management (i.e., handling and disposal). As Article 20 also requires the performance of a soil quality investigation, one soil quality investigation shall be conducted for the entire Light Rail Alternative to satisfy the corresponding requirements of Article 20 and this mitigation measure. Investigations would be conducted by qualified environmental professionals and in conformance with State and local guidelines and regulations.

  Before soil quality investigation activities begin, the lead oversight agency for the Project shall be determined. The agency may be the San Francisco Department of Public Health (DPH), Department of Toxic Substances Control (DTSC), and/or the RWQCB. Oversight for areas within Article 20 jurisdiction is provided by DPH. DPH may also provide remedial action oversight for the cleanup of waste releases outside the Article 20 jurisdiction, provided that the requisite technical expertise and capabilities are available to supervise the action. DPH would be required to notify the DTSC and the RWQCB prior to the commencement of the oversight.

  For the Alignment segment between King and Jackson Streets, an approved soil and grab groundwater sampling work plan identified the proposed sampling locations and depths, methodology, and laboratory analyses.[17]

- Soil Analysis Report. All field activities, findings, and recommendations would be documented in a soil analysis report. The soil and groundwater investigation conducted as described in the 2005

[17] Phase II Work Plan, Task 1.02-03, Hazardous Materials Investigation, Revision 0, Geomatrix Consultants, Inc., July 20, 2005.

approved work plan was summarized in an investigation report prepared consistent with the requirements of Article 20.[18,19]

- Site Mitigation Report (SMR). Following the completion of the soil investigation activities and preparation of the Soil Analysis Report, an SMR would be prepared and submitted to the oversight agency for approval. As Article 20 also requires the preparation of a Site Mitigation Report, one report would be prepared for the Central Subway Project. The contents of the SMR would include the following, which incorporates Article 20 requirements:

  Description of Environmental Conditions - Identification of the contaminants and potential concentrations that may be encountered during construction; determination of whether hazardous materials in soil would cause, or likely cause, environmental or public health and safety adverse effect.

  Health and Safety Plan (HSP) - The City would specify the mechanism that would be needed to ensure the preparation and implementation of a HSP. The construction HSP would be prepared by a certified industrial hygienist in accordance with Title 8 California Code of Regulations (CCR), Section 5192; the contents would identify potential chemical hazards and exposure assessment; health and safety procedures to be followed to protect site workers/visitors and the general public from exposure to contaminated soils during construction activities; site worker/visitor training requirements (e.g., initial training, pre-entry briefings, respiratory training, tailgate safety meetings); worker medical surveillance; air monitoring; emergency response procedures; site and engineering controls (e.g., wetting down dusty operations); informational program; and decontamination methods.

  The HSP would also discuss safe work practices to protect site workers, the public, and the environment from exposure to hazardous materials associated with fueling, operation, and maintenance of the construction equipment. In addition, regulatory requirements and Best Management Practices as outlined in Section 5.8, Hydrology and Water Quality, would be implemented to protect the environment from the release of hazardous materials to the environment.

  Guidelines for the Management and Disposal of Excavated Soils - Soil management guidelines would include: 1) procedures for proper soil stockpiling and containment; 2) dust control measures to minimize offsite migration of contaminants; 3) additional soil stockpile sample collection and analytical requirements to meet landfill acceptance criteria, if necessary; 4) transportation and

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[18] Phase II Hazardous Materials Investigation Report, for the Fourth/Stockton Alignment, Task 1.02-03, Hazardous Material Investigations, Revision 0, Geomatrix Consultants, Inc., May 18, 2006.

[19] Ibid.

disposal options and procedures; 5) federal and/or California hazardous waste generator requirements if the excavated soils were to constitute a federal and/or California hazardous waste; and 6) record keeping.[20, 21]

Certification Statement - Article 20 requires that the Certification Statement confirm that either no mitigation is required or the mitigation measures identified in the report, when completed, would mitigate the risks to the environment or human health and safety.

The SMR required in Mitigations would also include the following components to reduce the effects from exposure to unanticipated subsurface structures containing hazardous materials:

– Pre-excavation procedures to identify subsurface utility lines and hazardous materials-containing pipelines; this can be accomplished by notifying Underground Service Alert (USA) 72 hours in advance and performing subsurface surveys (i.e., geophysical) when warranted.

– Protocol in the HSP to protect site workers, the public, and the environment if unanticipated structures containing hazardous materials (e.g., underground tanks, pipelines, drums, or wells) were encountered. Protocol may include criteria for ceasing work immediately, and procedures for performing air monitoring to determine site conditions, and approaches for assessing the hazardous materials involved (e.g., sampling).

– Protocol for handling unanticipated structures containing hazardous materials including contractor notification to the City of San Francisco. Due to the likelihood of USTs present along the light rail alignment, the SMR shall describe UST removal procedures, in accordance with State and local requirements including the following topics:

  - Minimizing fire hazards
  - Tank emptying
  - Vapor displacement
  - Tank rinsing
  - Tank removal
  - Leak reporting and regulatory notification

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[20] Disposal options for the excavated soils would be dependent on the results of waste stream classification. Nonhazardous wastes must be disposed at a Class II or III landfill facilities; federal (i.e., RCRA) hazardous wastes must be disposed at a Class I landfill facility; non-RCRA California hazardous waste may be disposed of at either a Class I landfill or an out-of-state landfill permitted to accept California hazardous waste.

[21] If excavated soils were classified as a federal hazardous waste, then compliance with Title 40 Code of Federal Regulations (CFR) Part 261 would be required. If excavated soils were to constitute a California hazardous waste, then compliance with Title 22 CCR, Section 66262 would be required. These requirements were established to regulate the management of generated hazardous wastes and protect site workers during management of these wastes.

- Coordination with the DPH to ensure compliance with State and local requirements.

To mitigate the potential for exposing site workers and the public to dewatered groundwater containing hazardous materials, the measures described below would be implemented.

The City would conduct a groundwater quality investigation at areas where groundwater would be dewatered during construction activities. The purpose of the investigation would be to: 1) identify potential contaminants in groundwater to which site workers and the public could be exposed; 2) provide for an initial assessment of the quality of dewatered groundwater; and 3) to assess treatment options for the groundwater. Groundwater sampling for the alignment between King Street and Jackson Street was conducted simultaneously with the soil investigation described above.[22] All field activities, findings, and recommendations would be documented in a groundwater quality investigation report. The results of the groundwater sampling conducted for the Alignment between King Street and Jackson Street was included in the soil investigation report.[23]

Following the completion of the investigation activities, the Site Mitigation Report (described above) would also include the following:

- Measures in the HSP to protect site workers and the public from contaminated dewatered groundwater; and
- Dewatered groundwater management protocol.

The City would specify the mechanism that would be needed to ensure the preparation and implementation of the dewatered groundwater management protocol. The dewatered groundwater management protocol would specify: 1) permit criteria to discharge effluent water into the San Francisco Bay and/or the City combined sewer system, whichever is applicable (e.g., when and how the permit would be obtained); 2) pumping and storage handling specifications established by the permit; 3) treatment methods to reduce contaminant concentrations if warranted; 4) verification sampling of the discharge to ensure compliance with regulatory limits; and 5) dewatering operation procedures (e.g., flow rates, discharge point, timing). Disposal to the Bay or combined sewer system would be contingent on the effluent water quality and approval of the applicable regulatory agencies (RWQCB or BERM). If discharge to either system were not allowed, then provisions for other off-site disposal would be specified in the groundwater management protocol.

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[22] Phase II Hazardous Materials Investigation Report, for the Fourth/Stockton Alignment, Task 1.02-03, Hazardous Material Investigations, Revision 0, Geomatrix Consultants, Inc., May 18, 2006.
[23] Ibid.

Implementation of the mitigation measures identified herein would mitigate the potential adverse effect of exposure associated with encountering unforeseen subsurface structures containing hazardous materials.

Contaminated soils excavated from construction of planned or ongoing projects, in addition to the Enhanced EIS/EIR Alignment, may be disposed of at off-site landfill(s). As a result, the rate of reaching landfill capacities would increase. Projected quantities of excavated soil requiring disposal should be provided to the landfill(s). It would then be the landfill's responsibility to determine whether the acceptance rates are within the landfill's projected capacity goals.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Construction activities for the surface segment of the Fourth/Stockton Alignment Option A include soil excavation for the construction of the surface light rail tracks and associated utility trenches. Utility trenches would be excavated to approximately 8 feet below ground surface (bgs). The surface light rail tracks would be transitioned into a subway tunnel at the portal location. A cut-and-cover method would be used for constructing the Moscone and Union Square/Market Street stations and to connect the surface tracks to the subway from the portal to Harrison Street. The remaining portions of the subway would be constructed using a TBM feet. Construction of the portals, stations, and tunnels would require excavation, transportation, and off-site disposal of approximately 489,000 cubic yards of soil. For Alternative 3A, an estimated 25,000 cubic yards of spoils would be disposed of at a Class I facility.

<u>Mitigation Measures</u>

Mitigation measures would be the same as described above for Alternative 2, except an additional sampling work plan for the segment along Stockton Street from Jackson Street to Green Street and the portion of Columbus Avenue from Green Street to just north of Union Street would also be prepared for regulatory agency approval as part of the Soil Quality Investigation for North Beach Construction Variant..

The additional investigation for the Soils Analysis Report, to be conducted north of Jackson Street and onto Columbus Avenue for the North Beach Construction Variant, would meet the corresponding requirements of Article 20 which include: 1) names/addresses of persons and certified laboratory that conducted the soil sampling, laboratory analysis, and report preparation; 2) explanation of sampling and testing methodology; 3) analytical results; 4) indication of the presence of hazardous materials based on the analyses performed; 5) state and federal agencies to which the presence of hazardous materials has been reported and the date of the report; 6) statement indicating whether the site is listed on the National Priorities List of hazardous waste sites, published by US EPA, or listed as a hazardous substance release site. In addition to the Article 20 requirements, the report would include the evaluation and results of the waste stream(s) classification of excavated soils.

For the additional investigation to be conducted north of Jackson Street and onto Columbus Avenue, the groundwater investigation will be conducted simultaneously with the soil investigation. Groundwater quality investigation activities would be performed in accordance with a groundwater sampling work plan approved by the oversight regulatory agency. The work plan would identify the proposed sampling locations, methodology, and laboratory analyses. Activities would be conducted by qualified environmental professionals and in conformance with State and local guidelines and regulations. Sampling locations would focus on areas subject to dewatering. Contaminants selected for analysis would be based on existing groundwater quality data collected in the vicinity, land use history, and discharge requirements.

Alternative 3 - Fourth/Stockton Alignment Option B (Modified LPA)

Construction activities for the surface segment of the Fourth/Stockton Alignment Option B include soil excavation for the construction of the surface light rail tracks and associated utility trenches. Utility trenches would be excavated to approximately 8 feet below ground surface. The surface light rail tracks would be transitioned into a subway tunnel at the portal locations. A cut-and-cover method would be used for constructing the Moscone and Union Square/Market Street stations and to connect the surface tracks to the subway. The remaining portions of the subway would be constructed using two TBMs. Construction of access portal and subway stations to the tunnels would require excavation, transportation, and off-site disposal of about 637,000 cubic yards of soil. For Alternative 3B, an estimated 13,000 cubic yards of spoils would be disposed of at a Class I facility.

<u>Mitigation Measures</u>

The mitigation measures would be the same as described above for Alternative 3A.

6.14 CONSTRUCTION IMPACTS AND MITIGATION FOR AIR QUALITY

Since publication of the 1998 EIS/EIR, approaches and analysis tools for evaluating the construction impacts of air quality have changed. Construction emissions vary substantially from day-to-day, depending on the level of activity, the specific type of construction operations and the prevailing weather in the case of dust emissions. The BAAQMD does not recommend quantification of construction emissions. As a result, attempts were not made in this document to estimate construction emissions. Rather the discussion is based on feasible control measures that are being incorporated into the Project.

Sensitive receptors susceptible to air quality impacts during construction include: playgrounds, parks, schools, hospitals, clinics, and health centers, community centers, convalescence homes, and residential areas (refer to Section 4.11.7 for more detailed discussion of sensitive receptors). School playgrounds and parks along the Project Corridor are shown on Figure 4-4. Sensitive receptors of particular interest for air quality include: Yerba Buena Center of the Arts at Third and Mission Streets; Union Square along Stockton Street; Gordon Lau Elementary School playground at Washington Street; Willie “Woo Woo” Wong Playground at Sacramento Street; and Washington Square at Columbus Avenue and Union Street.

Alternative 2 - Enhanced EIS/EIR Alignment

Construction of the guideway would occur by several construction methods, including mining, a sequential excavation method (SEM), a special excavation method (SXM), and cut-and-cover methods. The Union Square, Market Street, and Moscone stations would be constructed by cut-and-cover. The Chinatown Station would be mined using the SEM method. For more construction details, see Section 6.1.

Dust Emissions. Construction activities involving soil movement, such as cut-and-cover and to a lesser extent SXM, utility relocation/installation, hauling of spoils could generate dust. These activities would occur over an estimated period of almost six years and would occur over a surface area of about eight acres. This area includes construction of the stations, portals, guideway, and utility relocation/installation. Spoil material from tunnel excavation would be moist and would likely not generate fugitive dust.

The impacts from construction activities on nearby residences and other areas where the public has access would depend on the proximity of construction work to these areas. The highest pollutant levels are typically within 200 feet of the construction activity. Since the location of construction would change, some members of the public may experience occasional annoyances when construction activities are closest to them. The application of construction-specific control measures would eliminate many potential annoyances.

The following dust control measures as required by the BAAQMD have been incorporated into the Project: [24]

- Where appropriate, active construction areas shall be watered at least twice daily.
- All trucks hauling soil, sand, and other loose materials shall be covered with tarpaulins or other effective covers.
- All unpaved access roads, parking areas, and staging areas at the construction site shall be paved; otherwise, water or non-toxic soil stabilizers shall be applied. In addition, paved access roads, parking areas, and staging areas shall be swept daily with a water sweeper. Streets shall be swept daily with a water sweeper in areas where visible soil material is carried onto adjacent public streets.
- Inactive construction areas, including previously graded areas inactive for at least ten days, shall be hydroseeded or applied with a non-toxic soil stabilizers.
- Exposed stockpiles shall be enclosed, covered, and watered twice daily (or applied with a non-toxic soil binder) if material is dry.
- The speed of all vehicles driving on unpaved roads shall be limited to 15 mph.
- To prevent silt runoff to public roadways, sandbags or other erosion control measures shall be implemented.
- Disturbed areas shall be replanted with vegetation as quickly as possible.
- Excavation and grading activities shall be terminated when winds exceed 25 mph.

Controlling dust and PM_{10} would also reduce $PM_{2.5}$ at construction sites. Air monitoring at playgrounds and school yards would be included as part of the Project.

Exhaust Emissions. Short-term exhaust emissions would be generated from surface construction-related equipment. In addition, exhaust emissions would be generated from off-site transport of soils excavated from surface construction, cut and cover, and tunneling activities. Soils generated from tunneling activities would be transported underground via rail or conveyor belt to the portal locations. At this point, the excavated soils would be transported off-site. In addition, construction-related lane closures and detours could cause traffic congestion and as a result additional air pollutant emissions. See Chapter 3.0 for measures proposed to reduce traffic congestion in the construction area. Increased emissions would

[24] Bay Area Air Quality Management District, CEQA Guidelines Assessing the Air Quality Impacts of Projects and Plans, December 1999.

affect short-term air quality and could affect nearby sensitive receptors. However, the emissions are not expected to cause or contribute to violations of ambient air quality standards.

Implementation of the following control measures will be included in the Project construction specifications and contract documents to further reduce exhaust emissions (including $PM_{2.5}$) from construction-related equipment:

- The idling time of all construction equipment used at the site shall not exceed five minutes per hour.
- The hours of operation of heavy duty equipment and/or the amount of equipment in use shall be limited.
- <u>The idling time of all construction equipment used at the site shall not exceed five minutes per hour</u>. All equipment shall be properly tuned and maintained in accordance with the manufacturer's specifications <u>to perform at EPA certification levels</u> at the manufacturer's recommended frequency. <u>Employ periodic, unscheduled inspections to limit unnecessary idling.</u>
- Prohibit any tampering with engines and require continuing adherence to manufacturer's recommendations for operations.
- Particulate matter filters shall be installed on all on-site diesel powered equipment for the duration of the Project.
- When feasible, alternative fueled or electrical construction equipment shall be used at the Project site.
- Use ultra-low sulfur fuel if available and maintain receipts from all purchases for verification.
- The minimum practical engine size for construction equipment shall be used.
- Gasoline-powered equipment shall be equipped with catalytic converters, where feasible.
- Use no more than two pieces of equipment simultaneously near or upwind of sensitive receptors.
- Establish emission limits within 1,000 feet of K-12 schools along the Corridor and notify schools of construction activity.
- Develop a plan for limiting truck traffic movements during critical hours to minimize community risk.
- A Contract Project Manager will conduct spot checks for compliance with committed measures.

- “Reduce use, trips, unnecessary idling from heavy equipment.
- Use EPA-registered particulate traps and other appropriate controls where suitable to reduce emissions of diesel particulate matter at construction sites.
- When hauling material and operating non-earthmoving equipment onsite, prevent spillage and limit speeds to 15 mph. Limit speed of earthmoving equipment to 10 mph.”

An increase in Project-related short-term construction emissions in addition to emissions from other Projects in the Bay Area may result in cumulative effects to air quality for the Enhanced EIS/EIR

Alignment. However, construction activities are subject to control measures established by BAAQMD to reduce impacts from the Project.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 – Central Subway Fourth/Stockton Alignment A (LPA)

Construction of the guideway would occur by TBM and decked cut-and-cover methods. The Union Square/Market Street Station would be constructed by both cut-and-cover and Sequential Excavation Method (SEM). The Moscone Station would be constructed by cut-and-cover. The Chinatown Station would be mined using the SEM method. For more construction details, see Section 6.1.

Dust Emissions. Dust impacts would be the same as those described for Alternative 2 with a few exceptions. It is expected that use of the TBM would help reduce dust emissions during construction of the tunnel. Construction activities would occur over an estimated period of approximately six years and would occur over a surface area of about five acres, which results in less surface area exposed.

Impacts should be similar if the North Beach Construction Variant is chosen. This option would have a TBM retrieval shaft on Columbus Avenue next to Washington Square Park. However, the exposed area is relatively small and control measures are being included in the Project to reduce dust emissions.

The same dust control measures listed under Alternative 2 would be incorporated into the Fourth/Stockton Alignment Option A. The application of these dust control measures would eliminate annoyances.

Exhaust Emissions. The impacts and control measures related to exhaust emission for the Fourth/Stockton Alignment Option A would be the same as those identified under Alternative 2.

Mitigation Measures

No mitigation measures would be required.

Alternative 3 - Central Subway Fourth/Stockton Alignment B (Modified LPA)

Construction impacts of the Fourth/Stockton Alignment B would be the same as those described for Alternative 3A. The Union Square/Market Street and Moscone Stations would be constructed using a decked cut-and-cover approach. The Chinatown Station would be mined using the SEM method. For more details, see Section 6.2.

Dust Emissions. Dust impacts and control measures would be the same as those described for Alternative 3A except as noted here. Construction would occur over an estimated period of approximately 5.5 years, which is a shorter construction period than other alternatives, and would occur over a surface area of about five acres.

Exhaust Emissions. The impacts and control measures related to exhaust emission for the Fourth/Stockton Alignment Option B would be the same as those identified under Alternative 2.

Mitigation Measures

No mitigation measures would be required.

6.15 CONSTRUCTION IMPACTS AND MITIGATION FOR NOISE AND VIBRATION

Alternative 2 – Enhanced EIS/EIR Alignment

Noise. Noise impacts from construction would differ for the at-grade and the underground section of the Project. At-grade construction noise would be generated by heavy equipment used during major construction periods as close as 25 feet to existing structures along the alignment. Table 6-3 shows the estimated maximum noise levels for the different stages of at-grade construction at 100 feet from a receiver.

Most of the underground tunnel activities would not be audible at street level. Support equipment for the excavation and tunneling would be located at street level and could include ventilation fans, compressors, electric generator sets and a concrete batch plant. Construction of the stations would include equipment

TABLE 6-3

ESTIMATED PEAK HOUR CONSTRUCTION NOISE LEVELS

Construction Phase	Loudest Equipment	Noise Level at 100 feet Lmax (dBA)
Clearing and grubbing	Bulldozer, Backhoe, Haul Trucks	86
Earthwork	Scraper, Bulldozer	88
Foundation	Backhoe, Loader	85
Structures	Crane, Loader, Haul Truck	86
Base preparation	Trucks, Bulldozer	88
Paving	Paver, Pumps, Haul Trucks	89
Source: Transit Noise and Vibration Impact Assessment, FTA, May 2006.		

at street level such as a crane, excavator, loader, and haul trucks. Construction activities at each of the stations could potentially affect nearby noise sensitive receivers. Tunnel excavation material would be removed and stock-piled at the tunnel construction shaft on Fourth Street. Haul trucks, used to remove the excavated material, would be a potential source of noise along city streets. Haul routes would have to be selected to avoid impacting residential areas, schools and playgrounds.

Vibration. As with noise, the vibration from construction is temporary, and, as long as the vibration does not cause any damage to buildings, there would be no permanent impacts. The vibration processes that are likely to be either intrusive or have the potential for damaging buildings include: pile driving, demolition with jack hammers and hoe rams, and the use of tracked vehicles close to buildings. Potential for impact from construction vibration is controlled by adhering to vibration limits for settlement of structures and requiring monitoring to assure that vibration is within specified limits during construction activities. These types of measures will be included in the construction specifications for this Project and there should not be any vibration-induced damage to buildings during construction and intrusive vibration should not last for more than a few days.

Common vibration producing equipment used during at-grade construction activities include pile drivers, jackhammers, pavement breakers, hoe rams, augur drills, bulldozers and backhoes. No pile driving is expected during construction of this Project. Pavement breaking and soil compaction would probably be the activities that produce the highest level of vibration. Table 6-4 presents various types of construction equipment measured under a wide variety of construction activities with an average of source levels reported in terms of velocity levels. Although the table gives one level for each piece of equipment, it should be noted that there is a considerable variation in reported ground vibration levels from construction activities based on soil conditions. The data provides a reasonable estimate for a wide range of soil conditions.

TABLE 6-4

VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment		**PPV at 25 ft. (in/sec)**	**Approximate Lv at 25 ft.**
Pile Driver (impact)	upper range	1.518	112
	Typical	0.644	104
Pile Driver (sonic)	upper range	0.734	105
	Typical	0.170	93
Clam shovel drop (slurry wall)		0.202	94
Hydromill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Lv = RMS velocity in decibels (VdB) re 1 micro-inch/sec
Source: *Transit Noise and Vibration Impact Assessment,* FTA, May 2006.

Equipment used for underground construction, such as TBM and mine trains would generate vibration levels that could result in audible ground-borne noise levels in residential buildings at the surface. The operation of the mine trains would be the major source of underground construction vibration since it would operate continuously during the excavation, mining and finishing of the tunnel. Since underground construction is expected to occur continuously over a 24-hour day, there is the potential for these operations, particularly the mine trains, to be perceptible during the nighttime sleep hours when background noise levels inside the residential buildings are very low.

Recent transit tunneling projects, such as the Metro Red Line Project in Los Angeles, used a driven-shield TBM for the mining work. A ground vibration study of the mining operations was conducted to estimate construction vibration both from actual excavation of the tunnel and from the trains used to haul mine spoils out of the tunnel. The primary conclusions of that study are:

- Vibration from the tunnel excavation would rarely be a significant problem in adjacent communities, although the vibration can be sufficient to cause several hours of intrusive low level ground-borne vibration at residential buildings above the tunnel.
- Although well below any damage thresholds, vibration from mine trains has the potential of causing intrusive ground-borne noise inside buildings above the tunnel.

Similar effects from the mining operations for this Project would be expected.

Mitigation Measures

Noise and vibration mitigation during construction will require improvement measures to meet the San Francisco Noise Ordinance Limits. In addition, all construction activities within 200 feet of a historic building or cultural resource structure will have to meet the vibration limits and monitoring requirements presented in Section 4.12 Noise and Vibration Affected Environment. The final determination of construction noise and vibration impacts will depend on the equipment and activities used by the Contractor to construct the proposed Central Subway Project. During final engineering design for the LPA, a more detailed construction noise and vibration analysis will be prepared to assess potential impacts to receivers at construction staging areas, tunnel portals, cut-and-cover station construction, and those within close proximity to the underground mining and excavation operations. Since this information on means and methods of construction is not available now, noise control measures are presented as typical control measures which have been used on other similar construction Projects. The Contractor for this Project would be responsible for hiring an acoustical consultant to prepare a Noise and Vibration Control Plan that would identify all potential impacts that may occur during construction and would provide adequate control measures to clearly demonstrate that the noise and vibration criteria and limits presented in this SEIR/SEIS would be achieved.

Noise control measures for construction noise would include the following:

- Use noise control devices, such as equipment mufflers, enclosures, and barriers. Natural and artificial barriers such as ground elevation changes and existing buildings can shield construction noise. Stage construction operations as far from noise sensitive uses as possible;

- Avoid residential areas when planning haul truck routes;
- Maintain all sound-reducing devices and restrictions throughout the construction period;
- Replace noisy equipment with quieter equipment (for example, a vibratory pile driver instead of a conventional pile driver and rubber-tired equipment rather than track equipment); and
- Change the timing and/or sequence of the noisiest construction operations to avoid sensitive times of the day.
- Hire or retain the services of an Acoustical Engineer to be responsible for preparing and overseeing the implementation of the Noise Control and Monitoring Plans.
- Prepare a Noise Control Plan that includes an inventory of construction equipment used during daytime and nighttime hours, estimate of Projected construction noise levels, and locations and types of noise abatement measures that may be required to meet the specified noise limits.
- In the case of nighttime construction, the Contractor will comply with the provisions of the nighttime noise variance issued by the San Francisco Police Department.
- Conduct periodic noise measurement in accordance with an approved Noise Monitoring Plan, specifying monitoring locations, equipment, procedures, and schedule of measurements and reporting methods to be used.
- During nighttime hours, use equipment at the surface of the construction site that, operating under full load, is certified to meet the specified lower noise level limits than standard equipment.

The Contractor would be responsible for the protection of vibration sensitive historic buildings structures that are within 200 feet of any construction activity. These historic structures have been identified in the Historic Architectural Survey Report (Garcia, 2007). The maximum peak particle vibration (PPV) velocity level, in any direction, at any of these structures should not exceed 0.12 inches/second for any length of time. The Contractor would be required to perform periodic vibration monitoring at the closest structure to any construction activities using approved seismographs. If at any time the construction activity exceeds this level, that activity will immediately be halted until such time as an alternative construction method can be used that would result in lower vibration levels.

Alternative 3 - Fourth/Stockton Alignment Option A (LPA)

Noise and vibration during construction would be similar to the Alternative 2. The exception would be there is one double-track portal located on Fourth Street between Townsend and Brannan Streets. The portal construction on Third Street as part of the Enhanced EIS/EIR Alignment would be eliminated. Potential impacts under this alternative would be limited to those buildings along Fourth Street.

Mitigation Measures

The mitigation measures would be the same as those identified for Alternative 2.

Alternative 3 – Fourth/Stockton Alignment Option B (Modified LPA)

Noise and vibration during construction would be similar to Alternative 2 except at the double-track portal located on Fourth Street between Bryant and Harrison Streets. The portal construction on Third Street as part of Alternative 2 would be eliminated. Potential impacts under this alternative would be limited to those buildings along Fourth Street from Bryant Street south.

Mitigation Measures

The mitigation measures would be the same as those identified for Alternative 2.