THIRD STREET LIGHT RAIL PROJECT

VOLUME 1

FINAL ENVIRONMENTAL IMPACT STATEMENT

FINAL ENVIRONMENTAL IMPACT REPORT

Federal Transit Administration - U.S. DOT
City and County of San Francisco
Planning Department

November 1998

State Clearinghouse #96102097
SF Case File No. 96.281E

FINAL ENVIRONMENTAL IMPACT STATEMENT/ FINAL ENVIRONMENTAL IMPACT REPORT

for the

THIRD STREET LIGHT RAIL PROJECT IN THE CITY AND COUNTY OF SAN FRANCISCO

prepared by the

US DEPARTMENT OF TRANSPORTATION
FEDERAL TRANSIT ADMINISTRATION

and the

CITY AND COUNTY OF SAN FRANCISCO PLANNING DEPARTMENT

Pursuant to

National Environmental Policy Act (42 USC э4332) 49 USC Chapter 53, 49 USC э303, 16 USC э470, 23 CFR Part 771, 23 CFR Part 450, Executive Order 12898; and California Environmental Quality Act, PRC 21000 *et seq.*; and the State of California CEQA Guidelines, California Administrative Code, 15000 *et seq.*

Date: NOV 0 6 1998 **For FTA:**

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Date: November 6, 1998 **For San Francisco Planning Department:**

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ABSTRACT: This document describes and summarizes the transportation impacts, environmental impacts, and cost of transportation improvements in the Third Street Corridor in San Francisco, California. The San Francisco Public Transportation Commission/Municipal Railway proposes to extend light rail into the southeastern quadrant of the City. Alternatives being considered are the No Project, No Build/Transportation System Management, and Light Rail Alternative. The Light Rail Alternative would be constructed in two phases. The first phase, the Initial Operating Segment (IOS), would extend the J-Church light rail line from the MUNI Metro Extension along Third Street and Bayshore Boulevard to a southern terminal at the Caltrain Bayshore Station near the County line, a total of 5.4 miles. The IOS would be operational in 2003. A subsequent phase, the New Central Subway, would not be constructed until sometime after 2005 and would establish an independent light rail line traveling from the Caltrain Bayshore Station along Bayshore and Third into a new subway traversing Downtown to Chinatown, a total of 7.0 miles. Although this document analyzes the New Central Subway at the same level of detail as the IOS, this phase of the project would be designed and constructed at a future time period (about 2008). Subsequent environmental analysis of the subway may be required.

On June 23, 1998, the San Francisco Public Transportation Commission selected the Light Rail Alternative as the Locally Preferred Alternative, which includes the mixed-flow option for the Third Street commercial core, high platform stations, a bi-directional alignment across the Fourth Street bridge, and the Western Pacific site (west end) for the new light rail maintenance facility. The Final Environmental Impact Statement/Report describes the Locally Preferred Alternative and incorporates, modifications to the Project Description and Impact Analysis resulting from responses to comments, on the Draft Environmental Impact Statement/Report and preliminary engineering for the Light Rail Alternative.

Impacts for the Light Rail Alternative include displacement of four businesses; alteration of visual character of the Islais Creek bridge; on-street parking displacement at station locations along Third Street; traffic flow and parking disruption during construction; degraded traffic service levels at several intersections on Third Street and Fourth Street; pedestrian overcrowding at sidewalks surrounding subway station access points at Moscone, Market Street, and Union Square stations; displacement of a trunk sewer line at Third/Mission; possible displacement of the Union Pacific Sunnydale spur track; and vibration impacts to residences, two churches, and one library located adjacent to the alignment on Third Street. Mitigation measures are proposed to reduce project-related impacts to a less-than-significant level, except for the preclusion of bicycle lanes on Third Street. The Light Rail Alternative would contribute to cumulative traffic congestion on Third Street.

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PREFACE

The Final Environmental Impact Statement/Final Environmental Impact Report (FEIS/FEIR) represents the culmination of a lengthy planning and environmental review process for the Third Street Light Project. After an initial screening process, three alternatives for the Third Street Corridor were identified and evaluated: 1) No Project Alternative; 2) No Build/Transportation System Management Alternative; and 3) Light Rail (Build) Alternative. Technical analyses of each alternative and the Light Rail Alternative design options were conducted for a range of environmental issues. The results were compiled in the Draft Environmental Impact Statement/Draft Environmental Impact Report (DEIS/DEIR) and circulated for public and agency comment between April 3 and May 19 of 1998. A Public Hearing on the DEIS/DEIR was held before the San Francisco Planning Commission on May 7, and a hearing on the selection of the Locally Preferred Alternative was held before the San Francisco Public Transportation Commission on June 23, 1998. Written and oral comments on the DEIS/DEIR were received from a total of 29 agencies, organizations, and individuals.

The FEIS/FEIR is presented in two volumes. Volume I of this FEIS/FEIR contains information regarding the purpose and need for the project, alternatives considered, the transportation and environmental effects for the alternatives, the financial plan and analysis for the alternatives, and an evaluation of alternatives. Volume II of this FEIS/FEIR (Response to Comments) contains copies of all written and oral comments received on the DEIS/DEIR and the responses to those comments. The responses, which follow each comment letter, were grouped by category - agency, special interest group, individual, and public hearing comments - and numbered sequentially by comment for easy cross-referencing. Volume II also includes Staff Initiated Changes to the Light Rail Alternative, selected on June 23, 1998, by the San Francisco Public Transportation Commission as the Locally Preferred Alternative. If a particular response to a comment or staff initiated change required a change to the text of the DEIS/DEIR, the revised paragraph or paragraphs are included as part of the response. New text is inserted into the paragraph and identified by bold typeface and underline. Deleted text is indicated by a "strike-through."

Volume I incorporates the text changes to the DEIS/DEIR identified in Volume II. As in Volume II, the new text is identified by bold typeface and underline. Deleted text is removed. Much of the revised text pertains to modifications to the Light Rail Alternative resulting from engineering refinements responsive to public and agency comments to the DEIS/DEIR. A copy of this FEIS/FEIR is being provided to those agencies, organizations, and individuals that commented on the DEIS/DEIR.

This FEIS/FEIR is prepared pursuant to the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). There are a few differences between these regulations that affect reporting in this document. CEQA requires identification of and mitigation for significant adverse impacts in an EIR, while under NEPA, mitigation is considered for all of the adverse impacts of a project, regardless of significance. This combined NEPA/CEQA document identifies the impacts of the alternatives regardless of whether they would be considered as significant under CEQA and proposes mitigation wherever practicable to reduce identified adverse impacts. Specific discussion of impact significance and mitigation, as well as a summary of unavoidable significant impacts, growth-inducing impacts, and cumulative impacts in accordance with CEQA, is provided in Chapter 6.0.

Technical studies, which were prepared as part of the environmental investigations for the Third Street Light Rail Project, are available for review at the San Francisco Planning Department, 1660 Mission Street, San Francisco, CA.

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ICF Kaiser Engineers, Inc.

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Korve Engineering • Pittman & Hames
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S.0 EXECUTIVE SUMMARY

S.1 PROJECT PURPOSE AND NEED

S.1.1 PURPOSE OF PROPOSED ACTION

The San Francisco Municipal Railway (MUNI) is seeking federal funding assistance to construct the proposed Third Street Light Rail Project (Project). Having completed the Major Investment Study (MIS) for the Third Street Corridor (Corridor), the initial planning phase in the federal funding process, MUNI has initiated the federal National Environmental Policy Act (NEPA) and the state California Environmental Quality Act (CEQA) environmental processes for the Project in order to assess the potentially significant environmental impacts of the Project alternatives and to qualify for federal funding. After the Environmental Impact Statement/Environmental Impact Report (EIS/EIR) is completed, the City and County of San Francisco (City) will consider adoption and use of local funds for the preferred alternative (or a portion thereof), which will be selected by the San Francisco Public Transportation Commission in May 1998. The Federal Transit Administration (FTA) will then determine if the preferred alternative meets their transit investment objectives and whether to recommend federal funding for the Project. If the City does go forward with the Project, the City intends to request a letter from FTA which authorizes the City to use local funds for the first phase of the Project as the local contribution toward a future, yet to be secured, federal grant. This letter from FTA is called a Letter of No Prejudice.

S.1.2 NEED FOR TRANSPORTATION IMPROVEMENTS IN THE CORRIDOR

The Project would address deficiencies in the transit system serving the communities in the southeastern part of San Francisco, including deficiencies that exist at present and those that are anticipated to exist during the 20-year planning horizon (2015). In addition, the Project is also intended to serve as a key infrastructure improvement to help support the economic and physical revitalization of the Bayview Hunters Point commercial core along Third Street and the planned development in Mission Bay. It would also serve as the key element in establishing a Downtown Subway identified in the San Francisco Transportation Authority's Four Corridor Plan.

MUNI Service Reliability Problems In The Third Street Corridor

Buses caught in Corridor traffic congestion often provide unreliable service south of Downtown. Currently, passengers may experience overcrowding and extended waiting times between buses, as well as slower operating times and increased travel times. This situation is projected to worsen as traffic in Downtown and along the Corridor increases to projected 2015 levels.

Inadequate Connectivity Between Corridor Transit Lines And Other Transit Services

Residents of the communities in the Corridor perceive that they do not enjoy the same quality transit connections to the MUNI Metro rail system and to regional transit services such as Bay Area Rapid Transit (BART) as do residents in other parts of the City.

Projected Increases In 2015 Transit And Auto Travel Demand In The Corridor

As presented in **Table S-1**, a 39 percent increase in Corridor population and a 35 percent increase in Corridor employment is anticipated by 2015. Much of the population and employment growth will result from development in Mission Bay which is projected to include a new University of California campus, research and development functions, over 6,000 dwelling units, a cineplex, a 500-room hotel, and commercial uses. Other development proposals in the Corridor, such as the new Giants ballpark (Pacific Bell Ballpark), Candlestick Mills Mall and the new 49ers stadium, San Francisco Executive Park development, and Hunter's Point Reuse Plan would contribute to this growth.

TABLE S-1

**POPULATION AND EMPLOYMENT PROJECTIONS
1995 AND 2015**

	Population				Employment			
Area	1995	2015	Difference	% Change	1995	2015	Difference	% Change
Corridor	113,380	157,246	43,866	39%	277,348	373,624	96,276	35%
SF	759,906	795,363	35,457	5%	534,610	650,057	115,447	22%
Brisbane	10,255	12,549	2,294	22%	6,216	11,992	5,776	93%

Source: Metropolitan Transportation Commission/Association of Bay Area Governments Land Use Data Projections '96 and San Francisco Cumulative Update to Projections '96.
Notes: Corridor is defined by the MTC Travel Analysis Zones that are included in the Study Area identified in Figure 1-2.

Projected Increases In 2015 Transit Travel Times In The Corridor

As a result of the projected population and employment growth in the Corridor, traffic congestion on major highways and arterials, particularly Highway 101 and Third Street, is expected to increase substantially. Highway 101 at Cesar Chavez is expected to be Level of Service (LOS) F (excessive delays) and LOS E (significant delays) at intersections of Third/ Cesar Chavez and Third/King.

Integration Of Transportation Improvements With Community Revitalization Along Third Street

The South Bayshore Area Plan of the City's General Plan addresses the need for transit improvements by calling for the integration of transit- and pedestrian-oriented land use and new development along Third Street in concert with a new light rail investment.

Air Quality Issues

The Bay Area air basin is designated as a state non-attainment area (not in compliance with state air quality standards) for ozone and small-diameter particulate matter. Reducing dependence on automobiles for Corridor trips will reduce mobile emissions in the region.

S.1.3 PROJECT GOALS AND OBJECTIVES

In accordance with the revised FTA transit planning guidelines, MUNI has identified seven principal goals to be used to guide the evaluation of the No Build/TSM and Light Rail Alternatives. They are:

1. <u>Travel and Mobility Goal</u>. Improve transit service to, from, and within the 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.
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.

S.2 ALTERNATIVES

S.2.1 DEVELOPMENT AND SELECTION OF ALTERNATIVES

The Bayshore Corridor System Planning Study[1], completed by MUNI in December 1993, was the first step in the planning process to implement major public transportation improvements in the southeastern quadrant of the City. The study recommendations emphasized the importance of implementing light rail service along Third Street in the Corridor and the opportunity to use transportation investments to support economic revitalization efforts in the Corridor. In February 1994, the San Francisco Public Utilities Commission (the predecessor of the Public Transportation Commission) approved a resolution (#94-0044) to carry forward light rail through the federal capital project development process.

Two public meetings were held in November 1996 during the Scoping Process to receive public commentary on the environmental issues associated with the Project alternatives. As a result of public input during the Scoping Process and at the neighborhood workshops and economic forums, the following modifications were made to the Light Rail Alternative:

- Multiple traffic lane and streetscape options were incorporated into the light rail surface alignment along Third Street between Kirkwood and Thomas Avenues. One-lane, two-lane, and flexible (tow-away) lane configurations were developed, each with varying sidewalk widths, curb parking patterns and, in the case of the one-lane option, the opportunity for establishing a bike lane. In addition, a fourth option that permitted track and light rail to share a lane in each direction also was developed. This "mixed-flow" option would retain curb parking on Third Street along the nine-block commercial core as well as providing a landscaped median.

- Center and side platform configurations were considered on a station-by-station basis to allow left-turn pockets, added parking, and streetscape enhancements where desired.

- Several station locations were newly-designated or reassigned: 1) the proposed station at Thomas Avenue was moved to Williams-Van Dyke to coincide with the transfer point for the 54-line; 2) a station was added at Third/Shafter to serve the southern end of the Third Street commercial core; 3) a

[1] San Francisco Municipal Railway, *Bayshore Transit Study*, December 1993; available for review in Project File #96.281E at the San Francisco Planning Department, 1660 Mission Street, San Francisco.

station at the intersection of Third and South Streets in Mission Bay was added to serve the planned University of California campus; and 4) a station was added at Third and Mission Rock Streets in Mission Bay to serve the planned uses south of Mission Creek.

- A bi-directional alignment on the Fourth Street bridge across Mission Creek was added as a design option in order to provide better access to the Caltrain Terminal at Fourth and King Streets, reduce conflict between the light rail line and vehicular/pedestrian activity at the Pacific Bell Ballpark, and reduce capital costs associated with two separate rights-of-way.

- A “hybrid” (low, mini-high) station platform design was added to minimize potential visual intrusiveness of the station platforms while still maintaining compatibility with standard high-floor light rail vehicles.

- An additional location for the new LRV maintenance facility at a former Western Pacific railyard adjacent to Pier 80 was identified.

The Light Rail Alternative incorporated a series of design options that were subsequently examined from technical, financial, environmental, economic revitalization, and community perspectives. The screening of design options was used to determine which options should be carried forward for evaluation in the Draft Environmental Impact Statement/Draft Environmental Impact Report (DEIS/DEIR).

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) on July 8, 1997, narrowed the design options for the Light Rail Alternative. The PTC eliminated the 16th/I-280/King alignment through Mission Bay, the Central Subway alignment via Kearny, and the Downtown Surface Route via Market or Washington. A description of three alternatives carried forward in the DEIS/DEIR is provided below.

Possible future extensions (branches of Third Street light rail) were addressed in the 1993 Bayshore Transit Study and include possible branches to Hunters Point Shipyard, Candlestick Point, and the Balboa Park BART Station. These possible future branches of the proposed Project, including a possible branch to the planned stadium and mall at Candlestick Point, would need subsequent conceptual engineering and environmental analysis if proposed at a future date. No funding for these possible branches has been identified.

S.2.2 LIGHT RAIL (BUILD) ALTERNATIVE (PROPOSED PROJECT)

The Light Rail Alternative would construct a light rail line linking some or all of the Chinatown, Downtown, South of Market, Potrero Hill, Bayview Hunters Point, and Visitacion Valley/Little Hollywood neighborhoods, primarily along Third Street. In addition, a new light rail maintenance and storage facility would also be constructed on approximately 5.3 hectares (13 acres) of western sections of the former Western Pacific rail yard and north of Pier 80. The line would operate at service levels comparable to existing MUNI Metro service frequencies and hours.

The Light Rail Alternative would be constructed in two phases. The two phases of the Light Rail Alternative, presented in **Figures S-1 and S-2**, are:

- Light Rail Alternative - Initial Operating Segment (IOS), to be operational in 2003
- Light Rail Alternative - New Central Subway, to be constructed sometime after 2008

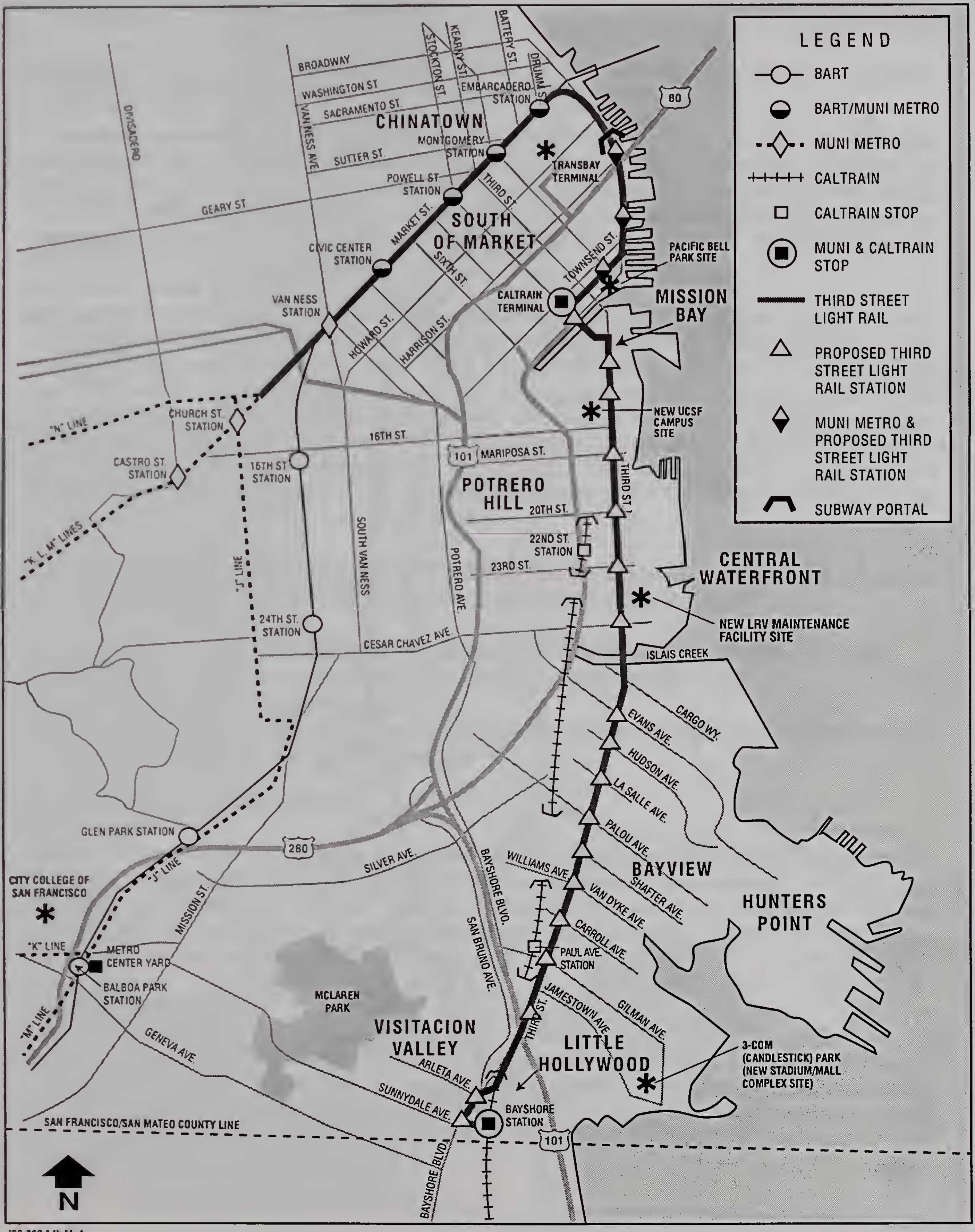

FIGURE S-1

LIGHT RAIL ALTERNATIVE – INITIAL OPERATING SEGMENT

(via Market Street Subway and the MUNI Metro Extension)

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.

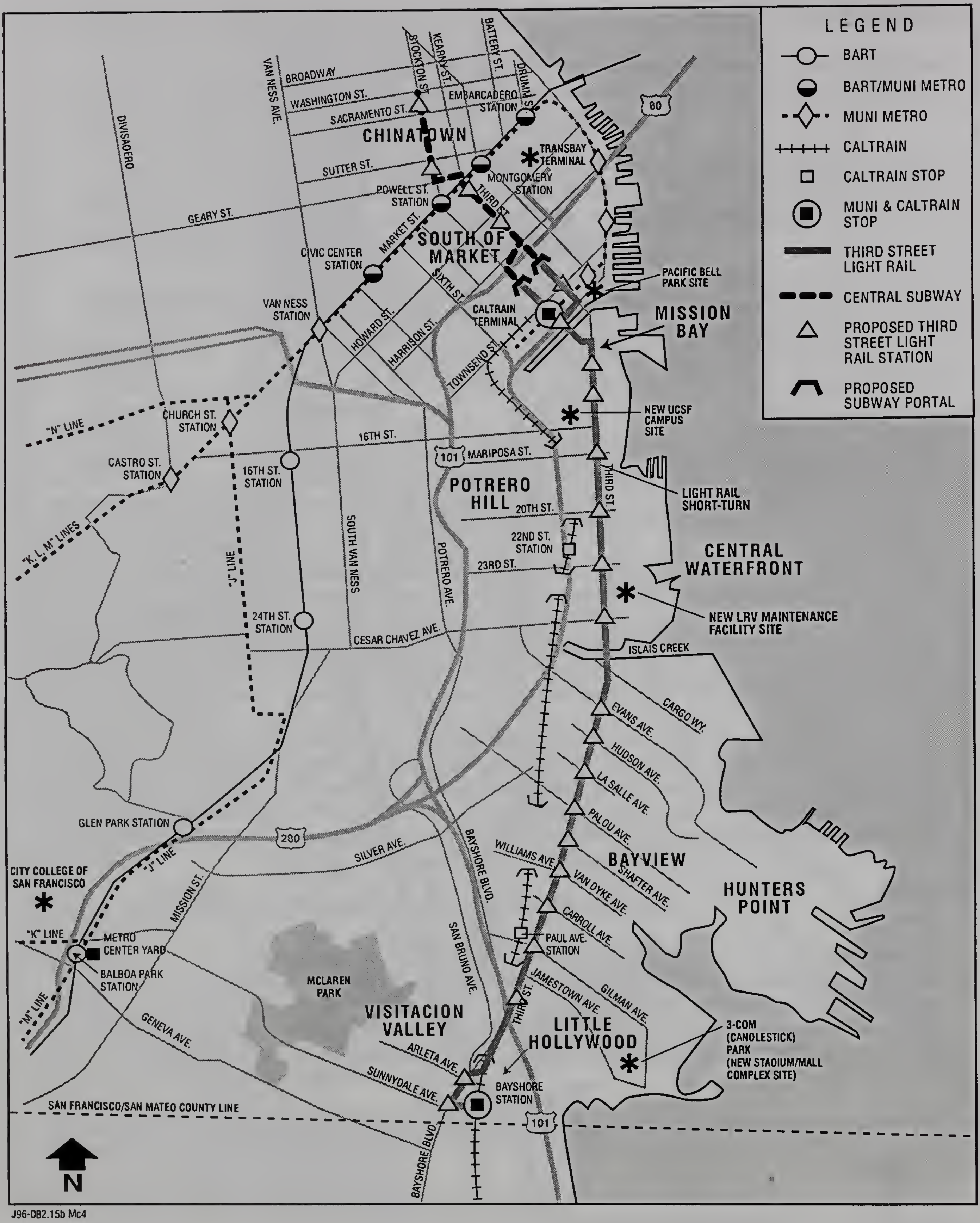

FIGURE S-2

LIGHT RAIL ALTERNATIVE – NEW CENTRAL SUBWAY

(via Third and Stockton)

Source: ICF Kaiser Engineers, Inc.

Third Street Light Rail EIS/EIR

Because of the later construction schedule for the New Central Subway, supplemental environmental analysis may be required prior to the final design of the subway.

The Light Rail Alternative - IOS represents an initial phase of the Project. The existing J-Church service would extend from the Market Street Subway and the MUNI Metro Extension along Third Street and Bayshore Boulevard to the Caltrain Bayshore Station near the County line. Temporary private shuttles could be provided from this terminus to the proposed mall and stadium at Candlestick Point until the need for possible future planning of a branch line of Third Street light rail is established. The total length of the IOS would be 8.7 kilometers (5.4 miles).

The Light Rail Alternative - New Central Subway represents the full-build or completed project, operating as an independent line (not integrated with the MUNI Metro system) from the Caltrain Bayshore Station along Bayshore Boulevard and Third Street into a new Central Subway north of Brannan Street. The northern terminus of the Central Subway would be a station at Stockton and Clay Streets. The total length of this alignment would be 11.3 kilometers (7.0 miles), including 2.8 kilometers (1.75 miles) for the New Central Subway portion north of King Street. The IOS would require 25 additional light rail vehicles (LRVs) to operate the line and to accommodate 2015 demand. Three additional LRVs would be required to operate the New Central Subway. By replacing diesel buses with LRVs, MUNI's diesel bus peak-vehicle requirement will be reduced by 30 to 35 buses.

On June 23, 1998, the San Francisco Public Transportation Commission selected the Light Rail Alternative as the Locally Preferred Alternative, which includes the following:

- **Mixed-flow alignment through the Third Street commercial core in Bayview Hunters Point;**
- **Bi-directional operation on the Fourth Street bridge crossing Mission Creek;**
- **High platforms at surface stations; and**
- **A new light rail maintenance and storage facility at the western end of the former Western Pacific site, now owned by the Port of San Francisco.**

S.2.3 NO PROJECT ALTERNATIVE

The No Project 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 Corridor. The No Project Alternative, therefore, includes the existing MUNI route network, fleet size and fleet mix, facilities, and existing service frequencies as well as the existing roadway system. The No Project Alternative would not accommodate 2015 demand.

Existing Transit System

Within the Corridor, service from the southern end of the Corridor to Downtown is provided by diesel bus lines, particularly the 15-Third bus line and the 9X-San Bruno Expresses (**Figure S-3**). The 15-line, which currently carries over 25,000 daily riders, operates between City College and North Beach. For the No Project Alternative, the total bus fleet size, including spare vehicles, would be 764. The total LRV fleet size would be 136.

S.2.4 NO BUILD/TRANSPORTATION SYSTEM MANAGEMENT (TSM) ALTERNATIVE

The No Build/TSM Alternative would include the transit and roadway system and improvements to the system identified in the No Project Alternative in combination with added transit service in the Corridor, primarily on the 15-line, to meet 2015 demand.

For the No Build/TSM Alternative, MUNI would need 40 new buses (33 articulated diesel and 7 trolley buses), including spare buses (the additional vehicles needed in the peak to compensate for those that are being repaired), to meet peak period demand in 2015. For this scenario, the total bus fleet size,

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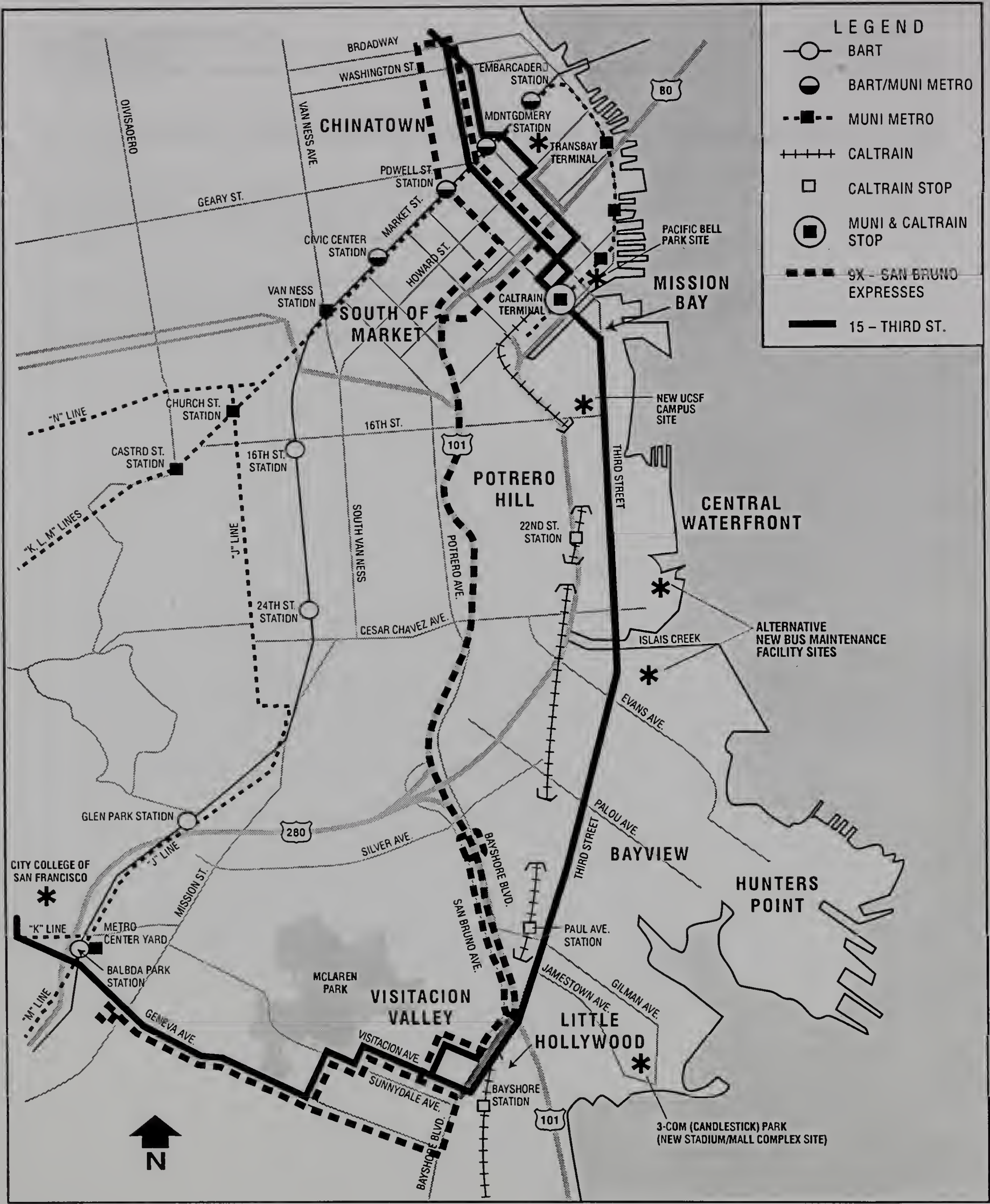

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FIGURE S-3

TRANSPORTATION NETWORK FOR THE NO PROJECT ALTERNATIVE AND THE NO BUILD/TSM BUS ALTERNATIVE

Source: ICF Kaiser Engineers, Inc.

Third Street Light Rail EIS/EIR

including spares, would be 804, or 40 more buses than the No Project Alternative (existing conditions). The total light rail fleet size, including spares, would be 136, or the same as in the No Project Alternative[2].

S.2.5 OPERATING STATISTICS FOR THE LIGHT RAIL, NO PROJECT, AND NO BUILD/TSM ALTERNATIVES

A summary of the operating statistics for the Light Rail Alternative (IOS and New Central Subway) is presented in **Table S-2** and compared with the No Project Alternative and No Build/TSM Alternative. As indicated in **Table S-2** the No Build/TSM Alternative would increase existing annual systemwide bus hours by 110,000 reflecting the additional service on the 15-Third bus line to accommodate 2015 demand. The Light Rail Alternative would reduce systemwide bus hours but increase annual light rail operating hours by approximately 72,000 and 106,000, respectively, for the IOS and the New Central Subway.

TABLE S-2

ANNUAL OPERATING STATISTICS FOR THE PROJECT ALTERNATIVES (REVISED JULY 21, 1998)

Alternative	Peak Headways 15 Line	Diesel/Trolley Peak Demand (Systemwide)	Total Annual Diesel/Trolley Bus Hours (Systemwide)	Peak Headways (1): Third Street Light Rail	LRV Fleet Peak Demand (Systemwide)	Annual LRV Car-Hours (Systemwide)
Existing (1997-1998) (No Project Alternative)	6 minutes	373 diesel buses/ 263 trolley buses	2.29 million	–	107 LRVs	395,600
No Build/ TSM (2015)	5 minutes	400 diesel buses/ 269 trolley buses	2.40 million	–	107 LRVs	395,600
Light Rail Alternative - IOS (2015)	–	Plan A:(2) 370 diesels/269 trolleys Plan B: 369 diesels/269 trolleys	Plan A: 2.26 million/Plan B: 2.27 million	6 minutes	129 LRVs	471,500(3)
Light Rail Alternative - New Central Subway (2015)	–	Plan A: 365 diesels/258 trolleys Plan B: 365 diesels/258 trolleys	Plan A: 2.23 million/Plan B: 2.23 million	5 minutes	132 LRVs	507,000(3)

Notes: (1) "Headways" refers to the time between transit vehicles on a given line
(2) Plans refer to Bus Route Plans associated with the Light Rail Alternative.
(3) Assumes one-car trains operating in the peak and midday for the IOS and for the New Central Subway.

[2] San Francisco Municipal Railway, *Light Rail and Bus Transit Operating Plan*, February 1997, revised September 25, 1997; available for review in Project File 96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

S.2.6 CAPITAL COST SUMMARY

Light Rail Alternative

The total capital cost for the IOS, including the purchase of 26 additional LRVs to accommodate 2015 demand and the construction of the initial phase for the new LRV maintenance and storage facility, is estimated at $408.9 million (1997 dollars). The base capital cost estimate assumes that:

- light rail uses the Fourth Street bridge in both directions;
- the two-lane design option is selected for the Third Street commercial core;
- ballast mats are installed to mitigate the vibration impacts anticipated from operating the existing LRV fleet; and
- hybrid low platforms are used for all surface stations.

The cost estimate would be greater if any other options replaced those in the base case, including use of the Third and Fourth Street bridges, selection of the one-lane or mixed-flow design option in the Third Street commercial core, installation of floating slabs rather than ballast mats to mitigate vibration impacts, or additional features to the new LRV maintenance facility.

Construction of the New Central Subway, including three additional LRVs and the same base case assumptions identified for the IOS, would require $505.9 million (1997 dollars). The combined total capital cost estimate for the Light Rail Alternative is $914.2 million.

No Build/TSM Alternative

The No Build/TSM Alternative requires the purchase of 33 articulated diesel buses and seven articulated trolley buses (including spares) to meet 2015 demand. Existing MUNI bus storage and maintenance facilities could not accommodate the additional buses. As a result, a new 40-bus operations and maintenance facility would need to be constructed at the Western Pacific site or the Cargo Way site. The total capital cost of the No Build/TSM Alternative is $53.8 million.

S.2.7 OPERATING & MAINTENANCE (O&M) COST SUMMARY

Compared with the No Project Alternative, total systemwide O&M costs increase for the No Build/TSM and Light Rail Alternatives. Total annual systemwide O&M costs are approximately $10 million more for the No Build/TSM Alternative and the IOS than the No Project Alternative, reflecting the increased service to accommodate 2015 demand. The additional route miles and five minute peak service levels increase the annual O&M costs for the New Central Subway approximately $3.6 million over the IOS. The No Build/TSM Alternative and the Light Rail Alternative differ in bus and LRV O&M costs because of the use of articulated buses and light rail, respectively, to meet projected 2015 demand.

In 2003, the implementation year for the Third Street Light Rail Project, annual systemwide O&M costs would be similar for the No Project and No Build/TSM Alternatives, since 2003 demand is not expected to warrant substantially increased service for the No Build/TSM Alternative. Annual O&M costs for the IOS in 2003 would be over $4 million greater than the No Build/TSM Alternatives, reflecting the increased costs to operate light rail and a new LRV maintenance facility.

S.3 TRANSPORTATION ANALYSIS

Section S.3.1 provides a summary of existing and 2015 general transportation findings for the Corridor. Section S.3.2 provides a table summary of major transportation-related impacts (transit, traffic, freight, parking, and pedestrian and bicycle circulation) for the Light Rail, No Build/TSM, and No Project Alternatives.

S.3.1 SUMMARY OF GENERAL TRANSPORTATION FINDINGS

Transit Demand

Table S-3 presents existing and 2015 weekday transit ridership estimates for the Corridor. Currently, about 66,000 person-trips are made by bus each weekday in the Corridor. Substantial increases in Corridor population and employment are anticipated in the future. By 2015, it is estimated that patronage demand for Corridor transit services will increase by between 105 and 116 percent over existing conditions. Without any improvement to transit service in the Corridor, substantial overcrowding would occur on all bus lines serving the Corridor. Without implementation of light rail, about 40 new articulated buses would be required to serve the additional future demand.

TABLE S-3

ESTIMATED WEEKDAY TRANSIT RIDERSHIP

LRT/BUS LINE	EXISTING (1996)	2015 NO PROJECT & NO BUILD/TSM ALTERNATIVES	2015 LIGHT RAIL ALTERNATIVE IOS	2015 LIGHT RAIL ALTERNATIVE NEW CENTRAL SUBWAY
Light Rail Lines in Corridor:				
MUNI Metro Extension LRT [1]	n/a	11,240	9,050	2,020
Third Street LRT [2]	n/a	n/a	71,010	92,110
Subtotal	**n/a**	**11,240**	**80,060**	**94,130**
Bus Lines in Corridor:				
Line 15	25,050	75,530	n/a	n/a
Lines 9X, 9AX, 9BX	14,330	17,100	21,780	18,200
Lines 30, 45	26,640	31,770	31,770	25,880
Shifts from Line 15 [3]	n/a	n/a	4,480	4,480
Subtotal	**66,020**	**124,400**	**58,030**	**48,560**
TOTAL IN CORRIDOR:	**66,020**	**135,640**	**138,090**	**142,690**
Increase Over Existing:	n/a	69,620	72,070	76,670
Increase Over No Build/TSM:	n/a	n/a	2,450	7,050

Notes: [1] MUNI Metro Extension will operate with the L-Taraval to the Caltrain Terminal and the N-Judah light rail to Third and Mariposa.
[2] Third Street light rail will interconnect with the J-Church.
[3] Line 15-Third shifts to 43-Masonic, 9-San Bruno and/or 54-Felton routes.
Source: *Travel Demand Forecasting Results Working Paper #4,* San Francisco Municipal Railway, December 1997.

Transit Travel Times

As increased automobile and truck traffic congests Corridor roadways in the future, bus travel times will get longer and service reliability would become inconsistent. By 2015, patrons using Corridor buses will experience substantial travel time increases over existing conditions as shown in **Table S-4**. Light rail, which would operate in an exclusive right-of-way separate from automobile and truck traffic, would have comparatively lower travel times.

TABLE S-4

IN-VEHICLE/TOTAL TRANSIT TRAVEL TIMES FOR SELECTED TRANSIT TRIPS

	TRANSIT TRAVEL TIME (minutes) [4]			
ORIGIN-DESTINATION	**EXISTING (1996)**	**2015 NO PROJECT & NO BUILD/TSM ALTERNATIVES**	**2015 LIGHT RAIL ALTERNATIVE IOS**	**2015 LIGHT RAIL ALTERNATIVE NEW CENTRAL SUBWAY**
Arleta/Bayshore - Third/Market [1]	36/45	42/51	31/44	27/40
Third/Palou - Third/Market [2]	26/40	30/44	24/38	19/33
Arleta/Bayshore - Stockton/Clay	42/54	49/61	n/a	30/44
Third/Palou - Stockton/Clay	32/45	36/50	n/a	22/37
Arleta/Bayshore - Main/Market [3]	36/48	42/54	29/42	n/a
Third/Palou - Main/Market	26/43	30/47	22/36	n/a

Notes: [1] Station is at Arleta/Raymond for IOS and New Central Subway.
[2] Station is at Montgomery for IOS.
[3] Station is at Embarcadero for IOS.
[4] First number represents in-vehicle travel times and second number represents total travel times.
Source: *Travel Demand Forecasting Results, Working Paper #4*, San Francisco Municipal Railway, December 1997.

Traffic Volumes

Increased automobile and truck traffic will further congest Corridor roadways. By 2015, Bayshore Boulevard's peak hour traffic volumes are expected to increase by up to 53 percent over existing conditions. On Third Street between Highway 101 and the southern part of the Bayview Hunters Point district, peak hour traffic volumes are estimated to increase by up to 44 percent. From the northern part of the district to near the Islais Creek channel, peak hour volumes are projected to increase by up to 80 percent. North of Cesar Chavez Street, peak hour traffic is anticipated to increase by up to 50 percent over existing conditions.

Travel Speeds and Intersection Service Levels

With increased 2015 traffic levels, automobile and truck travel speeds will decrease on Bayshore Boulevard and on Third Street. Provision of light rail tracks would remove one of the three travel lanes in each direction on both of these arterial roadways, decreasing roadway capacity and further lowering automobile and truck travel speeds.

By 2015, due to increased background traffic levels, seven intersections in the Corridor will be operating at congested conditions (LOS E or F) during weekday peak periods. Therefore, the impacts to the intersections would be considered cumulative unavoidable adverse impacts. **One** of intersections (Fourth/Brannan) could be mitigated to acceptable operations with minor improvements, such as lane re-striping, parking removal, etc., but the other six intersections (Third/Cesar Chavez, Third/King, Third/Townsend, Third/Brannan, Fourth/King, and Fourth/Bryant) could not be feasibly improved without major investment and/or potential environmental impacts.

With the implementation of the IOS, the above intersections would become somewhat more congested, and additional intersections would degrade to LOS E or F conditions by 2015. The intersection of Third and Evans Streets could be improved to acceptable operations through minor traffic re-routing of the southbound left-turn movement.

With implementation of the New Central Subway, the intersection of Third and Bryant Streets would degrade to LOS F, but could be mitigated to an acceptable service level through lane re-striping and parking removal.

Freight Movements

With the implementation of the Light Rail Alternative, some on-street parking would be removed, reducing the number of on-street loading zones throughout the Corridor. By designating some of the remaining on-street spaces as loading zones, this would not be a significant impact. At the Caltrain Bayshore intermodal station, removal of the Union Pacific spur track would significantly affect nearby businesses that rely on the track for cargo shipments. Alternative designs of the station layout that would retain the existing spur track would mitigate this potential impact.

On-Street Parking

On Bayshore Boulevard and on Third Street (between the Caltrain Bayshore intermodal station and Bryant Street), on-street parking capacity for about 1,675 vehicles currently exists. During weekdays, existing on-street parking occupancy is about 65 percent on a Corridor-wide basis. The lowest occupancy occurs to the south (about 31 percent of the available curb space on Bayshore Boulevard is used), but parking occupancy increases gradually to the north. On Third Street, between 16th and Bryant Streets, typically 90 percent or more of the curb lanes are occupied with parked cars during weekdays.

With the provision of light rail, parking would be displaced in the Corridor adjacent to light rail station platforms, in the transition areas before and after the platforms, and where additional room is needed to accommodate left-turn lanes. Implementation of the IOS, along with the proposed Mission Bay development, would displace between 773 and 842 on-street parking spaces in the Corridor (the range in total parking displacement is dependent on which design option through the Third Street commercial core is selected). Almost 470 of the displaced parking spaces would occur in Mission Bay, where additional on-street parking is proposed along new roadways (resulting in a net gain of about 40 spaces within Mission Bay). The New Central Subway would displace between 97 and 98 additional parking spaces. Based on current parking occupancies, however, substantially fewer vehicles would actually be displaced. South of 16th Street most displaced vehicles could be accommodated in other nearby on-street spaces.

Pedestrian Circulation

Pedestrian activity throughout the Corridor is expected to increase in the future. Under the Light Rail Alternative, minor reduction in sidewalk widths would occur in areas adjacent to some of the proposed light rail station platforms and where left-turn lanes are provided. Minor reductions or widenings would occur in the Third Street commercial core. These impacts would not be significant.

With implementation of the New Central Subway, sidewalks on Third and Fourth Streets between Townsend and Brannan Streets would be narrowed in order to maintain on-street parking on one side of Third and Fourth Streets. An alternative to reducing the sidewalk widths would be to prohibit on-street parking and instead widen the sidewalks. This option would need to be evaluated during final design. Some of the subway station's proposed stairways, escalators, and elevators would encroach upon the sidewalks, reducing the effective sidewalk widths and resulting in overcrowded conditions at three station locations. Mitigating measures include obtaining public access rights to an adjacent private sidewalk and re-evaluating future sidewalk widths and adjacent parking needs.

Bicycle Circulation

The San Francisco Bicycle Plan identifies Bicycle Route 5 as an 11.3-kilometer (7.0-mile) route extending along Bayshore Boulevard, Third Street, King Street, and The Embarcadero. Within the Corridor, the Bicycle Plan recommends 1.8-meter (6.0-foot) wide bicycle lanes on Third Street between China Basin and Bayshore Boulevard. The Bicycle Plan states that although this segment of Third Street serves a high amount of cargo trucking operations, it was recommended as a bicycle route because no other direct bicycle route exists. The Bicycle Plan also recognizes that the possible establishment of a light rail line on Third Street would compete with the bicycle lanes for street width and that the current width of the street cannot accommodate both light rail and bicycle lanes. According to the Bicycle Plan, Bicycle Route 7 (Indiana Street/Third Street/Phelps Street/Palou Avenue/Keith Street) was designed to provide an alternative to a segment of Bicycle Route 5. With the implementation of light rail, bicycle travel along Third Street would be constrained.

Construction

Construction of the light rail line would affect transit service, traffic flow, freight movements, on-street parking, and pedestrian and bicycle circulation. The impacts would not be significant, however, with the improvement measures proposed to be undertaken, e.g., detour routes, exclusive bus zones, short-term parking limits, maintenance of sidewalks, etc.

S.3.2 SUMMARY OF KEY TRANSPORTATION IMPACTS AND MITIGATION MEASURES

A summary of potential transportation-related impacts (transit, traffic, freight, parking, and pedestrian and bicycle circulation) for the alternatives is presented in **Table S-5**. Mitigation measures for potential significant impacts are provided (indicated in italic). Suggested improvement measures for less-than-significant impacts are also discussed, where applicable.

TABLE S-5

SUMMARY OF MAJOR TRANSPORTATION-RELATED ENVIRONMENTAL IMPACTS FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES

Transportation Area	Light Rail Alternative—Initial Operating Segment	Light Rail Alternative—New Central Subway	No Project Alternative	No Build/TSM Alternative
Transit	In general, total transit travel times would be 6 to 12 minutes shorter (depending on trip origin and destination) than for the No Build/ TSM Alternative.	In general, total transit travel times would be 11 to 17 minutes shorter (depending on trip origin and destination) than for the No Build/TSM Alternative.	In general, total transit travel times would be 4 to 6 minutes longer (depending on trip origin and destination) than existing 15-Third bus travel times.	In general, total transit travel times would be 4 to 6 minutes longer (depending on trip origin and destination) than existing 15-Third bus travel times.
	In future, extra trains could be needed to serve Mission Bay and Hunters Point. Improvement measure to monitor patronage levels.	In future, extra trains could be needed to serve Mission Bay and Hunters Point. Improvement measure to monitor patronage levels.	Substantial overcrowding would occur on all bus lines serving Corridor. *With mitigation (i.e., adding 40 new articulated buses), impacts would be less than significant.*	Increased patronage demand would be served with 40 new articulated buses.
	During construction, buses stopped in travel lane would increase traffic congestion. Improvement measure to provide bus pullouts.	During construction, buses stopped in travel lane would increase traffic congestion. Improvement measure to provide bus pullouts.	No construction impacts affecting transit.	No construction impacts affecting transit.
	During construction, bus travel times would be longer. Recommended improvement measure for MUNI to monitor performance and add service, as appropriate.	During construction, bus travel times would be longer. Recommended improvement measure for MUNI to monitor performance and add service, as appropriate.	No construction impacts affecting transit.	No construction impacts affecting transit.

TABLE S-5 (Cont.)

SUMMARY OF MAJOR TRANSPORTATION-RELATED ENVIRONMENTAL IMPACTS FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES

Transportation Area	Light Rail Alternative—Initial Operating Segment	Light Rail Alternative—New Central Subway	No Project Alternative	No Build/TSM Alternative
Traffic	Implementation of light rail would contribute to the LOS E and F conditions expected at three intersections also significantly impacted by the No Project Alternative under cumulative conditions: Third/Cesar Chavez, Third/King; and Fourth/King. In addition, one other intersection would be significantly affected by the IOS: Third/Evans. *With mitigation (e.g., lane striping, parking removal, and/or other measures), impacts would be less than significant for the above intersections, except Third/Cesar Chavez, Third/King and Fourth/King, which could not be feasibly mitigated (cumulative unavoidable adverse impacts).* Additionally, the one-lane design options in the Third Street commercial core would result in LOS F conditions (a significant impact) at all intersections throughout the commercial core, resulting in extreme congestion and traffic diversion. *This impact cannot be mitigated feasibly.*	Implementation of the New Central Subway would contribute to LOS E and F conditions expected at four intersections also significantly impacted by the No Project Alternative under cumulative conditions: Third/Townsend, Third/Brannan, Fourth/Brannan, and Fourth/Bryant. In addition, under the New Central Subway, the Third/Bryant intersection would degrade to LOS F. *With mitigation (e.g., lane striping, parking removal, and/or other measures), impacts would be less than significant at Third/Bryant and Fourth/Brannan, but the other three intersections could not be feasibly mitigated (cumulative unavoidable significant impacts).*	Level of Service E or F conditions would exist at eight intersections under cumulative conditions: Bayshore at Arleta; Third at Cesar Chavez, King, Townsend, and Brannan; and Fourth at King, Brannan, and Bryant. *With mitigation (e.g., lane striping, parking removal, and/or other measures), impacts at Bayshore/Arleta and Fourth/Brannan would be less than significant.* The remaining six intersections could not be reasonably mitigated, and therefore the impacts are considered cumulative unavoidable adverse impacts.	Level of Service E or F conditions would exist at eight intersections under cumulative conditions: Bayshore at Arleta; Third at Cesar Chavez, King, Townsend, and Brannan; and Fourth at King, Brannan, and Bryant. *With mitigation (e.g., lane striping, parking removal, and/or other measures), impacts at Bayshore/Arleta and Fourth/Brannan would be less than significant.* The remaining six intersections could not be reasonably mitigated, and therefore the impacts are considered cumulative unavoidable adverse impacts.

TABLE S-5 (Cont.)

SUMMARY OF MAJOR TRANSPORTATION-RELATED ENVIRONMENTAL IMPACTS
FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES

Transportation Area	Light Rail Alternative—Initial Operating Segment	Light Rail Alternative—New Central Subway	No Project Alternative	No Build/TSM Alternative
Traffic (cont.)	Compared to the No Project and No Build/TSM Alternatives, Corridor travel speeds would decrease, but not significantly. However, the one-lane design options in the Third Street commercial core would decrease speeds to below 5 mph due to extreme traffic congestion, resulting in a significant impact. *This impact cannot be mitigated feasibly.* During construction, only two travel lanes per direction would be open, but traffic would only be marginally affected unless buses stop in general travel lanes or cars double-park. Improvement measure to provide bus pull-outs, designated short-term parking areas, and enforcement would make impact less than significant.	No significant impacts related to travel speeds. During construction, only two travel lanes per direction on Third and Fourth would be open and only one travel lane per direction on Geary and Stockton would be open. Implementation of Department of Parking and Traffic's (DPT's) traffic detour plan would reduce congestion.	Compared to existing conditions, Corridor travel speeds would decrease. No construction impacts affecting traffic.	Same as No Project Alternative. No construction impacts affecting traffic.
Trucks	Reduced number of on-street loading zones and parking would occur. Improvement measures to provide designated loading areas, short-term parking and parking enforcement to alleviate double-parking.	On Third and Fourth (between King and Brannan), reduced number of on-street loading zones and parking would occur. Improvement measure to provide designated loading areas and short-term parking.	No significant impacts affecting trucks.	No significant impacts affecting trucks.

TABLE S-5 (Cont.)

SUMMARY OF MAJOR TRANSPORTATION-RELATED ENVIRONMENTAL IMPACTS FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES

Transportation Area	Light Rail Alternative—Initial Operating Segment	Light Rail Alternative—New Central Subway	No Project Alternative	No Build/TSM Alternative
Trucks (cont.)	During construction, reduced number of on-street loading zones and parking would occur. Improvement measure to provide designated loading areas and short-term parking.	During construction, reduced number of on-street loading zones and parking would occur. Improvement measure to provide designated loading areas and short-term parking.	No construction impacts affecting freight.	No construction impacts affecting freight.
Railroad	Significant impacts to freight rail access by removing the Union Pacific Railroad's Sunnydale spur track. *Mitigation would be to redesign station layout to retain the existing spur track. With mitigation, impact would be less than significant.*	No railroad impacts.	No railroad impacts.	No railroad impacts.
Parking	On-street parking "shortfalls" would exist on 15 to 18 blocks along Bayshore and Third, excluding parking displacement in Mission Bay, but parking could be accommodated on-street and close-in. Impact is not significant. Recommended improvement measure to designate loading areas and short-term parking. Also, develop plan to increase on-street parking on nearby cross-streets. See "Trucks" for construction impacts.	On-street parking "shortfalls" would exist on 5 blocks along Third and Fourth. About 11 parking spaces would be lost near Union Square and Chinatown stations. Impact is not significant. See "Trucks" for construction impacts.	As part of collaborative planning efforts between City and County of San Francisco and developers of Mission Bay project, all parking on Third Street and the existing portion of Fourth Street between King and Mariposa would be displaced. Impact is not significant. See "Trucks" for construction impacts.	Same as No Project Alternative.

TABLE S-5 (Cont.)

SUMMARY OF MAJOR TRANSPORTATION-RELATED ENVIRONMENTAL IMPACTS FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES

Transportation Area	Light Rail Alternative—Initial Operating Segment	Light Rail Alternative—New Central Subway	No Project Alternative	No Build/TSM Alternative
Pedestrians	No significant pedestrian impacts.	Stairs, escalators and elevators to subway stations would reduce effective sidewalk widths, resulting in overcrowding near Moscone, Market Street, and Union Square stations. *Mitigation measure to obtain sidewalk easement at Moscone station*. Improvement measure to re-evaluate (during final design) subway entry widths, sidewalk widths, and adjacent traffic and parking lane needs. Sidewalk reductions on Third and Fourth between Townsend and Bryant would contribute to moderate pedestrian crowding. Improvement measure to evaluate, during final design, sidewalk width versus parking needs.	No pedestrian impacts.	No pedestrian impacts.
	During construction, the passageways on some sidewalks would be narrowed and some pedestrian crosswalks would be closed temporarily.	During construction, the passageways on some sidewalks would be narrowed and some pedestrian crosswalks would be closed temporarily.	No construction impacts affecting pedestrians.	No construction impacts affecting pedestrians.

TABLE S-5 (Cont.)

SUMMARY OF MAJOR TRANSPORTATION-RELATED ENVIRONMENTAL IMPACTS FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES

Transportation Area	Light Rail Alternative—Initial Operating Segment	Light Rail Alternative—New Central Subway	No Project Alternative	No Build/TSM Alternative
Bicyclists	Bicycle lanes would not be possible along Third Street if light rail were implemented (except with the one-lane design option in the Third Street commercial core). Bicycle travel would be constrained along Third Street **and Bayshore Boulevard**. *Mitigation measures to improve the bicycle environment within the Corridor, such as restriping portions of Third Street (between Cargo Way and Cesar Chavez) for bike lanes where on-street parking is currently prohibited, improving* ***and extending*** *Bicycle Route 7,* ***providing improved bicycle circulation south of San Bruno Avenue,*** *and possibly permit****ting*** *bicycles on Third Street light rail vehicles.*	No significant impacts to bicycles.	Pending future study, it is possible that bicycle lanes could be provided on Bayshore and Third if on-street parking were removed.	Same as No Project Alternative.
	During construction, bicycle travel would be constrained in areas under construction. Improvement measure to retain wide outside travel lane, where feasible.	During construction, bicycle travel would be constrained in areas under construction. Improvement measure to retain wide outside travel lane, where feasible.	No construction impacts bicycles.	No construction impacts bicycles.

Light Rail Alternative

The Light Rail Alternative would produce no potentially significant impacts that cannot be mitigated, except the preclusion of a bicycle lane along Third Street. With light rail replacing a travel lane in each direction along the entire Corridor, bicycle travel along Third Street and Bayshore Boulevard would become constrained and installation of a continuous bicycle lane would not be possible. (Note that cumulative unavoidable significant impacts are expected at several intersections throughout the Corridor, with or without the light rail project.)

Significant impacts, which can be mitigated, and several of the key less-than-significant impacts for the IOS include:

- degraded service levels at several intersections;
- reduced automobile and truck travel speeds on Bayshore Boulevard and Third Street;
- potential for impacting rail access via the Union Pacific's spur track at the Caltrain Bayshore intermodal station;
- long-term displacement of on-street parking and loading zones along Bayshore Boulevard and Third Street;
- reductions in sidewalk passageway widths adjacent to station platforms and left-turn lanes; and
- construction impacts, including impacts to transit service, traffic flow, freight movements on-street parking, and pedestrian and bicycle circulation.

In addition, implementation of the New Central Subway would:

- contribute to reduced service levels at some intersections;
- cause long-term parking displacements along Third and Fourth Streets between King and Bryant Streets, at the Union Square garage, and on Stockton/Clay Streets;
- reduce the effective sidewalk widths near access points (i.e., stairways, escalators and elevators) to the proposed New Central Subway stations; and
- result in construction impacts, including impacts to transit service, traffic flow, freight movements, on-street parking, and pedestrian and bicycle circulation.

The Light Rail Alternative would produce beneficial impacts, including, for example, improvement in transit travel times, accessibility, and service reliability between Downtown and the southeast quadrant of the City.

No Project and No Build/TSM Alternatives

Compared to the Light Rail Alternative, the No Project and No Build/TSM Alternatives would result in reduced transit service reliability, and increased travel times and diminished mobility for residents in the southeast quadrant of the City. They would, however, have no short-term construction impacts or long-term parking impacts. However, by 2015, eight intersections would operate at LOS E or F conditions due to increases in background traffic levels and would be considered cumulative unavoidable adverse impacts. Two of the intersections (Bayshore/Arleta and Fourth/Brannan) could be mitigated to acceptable operations with minor improvements, but the other six intersections (Third/King, Third/Townsend, Third/Brannan, Fourth/King, Fourth/Townsend, and Fourth/Bryant) could not be feasibly improved without major investment and/or potential environmental impacts. The No Project and No Build/TSM Alternatives could possibly enable, pending further study, implementation of exclusive bicycle lanes along Third Street if on-street parking were removed.

S.4 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

A summary of potentially significant environmental impacts and mitigation measures (indicated in italic), excluding transportation-related impacts (see previous section), for the Light Rail, No Build/TSM, and No Project Alternatives is presented in **Table S-6** and briefly described below.

S.4.1 LIGHT RAIL ALTERNATIVE

Potentially significant impacts produced by the Light Rail Alternative can be mitigated. The key non-transportation impacts are:

- <u>four</u> business displacements;
- alteration of the historic architectural character of the Islais Creek bridge due to the addition of light rail track and overhead wires on the bridge (the Third and Fourth Street bridges over Mission Creek historically have had streetcar operation);
- potential for earthquake-induced liquefaction at the new LRV maintenance facility site and for encountering hazardous materials during construction of the light rail alignment and the new maintenance facility;
- vibration impacts to <u>**two residential/commercial buildings along Third Street between 20th and 22nd Streets;**</u> and
- displacement of the North Point trunk sewer line.

Business displacements would <u>**be at the Palou/Oakdale triangular parcel along Third Street and at the southern terminal site.**</u> Potential impacts for the Western Pacific maintenance facility site are related to the fact that <u>it is</u> underlain by heterogeneous artificial fill potentially susceptible to earthquake-induced liquefaction. The potential for hazardous materials (metals, volatile organic compounds (VOCs), semi-VOC's including polynuclear aromatic hydrocarbons, total petroleum hydrocarbons, and friable asbestos from serpentine fragments) that may expose site workers and the public to health risks is present. Measures to avoid adverse effects caused by the presence of hazardous materials are required by Article 20 of the San Francisco Municipal Code. Construction of the New Central Subway would displace the existing North Point trunk sewer line at the intersection of Third and Mission Streets, requiring relocation of the sewer line or installation of an underground siphon and pump station to mitigate displacement.

S.4.2 NO PROJECT AND NO BUILD/TSM ALTERNATIVES

The No Project and No Build/TSM Alternatives would not provide the beneficial impacts of the Light Rail Alternative, yet would contribute to the following impacts:

TABLE S-6

SUMMARY OF MAJOR ENVIRONMENTAL IMPACTS FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES

Environmental Area	Light Rail Alternative- Initial Operating Segment	Light Rail Alternative-New Central Subway	No Project Alternative	No Build/TSM Alternative
Land Use	Consistent with adopted plans and policies; consistency with federal Coastal Zone would be determined for maintenance facility sites. Potential beneficial land use impacts at station locations.	Consistent with adopted plans and policies.	Not consistent with adopted plans and policies.	Consistent with City "Transit First" policies, but not consistent with policies promoting fixed rail transit along Third Street.
Acquisition and Displacement	Nine property acquisitions, including 4 business displacements. *MUNI would follow the Uniform Relocation Act provisions to mitigate this impact to less than significant.*	Union Square garage parking displacement (2 or 3 stalls); an easement along a private arcade on the east side of Third at Clementina.	None required.	No displacements.

TABLE S-6 (Cont.)

SUMMARY OF MAJOR ENVIRONMENTAL IMPACTS FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES

Environmental Area	Light Rail Alternative- Initial Operating Segment	Light Rail Alternative-New Central Subway	No Project Alternative	No Build/TSM Alternative
Socioeconomic and Environmental Justice	Reduced travel times/enhanced service reliability would improve residents' mobility. Construction of IOS would create 1,845 person-years of employment, 145 permanent jobs, and access to job centers. Consistent with Executive Order No. 12898. *Temporary construction-related impacts to business would be mitigated to less-than-significant levels by using standard construction mitigation practices, such as dust and noise abatement and proper signage if temporary traffic or pedestrian detours were required.*	Reduced travel times would improve residents' mobility. Construction of the New Central Subway would create 3,033 person-years of employment and 80 permanent jobs. Consistent with Executive Order No. 12898. *Temporary construction-related impacts to business would be mitigated to less-than-significant levels by employing standard construction mitigation practices.*	Corridor would be underserved by transit. Increased traffic congestion would diminish service reliability. Project benefits not realized.	140 new jobs to operate additional bus service would be created. Traffic congestion would persist, affecting transit service reliability.
Community Facilities and Services	Would enhance accessibility to community facilities because of improved service reliability and reduced travel times. One additional full-time equivalent MUNI-contracted security office may be required. New waterfront open space would be developed in conjunction with Western Pacific east site. No parklands would be affected.	Would enhance accessibility to community facilities because of improved service reliability and reduced travel times. *Temporary construction noise, dust, vibration impacts at Union Square and Yerba Buena Gardens could be mitigated to less-than-significant levels by employing standard construction mitigation practices.* No parklands would be affected.	Increased travel times would diminish residents' mobility and access to community facilities and services.	No impacts.

TABLE S-6 (Cont.)

**SUMMARY OF MAJOR ENVIRONMENTAL IMPACTS
FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES**

Environmental Area	Light Rail Alternative- Initial Operating Segment	Light Rail Alternative-New Central Subway	No Project Alternative	No Build/TSM Alternative
Cultural Resources	Construction of track and overhead wire on Islais Creek bridge would affect the character of the bridge. This impact would not be adverse and would not change its potential eligibility as a historic property. *With mitigation, impacts would be less than significant. State Historic Preservation Officer concurrence has been requested in a Finding of Effect Report.*	Potential indirect construction impacts could occur for 53 National Register of Historic Places (NRHP) properties and 86 potentially- eligible NRHP properties along the subway alignment between Brannan and Post. Two potential archeological sites along Third/Fourth between Bryant and Mission could be affected. *Mitigation includes pre-construction subsurface investigation. With mitigation (avoidance or data retrieval through excavation and documentation), impacts would be less than significant.*	No impacts.	No impacts.

TABLE S-6 (Cont.)

SUMMARY OF MAJOR ENVIRONMENTAL IMPACTS FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES

Environmental Area	Light Rail Alternative- Initial Operating Segment	Light Rail Alternative-New Central Subway	No Project Alternative	No Build/TSM Alternative
Visual and Aesthetic	Long-term visual modifications along alignment, particularly at the Caltrain Bayshore Station, Third/Meade, Third Street commercial core, and the new LRV maintenance facility site. In the context of the built-up, urban environment, impacts would be less than significant. Beneficial effects may occur in the Third Street commercial core and at the maintenance facility site with landscaping and sidewalk treatments.	Long-term visual modifications at portal locations. In the urban context of these locations, the impact would be less than significant.	No impacts.	No impacts.
Utilities and Energy	Construction of IOS would temporarily affect 380 utilities. Construction-related disruption would be minimal (two to three hours). Cost of utility relocation/replacement would be part of project. Although overall MUNI energy consumption would increase for this alternative, "clean" electric transit would replace diesel buses along Third Street.	Major trunk sewer line crosses subway alignment at Third/Mission. *Mitigation achieved by installing underground siphon and pump station or relocating sewer line.*	Increased auto trips would result in increased gasoline consumption.	No substantial impacts.

TABLE S-6 (Cont.)

SUMMARY OF MAJOR ENVIRONMENTAL IMPACTS FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES

Environmental Area	Light Rail Alternative- Initial Operating Segment	Light Rail Alternative-New Central Subway	No Project Alternative	No Build/TSM Alternative
Geology, Soils, Seismicity	No impacts. Methods to control potential settlement/remediate liquefaction conditions at new light rail maintenance facility site would be included in final design.	Dewatering of tunneling could cause settlement during construction. *Methods to prevent potential settlement due to subway construction would be included in final design.*	No impacts.	No impacts. Methods to control potential settlement and remediate liquefaction conditions at new bus maintenance facility site would be included in final design.
Hydrology and Water Quality	Construction and operation of the IOS/new light rail maintenance facility could discharge sediments, chemicals and metals into storm drainage system. *With mitigation (SWPPP-Best Management Practices), impacts would be less than significant.*	Construction of the Central Subway could discharge sediments, chemicals and metals into storm drainage system. *With mitigation (SWPPP-Best Management Practices), impacts would be less than significant.*	No impacts.	Construction and operation of new bus maintenance facility could discharge chemicals and metals into storm drainage system. *With mitigation, impacts would be less than significant.*
Biology and Wetlands	No impacts to wetlands or threatened and endangered species or special status species.	No impacts to wetlands or threatened and endangered species or special status species.	No impacts.	No impacts

TABLE S-6 (Cont.)

SUMMARY OF MAJOR ENVIRONMENTAL IMPACTS FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES

Environmental Area	Light Rail Alternative- Initial Operating Segment	Light Rail Alternative-New Central Subway	No Project Alternative	No Build/TSM Alternative
Hazardous Materials	Construction of the IOS and new light rail maintenance facility may encounter presence of hazardous materials; operation of maintenance facility may require handling of hazardous materials. Phase II soil characterization would be completed to ascertain levels of contamination. *With mitigation (compliance with Article 20 and Site Mitigation Report), impacts would be less than significant.*	Construction of the New Central Subway may encounter presence of hazardous materials. *With mitigation (compliance with Article 20 and Site Mitigation Report), impacts would be less than significant.*	No impacts.	Construction of new bus maintenance facility may encounter presence of hazardous materials; operation of facility may require handling of hazardous materials. *With mitigation, impacts would be less than significant.*
Air Quality	Would decrease regional ROG, NOx, and PM_{10} emissions over the No Project Alternative. Localized CO emissions would remain within state and federal standards. Transportation conformity requirements would be satisfied by the IOS. *Dust and exhaust emissions occurring during construction of the IOS and new LRV maintenance facility would be mitigated to less-than-significant level by watering the site and using exhaust controls.*	Would decrease regional ROG, NOx, and PM_{10} emissions over the No Project Alternative. Localized CO emissions would remain within state and federal standards. Transportation conformity requirements would be satisfied. *Dust and exhaust emissions occurring during construction of the New Central Subway would be mitigated to a less-than-significant level.*	Baseline conditions.	No substantial increase over baseline conditions. *Dust and exhaust emissions during construction of new bus maintenance facility could be mitigated to a less than significant level.*

TABLE S-6 (Cont.)

SUMMARY OF MAJOR ENVIRONMENTAL IMPACTS
FOR THE NO PROJECT, NO BUILD/TSM, AND LIGHT RAIL ALTERNATIVES

Environmental Area	Light Rail Alternative- Initial Operating Segment	Light Rail Alternative-New Central Subway	No Project Alternative	No Build/TSM Alternative
Noise and Vibration	No noise impacts; long-term vibration impacts would occur for **2 residential/commercial buildings.** *With proper mitigation (modify the transit vehicle suspension system, use of floating slabs in trackbed construction), these impacts would be less than significant.*	No long-term noise or vibration impacts are expected.	No impacts.	No impacts.

- increased traffic congestion;
- reduced transit service reliability;
- increased travel times and diminished mobility for residents in the southeast quadrant of the City;
- regional pollutant emissions;
- increased gasoline consumption; and
- inconsistency with the City's adopted land use and transportation plans and policies calling for rail transit development in the Corridor.

S.5 FINANCIAL FEASIBILITY

S.5.1 ANALYSIS OF FINANCIAL CAPACITY FOR THE NO BUILD/TSM AND LIGHT RAIL ALTERNATIVES

MUNI has the financial capacity to continue current bus and rail service levels as well as fulfill ADA para-transit requirements. Although no fund deficits are anticipated to occur in implementing the Capital Improvement Program under the No Build/TSM Alternative, MUNI, in conjunction with the Transportation Authority, does possess the ability to leverage future Proposition B revenues for the purpose of using debt financing to finance its acquisition of new buses and construction of new service facilities. Funding sources for constructing and operating the Light Rail Alternative are described below. The discussion below presents the capital requirements, the operating and maintenance costs and the revenues available to finance these costs through FY 2015 for the IOS and the New Central Subway.

Local Funding Sources for the Light Rail Alternative

The primary source of funding for the IOS is currently assumed to be the Proposition B one-half cent sales tax program presently in place in San Francisco. Passed by San Francisco voters in November 1989, sales tax revenues began being collected in April, 1990. The tax will sunset in March 2010.

Several components of the Proposition B Expenditure Plan that was adopted in 1989 can potentially contribute to the Project. These Expenditure Plan components are identified in **Table S-7**. In addition, **Table S-7** indicates what the Expenditure Plan identified as funding for the Third Street components in FY 90 dollars (i.e., those amounts actually identified in the Plan), and the escalated amount of those components in FY 96 dollars. The FY 96 dollar amounts were derived by escalating the Plan components at the same annual growth rates as the Proposition B revenues grew between FY 90 and FY 96, which was 4.8 percent. The FY 96 figure of $293.0 million is then escalated at a conservative 3.5 percent annual growth rate for years subsequent to FY 96 until it is utilized to meet the capital costs of the IOS. In terms of FY 97 dollars, this amount grows to $303.2 million.

In addition to the four Expenditure Plan components (identified in **Table S-7**) being dedicated to the Project, excess or surplus funds in two additional projects have also been dedicated to the Light Rail Alternative. These are, in 1997 dollars, $30 million from the MUNI Metro Extension project and $44.4 million from the MUNI vehicle replacement project. Combined, these two sources contribute an additional $74.4 million to the Light Rail Alternative, bringing the total Proposition B commitment to an estimated $377.7 million in FY 97 dollars.

In addition to local Proposition B funds identified for the Project, the City has also identified certain tax increment funds to be available to the Project from existing and potential redevelopment project areas located adjacent to the Third Street light rail line. These include Bayview

TABLE S-7

POTENTIAL PROPOSITION B FUNDING COMPONENTS
($ in millions)

Transportation Plan Component	$ FY90	$ FY96	$ FY97
Transit Corridor Construction Fund	$190.0	$244.2	$252.7
Third Street Median Isles	7.0	9.0	9.3
Metro East LRV Maintenance Facility	18.0	23.1	23.9
Mission Bay Metro Extension	13.0	16.7	17.3
TOTAL	**$228.0**	**$293.0**	**$303.2**
Source: G. Richard Swanson & Associates			

Hunter's Point (survey area), India Basin, and Mission Bay (survey area). The tax increment that is programmed to support the Project is estimated at $8.5 million in constant 1997 dollars. It is similarly assumed that the operating and maintenance costs associated with the incremental service provided by the Project will be met through existing sources used to fund MUNI's current operations and maintenance.

State Funding Sources for the Light Rail Alternative

Augmenting local funding from Proposition B sales taxes and tax increment funding, an estimated $25.0 million in State Regional Improvement Program funds have been earmarked for the Project. These funds are allocated regionally and are the result of the recently enacted SB45 which consolidates previous categorical state funding programs, such as Transit Capital Improvement funds, into a single category of funds administered and programmed regionally.

Federal Funding Sources for the Light Rail Alternative

Because of the significant lead time required to secure federal discretionary funding (Section 5309 New Starts) and formula funding (Section 5309 Fixed Guideway Modernization), no funding from these sources is anticipated to be available for the IOS. However, these sources are anticipated to be significant contributors to the New Central Subway.

In lieu of federal discretionary funding for the Project, the City is allocating an estimated $7.6 million in Federal Surface Transportation Program and Congestion Management Air Quality funding to supplement local and state funding. It is likely that a Letter of No Prejudice will be sought from FTA that will qualify the local Proposition B revenues that will be primarily used to fund the IOS as local match for subsequent federal funding for the New Central Subway.

S.6 EVALUATION OF ALTERNATIVES

The Project alternatives were evaluated according to FTA and local criteria. A summary of the evaluation is presented for each criterion utilized in the evaluation process.

S.6.1 MOBILITY IMPROVEMENTS

The Light Rail Alternative would provide travel time savings, improved service reliability, and enhanced quality of service for the residents of the Corridor. The mobility benefits would be further enhanced by the completion of the New Central Subway, which provides a direct link between the southeastern quadrant of the City and Union Square/Chinatown. The New Central subway also would establish the key link in the Downtown subway system as identified in the Four Corridor Plan. Because the bus service provided under No Project or No Build/TSM Alternatives would not operate in exclusive rights-of-way, service reliability and travel times would be impaired as congestion in the Corridor increases over the 20-year planning period.

S.6.2 TRANSPORTATION AND ENVIRONMENTAL IMPACTS AND BENEFITS

The Light Rail Alternative would generate short-term construction impacts that would not be produced by the No Project and No Build/TSM Alternatives. All long-term impacts resulting from light rail operations, such as property acquisition, parking displacement, conflict with the North Point sewer along Mission Street at Third, and vibration, could be mitigated to a less-than-significant level, with the following exception:

- constrained bicycle travel along Bayshore Boulevard and Third Street and preclusion of bicycle lanes along these roadways.

Cumulative future (2015) traffic impacts that would occur at selected Corridor intersections in the No Project and No Build/TSM Alternatives would remain in the Light Rail Alternative. Of these intersections projected to operate at LOS E or F, six cannot be feasibly mitigated for any of the alternatives.

The Light Rail Alternative (IOS and New Central Subway) would produce the following beneficial impacts that could not be provided by the No Project and No Build/TSM Alternatives:

- potential beneficial land use impacts at station locations;
- improved transit travel times, accessibility, and service reliability between Downtown and the southeast quadrant of the City;
- 1,845 person-years of employment and 225 permanent jobs;
- enhanced visual character and the potential for economic revitalization along the Third Street commercial core in Bayview Hunters Point and at the new maintenance facility site, particularly if a new waterfront open space were created;
- replacement of 15-line diesel buses with "clean" electric transit; and
- decreased regional ozone precursors (ROG), nitrogen oxides (NO_x), and particulate (PM_{10}) emissions compared with the No Project Alternative.

As a result, the Light Rail Alternative is the Environmentally Superior Alternative.

S.6.3 OPERATING EFFICIENCIES

Farebox recovery, the percentage of MUNI's revenues generated from fares, as well as cost per passenger and cost per bus and train hour, would be similar for all alternatives, in spite of the somewhat higher operating costs associated with light rail. The performance measurements indicate that light rail can carry a greater number of passengers while utilizing fewer vehicles to meet 2015 demand.

S.6.4 TRANSIT SUPPORTIVE LAND USE

The Light Rail Alternative furthers the goals of the San Francisco Transportation Authority's Four Corridor Plan and is compatible with City and area-specific plans and policies governing transportation and land use. The Light Rail Alternative would offer the opportunity for the transportation investment in the Corridor to be coordinated with land use planning and economic revitalization at station locations. In addition, it conforms with the City's Transit First policy by providing exclusive right-of-way for transit. These benefits would not be provided by the No Project and No Build/TSM Alternatives.

S.6.5 EFFICIENCY

The lowest cost per new rider and per user benefit, two former FTA evaluation criteria, would be offered by the Light Rail Alternative IOS using a dedicated right-of-way in the Third Street commercial core.

S.6.6 GOALS ATTAINMENT

The alternatives were evaluated to determine if Project goals would be achieved by implementing each of the alternatives in the Corridor. A summary of the evaluation for key goals is provided below.

Equity Goal

The Light Rail Alternative would address the concern of Corridor residents that existing transit service quality is not at a comparable level to that provided to other portions of the City. Light rail would offer more reliable service at slightly reduced travel times along Third Street because of the use of an exclusive right-of-way, particularly through Downtown and Chinatown via the New Central Subway. Minority communities in Bayview Hunters Point, Visitacion Valley, South of Market, and Chinatown would be the principal beneficiaries of this higher quality of service. Because of the increasing congestion in the Corridor, buses operating in the No Project and No Build/TSM Alternatives would not be expected to improve service reliability and travel times.

Economic Revitalization Goal

Because one of the primary objectives of the Light Rail Alternative is to support economic revitalization in the Third Street commercial core, the infrastructure investment that would accompany light rail implementation, in terms of street redesign, sidewalk improvements, and landscaping, would not be provided by the No Project and No Build/TSM Alternatives. For the four design options being considered for Third Street in the commercial core, the one-lane and mixed-flow options would allow a greater portion of the public right-of-way devoted to these improvements than the two-lane option.

Community Acceptance Goal

Community support for the Project has been established by holding over 40 meetings in the Corridor to discuss the Project alternatives, by fostering community input in previous Corridor planning studies, and by the cooperative efforts of City agencies operating in the Corridor. Subsequent community meetings will be held as part of the public review of the DEIS/DEIR to coalesce community input toward determining the Preferred Investment Strategy for the Corridor.

Financial Goal

The Light Rail and the No Build/TSM Alternatives would not incur capital or operating deficits for building or operating transit service in the Corridor. However, construction of the New Central Subway would require unsecured federal as well as unidentified state or local resources.

S.7 AREAS OF CONTROVERSY/ISSUES TO BE RESOLVED

Environmental issues to be resolved include: the potential displacement of curb parking at station locations along Third Street between Kirkwood and Thomas Avenues; an alternative to formally designate bike lanes in the Corridor; the extent of mitigation of potential vibration impacts; potential conflicts with the trunk sewer line on Mission Street at Third Street; resolution of potential conflicts with pedestrian circulation surrounding proposed subway access points; and the retention of the Union Pacific freight spur line at the proposed Caltrain Bayshore intermodal station. In addition, which of two Corridor bus service plans/route modifications that would accompany the Light Rail Alternative must be decided.

S.8 COMMUNITY INVOLVEMENT

The EIS/EIR builds on community input received over the past nine months:

- In November 1997, more than 100 interested citizens attended a pair of scoping meetings to learn more about the project and share their ideas about the proposed light rail line.
- The Community Advisory Group (CAG), a body of approximately 30 neighborhood representatives, has met throughout the planning process to provide public comments, discuss technical findings and make recommendations on the project.
- Early in 1997, MUNI hosted a series of neighborhood workshops in Visitacion Valley/Little Hollywood, Bayview Hunters Point, Potrero Hill, South of Market, and Chinatown/Downtown, to discuss the project with the community. Over 300 people attended the workshops.

- MUNI has made over 40 presentations on the project to community groups.
- Newsletters on the Project have been mailed to about 5,000 persons and distributed to 20,000 households in the Corridor as a means of providing information to the public on project development.

As a result of public input, MUNI modified existing design options and added new ones to ensure that the project fully reflects the community's desires. MUNI plans to continue their on-going public involvement program during the review period for this DEIS/DEIR and during the response to comments, selection of a preferred alternative, final design, construction and environmental compliance monitoring.

S.9 AGENCY COORDINATION AND APPROVALS REQUIRED

Public agencies formally or informally contacted and consulted during the preparation of this environmental document, that would have approval or permit requirements are listed below. A Technical Advisory Committee comprised of 42 public agency representatives and City Staff, listed in Chapter 9.0, participated in the planning and design options for the Light Rail Alternative and in the identification of issues described and analyzed in this document.

The San Francisco Public Transportation Commission has approval authority over San Francisco Municipal Railway facilities and the Project. State, federal, and local agencies that require permit approval for aspects of the Project are identified in Chapter 2.0.

Advisory Council on Historic Preservation

Bay Area Air Quality Management District

Bay Conservation and Development Commission (BCDC)

California Department of Fish & Game

California Environmental Protection Agency

California Office of Intergovernmental Management

California Public Utilities Commission

California State Lands Commission

California State Office of Historic Preservation (SHPO)

California Transportation Commission (CTC)

Caltrans District 4

Department of Boating & Waterways

Federal Highway Administration

Joint Powers Board (Caltrain)

Metropolitan Transportation Commission (MTC)

Regional Water Quality Control Board

San Francisco Department of Public Health

San Francisco Department of Public Works

San Francisco Parking and Traffic Commission

San Francisco Planning Department

San Francisco Port Commission

San Francisco Redevelopment Agency

US Army Corps of Engineers

US Coast Guard-Pacific Area

US Environmental Protection Agency

US Fish and Wildlife Service

1.0 PURPOSE AND NEED

The San Francisco Municipal Railway (MUNI) is proposing the Third Street Light Rail Project, which includes a package of transportation improvements in San Francisco's Third Street Corridor (Corridor). This Environmental Impact Statement/Environmental Impact Report (EIS/EIR) is studying three alternatives for the Third Street Light Rail Project. The alternatives are:

- No Project Alternative developed in conformance with California Environmental Quality Act (CEQA) Guidelines, maintains the existing transportation system and service levels without accommodating 2015 demand.
- No Build/Transportation System Management (TSM) Diesel Bus Alternative, which increases bus transit service to meet 2015 demand.
- Light Rail (Build) Alternative, which would be constructed in two phases: the Initial Operating Segment (IOS) via the Market Street Subway and the New Central Subway via Stockton Street. Because of the long lead time for receiving funding to construct the New Central Subway, supplemental environmental work may be required for this phase of the Light Rail Alternative.

1.1 CORRIDOR LOCATION

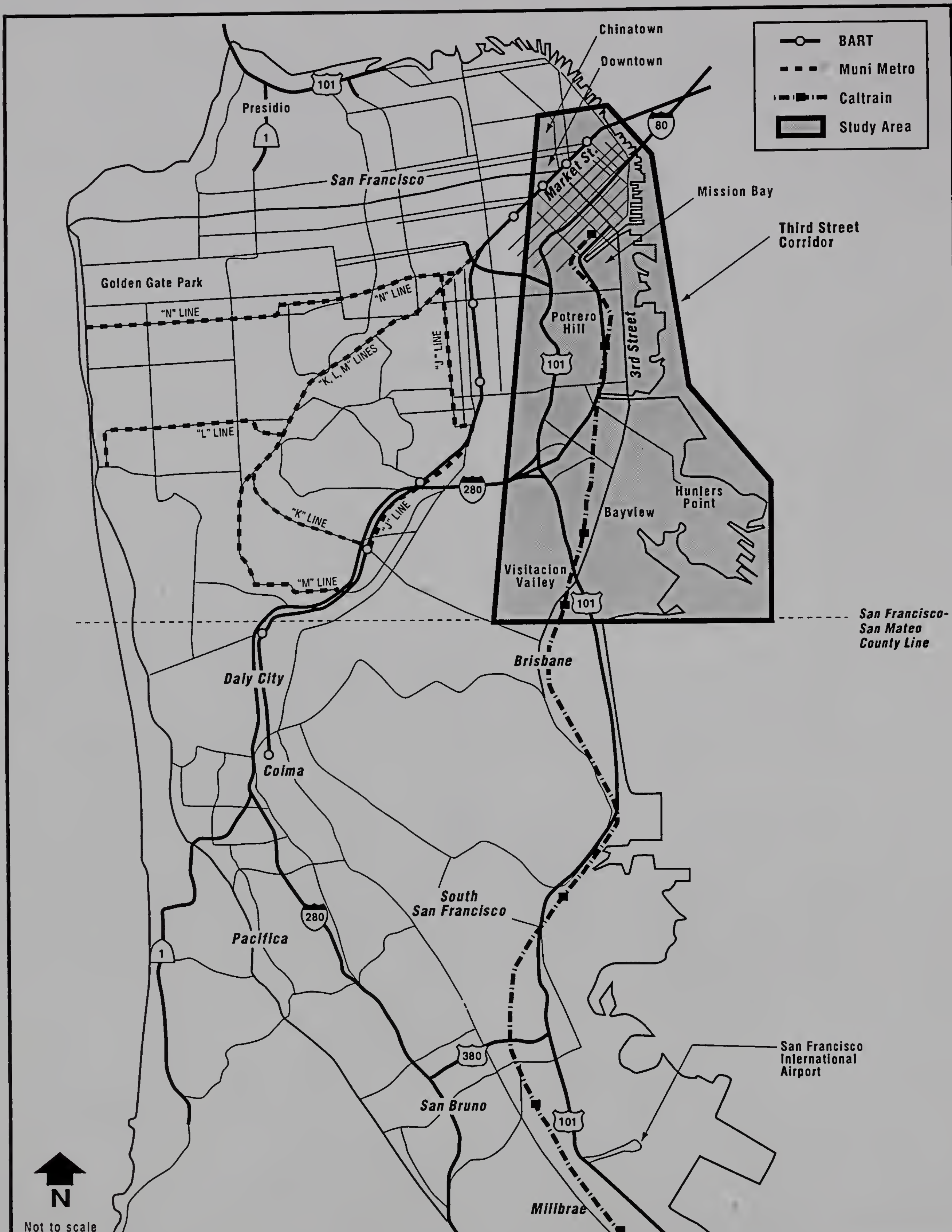
The location of the Third Street Corridor is shown in **Figure 1-1**. The Corridor, which is approximately seven miles long, extends along the northeastern and southeastern quadrants of San Francisco and encompasses Chinatown, Downtown, South of Market, Mission Bay, Potrero Hill, the Central Waterfront, Bayview Hunters Point, and Visitacion Valley/Little Hollywood.

1.2 PURPOSE OF PROPOSED ACTION

The Federal Transit Administration (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.

As the project applicant, MUNI's objective for the proposed project (this is CEQA language) is to provide transit improvements in the Third Street Corridor. MUNI is seeking federal funding assistance to construct the proposed Third Street Light Rail Project. Having completed the Major Investment Study (MIS) for the Corridor, the initial planning phase in the federal funding process, MUNI has initiated the federal National Environmental Policy Act (NEPA) and the state CEQA environmental processes for the Third Street Light Rail Project in order to assess the potentially significant environmental impacts of the project alternatives and to qualify for federal funding. After the EIS/EIR is completed, the City and County of San Francisco (City) will consider adoption and use of local funds for the preferred alternative (or a portion thereof), selected by the San Francisco Public Transportation Commission in 1998. FTA will then



J96-082.19b 3rd St. (11/17/97)

FIGURE 1-1

THIRD STREET CORRIDOR STUDY AREA LOCATION

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.

determine if the preferred alternative meets their transit investment objectives and whether to recommend federal funding for the Project. If the City does go forward with the Project, the City intends to request a letter from FTA which authorizes the City to use local funds for the first phase of the Project as the local contribution toward a future, yet to be secured, federal grant. This letter from FTA is called a Letter of No Prejudice.

1.3 NEED FOR TRANSPORTATION IMPROVEMENTS IN THE CORRIDOR

The Third Street Light Rail Project would address deficiencies in the transit system serving the communities in the southeastern part of San Francisco, including deficiencies that exist at present and those that are anticipated to exist during the 20-year planning horizon (2015). In addition, the Third Street Light Rail Project is also intended to serve as a key infrastructure improvement to help support the economic and physical revitalization of the Bayview Hunters Point commercial core along Third Street. The transportation deficiencies and project need are further described below.

1.3.1 MUNI SERVICE RELIABILITY PROBLEMS IN THE THIRD STREET CORRIDOR

The primary bus lines currently serving the Third Street Corridor are the 15-Third bus line, 9-San Bruno, 9X-San Bruno Express, 30-Stockton and 45-Union-Stockton. These lines traverse the dense and congested streets in Downtown San Francisco (Downtown) before traveling into the southeastern part of the City. Buses caught in this traffic congestion often provide unreliable service south of Downtown. Currently, passengers may experience overcrowding and extended waiting times between buses, as well as slower operating times and increased travel times. This situation is projected to worsen as traffic in Downtown and along the Corridor increases to projected 2015 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 2015, it will become increasingly important to provide efficient connections from the Third Street Corridor to transit lines serving all parts of San Francisco and the region. Residents of the communities in the Corridor perceive that they do not enjoy the same quality transit connections to the MUNI Metro rail system and to regional transit services such as BART as do residents in other parts of the City.

This mobility issue is particularly critical for residents in Bayview Hunters Point and Visitacion Valley who have the highest unemployment rate in the City (more than double the rate citywide[1]), and have limited public transportation access to rapidly-growing employment centers to the south in San Mateo and Santa Clara Counties. For example, to travel on public transportation to San Francisco International Airport (SFIA), which is the largest employer in San Mateo County with 32,000 jobs,[2] residents in the southeastern section of the City must make a circuitous and time-consuming trip that requires several transfers. Similar connectivity issues pertain to trips to Silicon Valley in Santa Clara County.

[1] 1990 US Census Data indicates that the South Bayshore area has an unemployment rate of 13.3%, Department of City Planning, San Francisco, Ca.
[2] 1997 Statistic, San Francisco International Airport Commission, Steve Gordon, Manager of Transportation and Planning, phone conversation, January 1998.

Connectivity issues also affect Chinatown. Residents of Chinatown perceive reduced connectivity resulting from the removal of Embarcadero Freeway following the 1989 earthquake. This perception of inadequate connectivity is heightened by the crowding experienced on MUNI bus lines serving Chinatown.

1.3.3 PROJECTED INCREASES IN 2015 TRANSIT AND AUTO TRAVEL DEMAND IN THE CORRIDOR

As presented in **Table 1-1**, a 39 percent increase in Corridor population and a 35 percent increase in Corridor employment is projected by 2015 **(Figure 1-2)**. This rate of increase is far greater than the City as a whole, which is expecting a five percent population increase and a 22 percent employment increase over the same period. Much of the population and employment growth will result from development in Mission Bay which is projected to include[3]:

- 246,450 sq. meters (2,650,000 sq. ft) developed space for the new University of California (UCSF) campus;
- 6,090 dwelling units;
- 137,000 sq. meters (1,476,000 sq. ft) of office space;
- 117,460 sq. meters (1,263,000 sq. ft) of retail space;
- 258,633 sq. meters (2,781,000 sq. ft) of research and development space;
- 9,300 sq. meters (100,000 sq. ft) of restaurant space;
- a 25-screen cineplex; and
- a 500-room hotel.

In addition to Mission Bay, other development proposals, which would contribute to population and employment growth in the Corridor, are being contemplated. They are:

- New 49ers stadium and Candlestick Mills Mall
- San Francisco Executive Park development
- Development in the proposed Transbay Redevelopment Area, including the Rincon Entertainment Center/US Postal Service Project

Other plans also may stimulate Corridor development. These plans are:

- Proposed Bayview Hunters Point Redevelopment Plan
- Hunters Point Shipyard Redevelopment Plan
- India Basin Industrial Park Redevelopment Plan
- Bayview Industrial Triangle Redevelopment Plan
- Rincon Point-South Beach Redevelopment Plan
- Proposed Transbay Redevelopment Plan
- Yerba Buena Center Redevelopment Plan
- Proposed Mid-Market Redevelopment Plan

[3] City and County of San Francisco Redevelopment Agency and Department of City Planning, March 1998; Mission Bay Draft Subsequent Environmental Impact Report; available in Project File #96.281E, Department of City Planning, 1660 Mission Street, San Francisco.

TABLE 1-1

POPULATION AND EMPLOYMENT PROJECTIONS 1995 AND 2015

	Population				Employment			
Area	1995	2015	Difference	% Change	1995	2015	Difference	% Change
Corridor	113,380	157,246	43,866	39%	277,348	373,624	96,276	35%
SF	759,906	795,363	35,457	5%	534,610	650,057	115,447	22%
Brisbane	10,255	12,549	2,294	22%	6,216	11,992	5,776	93%

Source: Metropolitan Transportation Commission/Association of Bay Area Governments Land Use Data Projections '96 and San Francisco Cumulative Update to Projections '96.
Notes: Corridor is defined by the MTC Travel Analysis Zones that are included in the Study Area identified in Figure 1-2.

More information about these development proposals and the Redevelopment Plan is presented in Section 4.1, Land Use.

South of the Corridor, employment opportunities in San Mateo and Santa Clara Counties are expected to increase substantially as well. For example, employment opportunities across the San Francisco-San Mateo County line in Brisbane are projected to nearly double by 2015 (refer to **Table 1-1).**

The rapid growth will affect travel demand in the Corridor correspondingly. **Table 1-2** indicates that Corridor daily trips are expected to increase by 42 percent in 20 years. For Mission Bay, total trips would increase by over 600 percent by 2015 given the present development scenario. In combination with the increase in trip generation expected to occur south of the City, travel demand in the Corridor, if accommodated by auto trips, would further exacerbate congested conditions on Corridor roads. 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 1995 AND 2015 DAILY PERSON TRIPS

Area	1995	2015	Difference	% Change
Mission Bay	46,384	293,517	247,133	633%
Corridor	1,073,707	1,520,791	447,084	42%
SF	3,815,274	4,475,060	659,786	17%
Brisbane	54,850	82,168	27,318	50%

Note: Transit patronage estimates considered the MTC regional travel demand model and land use assumptions from the San Francisco Cumulative Year 2015 Update to ABAG Projections '96. It should be noted that on-going projects (e.g., Mission Bay North Redevelopment Plan, Mission Bay South Redevelopment Plan, Transbay Terminal Redevelopment Plan, Hunters Point Naval Shipyard Redevelopment, etc.) are using similar approaches to estimate Year 2015 transit patronage. However, the transportation analysis for each of the projects assumes full build-out of the development under consideration, and utilizes assumptions for the rest of the city from the Update to ABAG Projections '96 (which assumes that a portion of total development would occur by 2015). Due to the variations in the development assumptions, however, the future transit conditions analysis are consistent with those estimates used in the traffic analysis.
Source: Metropolitan Transportation Commission 1995 Daily Trip Tables using Association of Bay Area Governments Projections '96 and Wilbur Smith Associates/Korve Engineering, Inc., updates to reflect San Francisco's 2015 Cumulative Update to Projections '96.

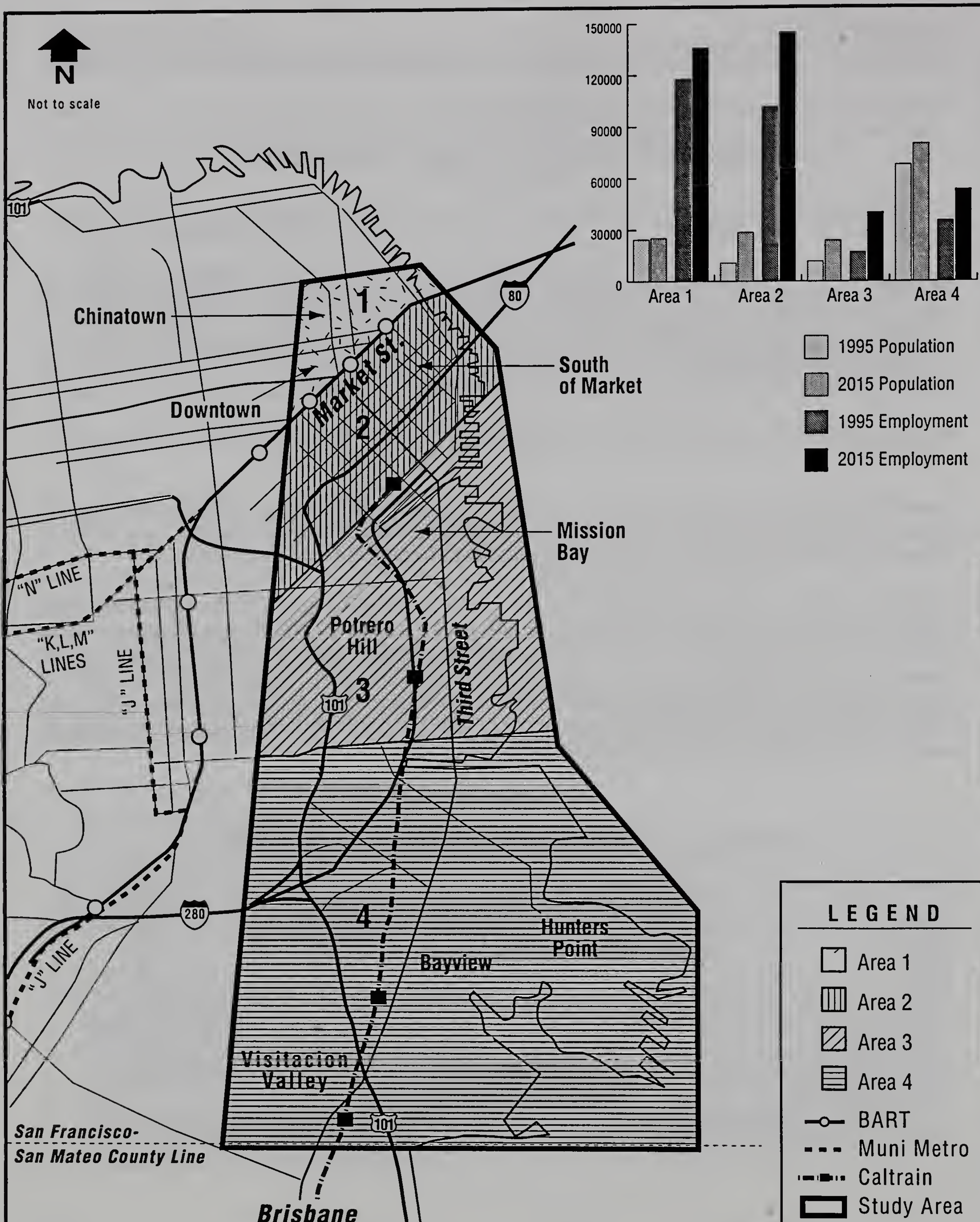


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FIGURE 1-2

POPULATION AND EMPLOYMENT PROJECTIONS FOR THIRD STREET CORRIDOR

Source: ICF Kaiser Engineers, Inc.

Third Street Light Rail EIS/EIR

1.3.4 PROJECTED INCREASES IN 2015 TRANSIT TRAVEL TIMES IN THE CORRIDOR

As a result of the projected population and employment growth in the Corridor, traffic congestion on major highways and arterials, particularly Highway 101 and Third Street, is expected to increase substantially **(Figure 1-3)**. As examples of increased congestion in the Corridor, the projected 2015 peak period Level of Service (LOS) for Highway 101 at Cesar Chavez is expected to be LOS F (excessive delays). Along Third Street, the existing Level of Service is expected to deteriorate from LOS C (acceptable delays) to LOS E (significant delays) along Third at Cesar Chavez, which has a substantial volume of cross-street traffic and left-turning traffic. Significant delays (LOS E) also are expected on Bayshore Boulevard at Blanken/Arleta Avenues. In addition, traffic in Downtown and Chinatown will remain extremely congested. The congestion will lengthen current operating times for transit in the Corridor, where major trunk lines currently travel in mixed traffic through Downtown and Chinatown, along Highway 101, and along Third Street.

1.3.5 INTEGRATION OF TRANSPORTATION IMPROVEMENTS WITH COMMUNITY REVITALIZATION ALONG THIRD STREET

The Bayview Hunters Point commercial core, located along Third Street, includes many small neighborhood-serving shops and services. In 1941, the streetcar line which had run down Third Street and helped spur the development of the Bayview Hunters Point commercial district, was removed. In addition, the adjacent Hunters Point Naval Shipyard closed in 1974, resulting in a substantial loss of jobs. Since then, the commercial district has fallen on hard times, with many empty storefronts and vacant lots detracting from the pedestrian character of the street and the economic vitality of the community.

The South Bayshore Area Plan of the City's General Plan addresses this problem by calling for the integration of transit- and pedestrian-oriented land use and new development along Third Street in concert with a new light rail investment. An example of the type of development called for in the South Bayshore Area Plan is affordable and market-rate housing above commercial and office space along Third Street.

1.3.6 AIR QUALITY ISSUES

The Bay Area air basin is designated as a state non-attainment area (not in compliance with state air quality standards) for ozone and small-diameter particulate matter. The 1994 Bay Area Clean Air Plan, prepared by the Bay Area Air Quality Management District (BAAQMD) in cooperation with the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG), includes measures which 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.

1.4 PROJECT GOALS AND OBJECTIVES

The goals and objectives for the Third Street Light Rail Project are based on the goals established in the *Bayshore Transit Study* [4] and modified to conform with FTA guidelines for evaluating the worthiness of proposed major transit capital investment projects. Prior to 1991, FTA evaluated major transit investment

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[4] San Francisco Municipal Railway, *Bayshore Transit Study Final Report:* December 1993, Available in Project File 96.281E at the Department of City Planning, 1660 Mission Street, San Francisco

FIGURE 1-3

THIRD STREET CORRIDOR PROJECTED 2015 LEVEL OF SERVICE (LOS) AT VARIOUS LOCATIONS

Source: ICF Kaiser Engineers, Inc.

Third Street Light Rail EIS/EIR

projects primarily on their cost effectiveness and their degree of local financial support. The FTA guidelines were modified by the 1991 federal Intermodal Surface Transportation and Efficiency Act (ISTEA) to include goals attainment and equity issues as major considerations in the evaluation of proposed transit projects. Further modifications to FTA guidelines were initiated in 1997 as part of the Section 5309 New Starts Criteria. The guidelines added mobility improvements, environmental benefits (particularly air quality and energy use reduction), transit system operating efficiencies, such as change in operating cost per passenger mile, transit-supportive land use, and local financial commitment. Measures are developed for each criteria for the purpose of comparing project alternatives.

In accordance with the revised FTA guidelines, MUNI has identified seven principal goals to be used to guide the evaluation of the No Project, No Build/TSM, and Light Rail Alternatives. They are:

1. Travel and Mobility Goal. Improve transit service to, from, and within the Third Street Corridor, thereby enhancing the mobility of Third Street Corridor residents, business people and visitors.
2. Equity Goal. Bring transit service in the Third Street 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 Third Street 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 Third Street Corridor residents and business people and is compatible with the City's planning initiatives.

Each goal has associated objectives, presented in **Table 1-3**. 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 study 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 use of the goals and objectives to compare and evaluate the No Project, No Build/TSM, and Light Rail Alternatives is presented in Chapter 8.

TABLE 1-3

GOALS AND OBJECTIVES SUMMARY

TRAVEL AND MOBILITY GOAL
Objective 1: Increase Transit Ridership Criteria: comparison of daily linked transit trips
Objective 2: Improve Service Reliability Criteria: number of miles of exclusive right-of-way for transit
Objective 3: Reduce 2015 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
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 Criteria: comparison of travel time from Third/Palou to Third/Market
Objective 2: Improve Access to Chinatown Criteria: comparison of travel time between Bayshore/Arleta and Stockton/Clay
ECONOMIC REVITALIZATION GOAL
Objective 1: Maintain Auto and Truck Access in the Third Street Commercial Core Criteria: curb parking supply on or near Third Street in Bayview
Objective 2: Maintain Adequate Transit and Vehicular Circulation in the Third Street Commercial Core Criteria: Third Street peak period level of service and average transit operating speed
Objective 3: Opportunities for Revitalization in the Third Street Commercial Core Adjacent to Transit Stops Criteria: acres of vacant or under-utilized land adjacent to transit stops
Objective 4: Enhance Urban Design/Streetscape Improvements along Third Street in Bayview Hunters Point Criteria: area for urban design/landscape treatments in the Third Street commercial core

TABLE 1-3 (Cont'd)

GOALS AND OBJECTIVES SUMMARY

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: 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 Beneficial Environmental Impacts to the Community Criteria: number of beneficial impacts 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 (Systemwide) Criteria: annual operating/maintenance costs compared with available and projected local funding
Objective 3: Maximize Transit Operating Efficiency While Accommodating 2015 Demand Criteria: operating cost per passenger (linked trips), per bus-hour, and per train-hour; farebox recovery ratio
COMMUNITY ACCEPTANCE GOAL
Objective 1: Gain Community Support for the Preferred Investment Strategy
Objective 2: Gain City Commissions' Support for the Preferred Investment Strategy
Objective 3: Gain Support from Appropriate Regional, State, and Federal Agencies

The proposed project would construct or institute new transit services in the southeastern section of San Francisco. Alternatives being considered include: 1) No Project; 2) No Build/TSM; and 3) Light Rail. This chapter describes these alternatives and the development process and screening of alternatives by the community and local agency representatives.

2.1 SCREENING AND SELECTION PROCESS

Initially, ten alternatives, encompassing diesel and electric buses and light rail having varied alignments/ operating scenarios were considered during a multi-phase planning and screening process which preceded the development of this EIS/EIR. The alternatives are described below as well as the previous studies which screened the initial set of alternatives. Where alternatives were rejected or eliminated from further study, the reasons are provided. A more detailed discussion of the screening process is presented in the *Detailed Definition of Alternatives, Working Paper #3.*[1]

2.1.1 SUMMARY OF PROJECT DEVELOPMENT PROCESS AND RELATED STUDIES

The Bayshore Corridor System Planning Study[2], completed by MUNI in December 1993, was the first step in the planning process to implement major public transportation improvements in the southeastern quadrant of the City. The study recommendations emphasized the importance of implementing light rail service along Third Street in the Corridor and the opportunity to use transportation investments to support economic revitalization efforts in the Corridor. In February 1994, the San Francisco Public Utilities Commission (the predecessor of the San Francisco Public Transportation Commission) approved a resolution (#94-0044) to carry forward five light rail options through the federal capital project development process.

Based on recommendations from a parallel study prepared under the direction of the Urban Habitat Program of Earth Island Institute in cooperation with the New Bayview Committee[3], MUNI conducted two feasibility studies to evaluate the feasibility of operating low floor vehicles into the Market Street Subway and consider locating a new light rail storage and maintenance facility (Metro East) in the Hunters Point Naval Shipyard. The Low Floor Light Rail Operations Study[4] determined that it would be feasible to operate low floor light rail vehicles (LRVs) into the Market Street Subway. The *Metro East Alternative ite Development Study*[5] compared the cost/benefits of alternative rail yard sites and recommended that Port property on Cargo Way near Third Street be considered as a viable alternative site.

In addition to the feasibility studies that related directly to the Third Street Project, MUNI and the San Francisco Transportation Authority conducted two other studies that further specified the light rail alternative. The Geary Corridor Systems Planning Study[6], completed by MUNI in 1995, determined the viability of a Third Street Central Subway in downtown San Francisco which could link the Third Street

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[1] San Francisco Municipal Railway, *Detailed Definition of Alternatives Working Paper #3*, October 1997; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco

[2] San Francisco Municipal Railway, *Bayshore Transit Study*, December 1993; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

[3] Earth Island Institute, *Social and Ecological Justice Transportation Plan*, January 1994; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

[4] San Francisco Municipal Railway, February 1996, *Summary of the Low Floor Light Rail Subway Operations Study*; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

[5] San Francisco Municipal Railway, *Metro East Alternative Site Development Study*; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

[6] San Francisco Municipal Railway, April 1995, *Geary Corridor System Planning Study*; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

service to Geary or another corridor. In 1995, the Transportation Authority's Four Corridors Study[7] refined the Central Subway concept and formalized the desirability of a light rail link between the Third Street and the Chinatown/North Beach corridor.

Simultaneously, MUNI and FTA staff met with representatives from other federal, state, regional and local agencies to discuss MUNI's request to advance the Third Street Light Rail Project through the federal capital development process. It was the consensus of those attending the collaborative meeting that MUNI, through the completion of the Bayshore Corridor System Planning Study, had already satisfied the first step of the federal planning process. The initial planning step, called the Major Investment Study (MIS), identified the project mode (light rail) and the alignment (Third Street). In October 1996, the Regional Administrator from the San Francisco FTA office concurred with MIS completion[8] and authorized the Third Street Project to proceed with Preliminary Engineering and preparation of a Draft Environmental Impact Statement.

The Third Street Light Rail Project is included in the current Metropolitan Transportation Commission Regional Transportation Plan as a totally locally-funded project (supported primarily by over $300 million - 1997 dollars - in Proposition B local sales tax revenues) which will implement the Initial Operating Segment of the Project. It is MUNI's intent to request formal FTA authorization (a Letter of No Prejudice) to allow the local funds expended for this initial phase to be used as the local contribution for future, yet to be secured, federal funds to construct the Central Subway. To date, no federal funds have been allocated to the Project.

Preliminary engineering of the IOS phase of Third Street Light Rail Project supports the evaluation of its impacts and alternatives in this EIS/EIR, but preliminary engineering of the New Central Subway phase of the Project has not yet been conducted. Though related, these two phases are distinct, subject to separate advancement decisions on separate schedules. This EIS/EIR presents, in addition to the detailed information about the Third Street Light Rail Project, planning-level information with less engineering detail about the impacts and alternatives of the New Central Subway phase of the Project. This full disclosure of future plans is in accordance with the guidance of the Council on Environmental Quality, which encourages the consideration of reasonably foreseeable related projects and cumulative impacts. The Third Street Light Rail Project being advanced at this time is shown to have independent transportation utility, so it does not depend on future decisions about the New Central Subway. When the New Central Subway phase of the Project is advanced, if FTA funding is sought, the environmental record will be reviewed for currency and adequacy and supplemented if necessary and appropriate.

2.1.2 ALTERNATIVES CONSIDERED

The initial Third Street Light Rail Project alternatives, described in the *Initial Definition of Alternatives Working Paper #1* (February 1997)[9], consisted of a No Build/TSM Alternative, which retained the existing 15-Third diesel bus service and increased service frequencies to meet 2015 demand, and a Light Rail Alternative, which implemented a new light rail line from the Caltrain Bayshore Station in Visitacion Valley to Downtown. The Light Rail Alternative had three Downtown alignment variations, or design

[7] San Francisco Transportation Authority, June 1995, *Four Corridor Plan*; available for review in Project File 96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.
[8] US Department of Transportation, Federal Transit Administration, letter from Leslie Rogers, Regional Administrator, San Francisco, Ca., June 4, 1996.
[9] San Francisco Public Transportation Commission and Municipal Railway, February 1997, *Initial Definition of Alternatives Report Working Paper #1*; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

options, as indicated in **Figure 2-1**: 1) via Third/King or 16th/Owens/King in Mission Bay into the Market Street Subway; 2) via a new Central Subway under either Stockton or Kearny; and 3) via a surface route along The Embarcadero and Market to the Transbay Terminal or along The Embarcadero and Washington to Kearny.

The alternatives were identified in the Notice of Preparation, which was sent to the Governor's Office of Planning and Research on October 18, 1996, and was distributed to Responsible and Trustee agencies and property owners and residents on October 24, 1996, and in the Notice of Intent, published in the Federal Register on October 25, 1996. In addition, the alternatives were presented for public comment at two Scoping meetings conducted by MUNI on November 20 and 21 in 1996. The Notice of Preparation was subsequently reissued on June 27, 1997, to include an alternative LRV maintenance site at the former Western Pacific yard adjacent to Pier 80 or at a site along Cargo Way.

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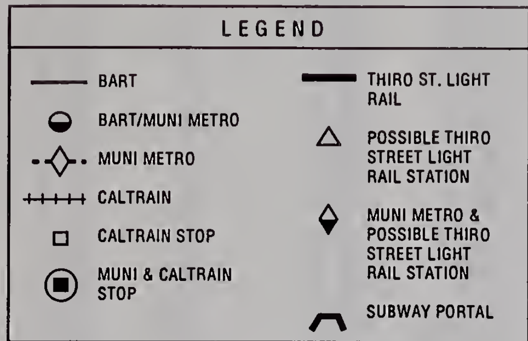
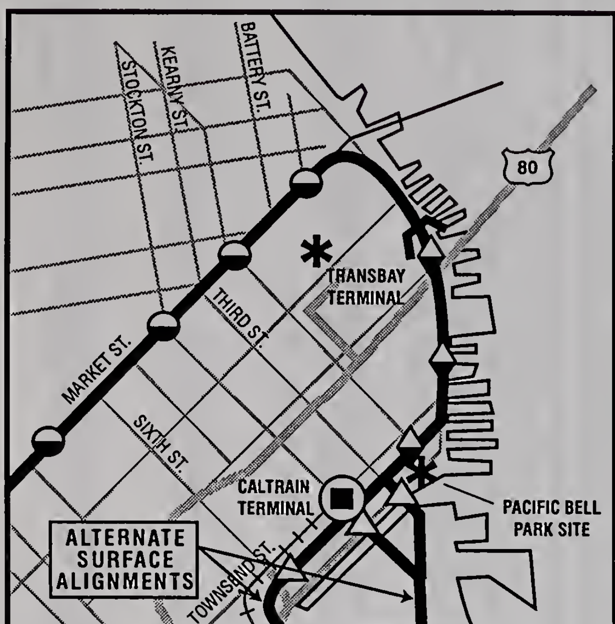
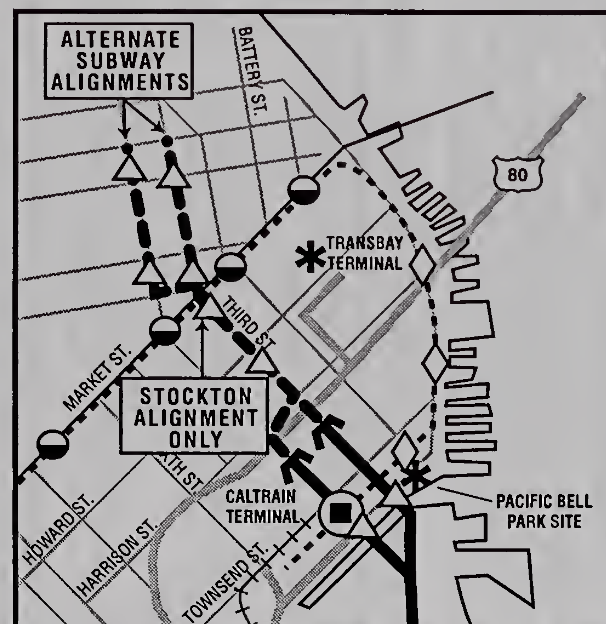
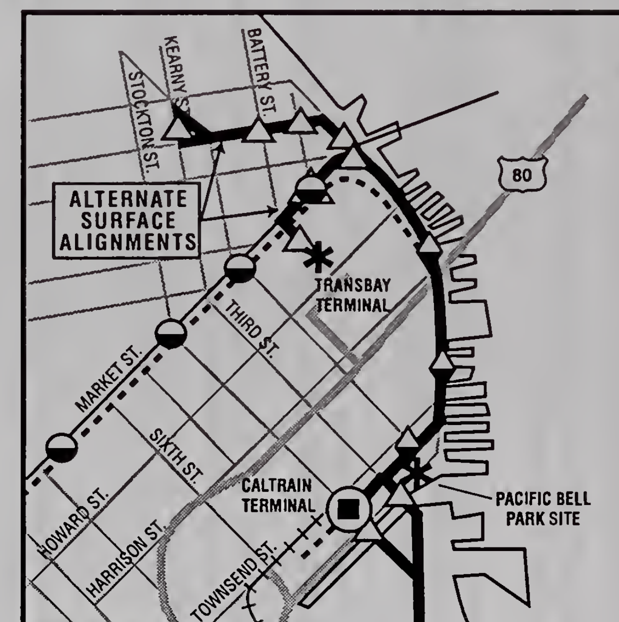




Option 1: Market Street Subway



Option 2: New Central Subway



Option 3: Downtown Surface Route

FIGURE 2-1

DOWNTOWN ALIGNMENT OPTIONS

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.

J96-082.38b Mc4

2.1.3 MODIFICATIONS TO THE ALTERNATIVES IN THE SCOPING AND PUBLIC PARTICIPATION PROCESS

Two public meetings were held during the Scoping Process to receive public commentary on the environmental issues associated with the Third Street Light Rail Project alternatives. Some of the key issues identified during Scoping are summarized in **Table 2-1**.

As a result of public input during the Scoping Process and at the neighborhood workshops and economic forums, the following modifications were made to the Light Rail Alternative:

- Multiple traffic lane and streetscape options were incorporated into the light rail surface alignment along Third Street between Kirkwood and Thomas Avenues. One-lane, two-lane, and flexible (tow-away) lane configurations were developed, each with varying sidewalk widths, curb parking patterns and, in the case of the one-lane option, the opportunity for establishing a bike lane.

- Center and side platform configurations were considered on a station-by-station basis to allow left-turn pockets, added parking, and streetscape enhancements where desired.

- Several station locations were newly-designated or reassigned: 1) the proposed station at Thomas Avenue was moved to Williams-Van Dyke to coincide with the transfer point for the 54-line; 2) a station was added at Third/Shafter to serve the southern end of the Third Street commercial core; 3) a station at the intersection of Third and South Streets in Mission Bay was added to serve the planned University of California campus; and 4) a station was added at Third and Mission Rock Streets in Mission Bay to serve the planned uses south of Mission Creek.

- A bi-directional alignment on the Fourth Street bridge across Mission Creek was added in order to provide better access to the Caltrain Terminal at Fourth and King Streets, reduce conflict between the light rail line and vehicular/pedestrian activity at the Pacific Bell Ballpark and reduce capital costs associated with two separate rights-of-way.

- A “hybrid” (low, mini-high) station platform design was added to minimize potential visual intrusiveness of the station platforms while still maintaining compatibility with standard high-floor light rail vehicles.

2.1.4 SCREENING OF DESIGN OPTIONS/ALTERNATIVES NOT CARRIED FORWARD

The Light Rail Alternative described in Working Paper #1 incorporated a series of design options that were subsequently examined from technical, financial, environmental, economic revitalization, and community perspectives. The screening of design options was used 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* (April 1997)[10]:

- <u>Decision 1</u>. 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)?

- <u>Decision 2</u>. 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?

[10] San Francisco Public Utilities Commission and Municipal Railway, April 1997, *Design Options Screening Report Working Paper #2*; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

TABLE 2-1

**SUMMARY OF PUBLIC COMMENTS RECEIVED
DURING THE SCOPING PROCESS**

PUBLIC COMMENT	ACTION
Include designated bike lanes along Third Street	While a desired goal, it was only possible to include such a lane for the eight-nine block segment of the Third Street commercial core under the one-lane design option. All design options retained the existing "bike route" designation throughout the length of Third Street.
Underground the light rail alignment on Third Street in Bayview	This idea was rejected because of the prohibitively high capital cost associated with such extensive subway construction, the duration of disruption to the businesses and residents during subway construction.
Grade-separate 16th Street from rail movements near the new LRV maintenance facility site at Mission Bay	The new LRV maintenance facility site at Mission Bay was subsequently dropped because of the conflicting land use with the planned UCSF campus.
Examine linkages of Third Street Light Rail to key destinations and with other transit systems	This analysis is included in the DEIS/DEIR.
Retrofit an existing building in the Corridor to serve as the new LRV maintenance facility	New LRV maintenance facility requires at least 11 acres of land and several structures to accommodate LRV storage and maintenance. This idea was rejected because no existing building(s) in the Corridor offered the requisite area or building configuration to serve as a maintenance and storage facility.
Evaluate one alternative that considers a realistic future level of funding	Option 1 (integrating the Third Street light rail line with MUNI Metro via the Market Street Subway) could be funded solely with local revenues. (Measure B and possibly other local funding sources).
Consider two stations for the Central Subway north of California Street	This idea was rejected as part of this project because two proximate Chinatown subway stations would slow light rail operating times and substantially increase project capital and operating costs. Another Chinatown station north of Clay will be considered as part of a future extension of the line.
Consider a lower-cost surface alternative in lieu of the Central Subway	The Initial Operating Segment via the Market Street Subway was designated as the lower-cost light rail option. The Central Subway has been retained because it offers greater travel time and operating cost savings in the congested South of Market, Downtown, and Chinatown areas than what can be achieved with a surface alignment.
Consider electrifying bus lines in the Corridor	Converting the 15-Third bus line to trolley bus service was eliminated during the System Planning Study phase of the project primarily because it did not meet MUNI's and the communities' transit service and economic revitalization goals.
Evaluate the use of raised rail bed along Third Street, or alternatively, the use of the Illinois Street rail right-of-way	A 4" to 6" raised rail right-of-way has been incorporated into the light rail surface alignment. The Illinois Street alignment was rejected because of the added travel time required and because Illinois Street is not included in the proposed new Mission Bay street plan.
Evaluate two tracks on the Fourth Street bridge	This option is in the DEIS/DEIR.

- Decision 3. Which Third Street configuration should be selected: two lanes, one/two flexible lanes, or one lane; and which LRV type (high floor or low floor), which station platform height and configuration, and which 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 40 meetings. 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) on July 8, 1997, narrowed the design options to be carried forward in the EIS/EIR. For the Light Rail Alternative, the PTC eliminated the 16th/I-280/King alignment through Mission Bay, the Central Subway alignment via Kearny, and the Downtown Surface Route via Market or Washington. The PTC decisions are summarized in **Table 2-2**.

Possible future extension (branches of the Third Street light rail line) were addressed in the *1993 Bayshore Transit Study*. Possible branches to Hunter's Point Shipyard, Candlestick Point and the Balboa Park BART station were identified, but were not carried forward for funding or conceptual engineering and are not analyzed in this environmental document. These possible future branches of the proposed Third Street Light Rail Project, plus a possible branch to the proposed stadium and mall at Candlestick Point, would need subsequent conceptual engineering and environmental analysis if proposed at a future date. No funding for these possible branches has been identified.

2.1.5 SUMMARY OF ALTERNATIVES TO BE CARRIED FORWARD IN THE EIS/EIR

The Public Transportation Commission directed MUNI to examine the No Build/TSM Alternative and the Light Rail (Build) Alternative in the EIS/EIR as follows:

- The No Build/TSM Alternative would retain service on the 15-Third bus line and increase service frequencies to meet 2015 demand, requiring additional diesel buses and a new bus maintenance and storage facility; and

- The Light Rail Alternative would replace the 15-Third diesel bus service with a light rail line along Bayshore Boulevard and Third Street to King Street and would accommodate 2015 demand. A subsequent phase would construct a new subway from King to a northern terminal at Stockton/Clay.

The Light Rail Alternative would include a new maintenance and storage facility for accommodating additional light rail vehicles (either high floor or low floor).

In addition, the EIS/EIR considers a No Project Alternative required by CEQA that retains the existing Corridor transportation system. The No Project Alternative would not accommodate 2015 demand, and it serves as a baseline for comparison with other alternatives.

2.2 NO PROJECT ALTERNATIVE

In conformance with CEQA guidelines, the No Project 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 Corridor. The No Project Alternative, therefore, includes the existing MUNI route network, fleet size and fleet mix, facilities, and existing service

TABLE 2-2

SCREENING OF DESIGN OPTIONS

DECISION	DESIGN OPTION	ACTION
Decision 1: Downtown Alignment Suboption 1A or 1B	Third/King or 16th/ I-280/King through Mission Bay	Dropped the 16th/I-280/King suboption because this longer route through Mission Bay produced increased capital and operating costs without generating additional riders. Added another alignment across Mission Creek using the Fourth Street Bridge in both directions.
Decision 1: Downtown Alignment Suboption 2A or 2B	Central Subway via Stockton or Kearny Streets	Dropped the Kearny Street alignment because of community support for the Stockton alignment, which would serve the heart of Chinatown and the Union Square retail area as well as generate greater ridership and reduced operating costs.
Decision 1: Downtown Alignment Suboption 3A or 3B	Surface Route via Market or Washington Streets	Dropped the Washington Street alignment because of community opposition, substantial parking impacts, and higher capital costs than the Market Street alignment.
Decision 2: Downtown Alignment Option 1, 2, or 3	Market Street Subway, New Central Subway, or Downtown Surface Route	Dropped the Surface Route because it had longer travel times, lower ridership, and did not directly serve the Union Square retail area or the heart of Chinatown. For capital cost and phasing reasons, the PTC selected the Market Street Subway alignment as the initial phase and the Central Subway as the ultimate project.
Decision 3: Third Street Lane Configuration	Two-lane, one-lane, or flexible lane	Dropped the flexible configuration (parking lane becomes tow-away zone in peak periods) because the community objected to this method of providing on-street parking along Third Street. At the request of some Bayview Hunters Point businesses, the Redevelopment Agency and the Department of Parking and Traffic, a new mixed-flow option was added.
Decision 3: Station Platforms/Vehicle Type	High-floor or low-floor LRVs and associated station platforms	Continued both options utilizing the existing high-floor LRVs, but required that the low platform configuration have a high boarding area at the front door of trains to provide accessibility for disabled persons on MUNI's existing high-floor LRVs.
Decision 3: Station Locations and Design	Stations, primarily side-platform configuration, spaced every three to five blocks south of King Street	Retained the station locations and design identified in the Design Options Screening Report, but added a second Mission Bay station south of Mission Creek and preserved the option for a future station at Cargo Way if demand warrants.
Decision 4: New LRV Maintenance Facility Site	Mission Bay, Western Pacific, or Cargo Way	Dropped the Mission Bay site because a new LRV maintenance facility would not be compatible with the planned UCSF campus across 16th Street from this site. Identified the Western Pacific site as the preferred location, pending negotiations with the Port.
Decision 4: New LRV Maintenance Facility Phasing	One- or two-phase approach	Requested a two-phase approach for accommodating an initial fleet of 60 LRVs in order to reduce initial project capital cost.

frequencies as well as the existing roadway system. The No Project Alternative would not accommodate 2015 demand. The existing transportation system in the Corridor is described below.

2.2.1 EXISTING TRANSIT SYSTEM

MUNI operates 79 lines seven days a week and, on an annual basis, carries over 211 million riders. Although the MUNI route network is a modified grid allowing multi-destinational travel, 54 of the 79

MUNI routes travel to the Central Business District (CBD), including 16 express routes. In general, service hours are 5 am until 1 am with 12 routes operating on a 24-hour basis.

Within the Third Street Corridor, service from the southern end of the Corridor to Downtown is provided by diesel bus lines, particularly the 15-Third bus line and the 9X-San Bruno Expresses (**Figure 2-2**). The 15-line, which currently carries over 25,000 daily riders, operates between City College and North Beach.

Including late night (Owl) service, transit along Third Street operates 24 hours a day. Although the 15-line has high daytime service frequency (six to seven minute headways during peak periods), the line often operates irregularly with gaps in service. The 9X-San Bruno Expresses (9X, 9AX, and, 9BX) operate on weekdays only, connecting Visitacion Valley with Downtown and Chinatown. The 9AX and 9BX offer peak period, peak direction service only, and the 9X provides reverse peak and midday service throughout the day. These expresses carry over 14,300 daily riders. From Visitacion Valley, they operate as express service along Highway 101 to Sixth and Bryant/Harrison Streets. They provide local service through South of Market, Downtown, and Chinatown. Local service between Visitacion Valley and Downtown to the Ferry Building is provided by the 9-San Bruno, which operates seven days a week. A route map for MUNI service in the Corridor is presented in Section 3.1.1.

In the northern portion of the Corridor, MUNI provides extensive route coverage, frequent service, and connections with MUNI Metro and regional transit services. The 30-Stockton and 45-Union-Stockton trolley bus lines complement the local service provided by the 15 and 9X in South of Market, Downtown, Chinatown, and North Beach. South of Mission Bay, MUNI crosstown service, provided by the 19-Polk, 22-Fillmore, 23-Monterey, 24-Divisadero, 29-Sunset, 44-O'Shaughnessy, and 48-Quintara/24th Street connects the Corridor with other areas of the City. The 54-Felton, 56-Rutland, and the 42-Downtown Loop provide feeder (community) service within the Corridor. Existing service frequencies for major Corridor bus lines are provided in **Table 2-3**. More detailed descriptions of the above and other transit services available in the Corridor are provided in Section 3.1.1.

In addition, the No Project Alternative includes the extension of MUNI Metro to the Caltrain Station at Fourth and King Streets, the implementation of the MUNI Metro Automated Train Control System (ATCS), 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 Third Street Corridor are assumed as part of the No Project Alternative. They are listed below, and those located north of Mission Bay are indicated in **Figure 2-3**.

- <u>LRV fleet replacement/expansion</u>. New Breda LRVs are beginning to replace the fleet of existing Boeing LRVs. By 2000, it is planned that 136 new LRVs will be available for service, completing the replacement cycle for the Boeing LRV fleet. A net gain of six LRVs above the existing equipment pool of 130 LRVs will allow for operation along the MUNI Metro Extension while maintaining existing service levels on all MUNI Metro lines.

- <u>15-Third bus line signal pre-emption</u>. MUNI will install signal pre-emption devices on Third Street and Bayshore Boulevard that will allow 15-line buses to pre-empt traffic signals, giving transit priority at signalized intersections.

- <u>30-Stockton and 22-Fillmore</u>. MUNI will place 30 new articulated and standard trolley coaches into service beginning in 1999. A portion of the new articulated trolleys will be assigned to the 30-Stockton, completing the replacement of standard trolley coaches operating on this line and all other trolley lines. In addition, the 30-line (and, if demand warrants, the 45-Union-Stockton) would be

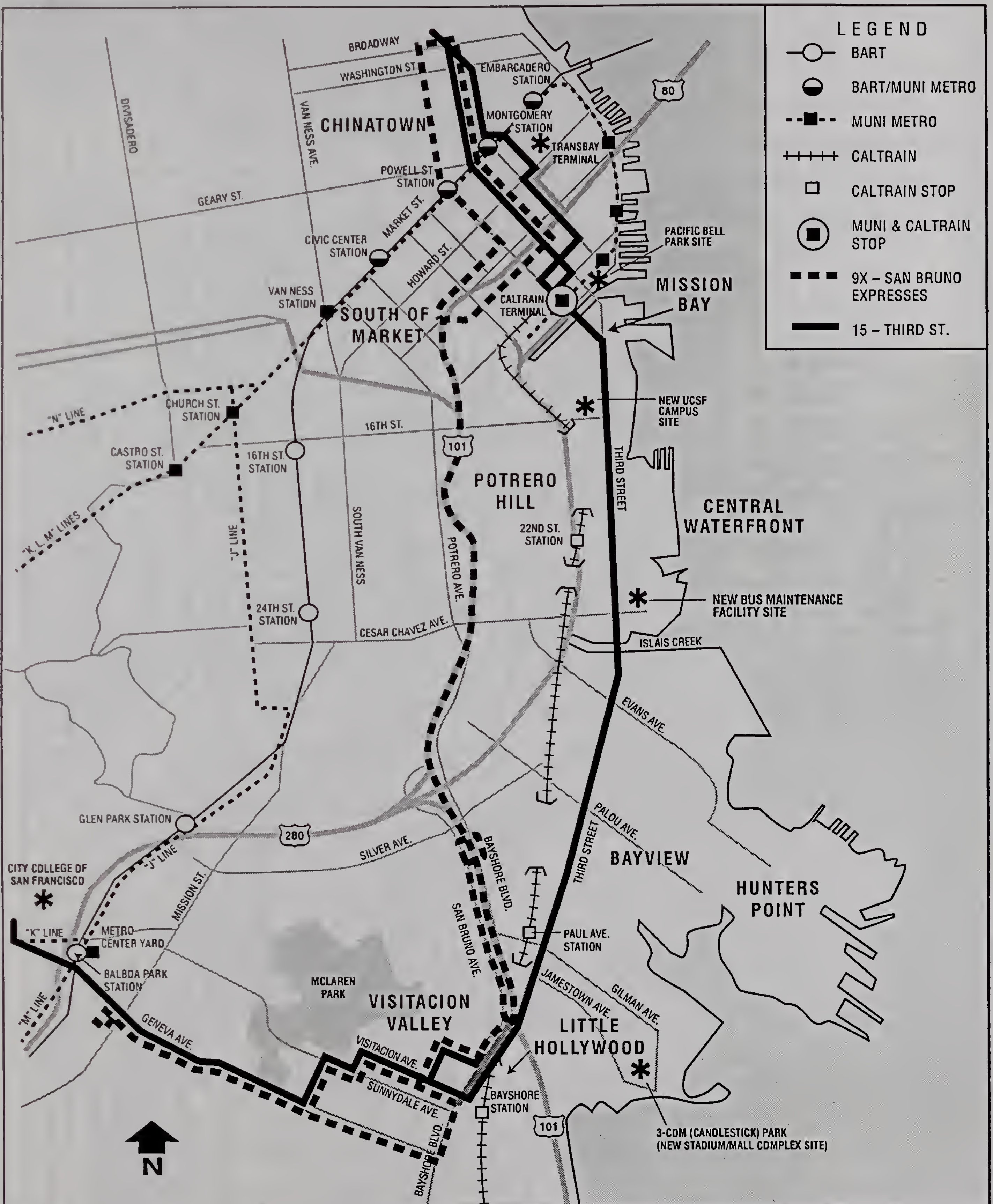


FIGURE 2-2

TRANSPORTATION NETWORK FOR THE NO PROJECT ALTERNATIVE AND THE NO BUILD/TSM BUS ALTERNATIVE

Source: ICF Kaiser Engineers, Inc.

TABLE 2-3

GUIDE TO FREQUENCY OF SERVICE
(AVERAGE TIME IN MINUTES)

		WEEKDAY						SATURDAY					SUNDAY					OWL
ROUTE NAME	ACCESSIBLE*	First	7-9a	9a-4p	4-6p	Eve	Last	First	7-10	10-6	Eve	Last	First	7-10	10-6	Eve	Last	1a-5a
9X San Bruno Express	Yes	-	12Ψ	12Ψ	10	-	-	Inbound: 6:45 - 8:30 a.m.					Outbound: 4:10 - 6:00 p.m.					
9AX San Bruno 'A' Express	No	-	10🗁	-	10🗁	-	-	Inbound:: - 8:56 a.m.					Outbound: 3:56 - 6:08 p.m.					
9BX San Bruno 'B' Express	No	-	10🗁	-	10🗁	-	-	Inbound: 6:41 - 8:58 a.m.					Outbound: 3:54 - 6:02 p.m.					
15 Third Street	Yes	5:28	6	10	6	15	11:54p	5:28	10	10	15	11:54pm	5L28	10	10	15	11:54p	
19 Polk◆	Yes	5:22	10	15	15	15	1:27	5:22	20	20	15	1:27	5:22	20	20	15	1:27	-
22 Fillmore	No	Owl	6	8	7	10	Owl	Owl	10	8	10	Owl	Owl	10	8	10	Owl	30
23 Monterey	Yes	6:05	15	20	15	20	12:05	5:42	20	20	20	12:05	5:42	20	20	20	12:05	-
24 Divisadero	No	Owl	10	10	8	15	Owl	Owl	20	15	15	Owl	Owl	20	15	15	Owl	30
29 Sunset S. of 25th & Calif.	Yes	6:03	15	15	14	20	12:43	6:00	15	15	20	12:34	6:00	15	15	20	12:34	-
30 Stockton	No	5:30	4	6	4	10	1:06	6:00	10	6	8	1:06	6:00	20	10	10	1:06	30‡
42 Downtown Loop	Yes	6:17	10	12	10	20	12:32	6:29	20	20	20	12:21	6:29	20	20	20	12:21	-
44 O'Shaughnessy	Yes	5:55	15	15	10	20	12:30	5:55	15	15	20	12:30	5:55	15	20	20	12:30	-
45 Union-Stockton	No	6:10	6	8	8	20	1:02	6:10	15	12	15	1:30	6:10	20	15	15	1:30	
48 Quintara-24th St.	Yes	5:20	12	20	12	20	12:20	5:45	20	15	20	12:20	5:45	20	15	20	12:20	-
54 Felton	Yes	5:53	20	20	20	20	12:35	5:50	20	20	20	12:34	5:50	20	20	20	12:34	-
56 Rutland	Yes	6:50	30	30	30	30	7:05p	6:50	30	30	30	7:05p	6:50	30	30	30	7:05p	-

* Lines that are indicated as accessible operate <u>all</u> service with wheelchair accessible buses.
Ψ Reverse-peak direction service
🗁 Service operates peak-hour, peak-direction only
◆19 Service to Hunters Point Naval Shipyard ends at 7:42 p.m.
‡ Late night service provided by the 91-Owl.
Source: San Francisco Municipal Railway

J96-082.12c Mc4

FIGURE 2-3

NO PROJECT AND NO BUILD/TSM ALTERNATIVES TRANSIT AND ROADWAY IMPROVEMENTS

Source: ICF Kaiser Engineers, Inc.

extended from Fourth/Townsend through Mission Bay and Potrero Hill to a new terminus at Third/20th Streets, replacing 22-Fillmore service in Potrero Hill. At the same time, the 22-Fillmore would be rerouted through Potrero Hill along 16th Street to Third, in accordance with the Mission Bay planning process.

- F-line historic streetcar. MUNI will extend the F-line streetcar east along Market Street, south on Steuart Street, and through the MUNI bus turnaround to the Ferry Building. From the Ferry Building, the route will continue north along The Embarcadero to Fisherman's Wharf. Although portions of the trackway have been installed in the median of the Embarcadero Roadway, operation to Fisherman's Wharf is contingent on completion of the Mid-Embarcadero Roadway project, which will include the F-line track in the roadway design and in the redesign of Justin Herman Plaza/MUNI bus turnaround. Completion of this project is expected in 2000.
- F-line/MUNI Metro Extension connector track. As part of the Mid-Embarcadero Roadway project, a connector track will be installed in the median of the Embarcadero Roadway from south of the Ferry Building to Folsom Street. The connector track will link the F-line with the MUNI Metro Extension to permit F-line vehicles to reach the new Giants ballpark (Pacific Bell Park) and other developments in Mission Bay. No regular service is planned at this time.
- Islais Creek bus maintenance and storage facility. In 1998, MUNI will begin construction of a new bus maintenance facility at Indiana and Tulare Streets to replace Kirkland Division. The $25 million facility will be situated on a 4.2-hectare (10.4 acre) site that can accommodate a maximum of 165 standard diesel buses. Running repair and heavy repair functions will be performed at this facility when it becomes operational in 2001.
- Potential Transbay Terminal relocation. The City and County of San Francisco, through its Redevelopment Agency, is examining the opportunity to replace the existing Transbay Terminal with a new bus facility. A site south of Howard Street and between Main and Beale Streets is being considered.

2.2.2 EXISTING ROADWAY SYSTEM

The Third Street Corridor contains major north-south roadways that link the southeastern quadrant of the City with Downtown and provide connections to the Peninsula, the Bay Bridge and the Golden Gate Bridge (refer to **Figure 2-2**). In addition, the Corridor contains principal thoroughfares that distribute traffic in South of Market, Downtown and Chinatown, as well as along the Waterfront. The major roadways are (more detailed descriptions of these and other roadways are provided in Section 3.1.2):

- Highway 101. The principal north-south highway linking San Francisco with the Peninsula to the south and with Marin County to the north. The ten-lane, limited access highway provides a direct connection with I-80 and the Bay Bridge.
- I-280. A ten-lane, limited access highway linking the Peninsula with the southwestern quadrant of the City and with South of Market and the Waterfront.
- Third Street. The principal north-south arterial in the Corridor extends from Highway 101 and Bayshore Boulevard to Market Street. In the southern portion of the Corridor, the roadway has three traffic lanes in each direction plus on-street parking. At King, Third Street is paired with Fourth Street as a one-way couplet and travels northbound to Market Street. It has three traffic lanes and two parking lanes which become traffic lanes during the peak.
- Bayshore Boulevard. A four-lane (with left turn pockets), north-south arterial that parallels Highway 101 on the east from Cesar Chavez to Third Street. At Third Street, Bayshore Boulevard crosses

Highway 101 and becomes a six-lane roadway, traversing Visitacion Valley and Little Hollywood into San Mateo County.

- Stockton/Kearny Streets. The north of Market continuation of Third and Fourth Streets, respectively, linking Downtown with Chinatown/North Beach. Stockton is a three-lane, southbound street containing a bus lane south of Sutter Street, and a two-way street with three traffic lanes and two parking lanes north of Sutter. Kearny is a four-lane one-way street northbound north of Market during peak periods and three lanes with parking during the off-peak.

- King Street/Embarcadero Roadway. Redesigned boulevards that are the principal thoroughfares along the Waterfront from Fifth to Folsom Streets. The linked roadways have two traffic lanes and left turn pockets in each direction, parking on both sides, and the MUNI Metro Extension in a wide landscaped median. West of Fifth, King will be connected to newly-constructed I-280 on- and off-ramps, thereby linking I-280 with the Waterfront.

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

- Mid-Embarcadero Roadway. The Embarcadero Roadway between Folsom and Broadway Streets will be redesigned to conform with the lane and parking configuration of the roadway south of Folsom Street and north of Broadway Street. The Embarcadero Roadway in this section will have five to six lanes during peak periods, transitioning to four travel lanes north and south of the project limits. In front of the Ferry Terminal, the roadway will be divided by open space, which will contain public monuments and the F-line track and station.

- Bay Bridge approach and Terminal Separator ramps. Caltrans is expected to provide seismic upgrade to the Bay Bridge approach structure and rebuild the Terminal Separator ramps by 2002 according to the designated Locally Preferred Alternative described in the Mid-Embarcadero Roadway FEIS/FEIR.

- King Street Surface Roadway - Phase 2. Frontage roads along the new King Street/I-280 freeway ramps are planned to be constructed, including landscaping, street lighting, traffic signal systems, retaining walls, and underground utilities. The project will provide for access along King Street between Fifth and Berry Streets.

- Third Street Mission Creek bridge. The Third Street lift bridge over Mission Creek was built in 1932 and is in need of seismic upgrade and rehabilitation. The City is currently designing the improvements for this bridge that will ensure carrying capacity for two-car LRV trains.

- Fourth Street Mission Creek bridge. The Fourth Street lift bridge over Mission Creek was designed in 1915 and also is in need of seismic upgrade and rehabilitation. The Department of Public Works will design the improvements for this bridge in 1998, ensuring carrying capacity for two-car LRV trains.

- Illinois Street Improvements. In 1999, Illinois Street will be repaved between Mission Bay and 25th Street and one existing freight rail track will be left in the southbound traffic lane. It should be noted that an extension of Illinois Street over the Islais Creek Channel has been proposed, but is not presently planned or sponsored by any agency.

- Cesar Chavez Street. The Department of Parking and Traffic will implement improvements in 1998 to improve access to and from I-280 and Highway 101. The planned improvements include adding a left-turn lane on eastbound Cesar Chavez Street between Third and Mississippi Streets, creating eastbound and westbound bicycle lanes, and adding a right-turn lane between Minnesota and Pennsylvania Streets to improve traffic flow to the I-280 freeway ramps. Signalization of the Highway 101 northbound off-ramp to Cesar Chavez Street is also proposed to facilitate truck movements directly onto Jerrold Avenue.

- Terry Francois Boulevard Improvements. The roadway is proposed to be restriped for four lanes of traffic and two bicycle lanes in accordance with decisions emanating from the Mission Bay redevelopment planning process.

2.3 NO BUILD/TSM ALTERNATIVE

The No Build/TSM Alternative (required by NEPA and FTA guidelines for comparative proposes) would include the transit and roadway system and improvements to the system identified in the No Project Alternative in combination with added transit service in the Corridor, primarily on the 15-line, to meet 2015 demand.

2.3.1 MUNI SERVICE, FLEET, AND FACILITY REQUIREMENTS TO MEET 2015 DEMAND IN THE CORRIDOR

The 2015 No Build/TSM Alternative Operating Plan incorporates modifications to transit service that include the transit improvements mentioned above and the need to increase the fleet size to accommodate 2015 ridership demand and to compensate for increased bus travel times caused by increasing traffic delays. In addition, the 2015 No Build/TSM Alternative Operating Plan reflects the additional service hours resulting from the increase in Corridor ridership and the increased transit travel times due to Corridor roadway congestion anticipated over the 20-year planning horizon.

The increased transit travel times will require additional diesel buses to be placed into service to maintain the existing scheduled headways on the 15 and 9X. The diesel bus fleet size would be further expanded to accommodate 2015 transit demand in the Corridor, expected to grow by 79 percent. To accommodate the demand, a short-line service between Third/20th Streets and Kearny/Pacific Streets would be instituted for the 15-line as part of the No Build/TSM Alternative, and service frequencies on the 15-line would be increased from the No Project Alternative to five minutes in the peak period and eight minutes during midday for the full-line and short-line service. Service on the 9X-San Bruno Expresses would remain at existing service levels except during the afternoon peak, which would have service frequencies increased from 10 to 7.5 minutes.

MUNI's existing bus maintenance and storage facilities could not accommodate the additional articulated buses. As a result, a new bus maintenance facility would need to be constructed for the No Build/TSM Alternative. This facility would be located on Port Commission land adjacent to Pier 80, on the western portion of the former Western Pacific site. The bus maintenance facility would occupy about 1.8 hectares (4 acres) of land to service about 33 diesel buses and seven trolley buses.

The changes in service to accommodate 2015 demand are reflected in the No Build/TSM Alternative service hours and miles, indicated in **Table 2-4**, from which the No Build operating and maintenance costs are derived. In this scenario, the additional buses needed to meet 2015 demand would be acquired to begin operation in 2008. The new bus maintenance facility would be constructed earlier to accommodate the newly-purchased buses.

2.3.2 TRANSIT FLEET REQUIREMENTS

For the No Build/TSM Alternative, MUNI would need 40 new buses (33 articulated diesel and seven trolley buses), including spare buses (the additional vehicles needed in the peak to compensate for those

TABLE 2-4
ANNUAL OPERATING STATISTICS FOR THE NO BUILD/TSM ALTERNATIVE

	Peak Headways: 15 Line	Diesel/ Trolley Peak Demand	Annual Bus Hours Systemwide	Peak Headways: MUNI Metro	LRV Fleet Peak Demand	Annual LRT Car-Hours Systemwide
Existing (1998) (No Project Alternative)	6 minutes	373 diesel buses/263 trolley buses	2.29 million	6 minutes (J,L,N lines) 12 minutes (K,M lines)	107 LRVs	395,600
No Build/TSM (2015)	5 minutes	400 diesel buses/269 trolley buses	2.40 million	6 minutes (J,L,N lines) 12 minutes (K,M lines)	107 LRVs	395,600
Difference from Existing	Reduced headways	+27 diesels/+6 trolleys	+.11 million	--	--	--

that are being repaired), to meet peak period demand in 2015. For this scenario, the total bus fleet size, including spares, would be 804, or 40 more buses than the No Project Alternative (existing conditions). The total light rail fleet size, including spares, would be 136, or the same as in the No Project Alternative[11].

2.4 LIGHT RAIL (BUILD) ALTERNATIVE (PROPOSED PROJECT)

The Light Rail Alternative would construct a light rail line linking some or all of the Chinatown, Downtown, South of Market, Potrero Hill, Bayview Hunters Point, and Visitacion Valley/Little Hollywood neighborhoods, primarily along Third Street. The line would operate at service levels comparable to existing MUNI Metro service frequencies and hours. The Light Rail Alternative includes the transit and roadway improvements described in the No Project Alternative.

The Light Rail Alternative would be constructed in two phases. Each phase is identified and described separately in the text below to facilitate the comparison and evaluation of benefits, costs, and impacts in the DEIS/DEIR.[12] The two phases of the Light Rail Alternative presented in **Figures 2-4 and 2-5** are:

- Light Rail Alternative - Initial Operating Segment (IOS)
- Light Rail Alternative - New Central Subway

The Light Rail Alternative - IOS represents an initial phase of the Third Street Light Rail Project. The existing J-Church service would extend from the Market Street Subway and the MUNI Metro Extension along Third Street and Bayshore Boulevard to the Caltrain Bayshore Station near the County line. Temporary private shuttles could be provided from this terminus to the proposed mall and stadium at Candlestick Point until the need for possible future planning of a branch line of Third Street light rail is established. The total length of the IOS would be 8.7 kilometers (5.4 miles). The Light Rail Alternative - New Central Subway represents the full-build or completed project, operating as an independent line (not integrated with the MUNI Metro system) from the Caltrain Bayshore Station along Bayshore Boulevard

[11] San Francisco Municipal Railway, *Light Rail and Bus Transit Operating Plan*, February 1997, revised September 25, 1997; available for review in Project File 96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

[12] More detailed engineering and architectural drawings for the Light Rail Alternative are presented in San Francisco Municipal Railway's, *Conceptual Engineering and Architectural Drawings for the Light Rail Alignment, Stations, and Maintenance Yard Options*, November 1997; available for review in Project File 96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

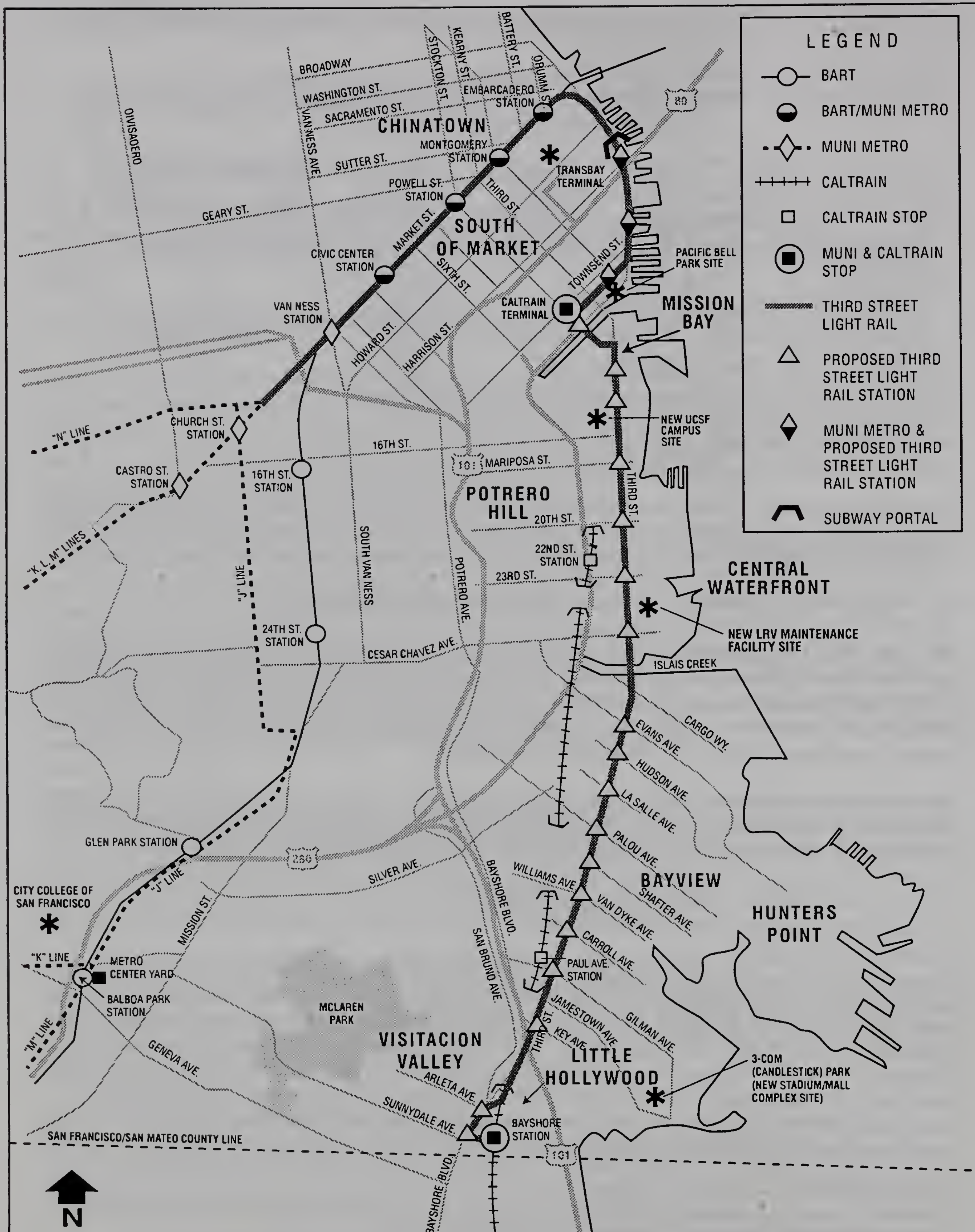


FIGURE 2-4

LIGHT RAIL ALTERNATIVE – INITIAL OPERATING SEGMENT

(via Market Street Subway and the MUNI Metro Extension)

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.

(Revised 7/21/98)

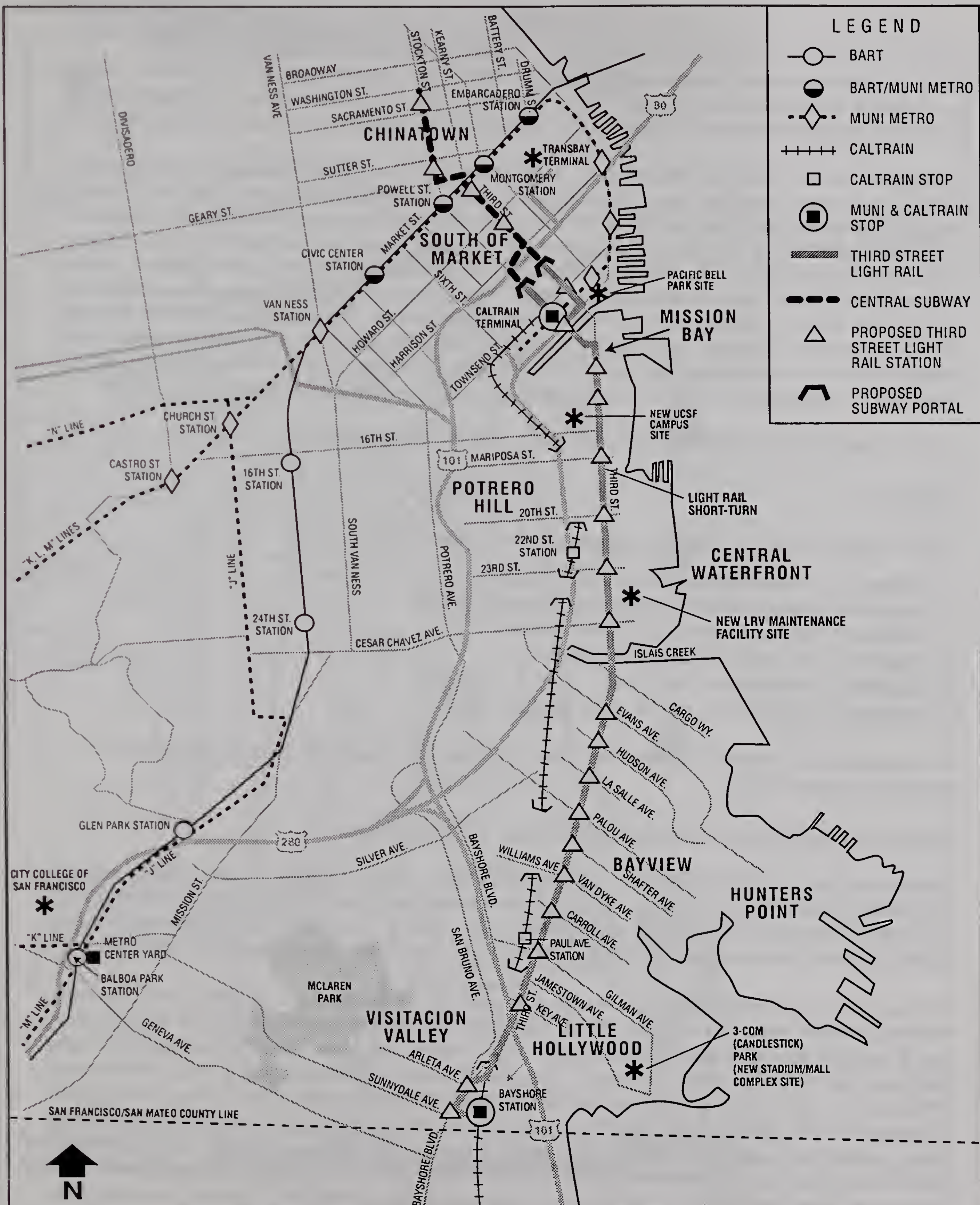


FIGURE 2-5

LIGHT RAIL ALTERNATIVE – NEW CENTRAL SUBWAY

(via Third and Stockton)

Source: ICF Kaiser Engineers, Inc.

Third Street Light Rail EIS/EIR

(Revised 9/1/98)

and Third Street into a new subway north of Brannan Street. The northern terminus of the subway would be a station at Stockton and Clay Streets. The total length of this alignment would be 11-kilometers (seven miles), including approximately 2.8 kilometers (1.75 miles) for the subway portion north of King Street.

A description of the Light Rail Alternative for both the IOS and New Central Subway is provided below. Because they would share the same alignment and station locations/configurations from the Caltrain Bayshore Station to King Street, as well as the same Third Street commercial core design options and new LRV maintenance facility options, a description of these elements is provided for the IOS and not repeated for the later subway phase. The description of the New Central Subway focuses on the alignment, station locations and light rail operation north of King Street. Bus operating plans that indicate the modifications in MUNI bus service to provide the most efficient use of transit in the Corridor are presented for both the IOS and New Central Subway. Additionally, a separate section is devoted to describing the construction methods that would be employed for constructing the surface alignment along Bayshore Boulevard and Third Street, including the new LRV maintenance facility, and for building the Central Subway.

2.4.1 LIGHT RAIL ALTERNATIVE - INITIAL OPERATING SEGMENT

Alignment

The IOS alignment has been divided into six segments as indicated in **Figure 2-6**:

- Segment 1: Caltrain Bayshore Station to the Highway 101 Overcrossing
- Segment 2: Highway 101 Overcrossing to Thomas Avenue
- Segment 3: Thomas Avenue to Kirkwood Avenue
- Segment 4: Kirkwood Avenue to 16th Street
- Segment 5: 16th Street to King Street
- Segment 6: King Street to Market Street Subway

Each segment is briefly described separately below. (Segment 7 pertains to the New Central Subway, described in Section 2.4.2.)

<u>Segment 1 - Caltrain Bayshore Station to the Highway 101 Overcrossing</u>

The southern terminus of the Build Alternative would be at the existing Caltrain Bayshore Station near the San Francisco-San Mateo County line. The southern terminus would be designed as an intermodal facility to facilitate transferring between the light rail line and Caltrain, SamTrans, MUNI bus services, and possibly a private shuttle connecting with the proposed new 49ers Stadium and Candlestick Mills Mall.

The plan for the intermodal facility, indicated in **Figure 2-7**, incorporates two boarding tracks, a center boarding platform, eight bus bays for MUNI, SamTrans, and private shuttles, a curbside drop-off area, and, **<u>if demand warrants</u>**, a parking structure. Ticket vending machines, sheltered boarding areas, and other passenger amenities would be included. The one- or two-level parking structure would provide up to 285 spaces for light rail passengers and additional spaces for those displaced at the rear of the Pacific Lithograph facility. **<u>Alternatively, MUNI may construct a 50-145 space surface parking lot, requiring fewer parcels and retaining the UPRR spur track, instead of the parking structure</u>**. The station area would be designed to facilitate cross-platform transfers with a relocated Caltrain Terminal, which would move south a few hundred feet. Caltrain riders would continue to use the surface parking area east of the Caltrain tracks.

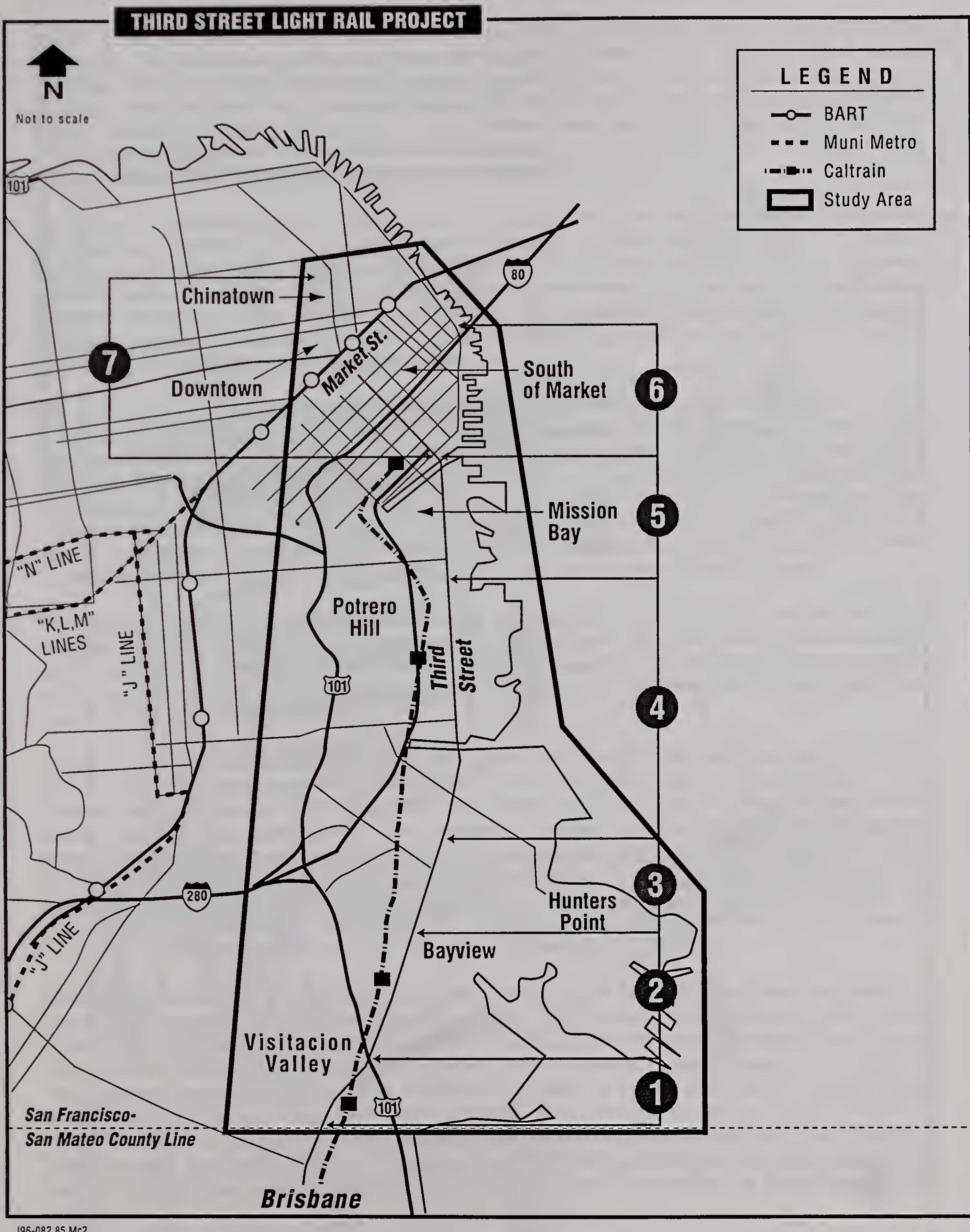
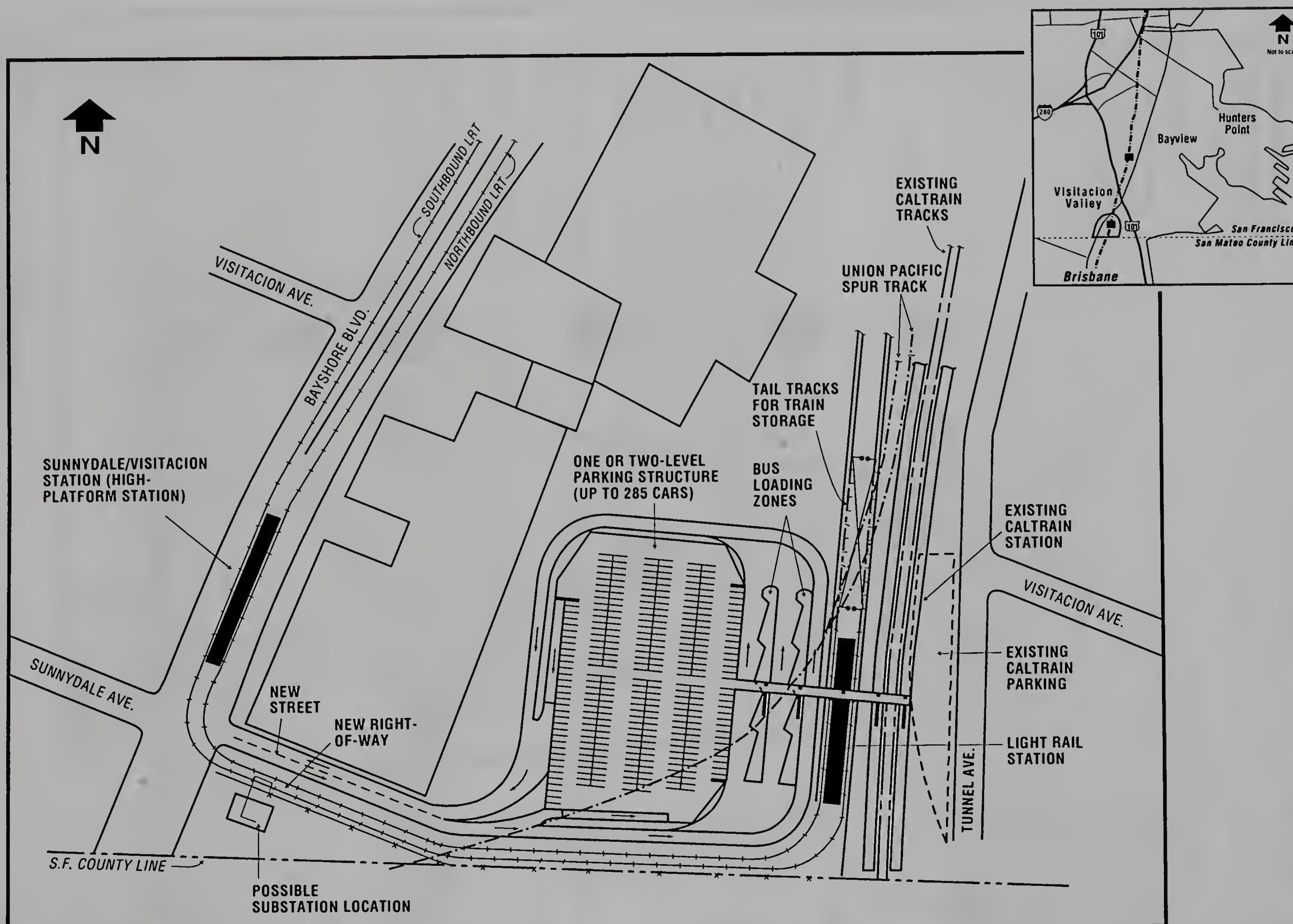


FIGURE 2-6

THIRD STREET CORRIDOR SEGMENTS

Third Street Light Rail EIS/EIR



J96-082.33b 3rd St. (10/29/98)

FIGURE 2-7

CALTRAIN BAYSHORE INTERMODAL STATION PLAN

Access to the intermodal facility would be via an extension of Sunnydale Avenue east of Bayshore Boulevard. The station area and access road would require acquisition of five privately owned parcels, including Universal Aragon Corporation property containing a single -story industrial building, two properties containing a car wash, abandoned maintenance-of-way sheds, and an unused parking area behind Pacific Lithograph, owned by Touch Plate. In the proposed intermodal facility design, an existing Union Pacific (UPRR) freight spur track would need to be removed or, if feasible, relocated. Design options to mitigate potential relocation impacts are discussed in Chapter 3.

At Bayshore Boulevard, the double-track alignment would curve north into the median of Bayshore Boulevard on a dedicated four- to six-inch raised trackway. A raised trackway, paved with textured concrete or cut stone paving blocks, would be accessible to emergency vehicles but would discourage vehicular traffic. Two lanes of the six-lane roadway would be dedicated to the light rail line. Intersections would be regraded to conform with the raised trackway **and a median strip in the middle of Bayshore would be retained**. The roadway width would allow parking to be retained throughout the length of Bayshore Boulevard except at the Sunnydale station.

The light rail line would continue north on Bayshore Boulevard curving past Arleta/Blanken Avenues, ascending to the Highway 101 overcrossing. **To accommodate a station immediately south of the Bayshore/Blanken intersection and to facilitate traffic flow at this intersection, Blanken will be realigned. Pending engineering analysis, Blanken will intersect Bayshore in a "T" design immediately to the north of the current location.** North of Blanken, the alignment would be constructed on retained fill approximately 2 meters (6 feet) high for a distance of 215 meters (705 feet) to reduce the gradient from nine to seven percent (**Figure 2-8**). The retained fill would block left turns from Bayshore onto Tunnel Avenue and the southern end of Hester Avenue, diverting these movements to Blanken Avenue.

Approaching the Highway 101 overcrossing, the light rail alignment would descend to grade and shift to the east side of the Bayshore Boulevard right-of-way. To accommodate this shift in the alignment, Bayshore Boulevard would be widened on the east and a retaining wall installed along the easterly slope near a motel and restaurant, requiring a 6-meter (19.5-foot) strip of City property bordering the Bayshore right-of-way near the northern end of Hester Avenue.

The shift in the alignment would allow northbound vehicles on Bayshore to be segregated into Third Street-bound traffic and northbound Bayshore/Highway 101-bound traffic (refer to **Figure 2-8**). At the Bayshore/Hester intersection (north end), traffic from Hester could turn northbound toward Third Street or toward Bayshore Boulevard/Highway 101 on-ramp. **Traffic reversing direction from Bayshore Boulevard southbound to northbound Third or the northbound Highway 101 on-ramp will have two left turn lanes to accommodate the volume of traffic anticipated in 2015. The additional left turn lane will require a 3.5-meter (11.4-foot) strip of Caltrans right-of-way to construct a retaining wall.** The complex turning movements at the Bayshore/Hester intersection in conjunction with light rail operation would be controlled by signalization. (See Chapter 3.0, Transportation Analysis)

After passing over Highway 101, the light rail alignment would descend onto Third Street in a retained cut which would reduce the steep nine percent grade to **five to eight** percent. The retained cut would be placed in the middle of Third Street 1.5 to 2.0 meters (6 to 8 feet) below street level and extend for 275 meters (900 feet), eliminating left turn movements between Third Street and Le Conte **Avenue**, Keith **Street**, and Key **Avenue**. Access to Third Street for residents living along Le Conte, Keith, and Key **west of Third** would be replaced by extending Keith Street northeast along the existing Caltrans right-of-way to the intersection of Third/Jamestown. **The proposed station location at Jamestown would be changed to Third between Le Conte and Key. The center high-platform would eliminate curb parking in this block. Pedestrian access across Third Street in this area would be provided at Jamestown and Key Avenues.**

Segment 2 - Highway 101 Overcrossing to Thomas Avenue

Light rail would cross Highway 101 on the existing Caltrans Bayshore Boulevard/Third Street overpass. The overpass would be expanded on the north and south (refer to **Figure 2-8**). The additional width would allow northbound vehicular traffic to remain to the east side of the trackway. A concrete barrier would separate vehicular traffic from the light rail alignment. Additionally, in order to avoid conflicting movements between vehicles exiting Highway 101 northbound to Third Street and the light rail line, the existing northbound Highway 101 off-ramp to Third would need to be redesigned. The redesigned off-

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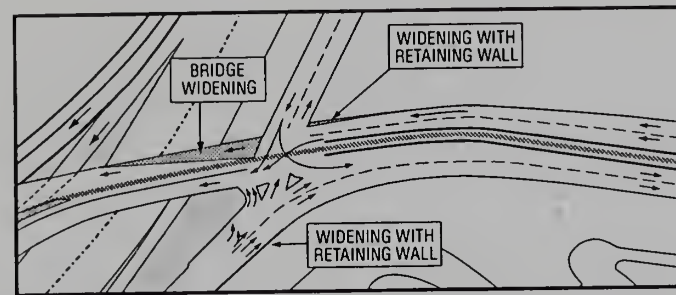
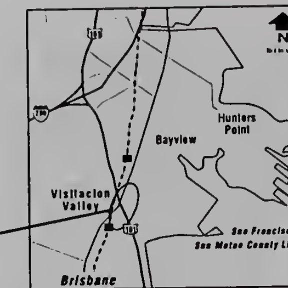
LEGEND

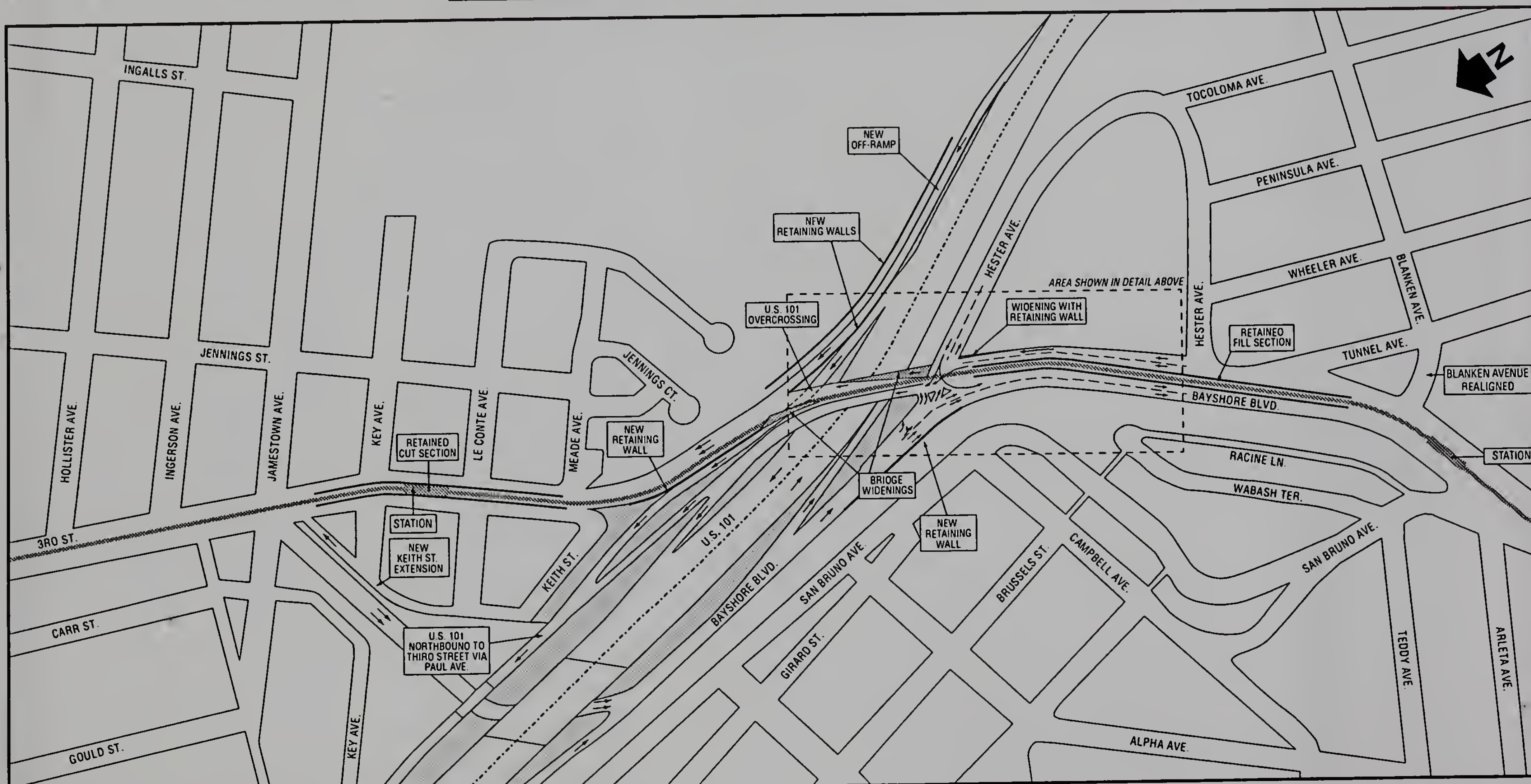
LIGHT RAIL ALIGNMENT

Note: Light rail is at grade unless indicated otherwise.





AREA SHOWN IN DETAIL BELOW



J96-082.26c 3rd St. (10/15/98) small

FIGURE 2-8

HIGHWAY 101 OVERCROSSING PLAN

Third Street Light Rail EIS/EIR

(Revised 10/15/98)

Source: ICF Kaiser Engineers, Inc.

ramp, which would require a 244-meter (800-foot) long, nine-meter (30-foot) high retaining wall along Bayview Hill, would allow vehicular traffic to merge into the northbound traffic lanes on Third Street without crossing the light rail alignment. North of Ingerson, light rail would be located in a dedicated right-of-way in the median of Third Street, as described for Segment 1. Curb parking would be retained along this segment except at those locations containing station platforms, thereby eliminating parking on one side or on both sides of the street, depending on the platform design and presence of left-turn lanes. In this segment, left turn lanes would occur at Jamestown (southbound), Gilman (northbound and southbound), Carroll (northbound and southbound), Yosemite (southbound), and Van Dyke (northbound and southbound).

Segment 3 - Thomas Avenue to Kirkwood Avenue

The design of the light rail alignment and station locations in the nine-block Third Street commercial core between Thomas and Kirkwood Avenues is being coordinated with Redevelopment Agency-assisted community initiatives to revitalize the Bayview commercial district. As an alternative to the same alignment configuration in this nine-block segment as in the remainder of Third Street, the community elected to study four design options for Third Street containing varying lane, parking, sidewalk, and streetscape configurations. A mixed-flow option was included as one of the four design options because of community concern for retaining existing parking along Third Street. **On June 23, 1998, the PTC selected the mixed-flow option as the preferred design for the nine-block commercial core**. Models for two of the design options are presented in **Figure 2-9**. All design options would include left turn lanes at Quesada (southbound), Oakdale (northbound), and Jerrold (northbound and southbound), except for the mixed-flow configuration which would have left turns at Jerrold (northbound and southbound), Newcomb (northbound and southbound), and Quesada (northbound and southbound). In addition, in the mixed-flow option, the Mendell triangle would be used to allow left turns at Oakdale. Three station locations have been designated for this segment.

The first design option (**two lanes**) would maintain two traffic lanes in each direction and two light rail tracks in a dedicated median (**Figure 2-10**). Sidewalks would remain approximately 3 meters (10 feet) wide. In this segment, 46 parking spaces would be displaced on blocks containing station platforms. A maximum of 175 spaces could be substituted, as perpendicular parking, on side streets about one-half block either side of Third Street. Between Oakdale and Palou, the station design would transform the triangular privately-owned parcel on the east side of Third Street into a landscaped plaza and integrate it with the block containing the Bayview Opera House. The 24-Divisadero would terminate at the plaza. Because sidewalks would not be widened, there would be less opportunity for landscaping and pedestrian amenities. A bicycle lane would not be included in this design.

The second design option (**one lane**) would reduce the number of traffic lanes on Third Street to one 5-meter (16-foot) wide traffic lane in each direction (**Figure 2-11**). Light rail would remain in a dedicated right-of-way in the street median. Vehicular traffic would transition from two lanes to one lane in each direction between Jerrold and Kirkwood (on the north) and between Thomas and Underwood (on the south). In place of the eliminated traffic lanes, sidewalks would be widened to 4.3 meters (14 feet) and street landscaping enhanced. The triangular parcel on the east side of Third between Oakdale and Palou would be integrated into the station design as a landscaped plaza similar to the first design option. Thirty-seven parking spaces would be displaced on blocks containing station platforms. A maximum of 175 perpendicular parking spaces could be added as replacement parking on side streets. For this design option only, a bicycle lane could be included in the street configuration.

Two Lanes in Each Direction
(Looking north along Third at Oakdale)

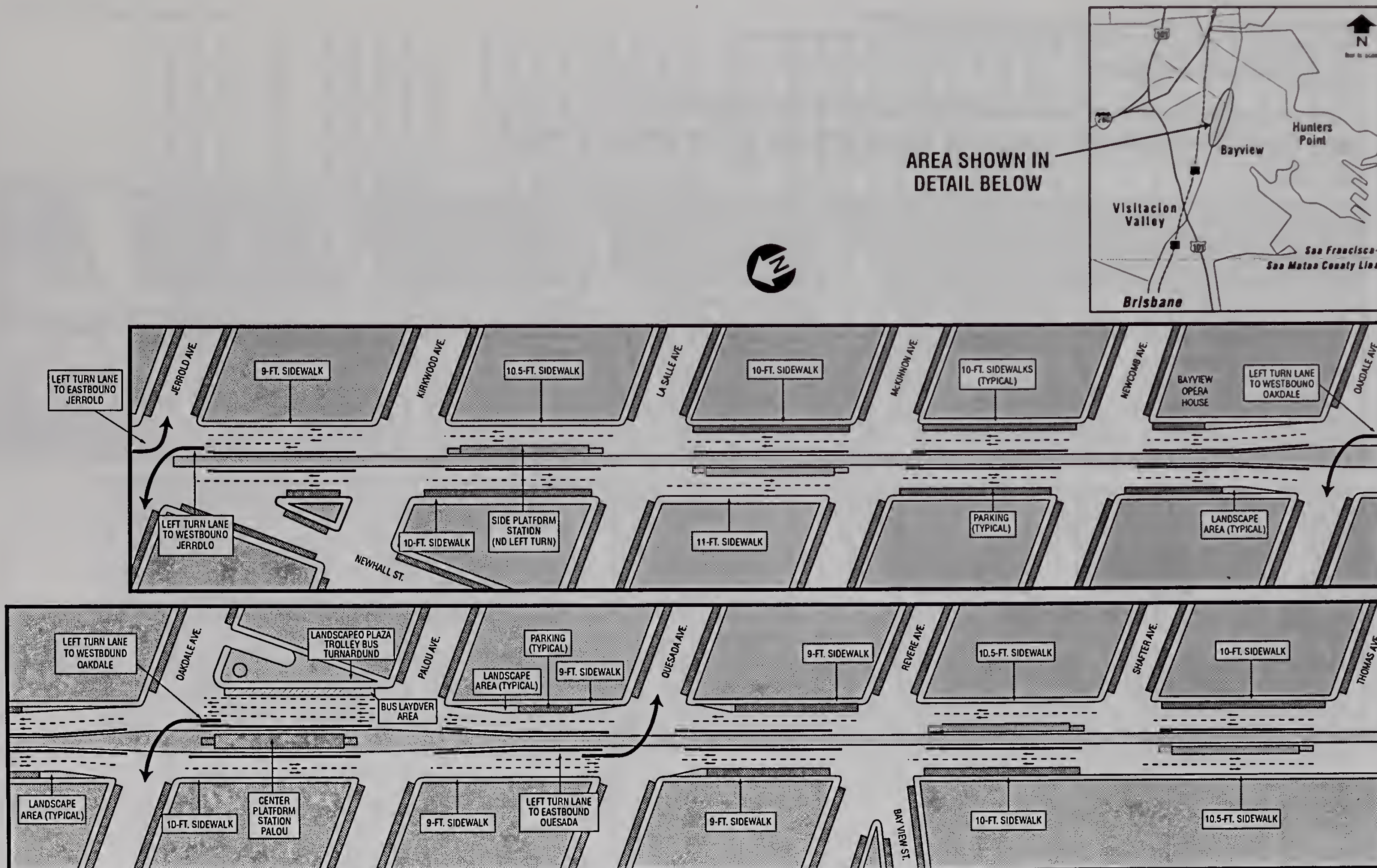
One Lane in Each Direction
(Looking south along Third at Oakdale)

FIGURE 2-9

THIRD STREET COMMERCIAL CORE DESIGN OPTIONS (MODELS)

Source: ICF Kaiser Engineers, Inc.

Third Street Light Rail EIS/EIR



J96-082.69a 3rd St. (11/6/97)

FIGURE 2-10

OPTION 1– DESIGN OPTION FOR NINE-BLOCK SEGMENT IN BAYVIEW COMMERCIAL CORE

(Two traffic lanes in each direction, without curb parking at station areas)

Third Street Light Rail EIS/EIR

**Curb parking on one side of Third Street is possible at side platform stations without left-turn lanes. Example: Kirkwood-La Salle-McKinnon blocks and Revere-Shafter-Thomas blocks.*

Source: ICF Kaiser Engineers, Inc.

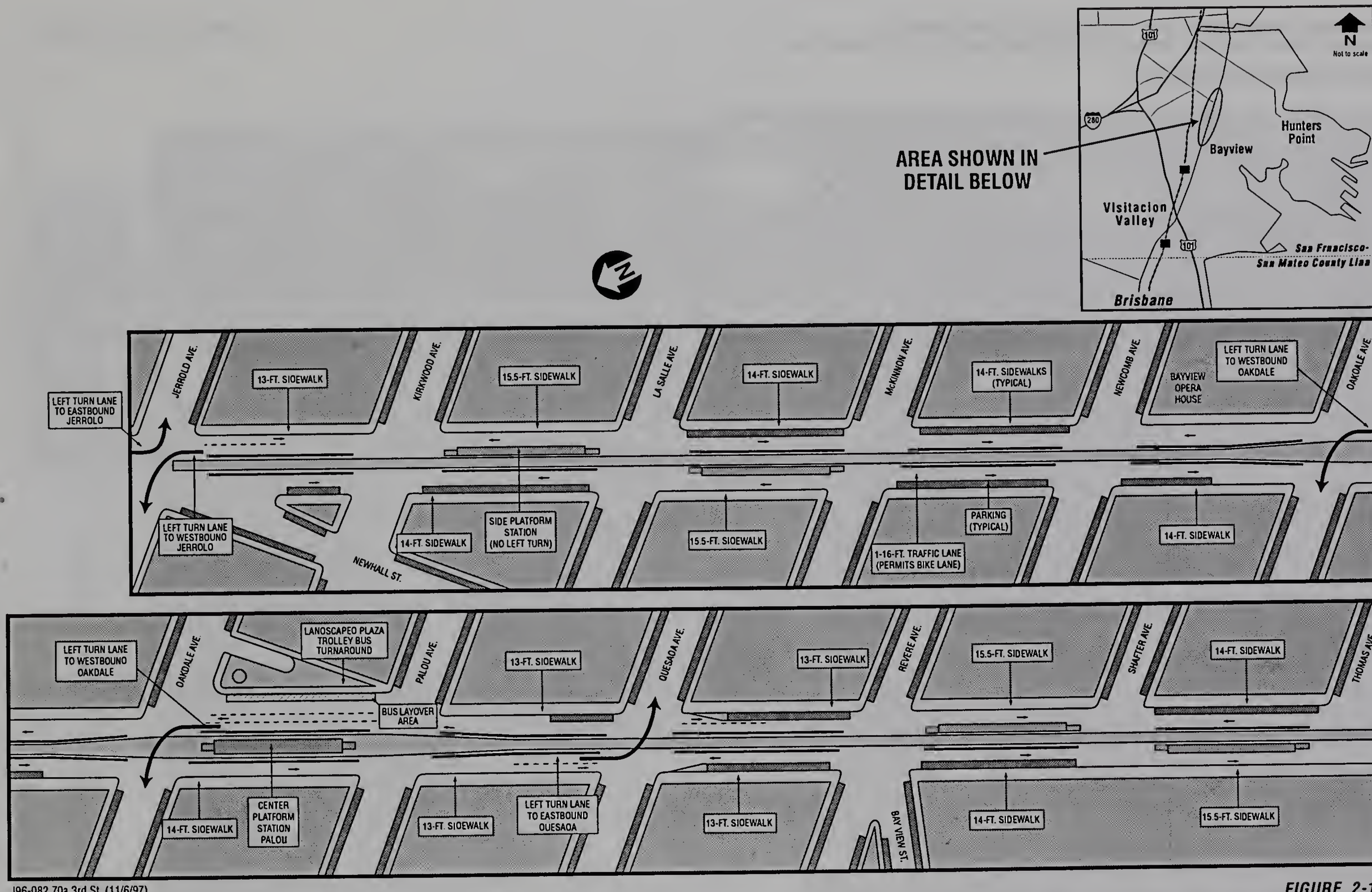


FIGURE 2-11

OPTION 2– DESIGN OPTION FOR NINE-BLOCK SEGMENT IN BAYVIEW COMMERCIAL CORE
(One traffic lane in each direction, with some curb parking at station areas)*

Third Street Light Rail EIS/EIR

**Curb parking on one side of Third Street is possible at side platform stations without left-turn lanes. Example: Kirkwood-La Salle-McKinnon blocks and Revere-Shafter-Thomas blocks.*

Source: ICF Kaiser Engineers, Inc.

The third design option (**one lane hybrid**) would have one 4-meter (14-foot) wide traffic lane in each direction. As in the second design option, light rail would operate in a dedicated right-of-way, and vehicular traffic would transition from two lanes to one lane in each direction between Jerrold and Kirkwood (on the north) and between Thomas and Underwood (on the south). However, instead of using the available right-of-way for widened sidewalks, curb parking would be maintained throughout the length of the segment, including at station locations (**Figure 2-12**). In addition, 23 new parking spaces would be made available by converting bus zones for the existing 15-line into curb parking. This design option would not include a bicycle lane, but would include landscaping of the triangular plaza between Oakdale and Palou.

The fourth design option (**mixed-flow**) differs from the other three in that light rail would share the inside two lanes of the four-lane roadway with vehicular traffic. In this design, the inside traffic lane would transition into the light rail right-of-way north of Kirkwood Avenue and south of Thomas Avenue. In the transition blocks, the median would widen and the light rail raised right-of-way would give way to mixed-flow operation. This configuration would allow Third Street to be designed with parking on most blocks throughout the length of the segment. Because the bus zones for the 15-line could be converted to curb parking spaces, a net gain of 16 parking spaces would occur on Third Street in this scenario. Sidewalks would be widened to 3.6 meters (12 feet), and a 4.4-meter (14.5-foot) center median would contain either platforms, landscaping, or occasional left turn pockets. The widened sidewalks would provide the opportunity for commercial uses and landscaping. Unlike the other design options, all station platforms would be center-platform configuration (**Figure 2-13**). This design option would not include a bicycle lane. Because vehicular traffic would share the right-of-way, this option would slow light rail travel times.

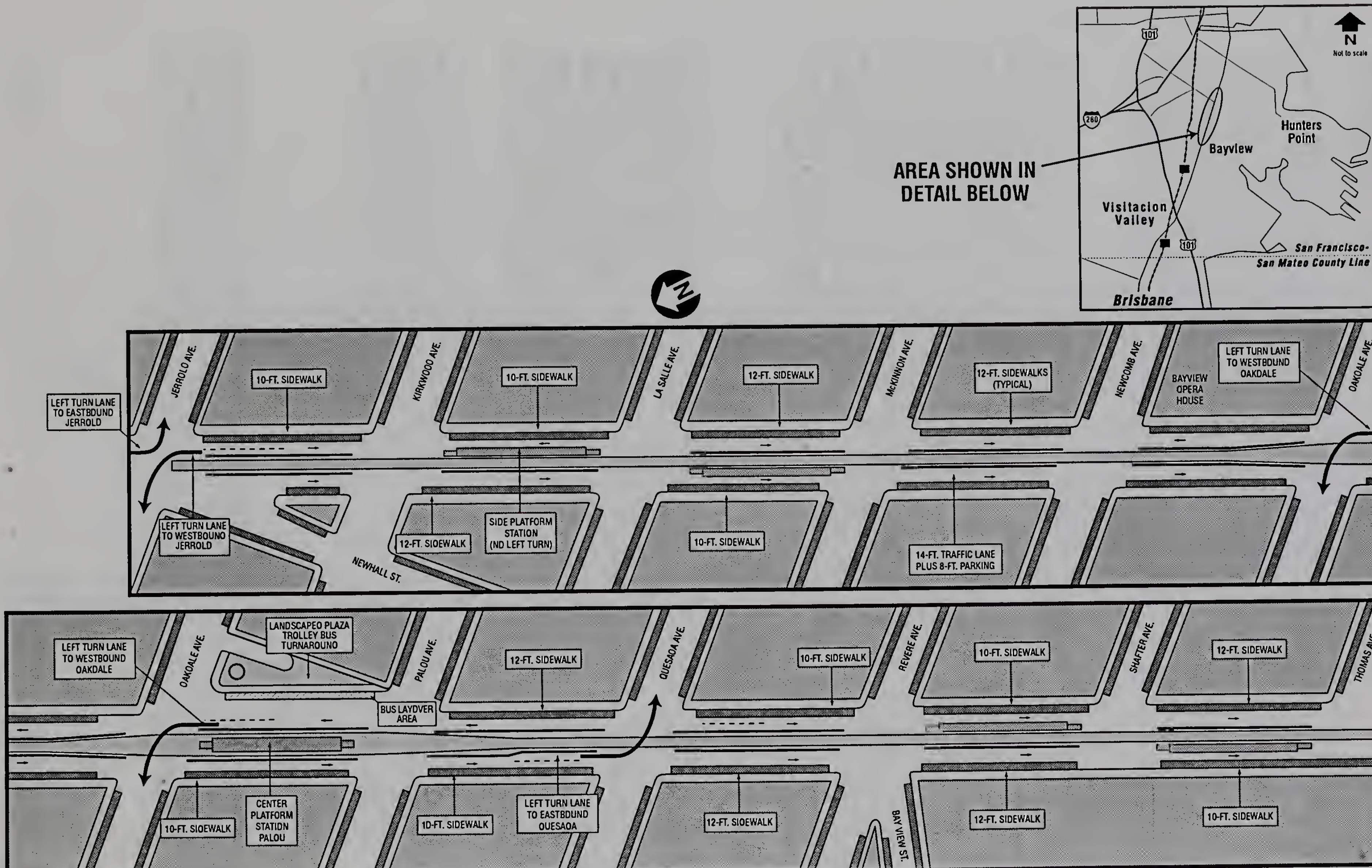
<u>Segment 4 - Kirkwood Avenue to 16th Street</u>

The light rail alignment would continue north in the median of Third Street, crossing Islais Creek on the existing double-leaf lift bridge built in 1945, which opens less than once a month. No structural improvements would be needed for the bridge to carry light rail trains. Two traffic lanes would be provided in each direction. Left turn lanes would be provided at Jerrold (northbound and southbound), Hudson (southbound), Evans (northbound and southbound) Cesar Chavez (northbound and southbound), 25th Street (northbound), 23rd Street (northbound and southbound), 20th Street (northbound and southbound), and Mariposa (northbound and southbound). Curb parking would be displaced on blocks containing station platforms. Light standards, currently in the median of Third Street, would be placed on sidewalks.

A short-turn loop from Third following 18th, Illinois, and 19th Streets would permit an extension of the N-Judah to the Mariposa Street station to serve Mission Bay. The track on Illinois between 18th and 19th would provide an area for 2-two car trains to layover. Main lead track to the new LRV maintenance facility would be installed on 25th Street. At the Western Pacific site, a secondary or emergency track may be installed from the south end of the yard along Cesar Chavez to Third Street.

<u>Segment 5 - 16th Street to King Street</u>

Between 16th and King Streets, light rail would travel through Mission Bay, which is currently undergoing a redevelopment planning process. Development in Mission Bay would include a new UCSF campus and biotechnology/light industrial uses in the area surrounding the campus. In addition, the street grid south of Mission Creek is proposed to be altered to facilitate traffic and pedestrian circulation in this area.



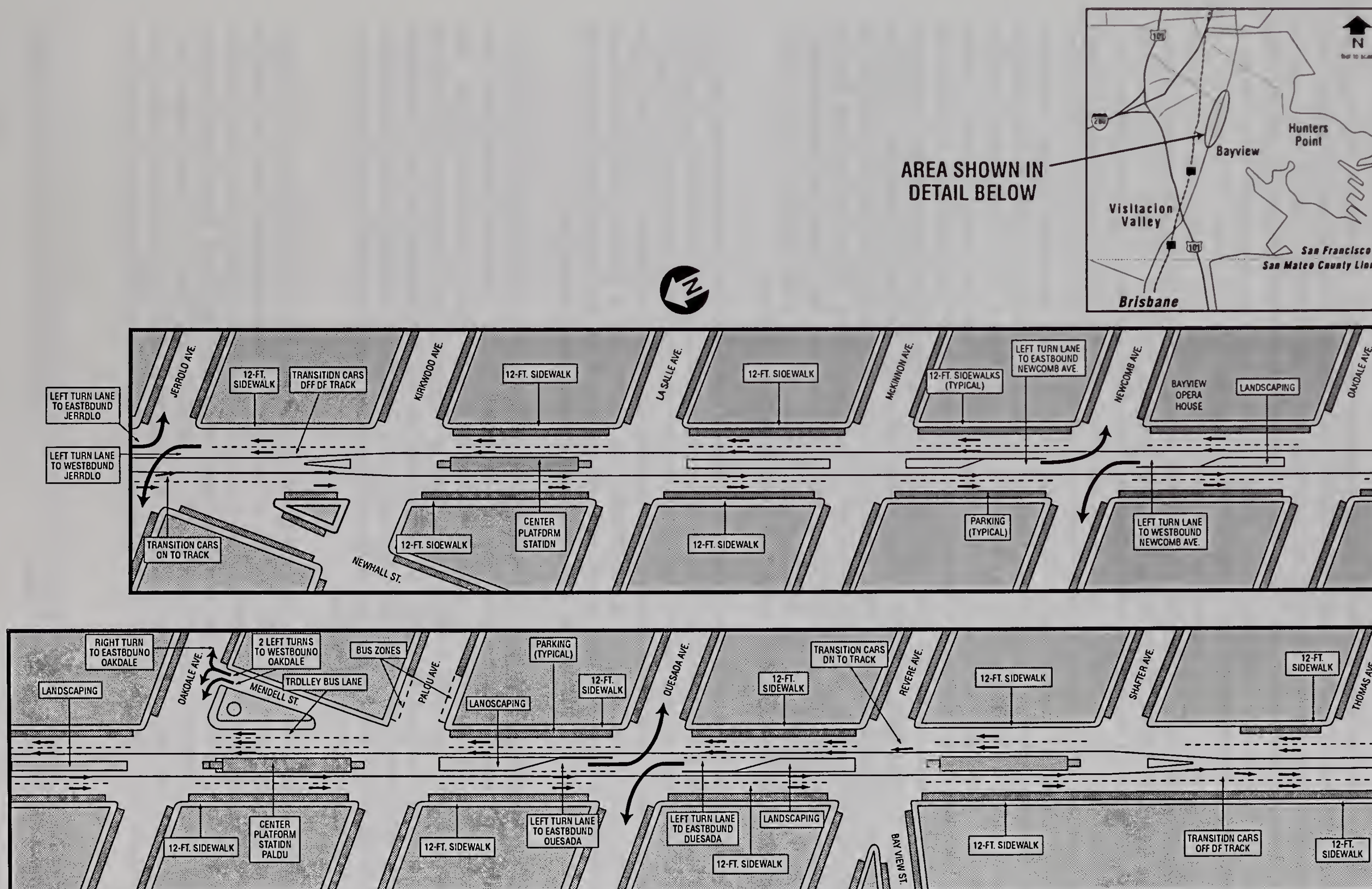
J96-082.71a 3rd St. (11/6/97)

FIGURE 2-12

OPTION 3– DESIGN OPTION FOR NINE-BLOCK SEGMENT IN BAYVIEW COMMERCIAL CORE

(One traffic lane in each direction, with curb parking at all station areas)

Source: ICF Kaiser Engineers, Inc.



J96-082.72a 3rd St. (10/15/98)

FIGURE 2-13

OPTION 4 – DESIGN OPTION FOR NINE-BLOCK SEGMENT IN BAYVIEW COMMERCIAL CORE
(One traffic lane & one mixed lane in each direction with curb parking at station areas)

Source: ICF Kaiser Engineers, Inc.

Similarly, light rail would serve the new uses and conform to the revised street pattern. The alignment would continue in the median of Third Street north of 16th Street. Third Street is proposed to be redesigned to incorporate the two-track light rail alignment, two lanes of traffic in each direction and left turn lanes. Instead of intersecting with Third, Fourth Street is proposed to be realigned to parallel Third Street from Mission Creek to Mariposa Street. Light rail would use a newly-extended Owens Street to travel from Third to Fourth just south of Mission Creek.

On June 23, 1998, the PTC selected the Fourth Street bridge for the light rail line to cross Mission Creek. To reach the Fourth Street bridge from Owens Street, both light rail tracks would turn west onto Owens Street from Third and then travel across the Fourth Street bridge to King Street (**Figure 2-14**). Light rail would enter the median of Owens Street and travel one block before curving into the Fourth Street right-of-way. Traffic signals would be timed to permit light rail to pass through the Fourth/Owens intersection in advance of general traffic. On Fourth, light rail would be straddled by one northbound traffic lane and two southbound traffic lanes. Light rail would operate in mixed traffic in both directions on the narrow Fourth Street bridge, which is a single-leaf lift bridge built in 1915. The bridge will soon be rehabilitated and seismically upgraded by the Department of Public Works as a separate project. Adding light rail to the bridge is not expected to require any major strengthening of the bridge structure since, in the past, streetcars operated across this span. **No major modifications to the Fourth Street bridge are required solely to carry light rail traffic. As defined in the Locally Preferred Alternative, this bridge will carry two light rail tracks. Some additional structural modifications may be required to strengthen the bridge deck. Strengthening of the bridge foundations will not be required for two tracks of light rail traffic. The steel structure of the bridge has been determined during preliminary engineering to be adequate for the loading of the LRVs and the main changes would be some additional steel to the floor stringers to carry the point load of the vehicles.**

North of Mission Creek, the tracks would regain an exclusive right-of-way on Fourth between Berry and King. Vehicular traffic would remain in the two-lane southbound, one-lane northbound configuration, although a left-turn lane would be added in the northbound direction at King. Fourth Street is proposed to be widened between King and Berry Streets to accommodate this street configuration. Additionally, light rail would pre-empt the traffic signals at Fourth/Berry and Fourth/King to facilitate light rail movement through these intersections. A station located on Fourth between King and Berry Streets would provide direct access to the Caltrain Terminal for both northbound and southbound passengers.

An alternative alignment would have split the alignment into a one-way couplet crossing Mission Creek (**Figure 2-15**). The northbound track would remain in the median of Third Street and cross Mission Creek in an exclusive lane that separates two lanes of northbound and two lanes of southbound traffic. The crossing on the Third Street (Lefty O'Doul) bridge, which is a single-leaf lift bridge built in 1932, could be interrupted by bridge openings, averaging two times per day for five to ten minutes per cycle. This bridge also is being rehabilitated and seismically upgraded by the Department of Public Works as a separate project. Like the Fourth Street bridge, this bridge is not expected to require any major strengthening since streetcars once operated across the structure.

North of Mission Creek, the light rail track would shift to the west side of the public right-of-way and remain in an exclusive right-of-way, allowing two to four lanes for northbound traffic and two lanes for southbound traffic. Because of the position of the track on Third, a station could not be constructed prior to the turn onto King. In this option, the southbound track would cross the Fourth Street bridge, which is also subject to approximately two openings per day. Light rail would travel in a shared right-of-way southbound across the bridge. North of the bridge, the single track would enter an exclusive lane in the middle of Fourth Street separating two lanes of southbound traffic and one right turn lane and one left turn lane in the northbound direction. Only southbound passengers would have direct access to the Caltrain Terminal using a station constructed on Fourth between King and Berry.

Segment 6 - King Street to the Market Street Subway

From Fourth, the IOS would turn into the median of King Street and join the existing MUNI Metro Extension track along King and The Embarcadero to the Market Street Subway portal north

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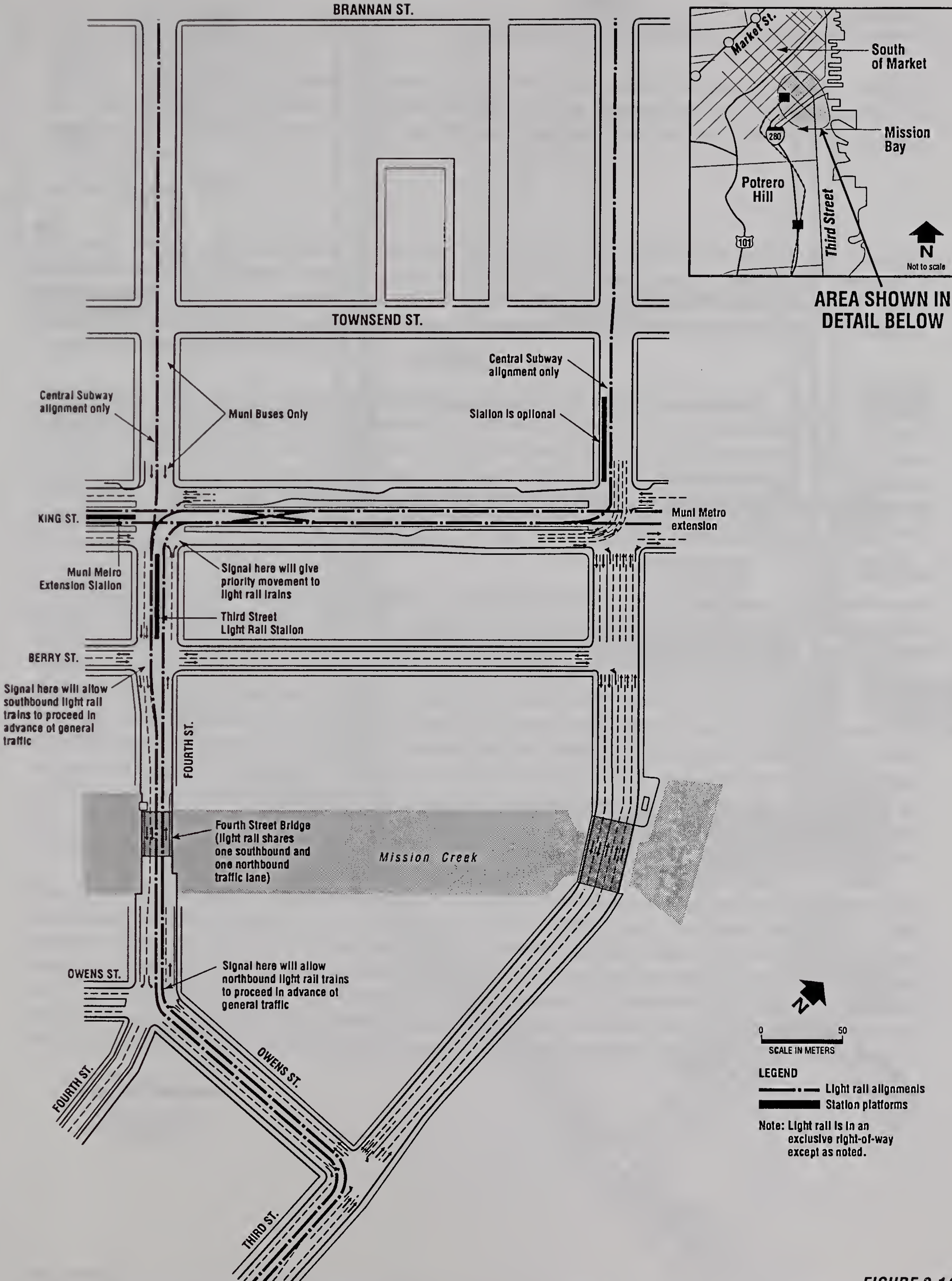


FIGURE 2-14

MISSION BAY ALIGNMENT - OPTION 1

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.

J96-082.56b 3rd St. (12/30/97)

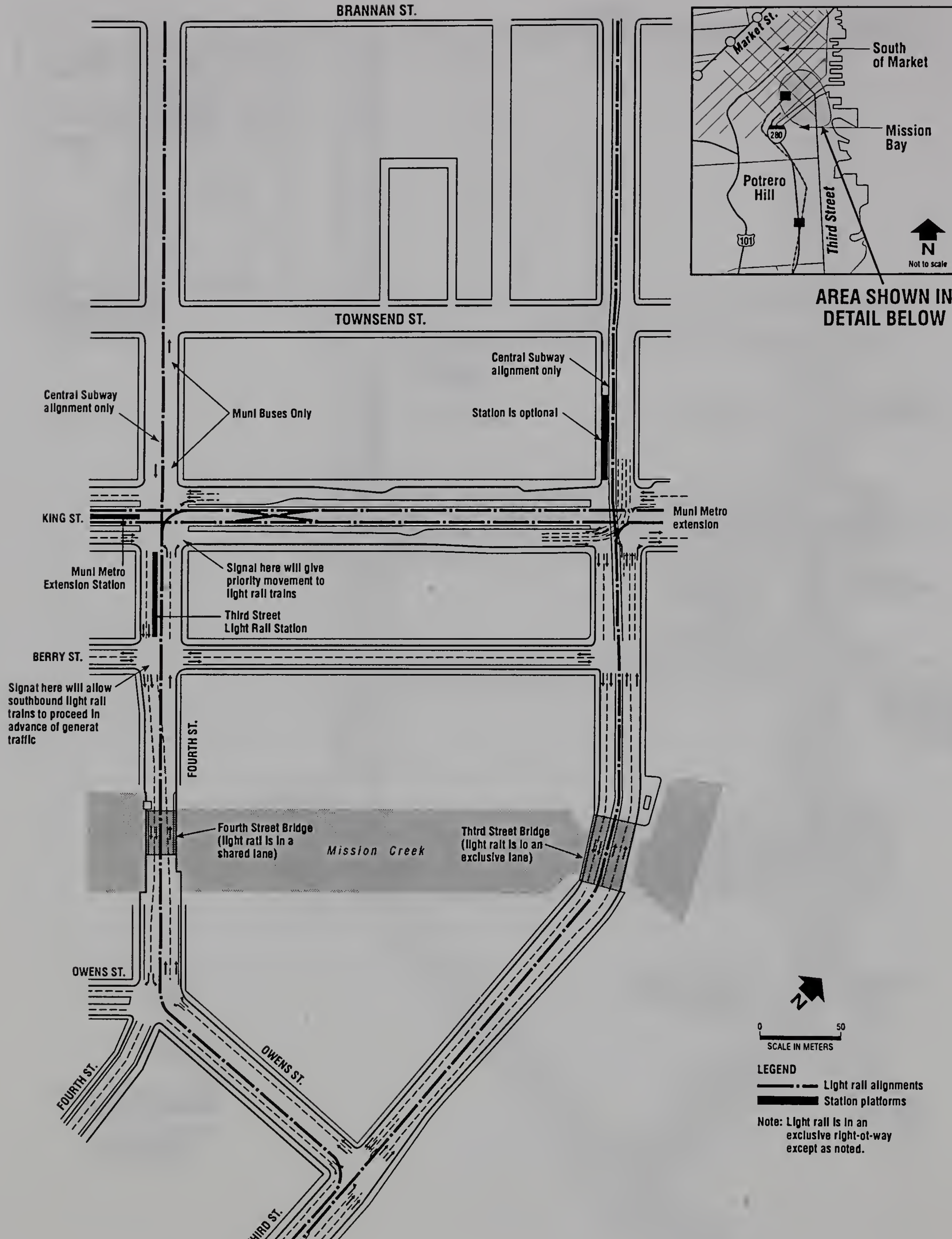


FIGURE 2-15

MISSION BAY ALIGNMENT - OPTION 2

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.

J96-082.57b 3rd St. (12/30/97)

of Folsom Street. Light rail turning movements to and from King would be sequenced to avoid conflicting with vehicular traffic movements at the Third and Fourth Street intersections. In this segment, light rail would use three existing Extension station platforms and continue in the Market Street Subway, operating as the J-Church.

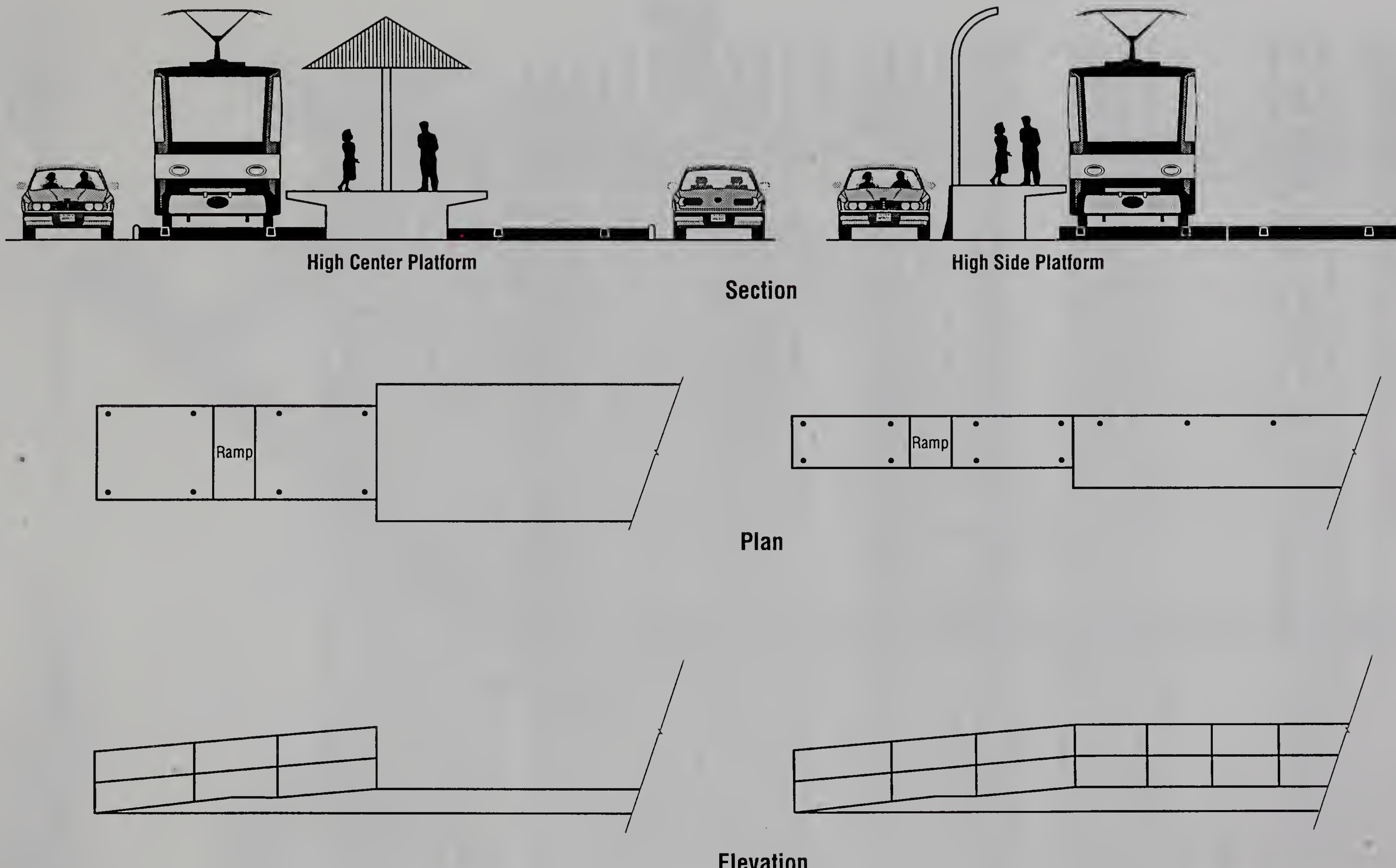
Surface Stations

In general, surface stations would be spaced every three to five blocks, with closer spacing (approximately three blocks) in the Bayview commercial core. Station platforms, which would extend for 50 meters (164 feet), would be designed to accommodate two-car trains. Although the type of station platform pavement has not been determined, brick paving is assumed for costing purposes. Ticket vending machines would be installed at eight high-volume stations.

On June 23, 1998, the PTC adopted the position of exclusively using high platforms at stations along the Third Street light rail line, after considering two design options for the station platforms: high and "hybrid" low platforms **(Figures 2-16A/B/C)**. High platforms (34 inches or 85 centimeters high) conform with the existing LRV fleet and do not require design modifications to the existing LRV fleet. Ramps would allow walk-on riders or wheelchair users to reach the platform level. The stairs on the LRVs would remain in the raised position, as in the Market Street Subway and the MUNI Metro Extension, along Third Street and Bayshore Boulevard.

High platforms would be placed in a staggered side-platform configuration (northbound and southbound platforms placed on the outside of the tracks caddy-corner from each other). Low platforms allow greater flexibility in the placement of stations along curved segments of the alignment and have reduced ramp lengths. In addition, low platforms permit left turn lanes or some curb parking on station blocks. However, to be compatible with MUNI's existing high-floor LRVs and to be in compliance with the Americans for Disabilities Act, the front boarding end of each low platform would be modified to contain mini-high boarding areas 85 centimeters (34 inches) high and ramps to permit seniors and disabled persons to board the high-floor LRV fleet. As a result of input from the MUNI Accessibility Advisory Committee, MUNI would also consider a design modification for the hybrid low side platforms that would widen the platform from 2.4 meters (8.0 feet) to 2.7 meters (9.0 feet) and would include an ADA-compliant ramp. The advantages and disadvantages of hybrid low platforms and high level platforms are summarized below.

High or hybrid low platforms would be placed in a staggered side-platform configuration (northbound and southbound platforms placed on the outside of the tracks caddy-corner from each other). The side platforms would be 2.4 meters (8.0 feet) wide and 54.9 meters (180 feet) long. At a few locations where engineering constraints or design opportunities made side platforms less desirable, 4.3-meter (14-foot) wide and 56.4-meter (185-foot) long center platforms were designated. To conform with the block lengths and loading characteristics in the Third Street commercial core and in Mission Bay, station platforms at these locations would be lengthened and widened, respectively, and the platform at Fourth and King shortened.



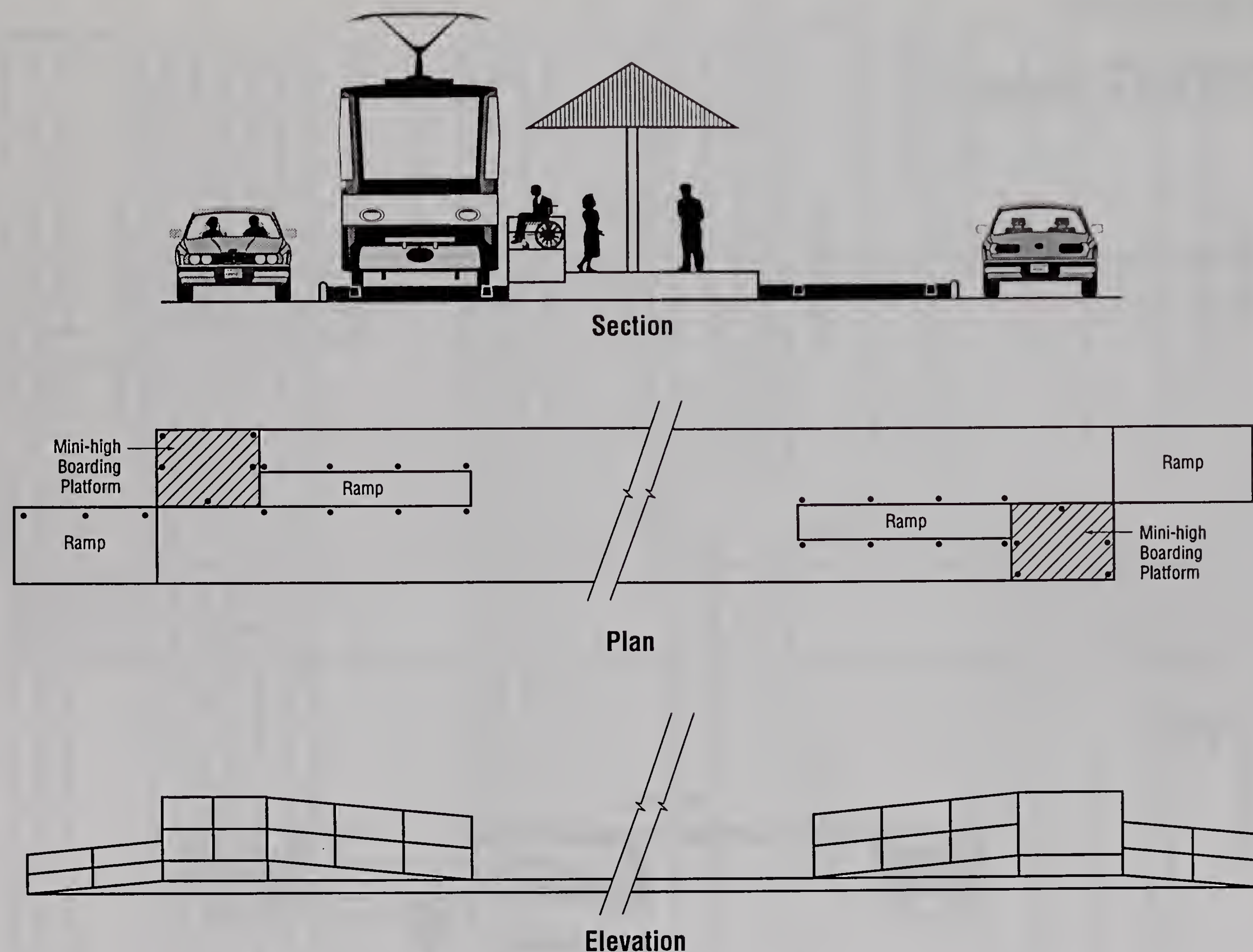
Source: ICF Kaiser Engineers, Inc.

J96-082.79 3rd St. (11/18/97)

FIGURE 2-16A

SCHEMATIC OF HIGH PLATFORM

Third Street Light Rail EIS/EIR

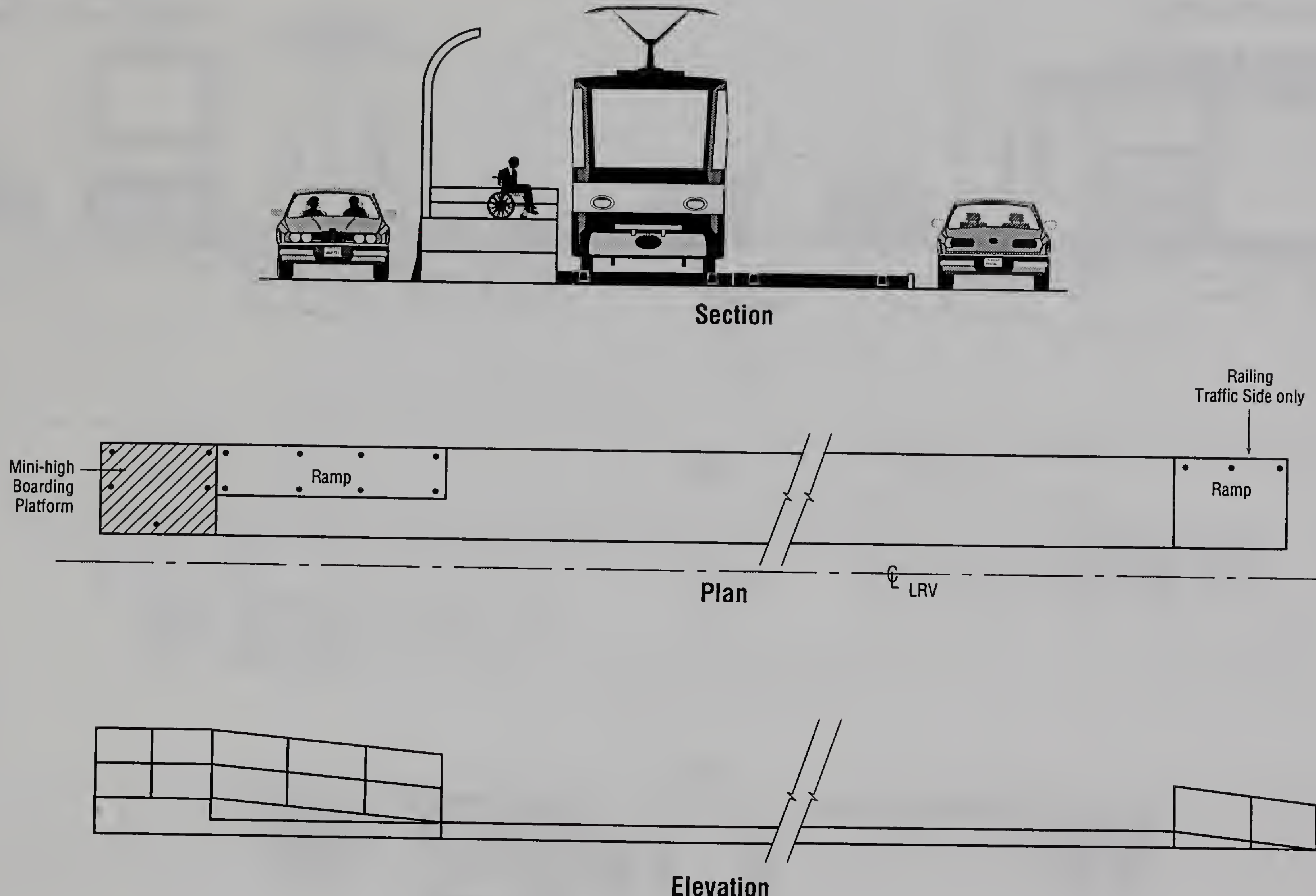


Source: ICF Kaiser Engineers, Inc.

J96-082.80 3rd St. (11/18/97)

FIGURE 2-16B

SCHEMATIC OF LOW CENTER PLATFORM WITH MINI-HIGH BLOCKS



Source: ICF Kaiser Engineers, Inc.

J96-082.81 3rd St. (11/18/97)

FIGURE 2-16C

SCHEMATIC OF LOW SIDE PLATFORM WITH MINI-HIGH BLOCK

HYBRID LOW PLATFORMS	HIGH PLATFORMS
Advantages	Advantages
Community support due to better aesthetics.	Level boarding at all doors.
Allows two separate station locations in Visitacion Valley.	Consistent with platform design elsewhere in the system, such as the MUNI Metro Extension platforms along The Embarcadero.
Easy future conversion to full low-level platforms.	Eliminates all steps into vehicle which are difficult for seniors to negotiate.
Perceived as safer (less distance to fall).	Provides a clear path of travel and wide access points, resulting in minimal congestion on platform.
Requires less length on block.	Would not require double stopping for two-car trains.
Helps promote retail vitality by maintaining cross-street visual connection.	
Can accommodate PCC or historic streetcar operation.	
Disadvantages	Disadvantages
Second (interior) access ramp to high-block area may not be ADA compatible (if it is shortened to provide wider access area for passengers using the LRV's second door).	Greater impact on streetscape, diminishes cross-street visual connection.
Center platform has less clear path for blind passengers.	More difficult future conversion to low-floor LRV's.
Double stop required if a wheelchair passenger is riding in second car (only a problem at four Mission Bay stations, where two-car operation is expected).	Would permit only one instead of two stations in Visitacion Valley.

Table 2-5 presents the proposed light rail station locations south of King Street along Third/Fourth and Bayshore Boulevard. The table indicates the type of platform (center or side) and the exact location of the platforms. **Center-platform stations would be located in Visitacion Valley along Bayshore Boulevard immediately south of Blanken Avenue and between Visitacion and Sunnydale Avenues**.

IOS Operating Plan

IOS Light Rail Operating Plan

Third Street light rail line for the IOS would operate in the Market Street Subway as part of the MUNI Metro system, interlined with J-Church trains. Service on Third Street would be provided by one-car trains in the peak and midday operating on service frequencies equivalent to the existing J-line scheduled headways (six minutes during peak periods and 10 minutes during the midday). In conformance with the existing MUNI Metro hours of operation, Third Street light rail would be replaced by diesel buses operating on the existing Owl service schedule at approximately 12:30 am. Owl patrons would either board buses at designated areas along the curb (if high platform stations were installed) or at the light rail station (if low platforms were installed).

To provide sufficient capacity to meet projected 2015 demand in the Mission Bay area, the N-Judah would share the IOS tracks to Third/Mariposa, and the L-Taraval would operate to the Caltrain Terminal at Fourth/King. However, Mission Bay development is not expected to warrant the additional N-line service until sometime after the IOS begins operation in 2003.

TABLE 2-5

THIRD STREET LIGHT RAIL PROJECT PROPOSED STATION LOCATIONS (THIRD/KING TO THE CALTRAIN BAYSHORE STATION)

GENERAL LOCATION	TYPE	NORTHBOUND SIDE PLATFORM	SOUTHBOUND SIDE PLATFORM
Fourth/King	Center Platform Station	N/A	N/A
Third/Mission Rock	Side Platform Station w/Left Turn Lanes	Mission Rock to Owens	Mission Rock to Rincon
Third/South	Side Platform Station w/Left Turn Lanes	South to South Mall	South to 16th St.
Third/Mariposa	Side Platform Station w/Left Turn Lanes	Mariposa to 16th St.	Mariposa to 18th St.
Third/20th Street	Side Platform Station w/Left Turn Lanes	20th St. to 19th St.	20th St. to 22nd
Third/23rd Street	Side Platform Station w/Left Turn Lanes	23rd St. to Tubbs	23rd St. to 24th St.
Third/Cesar Chavez	Side Platform Station w/Left Turn Lanes	Chavez to 26th St.	Chavez to Marin
Third/Evans	Side Platform Station w/Left Turn Lanes	Evans to Davidson	Evans to Fairfax
Third/Hudson	Side Platform Station w/Southbound Left Turn Lane	Hudson to Galvez	Hudson to Innes
Third/LaSalle	**Center** Platform Station No Left Turn Lanes	**N/A**	**N/A**
Third/Palou-Oakdale	Center Platform Station w/Northbound Left Turn at Oakdale; **via Mendell Street;** Southbound Left Turn at Quesada	N/A	N/A
Third/Shafter	**Center** Platform Station No Left Turn Lanes	**N/A**	**N/A**
Third/Williams-Van Dyke	Side Platform Station w/Left Turn Lanes	Williams-Van Dyke to Underwood	Williams-Van Dyke to Wallace
Third/Carroll	Side Platform Station w/Left Turn Lanes	Carroll to Bancroft	Carroll to Donner
Third/Gilman	Side Platform Station w/Left Turn Lanes	Gilman to Fitzgerald	Gilman to Hollister
Third/**LeConte-Key**	**Center** Platform Station **No** Left Turn Lanes	N/A	N/A
Bayshore/Arleta-**Blanken**	Center Platform Station	N/A	N/A
Bayshore/Visitacion-Sunnydale	Center Platform Station	N/A	N/A
Caltrain Bayshore Station	Center Platform Station	N/A	N/A

IOS Bus Operating Plan

Most proposed light rail station sites are already served by MUNI bus routes. Routes would be restructured to eliminate duplicate bus service in the Corridor and to replace service eliminated on the 15-line which is not covered by the new light rail line. Two possible bus operating plans that have differing service assumptions and operating cost implications are described below. Both operating plans increase peak period service frequencies on the 9X from every 10 minutes to every 7.5 minutes. Routes maps for Bus Service Plan A and Bus Service Plan B are presented in Appendix D.

Bus Service Plan A. In this plan, the North Beach portion of the 15-line would be replaced with the 9X, 9AX, and 9BX, extended from the existing northern terminal on Broadway to Kearny/North Point via Columbus, Powell, and Bay/North Point, weekdays only (peak and midday service). Evening and weekend service would be provided by the 9-San Bruno, rerouted from Market to Kearny/North Point via Stockton/Kearny, Columbus, Powell, and Bay/North Point. (On weekdays, the 9-line would continue along its current route to the Ferry Terminal.) Service frequencies for the 9-line and the San Bruno Expresses would be maintained.

In Visitacion Valley, the 9-San Bruno would be rerouted to follow the 15-line to a new southern terminal at Geneva/Santos. The remainder of the 15-line between Santos and City College would be replaced by the 43-Masonic, which would be extended along Geneva, Schwerin, and Sunnydale to the Caltrain Bayshore Station. The existing Crocker Amazon neighborhood loop of the 43-line would be replaced by the 36-Teresita, extended via Geneva, Naples, Munich/Prague, Cordova, Chicago, and South Hill Boulevard. Additionally, the 54-Felton would be rerouted off Third between Revere and Hudson, providing Bayview residents with a neighborhood circulator to the Palou and Hudson light rail stations. The 54-line would turn off its current route on Revere and follow Lane, Palou, Phelps and Hudson to Hunters Point. Existing service levels for these lines would be retained.

Bus Service Plan B. Bus Service Plan B would replace the northern and southern segments of the 15-line with expanded service (approximately 20-hours of service weekdays and weekends) on the 9X, 9AX, and 9BX. The San Bruno Expresses would be extended north from the existing northern terminal on Broadway to Kearny/North Point via Columbus, Powell, and Bay/North Point and from the southern terminals on Geneva to City College (Phelan Loop). In addition, the 54-Felton would be rerouted from Third Street in Bayview from Revere/Lane along Lane, Palou, Phelps, and Hudson, continuing on the existing route to Hunters Point. Since the 9X would incorporate the southern leg of the 15-line, the routes for the 9-San Bruno, the 43-Masonic, and the 36-Teresita would remain as currently configured. Existing service levels would be maintained.

Operating Statistics

A summary of the operating statistics for the Light Rail Alternative – IOS is presented in **Table 2-6**. Compared with the existing fleet, the table indicates that the IOS, **operating in mixed-flow conditions along the nine-block Third Street commercial core**, would require an additional **26** LRVs (including spares) to meet 2015 peak demand for the MUNI Metro system, including extension of the J-line along Third Street. To meet peak service requirements in 2003, the implementation year for the IOS, **16 of the 26** LRVs would be needed. The remaining ten vehicles would be needed for Mission Bay service. Restructuring Corridor bus routes, including the extension of the 30-line to Potrero Hill, would slightly reduce existing annual systemwide bus hours.

Transit Fleet Requirements

To meet 2015 demand, **26** new LRVs would be required, increasing MUNI's total fleet size, including spares, to **162, or 26** more than for the No Project and No Build/TSM Alternatives. The total diesel and trolley bus fleet size for the IOS would be 767, including spares, similar to MUNI's current bus fleet size and 36 less than the No Build/TSM Alternative[13].

[13]San Francisco Municipal Railway, *Light Rail and Bus Transit Operating Plan*, February 1997, revised September 25, 1997; available for review in Project File 96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

TABLE 2-6

**ANNUAL OPERATING STATISTICS FOR
LIGHT RAIL ALTERNATIVE - INITIAL OPERATING SEGMENT**

Alternative	Peak Headways: 15 Line	Diesel/Trolley Peak Demand (Systemwide)	Total Annual Bus Hours (Systemwide)	Peak [(1)] Headways: Third Street Light Rail	LRV Fleet Peak Demand (Systemwide)	Annual LRV Car-Hours (Systemwide)
Existing (1998) (No Project Alternative)	6 minutes	373 diesel buses/ 263 trolley buses	2.29 million	--	107 LRVs	395,600
No Build/TSM (2015)	5 minutes	400 diesel buses/ 269 trolley buses	2.40	--	107 LRVs	395,600
Light Rail Alternative - IOS (2015)	--	Plan A[(2)]: 370 diesels/ 269 trolleys Plan B: 369 diesels/ 269 trolleys	Plan A: 2.26 million/ Plan B: 2.27 million	6 minutes	129 LRVs	471,500[(3)]

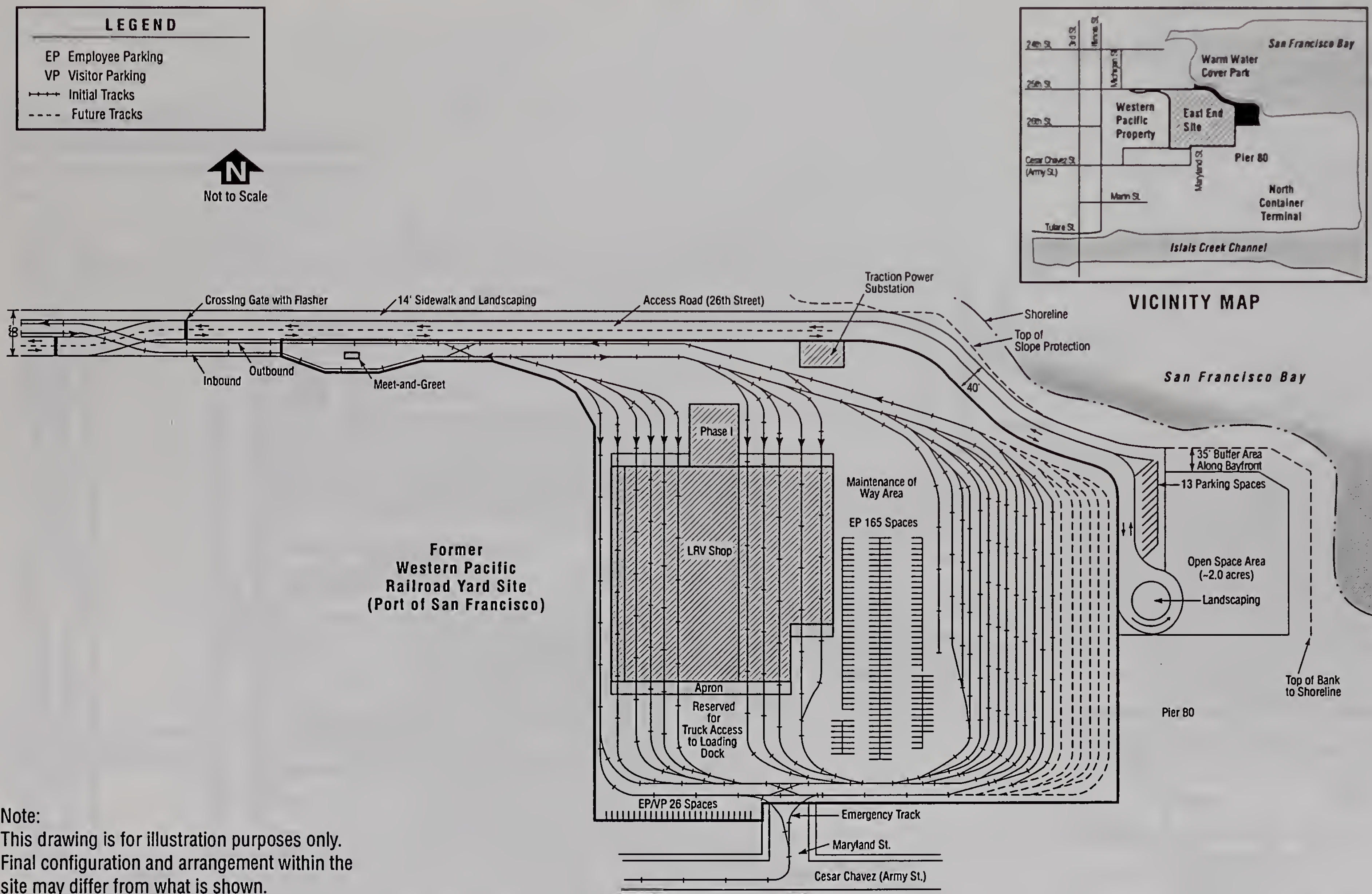
Notes: [(1)] **"Headways" refers to the time between transit vehicles on a given line**
[(2)] **Plans refer to Bus Route Plans associated with the Light Rail Alternative.**
[(3)] Assumes one-car trains in the peak and midday on the J-line, which would operate on Third Street.

Light Rail Facilities

New LRV Maintenance and Storage Facility

On June 23, 1998, the Public Transportation Commission elected to construct a new LRV maintenance and storage facility on 5.3 hectares (approximately 13.0 acres) of land on the western portion of an abandoned Western Pacific rail yard site, which is being transferred to the Port of San Francisco. The Western Pacific site is located east of Third and north of Pier 80 between Cesar Chavez and 25th Streets (**Figures 2-17A/B**). LRV access would be via an eastward extension of 25th Street into the northwest corner of the site. Although the LRV access track would cross freight track on Illinois Street, staging of freight trains does not currently occur in this area. No conflict between freight and LRV movement would be anticipated. Roadway access to the yard and shop would be from Cesar Chavez Street and Michigan or Maryland Streets at the southwest corner of the yard site.

Alternatively, MUNI is considering a 7-hectare (17.5-acre) Port-owned site along Cargo Way immediately south of Islais Creek and Pier 90 (**Figure 2-17C**). Approximately one-third of the site is currently designated for maritime use by the Port. In order for the entire site to be made available to MUNI, MUNI would need to request the Port Commission to reclassify the maritime acreage to non-maritime use. Other disadvantages of the Cargo Way site compared with the Western Pacific site are: 1) the longer deadhead times (LRV travel time to reach the line's start point); 2) maintenance functions located at the far end of the site so that LRVs must traverse the entire site to be serviced; 3) more extensive pre-construction work because of the unconsolidated nature of the site's fill material and the underlying Bay mud; 4) the displacement of seven existing businesses in two separate locations; and 5) conflict of LRV movements with the staging and movement of freight trains accessing Piers 92, 94, and 96. Freight



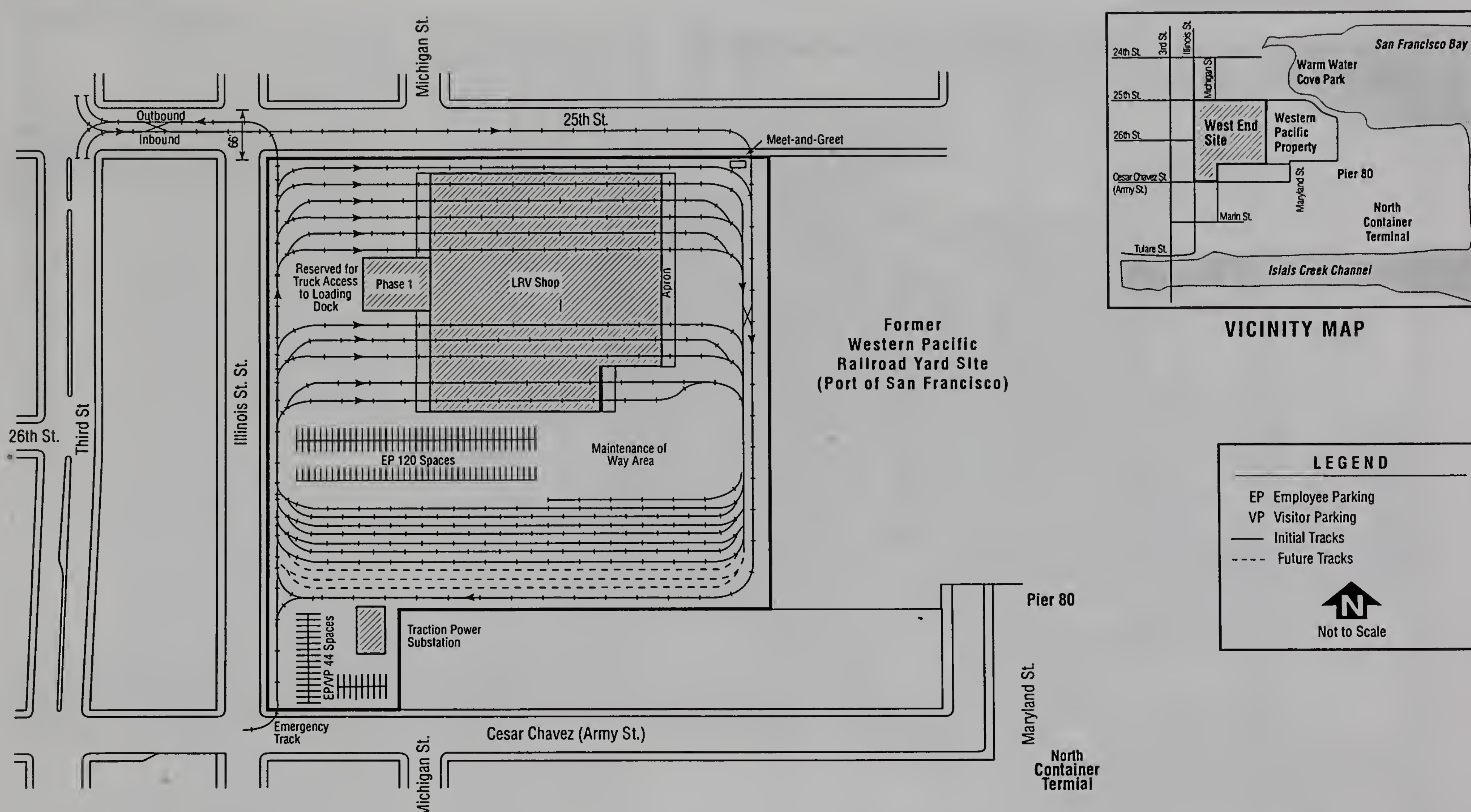
Note:
This drawing is for illustration purposes only. Final configuration and arrangement within the site may differ from what is shown.

FIGURE 2-17A

NEW LRV YARD AND SHOP
WESTERN PACIFIC SITE – EAST END – AND PROPOSED NEW OPEN SPACE

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.
J96-082.99 3rd St. (2/25/98)



Note:
This drawing is for illustration purposes only.
Final configuration and arrangement within the site may differ from what is shown.

Source: ICF Kaiser Engineers, Inc.

J96-082.107 3rd St. (2/25/98)

FIGURE 2-17B

NEW LRV YARD AND SHOP
WESTERN PACIFIC SITE – WEST END

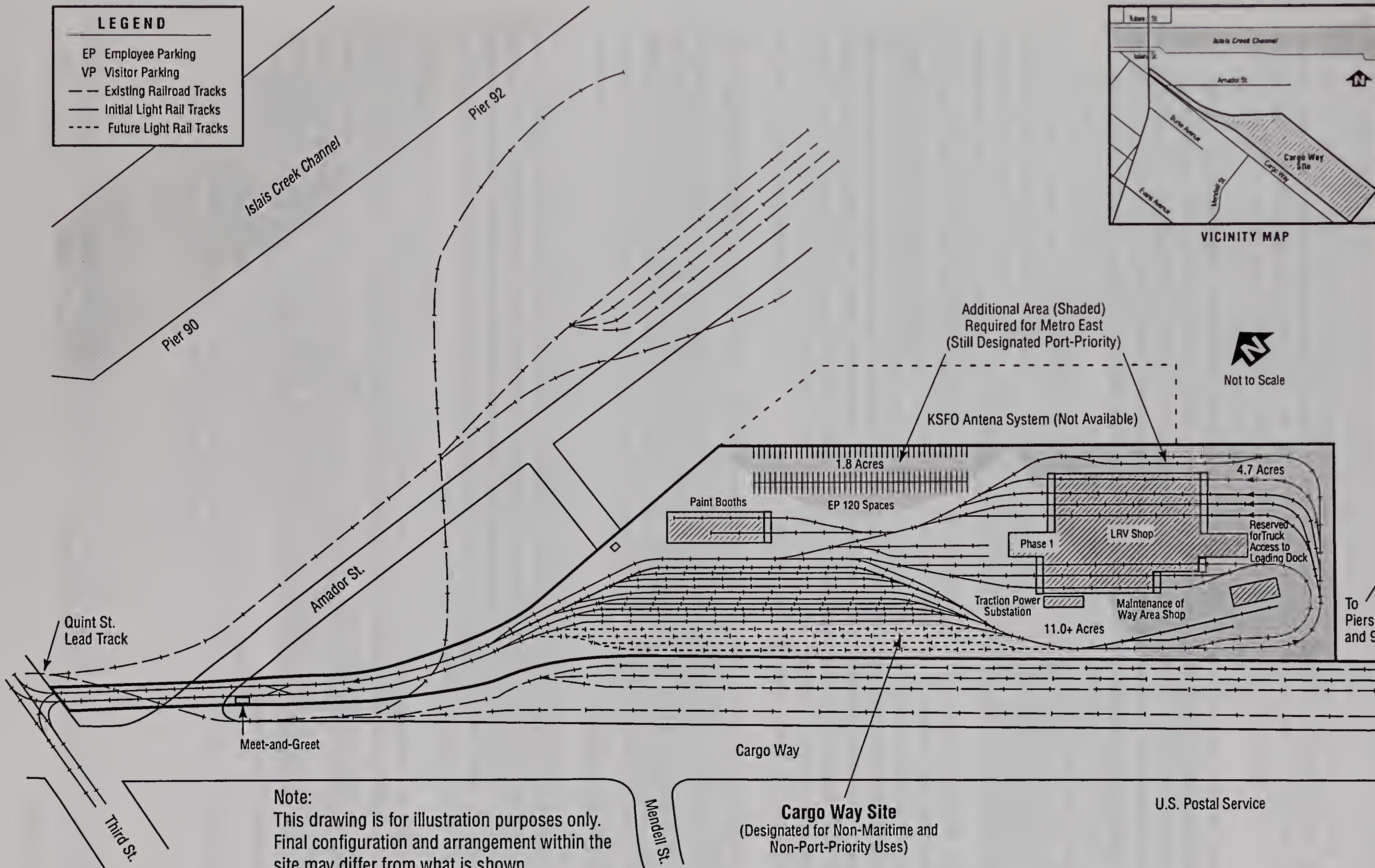


Figure 2-17C

NEW LRV YARD AND SHOP CARGO WAY SITE

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.
J96-082.111 3rd St. (1/2/98)

access tracks could be relocated to avoid conflicting movements between freight trains accessing Piers 94 and 96 and LRVs. However, LRVs would still cross the lead track providing access to Pier 92. The new LRV yard and shop facilities would include the following features for full build-out of the facility by 2015:

- practical yard and shop capacity for a total of approximately 100 LRVs, either high or low floor;
- approximately 14,307 sq. meters (154,000 sq. feet) of shop floor space for preventive maintenance running repair/daily service, fare vaulting, car washer and undercar blowdown, heavy repair/carbody shop, paint shop, support shops (electronic support shop, welding shop, truck/wheel/axle repair, component shops, systemwide glass and upholstery shops, and battery shop), maintenance-of-way, and offices for LRV operations and maintenance functions;
- guardhouse and a check-in (Meet-and-Greet) facility for incoming LRVs;
- traction power substations (2);
- environmental/waste treatment facilities; and
- approximately 200 spaces for employee and visitor parking.

For the Western Pacific site - east end, a 10.7-meter (35-foot) Bayfront shoreline band running for approximately 400 meters (1,320 feet) along the northern and eastern sides of the new LRV maintenance facility site and connecting a 0.8-hectare (2-acre) undeveloped tract of land with Warm Water Cove Park would be improved as open space in a manner yet to be determined. Access to the new open space would be via an extension of 25th Street. The open space would not be developed in conjunction with the Western Pacific site - west end - or the Cargo Way site.

Phased New LRV Maintenance Facility Implementation

To reduce IOS capital costs, the new LRV maintenance facility would be implemented in two phases. The initial phase would accommodate approximately 60 LRVs, sufficient to store 25 LRVs needed for the IOS and up to 35 LRVs transferred from the over-capacity Green Division. A later phase would expand new LRV maintenance facility to accommodate 100 LRVs, MUNI's ultimate goal, and could expand maintenance functions as identified previously.

Traction Power Facilities

Electric power, provided to MUNI substations by PG&E, is distributed from the substation to the light rail line via underground feeder cables and an overhead contact wire to the LRV pantograph. The overhead wire would extend the length of the surface alignment over each track and at crossovers. At the lift bridges, an underwater cable would tie into the power distribution system to provide a continuous flow of electric power along the alignment when the lift bridges open.

Three freight rail crossings occur on Third Street in addition to the crossings on Illinois Street and Amador Street to access the Western Pacific site and the Cargo Way site, respectively. The 5.8 meter (19-foot) height of the light rail overhead wire may need to be modified to meet the California Public Utilities Commission (CPUC) standard of 6.9 meters (22.5 feet) if and when the Port of San Francisco enlarges the rail tunnels along the Caltrain alignment to allow double stack freight rail cars. MUNI is consulting with the Port and the Union Pacific Railroad on this matter and would satisfy CPUC requirements under a Memorandum of Agreement.

For the IOS, seven substations, including an existing MUNI substation at Second and Berry Streets, would supply power to the light rail line. MUNI would construct six new substations on vacant land at or near the following locations (**Figure 2-18**):

- Mission Bay (**on 16th Street immediately west of** Terry Francois Boulevard);
- Western Pacific new LRV maintenance facility site (2);
- Third/Hudson (east side of Third Street); or, **alternatively, at the City's Southeast Sewage Treatment Plant, which would preclude purchase of private property;**
- West of Third/Keith at the Highway 101 Overcrossing; and Southeast corner of Bayshore/Sunnydale;
- **30 meters (100 feet) east of the** southeast corner of Bayshore/Sunnydale, **which would preclude purchase of private property.**

Two adjoining substations would be built at the new LRV maintenance facility site to provide electric power for the line and for the storage yard. Substations, which would be approximately 4 meters (13 feet) high and encompass 186 square meters (2000 square feet), would be designed to be as unobtrusive to the surrounding neighborhood as possible. The traction power system would be linked with the Bryant Control Center, which would monitor substation operation, via an underground cable.

Signaling and Communications System

The light rail line and its communication system, consisting of a public address system, public telephone, and closed circuit television at each station platform, would be linked to the MUNI Metro centralized control and communications system at West Portal. Pre-emption loops, located 30 meters (100 feet) in advance of traffic signals along Third Street and Bayshore Boulevard, would be used to give light rail priority at signalized intersections.

Fare Collection System

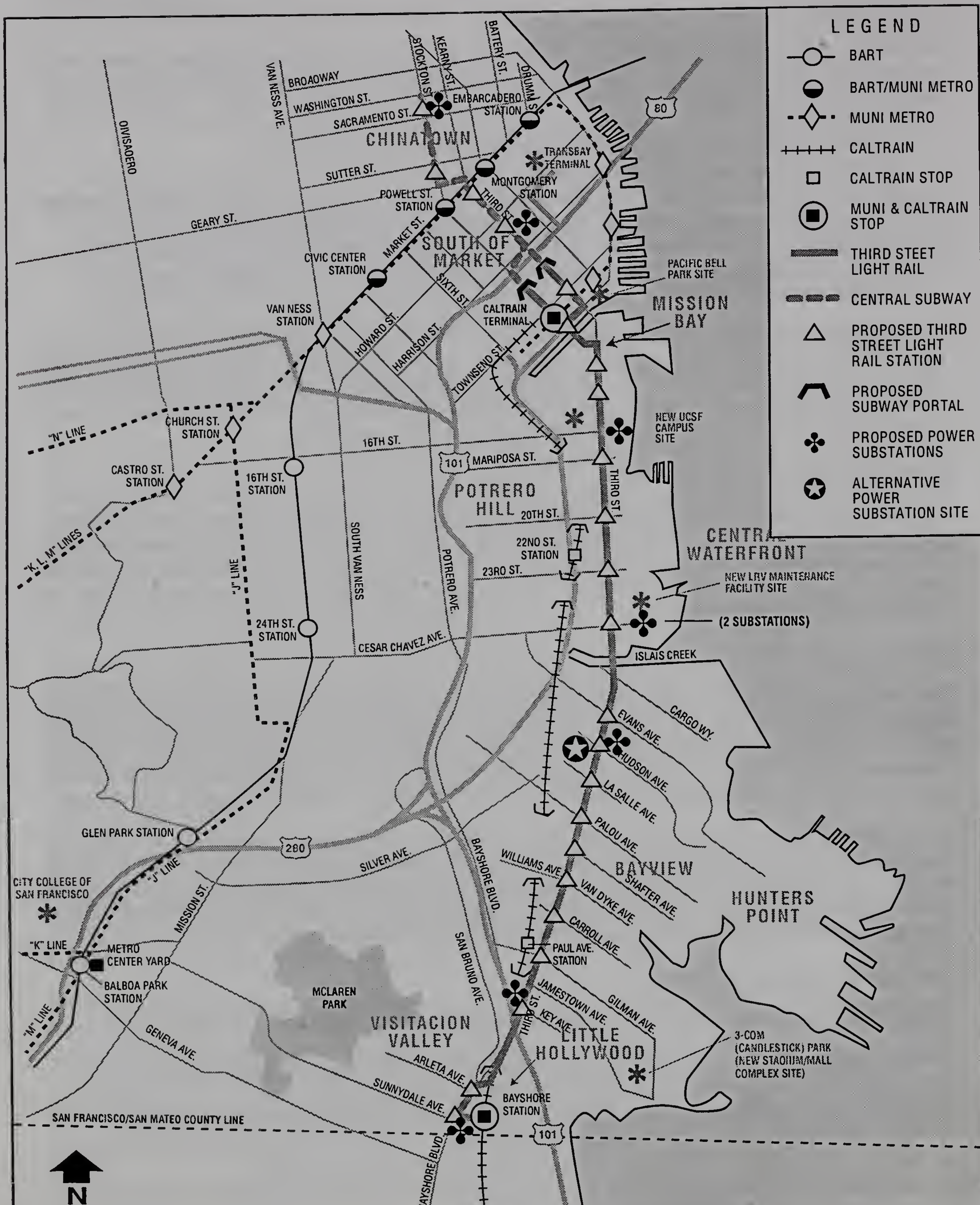
The Third Street light rail line would operate with a "proof-of-payment" fare system. In this fare collection system, each passenger would purchase a ticket (or carry a valid transfer or Fast Pass) prior to boarding the light rail line. All doors would be available for boarding since the operator would no longer be responsible for fare collection. Instead, roving inspectors would travel the light rail line randomly checking passengers' tickets. Fines would be issued to those who do not have a valid ticket, transfer, or Fast Pass.

To expedite the advance purchase of tickets, ticket vending machines similar to those installed at the cable car turnarounds would be placed on eight high-volume boarding platforms. Current MUNI plans to institute a proof-of-payment system on the existing light rail lines assume that passengers would be able to pay a cash fare to the operator in the first car. In the IOS phase, this system may be put into place as well, so that ticket vending machines would not have to be installed at each station.

Transportation Safety Considerations.

The IOS would incorporate the following features to address potential traffic safety concerns:

- light rail operation would be separated from motor vehicle traffic in a raised and protected median (except for the mixed flow option in the Third Street commercial core);
- along all two-way streets, light rail operations would be in the median of the street (rather than to one side of the street, conflicting with motor vehicle turns);
- all at-grade intersections which the light rail tracks cross would be signalized;
- the traffic signal phasing and timing near light rail crossings would be coordinated to preclude motor vehicles from stopping and blocking the light rail tracks;



J96-082.68 3rd St. (10/15/98)

FIGURE 2-18

PROPOSED LOCATIONS OF NEW TRACTION POWER SUBSTATIONS

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.

(Revised 10/15/98)

- where left-turns are allowed from the major street (e.g., Bayshore Boulevard and Third Street), exclusive left-turn lanes and storage bays would be provided, as well as signalized turn arrows;
- the LRV traffic signals would be clearly distinguishable from motor vehicle traffic signals;
- appropriate signage for motor vehicles, LRVs, and pedestrians would be installed;
- light rail passengers would board and alight from and to raised platforms (instead of the roadway); and
- separate and distinct pedestrian crosswalks would be provided, including pedestrian signals.

2.4.2 LIGHT RAIL ALTERNATIVE - NEW CENTRAL SUBWAY

The Light Rail Alternative - New Central Subway would be implemented as a second phase to the Third Street Light Rail Project. South of King Street, the New Central Subway would have the same southern terminal location, alignment, station locations, Third Street commercial core design, Third/Fourth alignment in Mission Bay, and new LRV maintenance facility site as for the IOS. North of King, the light rail line would travel in a surface/subway configuration, operating independently of the existing MUNI Metro system (refer to **Figure 2-5**). The New Central Subway alignment from King to Stockton/Jackson would be approximately 2.8 kilometers (1.75 miles) in length, differing slightly in the northbound and southbound directions because of the longer route along Fourth Street. A description of those elements that are unique to the New Central Subway is provided below.

Alignment

For the purpose of the environmental impact analysis, the New Central Subway from King Street to Stockton/Jackson is designated as Segment 7.

The New Central Subway would continue the IOS alignment north of King Street on Third and Fourth Streets. Two options are being considered for crossing Mission Creek. If the light rail line were to have bi-directional operation on the Fourth Street bridge, the alignment would diverge at King. After stopping at the station platform on Fourth at King, light rail traveling northbound would turn right into the King Street median and follow the MUNI Metro Extension tracks until Third Street (refer to **Figure 2-14**). At Third, the northbound track would curve left into the curb lane on the west side of Third Street, where a surface station serving Pacific Bell Ballpark would be located. Traffic signals would synchronize the left turn movement of LRVs from King to Third with right-turning cars/trucks from Third to King.

North of King, light rail would travel in an exclusive right-of-way northbound on Third Street and southbound on Fourth Street. As light rail would shift into the center of Third north of Townsend Street, the street configuration would transition to two traffic lanes on each side of the alignment. On Fourth Street between Brannan and Townsend, light rail would operate with two traffic lanes on each side of the light rail alignment. At Townsend, the eastern two lanes would be diverted onto Townsend to establish a bus lane and loading zone on the east side of Fourth for northbound buses and adjacent to the Caltrain Terminal for southbound buses. Up to 87 parking spaces would be eliminated between Townsend and Bryant on the east side of Third and west side of Fourth as well as on both sides of the street at the Third Street and Fourth Street portals (Brannan to Bryant).

If light rail operated in a one-way couplet across the Third and Fourth Street bridges, the northbound track would shift from the center to the left side of Third Street as it crossed King (refer to **Figure 2-15**). Light rail would stop at the surface station platform located adjacent to the sidewalk north of King. The light rail alignment and lane configuration on Third and Fourth north of King would be the same as described above.

On Third and Fourth north of Brannan Street, the northbound and southbound tracks would enter the subway in a 120-meter (400-foot) retained cut, located in the middle of the street. Two lanes of traffic would pass on each side of the retained cut. The northbound subway would continue under Third to

Harrison Street. The southbound subway, which would link the Fourth/Bryant portal with the northbound subway at Third Harrison, would curve under Assessor's Block #3762 bordering the south side of Harrison Street between Third and Fourth. Deep (mined) tunneling would be used to avoid affecting the foundations of five buildings located above the subway on Harrison (**Figures 2-19A/B**).

The northbound and southbound subways would converge at Third/Harrison in a stacked configuration with the southbound track located below the northbound track. The stacked configuration would continue under Third into the Moscone Center station located between Folsom and Howard. Northbound and southbound station platforms would share a common mezzanine. Station access from the surface (stairs/escalators and one elevator) would be permitted only on the east side of Third because the presence of truck ramps leading to loading docks underneath the Moscone Center would preclude surface access on the west side of Third (refer to **Figure 2-19A**). Direct access into the Moscone Center (basement level) would occur from the station mezzanine.

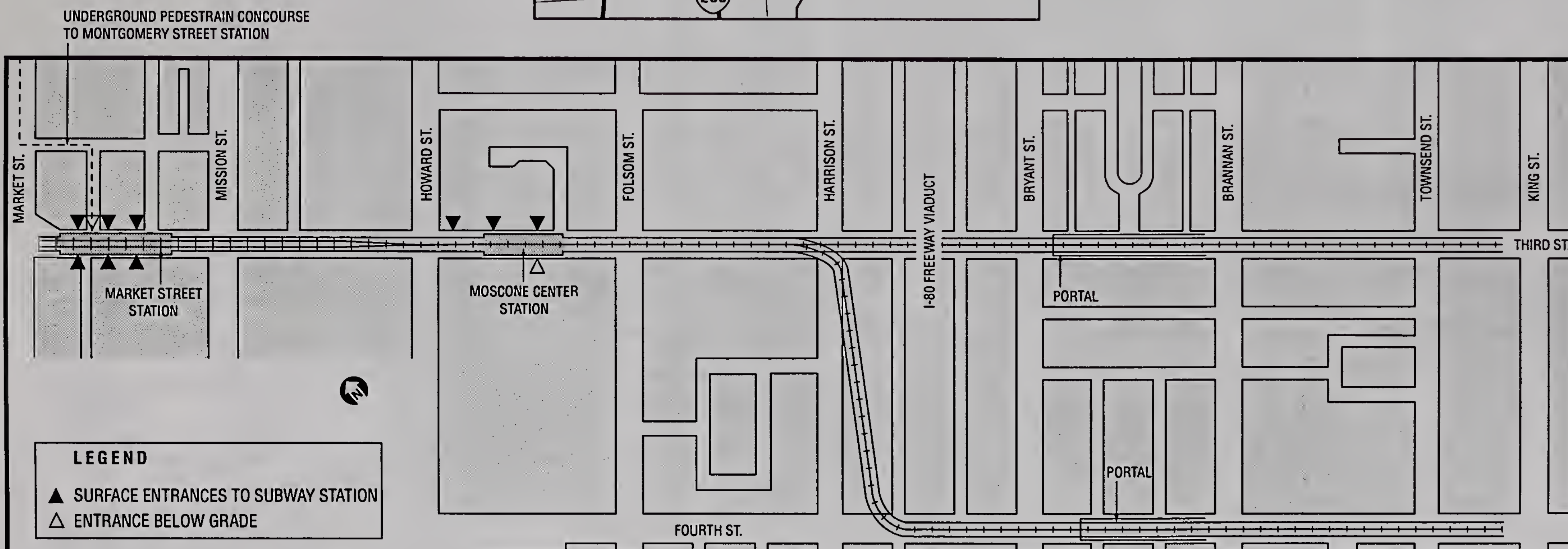
Immediately north of Howard, the alignment would ascend and transition to side-by-side configuration to permit a shallow crossing of the Market Street Subway (**Figure 2-20**). A station, linked by a 135-meter (443-foot) underground pedestrian concourse via Stevenson and Annie Streets to the Montgomery Street BART/MUNI Metro Station, would be located north of Mission Street (**Figure 2-21**). Station construction would displace a 2.5-meter (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 2.4.3, Build Alternative Construction Methods).

The shallow configuration of the station would preclude construction of a mezzanine level. Instead, direct access to the platform level would occur from multiple entrances (stairs/escalators and two elevators) placed on the east and west sidewalks along Third between Stevenson and Mission Streets or from the underground pedestrian concourse.

After crossing the Market Street Subway, the alignment would turn west under Geary and descend into a stacked configuration. The stacked subway configuration would permit a grade-separated junction for the Third Street light rail line southbound and future Geary rail line traveling eastbound. The stacked configuration also would permit construction of an optional subway tunnel on the west side of Stockton Street that would connect the future Geary line with the Third Street light rail line northbound and with a potential alignment eastbound on Pine Street. This optional subway alignment would bypass the Union Square station centered on Post Street and would be constructed simultaneously with the station. (The bypass is not included in the base capital cost for the Light Rail Alternative.)

The stacked configuration would affect the design of the Union Square station, which would contain a mezzanine and two platform levels (**Figure 2-22**). A pedestrian connection between the station's mezzanine and the Union Square garage elevators would be established, displacing two or three parking spaces. (Fifty additional spaces would be displaced if the bypass tunnel option were constructed.) Station entrances would be provided north of Post Street and an elevator would be installed on the east side of Stockton Street across from Union Square.

North of the Union Square station, the subway would continue in a mined tunnel under Stockton (**Figures 2-23A/B**). The northern terminus for the New Central Subway would be at an underground station in Chinatown centered on Clay Street (refer to **Figure 2-22**). The station would have mezzanine and



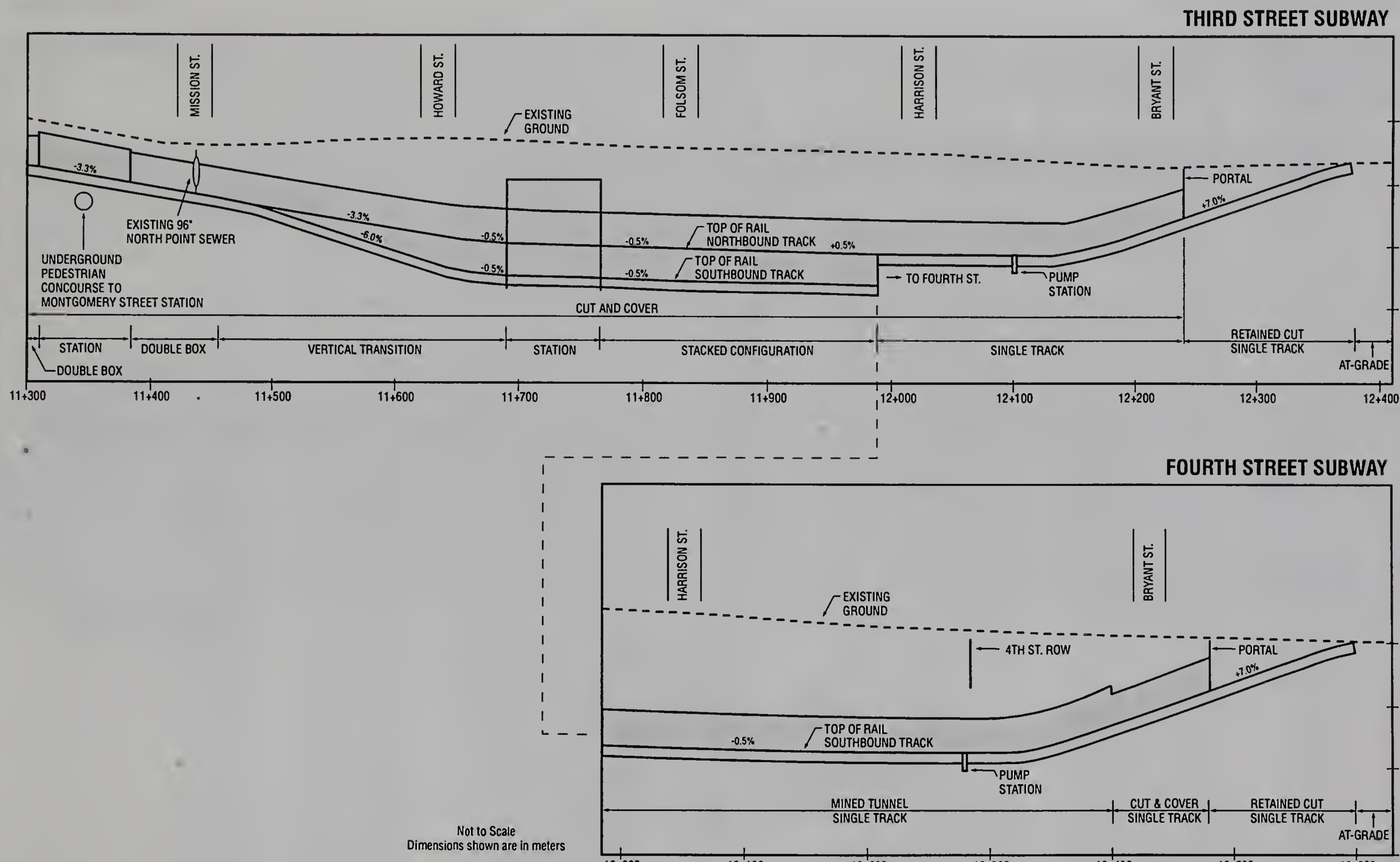
Source: ICF Kaiser Engineers, Inc.

J96-082.58c 3rd St. (11/14/97)

FIGURE 2-19A

NEW CENTRAL SUBWAY CONFIGURATION THIRD/FOURTH STREETS

Third Street Light Rail EIS/EIR



Not to Scale
Dimensions shown are in meters

FIGURE 2-19B

NEW CENTRAL SUBWAY CONFIGURATION THIRD/FOURTH STREETS

Third Street Light Rail EIS/EIRS

Source: ICF Kaiser Engineers, Inc.

J96-082.59a Mc2

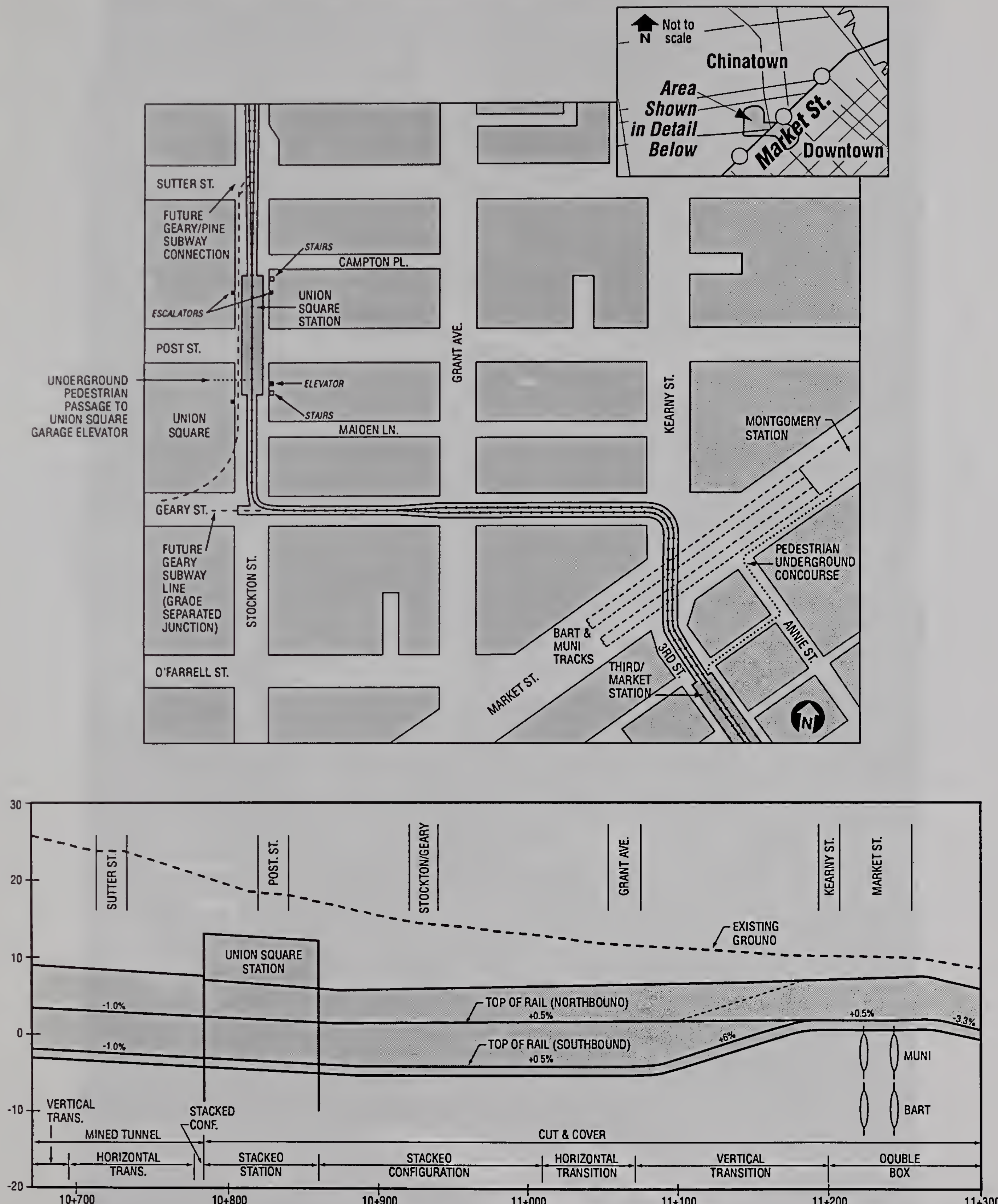


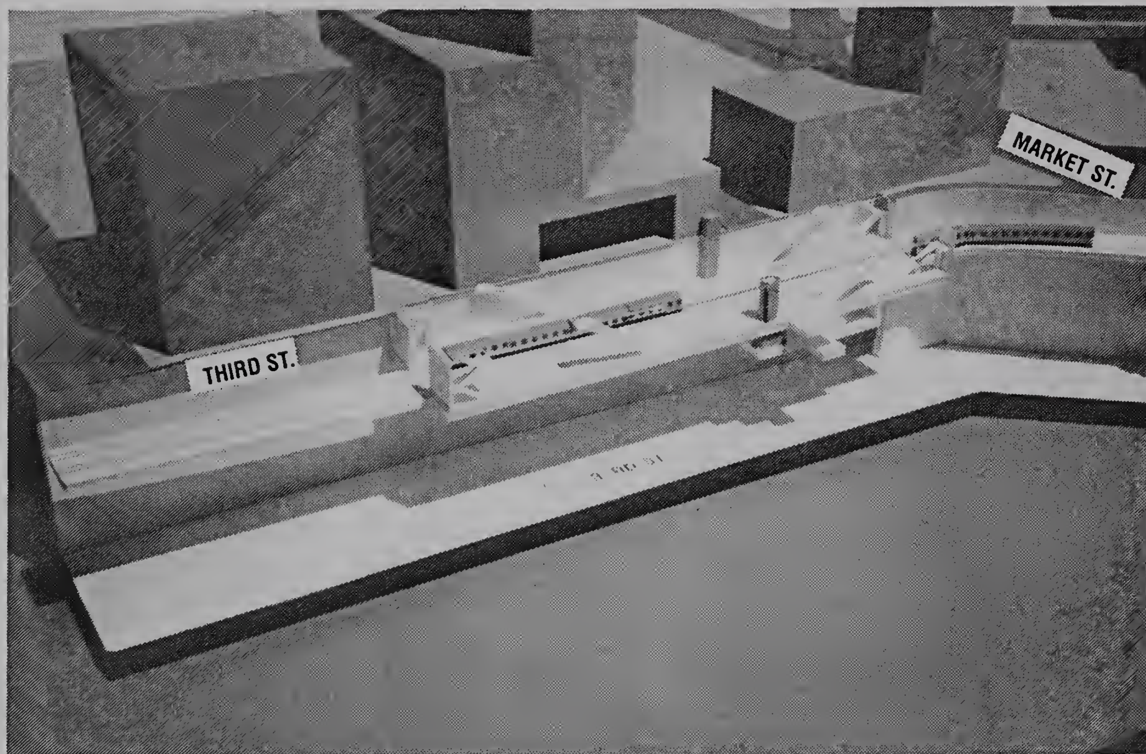
FIGURE 2-20

NEW CENTRAL SUBWAY CONFIGURATION NORTH OF MARKET

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.

J96-082.29a 3rd St. (1/7/98)



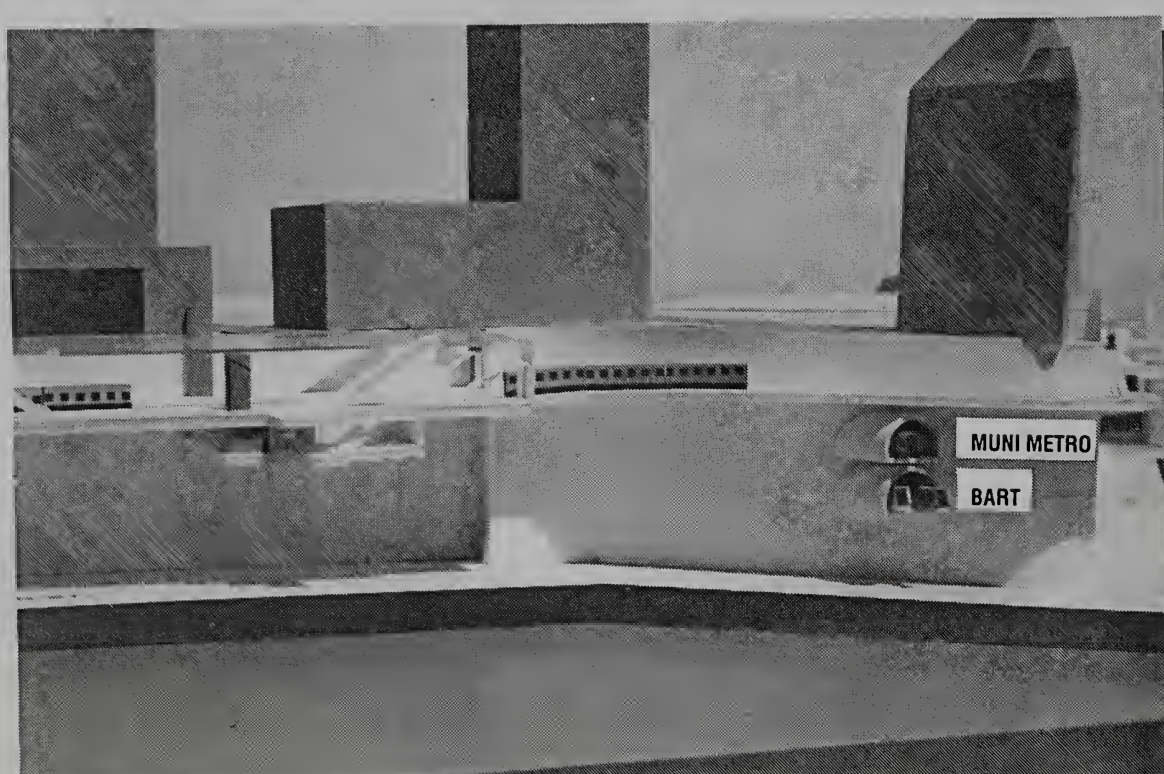


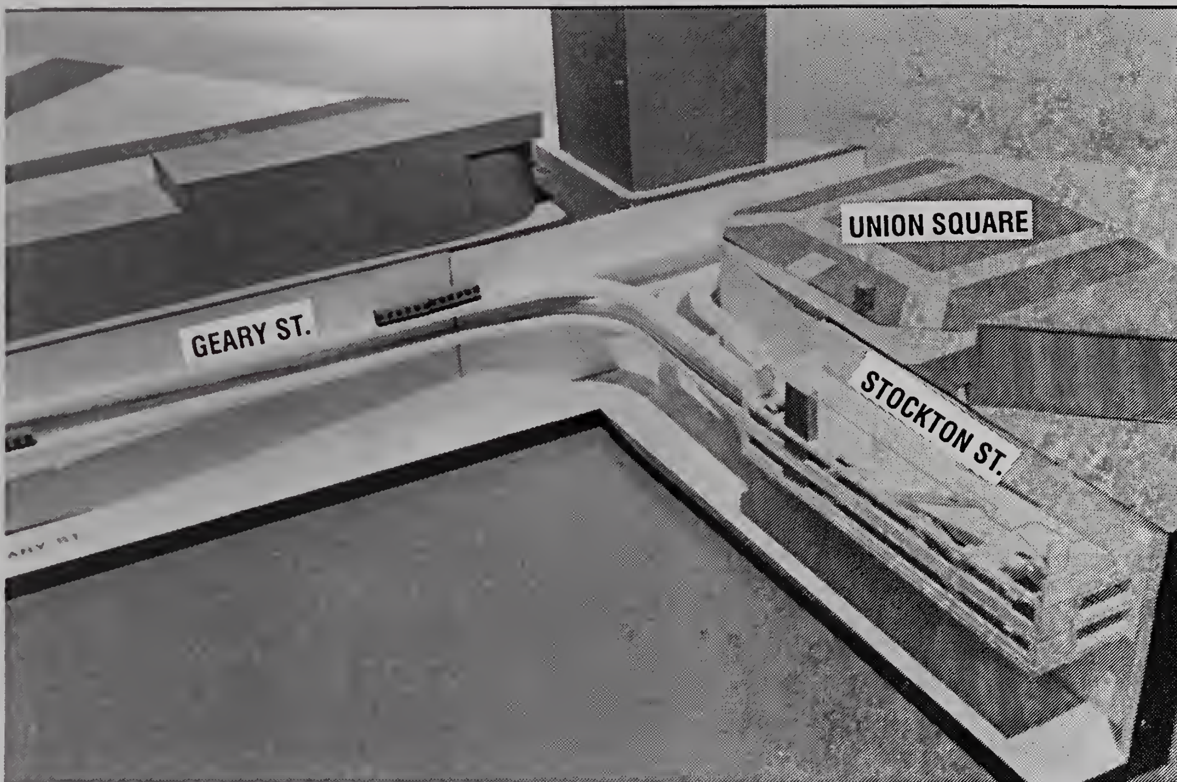
FIGURE 2-21

SUBWAY CONFIGURATION AT MARKET STREET STATION

Third Street Light Rail EIS/EIR

J96-082.73 3rd St. 6

Union Square Station



Chinatown Station

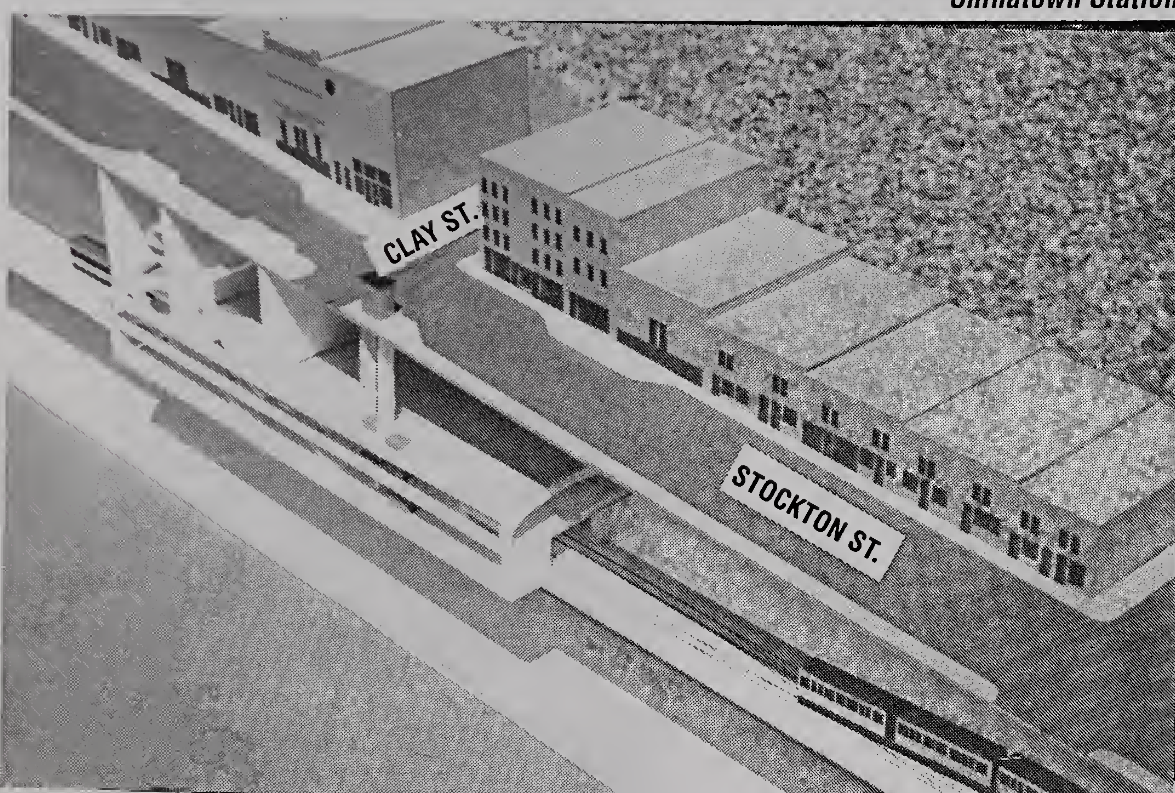
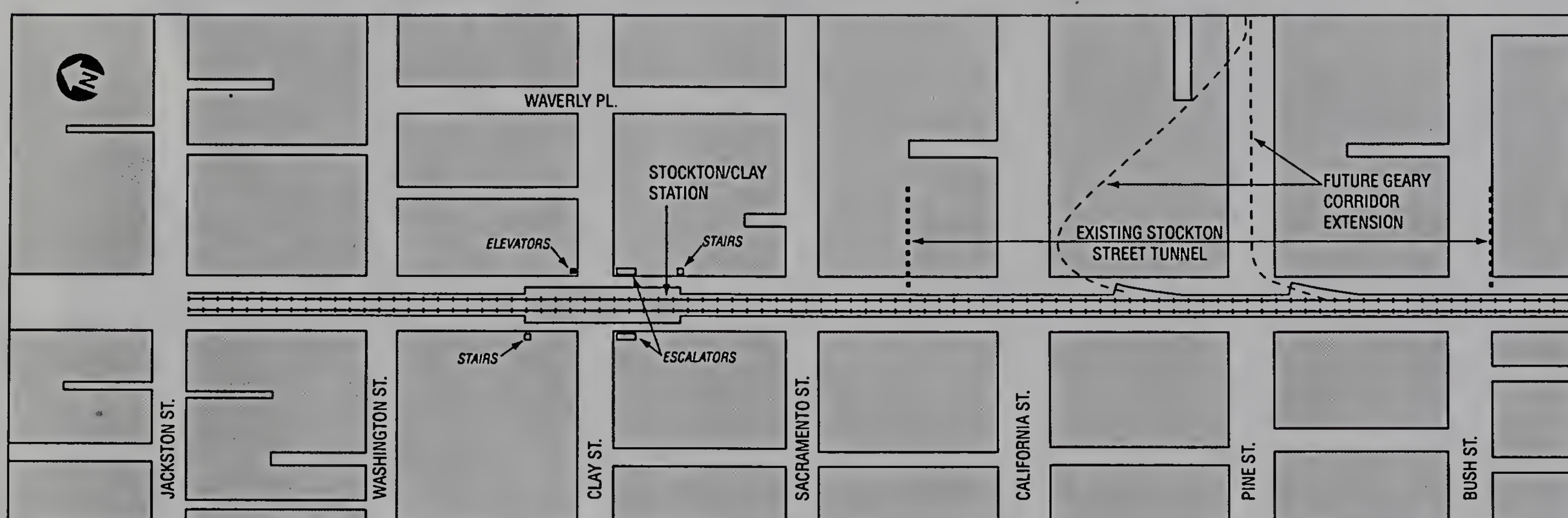


FIGURE 2-22

SUBWAY CONFIGURATION AT UNION SQUARE AND CHINATOWN STATIONS

Third Street Light Rail EIS/EIR

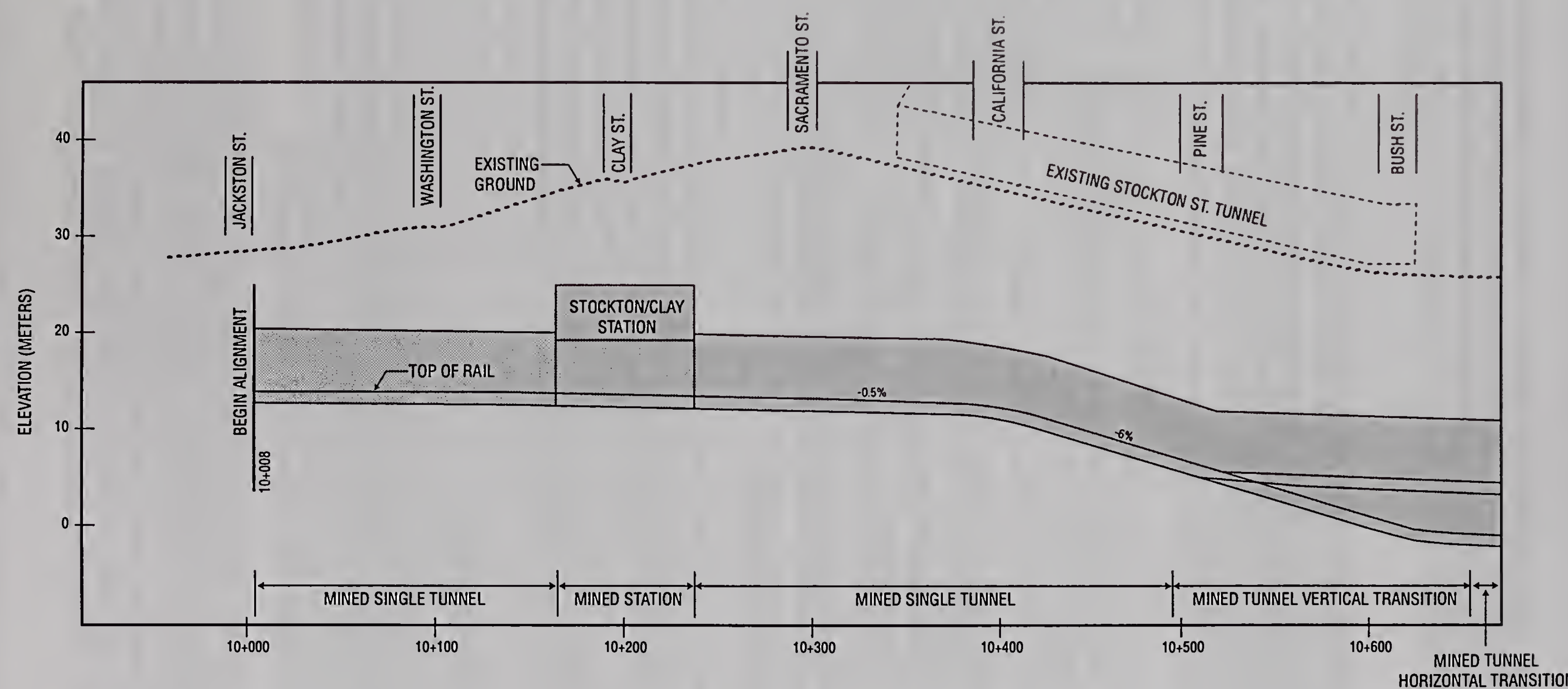


Source: ICF Kaiser Engineers, Inc.

J96-082.106 3rd St. (1/7/98)

FIGURE 2-23A

NEW CENTRAL SUBWAY CONFIGURATION STOCKTON STREET



Source: ICF Kaiser Engineers, Inc.

J96-082.109 3rd St. (1/2/98)

FIGURE 2-23B

NEW CENTRAL SUBWAY CONFIGURATION STOCKTON STREET

Third Street Light Rail EIS/EIR

platform levels with station entries, including two elevators, occurring in widened sidewalk areas along Stockton. The widened sidewalks would displace approximately eight curb parking spaces on Stockton at Clay. A double crossover and twin storage tracks, capable of storing two three-car trains, would extend beyond this station to Jackson Street.

Station Locations

In addition to those stations identified between King and the Caltrain Bayshore Station in **Table 2-5**, the New Central Subway would have four subway stations and one surface station, listed in **Table 2-7**. The surface station would be located on Third north of King to serve Pacific Bell Ballpark. Subway station platforms, which would extend for 75 meters (254 feet), could, ultimately, accommodate three-car trains using either high-floor or low-floor LRVs.

TABLE 2-7

NEW CENTRAL SUBWAY STATION LOCATIONS

Station	Type	Location
King Street (northbound only)	Surface Station - Platform adjacent to Sidewalk	Third Street between King and Townsend
Moscone Center	Underground - Two Platform Levels and a Mezzanine Level	Third Street between Folsom and Howard
Market Street	Underground - One Platform Level and a Pedestrian Concourse Level	Third Street between Mission and Stevenson
Union Square	Underground - Two Platform Levels and a Mezzanine Level	Stockton Street centered on Post
Chinatown	Underground - One Platform Level and a Mezzanine Level	Stockton Street centered on Clay

<u>New Central Subway Light Rail Operating Plan</u>

For the New Central Subway, one-car trains would operate as an independent line (not linked with MUNI Metro) from the Caltrain Bayshore Station southern terminus through the Central Subway to the northern terminus in Chinatown. Service frequencies for each line would be five minutes in the peak period and 10 minutes during the midday. When warranted by demand, a second independent line operating with one-car trains would provide additional service between Chinatown and Third/Mariposa and replace the N-line extension into Mission Bay (refer to the IOS operating plan). The L-line would continue to operate to the Caltrain Terminal.

<u>New Central Subway Bus Operating Plan</u>

To make efficient use of the light rail line using the New Central Subway, bus operations in the Corridor would be restructured. Two possible bus operating plans that have differing service assumptions and operating cost implications are described below. For both bus operating plans, the 9X would have five-minute, peak-period service frequencies, an increase over the No Build/TSM Alternative and the IOS bus operating plans. Route maps for Bus Service Plan A and Bus Service Plan B are presented in Appendix D.

<u>Bus Service Plan A</u>. In this plan, the 15-line would be replaced by the 9-San Bruno and by the 9X-San Bruno Express in the northern end of the Corridor. The 9AX and the 9BX zoned expresses would be eliminated. At the northern end, the 9X would be extended from its current terminus on Broadway to Kearny/North Point via Columbus, Powell, and Bay/North Point, weekdays (peak and midday service). Evenings and weekends, the 9-line would be rerouted from Market to Kearny/North Point via Kearny/Stockton, Columbus, Powell, and Bay/North Point. Existing service levels would be maintained,

except during peak periods when 9X service would operate in both peak and reverse peak directions and half the peak service would be turned back at the Third Street light rail station near Arleta. In this scenario, the 9X would offer five minute service frequencies to Arleta and 10 minute frequencies to Downtown during peak periods. Midday service frequencies would remain at 12 minutes. All midday trips would operate Downtown.

In addition, service on the 30-Stockton and 45-Stockton-Union would be modified as follows:

- 30-line peak-period service frequencies would be reduced from four to six minutes;
- 30-line and 45-line weekday, midday service frequencies would be reduced from six to seven and one-half minutes;
- 30-line Saturday midday service would conform to six minute intervals throughout the length of the alignment;
- 30-line Sunday midday service would be improved to seven and one-half minute headways throughout the length of the alignment; and
- 45-line service would turn back at Folsom instead of traveling to the Caltrain Terminal at Fourth and Townsend.

On the southern end, the 9-San Bruno would be rerouted to follow the 15-line through Visitacion Valley to a terminus at Geneva/Santos. The remaining segment of the 15-line along Geneva to City College (Phelan Loop) and the rerouted portion of the 9-line from Bayshore Boulevard/Visitacion to Geneva/Santos would be incorporated into the 43-Masonic, which would travel along Geneva, Schwerin, Sunnydale to the Caltrain Bayshore Station. The 36-Teresita would replace the 43-line along Geneva, Naples, Munich/Prague, Cordova, Chicago, and South Hill Boulevard in Crocker Amazon. Additionally, the 54-Felton would be rerouted off Third between Revere and Hudson, providing Bayview residents with a neighborhood circulator to the Palou and Hudson light rail stations. The 54-line would turn off its current route on Revere and follow Lane, Palou, Phelps and Hudson to Hunters Point. Existing service levels for these lines would be retained.

Bus Service Plan B. Service Plan B would incorporate the same service changes as in Service Plan A with the following exceptions:

- The 9X would operate throughout the week, including evenings and weekends, from City College to Arleta with every other bus continuing Downtown during peak periods and every bus traveling Downtown during the midday at service levels described in Service Plan A. Evening and weekend service along the northern leg of the 15-line would be provided by the 9-San Bruno, rerouted from Market to Kearny/North Point via Stockton/Kearny, Columbus, Powell, and Bay/North Point. (During the weekday, the 9-line would continue along its current route to the Ferry Terminal.); and
- Since the 9X would incorporate the southern leg of the 15-line, the routes for the 9-San Bruno, the 43-Masonic, and the 36-Teresita would remain as currently configured in the southern portion of the City.

Operating Statistics

A summary of operating statistics for New Central Subway is presented in **Table 2-8**. The table indicates that, compared with the IOS, the New Central Subway would require three additional peak period LRVs and one spare, primarily because of the additional route miles of the New Central Subway and the increased service frequencies.

TABLE 2-8

ANNUAL OPERATING STATISTICS FOR LIGHT RAIL ALTERNATIVE - NEW CENTRAL SUBWAY

Alternative	Peak Headways 15 Line	Diesel/Trolley Peak Demand (Systemwide)	Total Annual Diesel/Trolley Bus Hours (Systemwide)	Peak [(1)] Headways: Third Street Light Rail	LRV Fleet Peak Demand (Systemwide)	Annual LRV Car-Hours (Systemwide)
Existing (1998) (No Project Alternative)	6 minutes	373 diesel buses/ 263 trolley buses	2.29 million	--	107 LRVs	395,600
No Build TSM (2015)	5 minutes	400 diesel buses/ 269 trolley buses	2.40 million	--	107 LRVs	395,600
Light Rail Alternative - IOS (2015)	--	Plan A: [(2)]370 diesels/ 269 trolleys Plan B: 369 diesels/ 269 trolleys	Plan A: 2.26 million/ Plan B: 2.27 million	6 min.	<u>129</u> LRVs	<u>471,500</u>[(3)]
Light Rail Alternative - New Central Subway (2015)	--	Plan A: 365 diesels/ 258 trolleys Plan B: 365 diesels/ 258 trolleys	Plan A: 2.23 million/ Plan B: 2.23 million	5 min.	<u>132</u> LRVs	<u>507,000</u>[(3)]

Notes: (1) "Headways" refers to the time between transit vehicles on a given line
(2) Plans refer to Bus Route Plans associated with the Light Rail Alternative.
(3) Assumes one-car trains operating in the peak and midday for the IOS and for the New Central Subway.

Since the New Central Subway alignment coincides with the routes for the 30-line and 45-line south of Jackson Street, service hours for these bus lines could be reduced where duplicate service occurs. The New Central Subway would reduce the peak demand requirements for the diesel and trolley fleets by 15 vehicles as well as provide a reduction in systemwide bus hours.

Transit Fleet Requirements

The Light Rail Alternative – New Central Subway would require three additional LRVs beyond the requirements for the IOS. In this scenario, MUNI's total LRV fleet size, including spares, would be <u>165</u>. The trolley and client bus fleet would be reduced to approximately 748 vehicles, including spares, or 19 less than for the IOS and 54 less than for the No Build/TSM Alternative[14].

Light Rail Facilities

<u>New LRV Maintenance and Storage Facility</u>

The new LRV maintenance facility described for the IOS (Section 2.4.1.5) would be used to store and maintain the LRV fleet for the New Central Subway as well.

[14] San Francisco Municipal Railway, *Light Rail and Bus Transit Operating Plan*, February 1997, revised September 25, 1997; available for review in Project File 96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

Traction Power Distribution System for the Central Subway

The New Central Subway would use the IOS electric power distribution facilities, including substations. In addition, the subway would be constructed with overhead wire, feeder cable, and two new substations located at the Moscone Center Station and the Chinatown Station.

Signaling and Communications System for the Central Subway

The Automatic Train Control System used for MUNI Metro would be installed in the Central Subway to monitor and control train movement in the subway. In this scenario, the Third Street light rail line would operate independently from MUNI Metro although train control would occur at the existing control center at West Portal. In addition to the communications system identified for the IOS, the New Central Subway would 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 described for the IOS would be used for the New Central Subway. In the subway stations, turnstiles similar to those installed at MUNI Metro stations would facilitate fare collection. In this phase, the number of ticket vending machines on surface platforms may be increased.

2.4.3 BUILD ALTERNATIVE CONSTRUCTION METHODS

The following sections describe the construction techniques and the time-frame for construction activities for the two phases of the Build Alternative - the IOS and the New Central Subway. A summary of construction activities for the Build Alternative and the time-frame for performing the activities is presented in **Table 2-9** and **Tables 2-10A/B**.

IOS Construction Activities

According to the schedule presented in **Table 2-9**, pre-construction activities would require 18 months and coincide with utility relocation. Preconstruction activities, which would begin in 1999, would involve moving underground utility lines from the proposed light rail alignment to the parking lane and installing electrical conduits and conduits for traffic signalization. Work would require a minimum of two weeks per block.

Line construction, including trackwork and station platform installation, would begin in 2000 starting at the northern end of the line in Mission Bay and proceeding south. Line construction would be divided into three segments. To limit parking displacement and traffic disruption, construction would occur first on one side of the street and then the other, requiring a minimum of two weeks per side of the street. Additional time may be needed in the Third Street commercial core if the street design included sidewalk widening and extensive landscape treatments. Each side of the street would have one traffic lane and one curb parking lane temporarily displaced. At center platform locations, one of the two remaining traffic lanes may be temporarily diverted to the other side of the street into a contra-flow lane.

Traction power, including installation of poles to support the overhead wire, feeder cables, as well as communications and signal systems and related station finishings would be installed in 2001 and 2002. This work would require a minimum of one week per block and could temporarily displace one or two parking spaces per block.

TABLE 2-9
ESTIMATED CONSTRUCTION PHASING FOR THE LIGHT RAIL ALTERNATIVE - INITIAL OPERATING SEGMENT

Activity	Estimated Duration in Months	YEARS FROM PROJECT START: Year 1 (1999) Months 1-6	7-12	Year 2 (2000) Months 13-18	19-24	Year 3 (2001) Months 25-30	31-36	Year 4 (2002) Months 37-42	43-48	Year 5 (2003) Months 49-54	55-60
Pre-construction activities/Prepare new LRV maintenance facility site	18										
Relocate utility lines	18										
Construct new surface rail line and stations – Mission Bay section	24										
Construct new surface rail line and stations – Central Waterfront/Bayview	24										
Construct new surface rail line and stations – Visitacion Valley section	24										
Construct Phase 1 new LRV maintenance and storage facility	24										
Systems installation/station finishings	18										
LRV procurement and acceptance testing	30										
Pre-revenue testing	6										
Begin revenue operations	–										

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TABLE 2-10A
ESTIMATED CONSTRUCTION PHASING OPERATING FOR THE LIGHT RAIL ALTERNATIVE - NEW CENTRAL SUBWAY

Activity	Estimated Duration in Months	YEARS FROM PROJECT START									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Phase A- Third/King to Third /Market											
Pre-construction activities	18										
Relocate utility and transit lines	18										
Construct subway portals and station shells (cut-and-cover)	18										
Construct line sections (mined tunnels and special excavation)	12										
Install systems elements; install station finishings	18										
Pre-revenue testing (King to Market)	6										
Begin revenue operations (King to Market)	–										

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TABLE 2-10B
ESTIMATED CONSTRUCTION PHASING OPERATING FOR THE LIGHT RAIL ALTERNATIVE - NEW CENTRAL SUBWAY

Activity	Estimated Duration in Months	YEARS FROM PROJECT START									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Phase B- Third/King to Stockton/Jackson											
Pre-construction activities	18										
Relocate utility lines	18										
Construct subway station shells at Union Square (cut-and-cover)	18										
Construct mined tunnel and station shell at Chinatown	18										
Install system elements; install station finishings	18										
LRV procurement and acceptance testing	24										
Pre-revenue testing (Market to Clay Street)	6										
Begin revenue operations (Market to Clay Street)	–										

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Site preparation, including stabilization of existing soils would begin in 1999 for the new LRV maintenance facility. Remediation of the soil, installation of storage tracks, and construction for the maintenance facility would follow about 10 months later. In 2001 and 2002, grading and paving for access roads and parking areas would occur.

All construction for the IOS, including the new LRV maintenance facility and receipt of the requisite new LRVs, would be completed by January 2003, permitting light rail service to be inaugurated in July 2003.

Possible IOS Construction Staging Areas

Staging areas for construction activities would occur at multiple, vacant parcels in the Corridor. Potential staging area sites are:

- Catellus property east of Illinois Street at intersection with Terry Francois Boulevard;
- the Port's Western Pacific site near Pier 80 <u>or</u> the Port's Cargo Way site;
- vacant parcel at the intersection of Hudson/Newhall/Third Streets (east of Third) that would ultimately house a MUNI substation;
- vacant parcels at the intersection of Shafter/Thomas/Third Streets (west of Third);
- vacant Caltrans land at Keith/LeConte Streets west of Third; and
- the area to the west of the Caltrain Bayshore Station that would become the light rail line's southern terminus.

Construction of the New Central Subway

Construction of the New Central Subway would be accomplished in two phases: 1) Line Section 1 from Third/Fourth and King up to Market Street, including the stations at Moscone Center and at Market Street; and 2) Line Section 2 crossing Market Street and following Geary and Stockton to Stockton/Jackson, including the Union Square and Chinatown stations (**Figure 2-24**). By sequencing construction of the Central Subway in two phases, MUNI could begin subway operation to Market Street while construction of Line Section 2 occurs. Line Section 1 also could serve as an underground route for transporting construction debris from north of Market.

The construction techniques for building each Line Section are described in a technical memorandum for implementing the New Central Subway.[15] They are summarized below and identified in **Figure 2-25**.

<u>Phase A: King Street to Market Street</u>

The first 18 months of the Phase A would be devoted to pre-construction activities, particularly relocation of existing utility lines (refer to Section 5.7) and transit service rerouted from Third Street (refer to Section 3.2.1). At Mission and Third, the subway alignment would be in vertical conflict with the 2.4-meter (8-foot) North Point Main sewer line, which carries storm drain runoff and sanitary sewer flows. Several options are being considered, 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, approximately 18 months. More information about this impact is presented in Section 5.6, Visual and Aesthetic Resources, and Section 5.7, Utilities and Energy.

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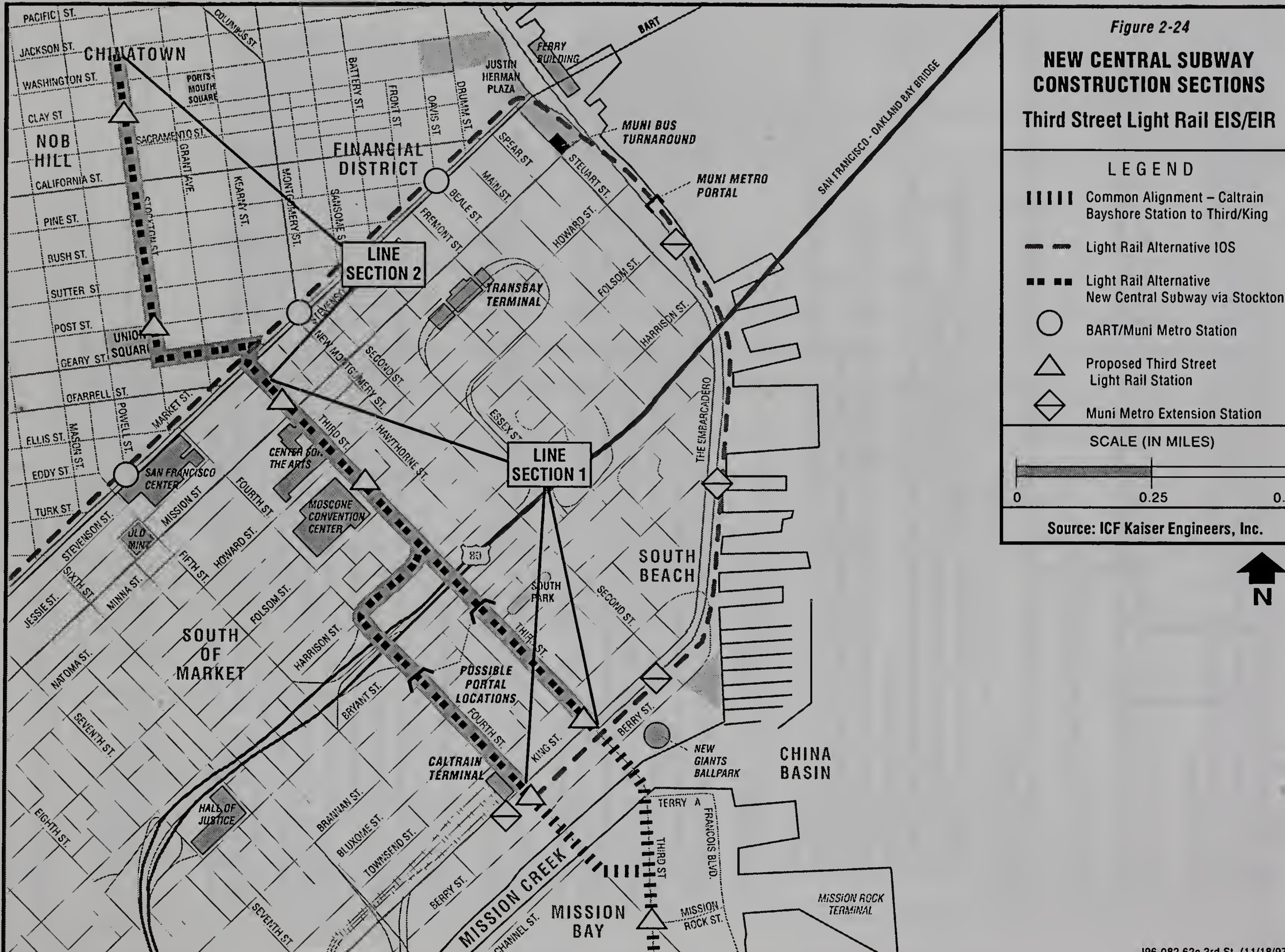
[15] ICF Kaiser, Technical Memorandum to File, Proposed Construction Plan and Schedule for Implementing the Third Street Light Rail project New Central Subway Segment, November 14, 1997; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

Figure 2-24

NEW CENTRAL SUBWAY CONSTRUCTION SECTIONS

Third Street Light Rail EIS/EIR



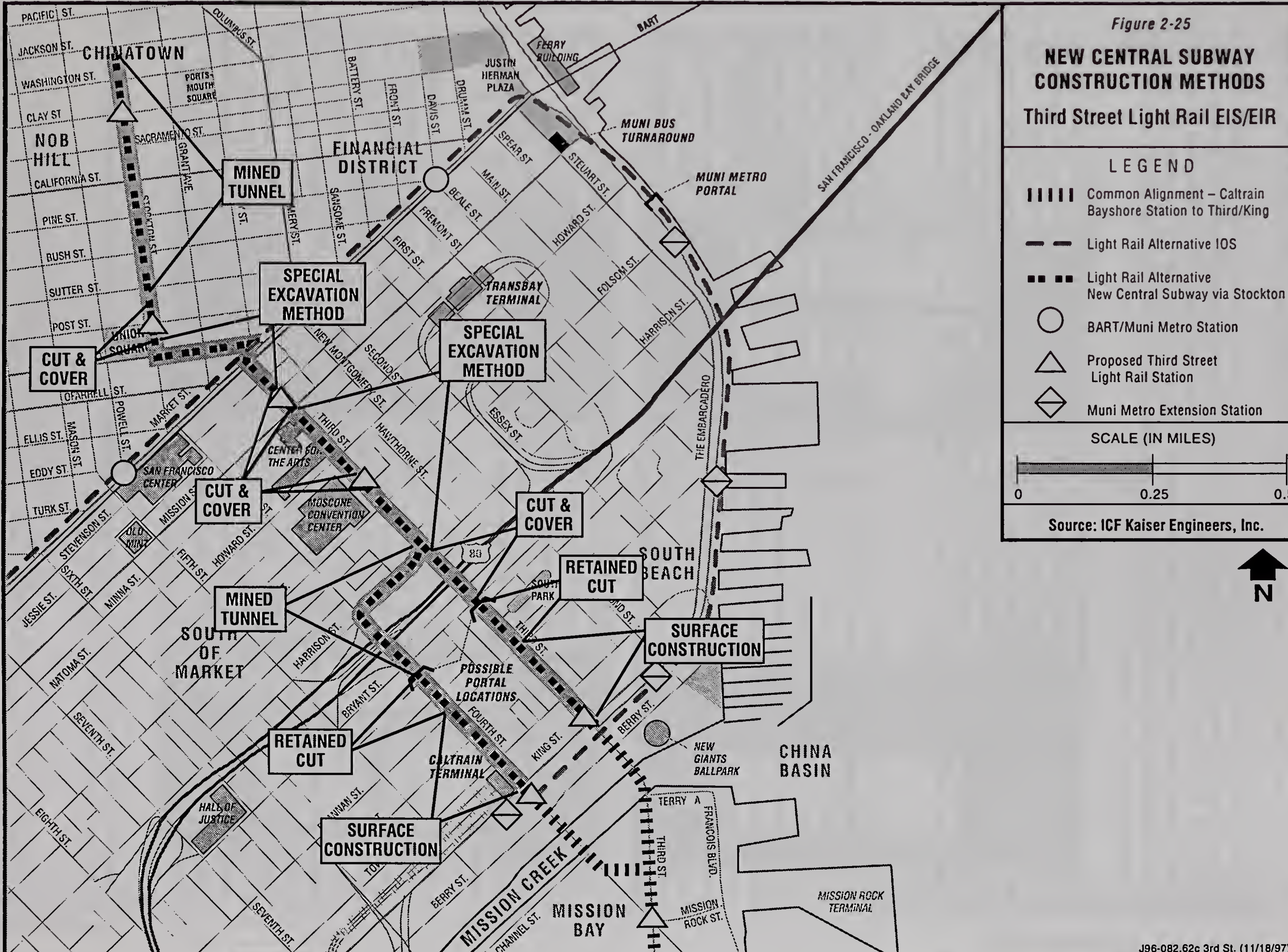
Source: ICF Kaiser Engineers, Inc.

J96-082.62c 3rd St. (11/18/97)

Figure 2-25

NEW CENTRAL SUBWAY CONSTRUCTION METHODS

Third Street Light Rail EIS/EIR



Source: ICF Kaiser Engineers, Inc.

J96-082.62c 3rd St. (11/18/97)

The subsequent 18-month period would focus on constructing the surface alignment on Third and Fourth between King and Brannan, the subway portals on Third and Fourth between Brannan and Bryant, and the subway on Third between Bryant and Harrison. In addition, excavation for the Moscone Center and Market Street stations would occur during this period. The surface segment and subway portals would require removal of two lanes of parking and two traffic lanes for six to nine months (refer to Section 3.2.2 for rerouting plans for vehicles).

Subway construction on Third between Bryant and Harrison would be less disruptive since the excavation would be decked over, restoring all lanes of traffic within three to five months. The larger excavations for the stations at the Moscone Center and at Market Street would require a longer period of surface disruption. Two lanes of traffic would be maintained, as well as access to the Moscone Center by trucks and delivery vehicles, until the entire station excavation could be decked over and four lanes of traffic restored, a period of six to eight months. The curb parking lane and one traffic lane would continue to be closed during off-peak hours to permit construction vehicles to supply materials and to haul construction debris.

Figure 2-26 indicates the sequence for cut-and-cover construction employed at the portals and along much of Third Street. Augers, 24 meters or 80 feet tall, would be brought in to install soil-cement walls to support the excavation **(Figure 2-27)**. A 3.7-meter (12-foot) excavation would be made between the support walls in order to install the support structure for the temporary roadway deck **(Figure 2-26, Frame A)**. Excavation would proceed under the deck, including installation of support struts, until reaching the level where the concrete subway box is constructed **(Figure 2-26, Frames B and C)**. Prior to decking, traffic would operate on one or two lanes of the street depending on the width of the excavation. At locations where the excavation would extend across the entire width of the street, such as at station sites, construction would proceed on half the street at a time by installing a temporary support wall. This procedure would permit limited traffic flow. Within 18 to 24 months, the subway tunnels and station framing would be completed and the street restored **(Figure 2-26, Frame D)**.

Twelve months after the construction of the subway portals and stations on Third Street began, the subway sections connecting the Fourth Street portal with the subway at Third/Harrison would be initiated using mined tunneling (construction completely underground starting at the portal location). Mined tunneling would permit subway construction to occur 11 meters (35 feet) below the foundations of five buildings on the south side Harrison Street between Third and Fourth without affecting the structural integrity of these buildings.

Simultaneously, one-block sections on Third Street between Harrison and Folsom and between Howard and Mission would be constructed using a special excavation method that limits surface disruption to six to eight weeks and minimizes ground movements caused by excavation. During this two-month period, soil-cement support walls would be installed from the surface as in cut-and-cover construction. Then highly-pressurized grout would be injected into the ground between the support walls to form the top and bottom levels of the subway structure. The grout would be injected in a grid pattern in the street right-of-way during off-peak, possibly evening, hours.[16] Two lanes of traffic, as well as truck access to the Moscone Center, would be maintained on Third Street during this period. At the end of the second month, construction would proceed entirely underground (within the subway structure), allowing the street to be restored. The mined tunnel and special excavation sections of the subway would be completed within 12 months. Total construction time for Line Section 1, from pre-construction to system testing, would be five years.

[16]Dames & Moore, *Special Excavation Methods for Central Subway Construction*, August 20, 1997: available for review in Project File 96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

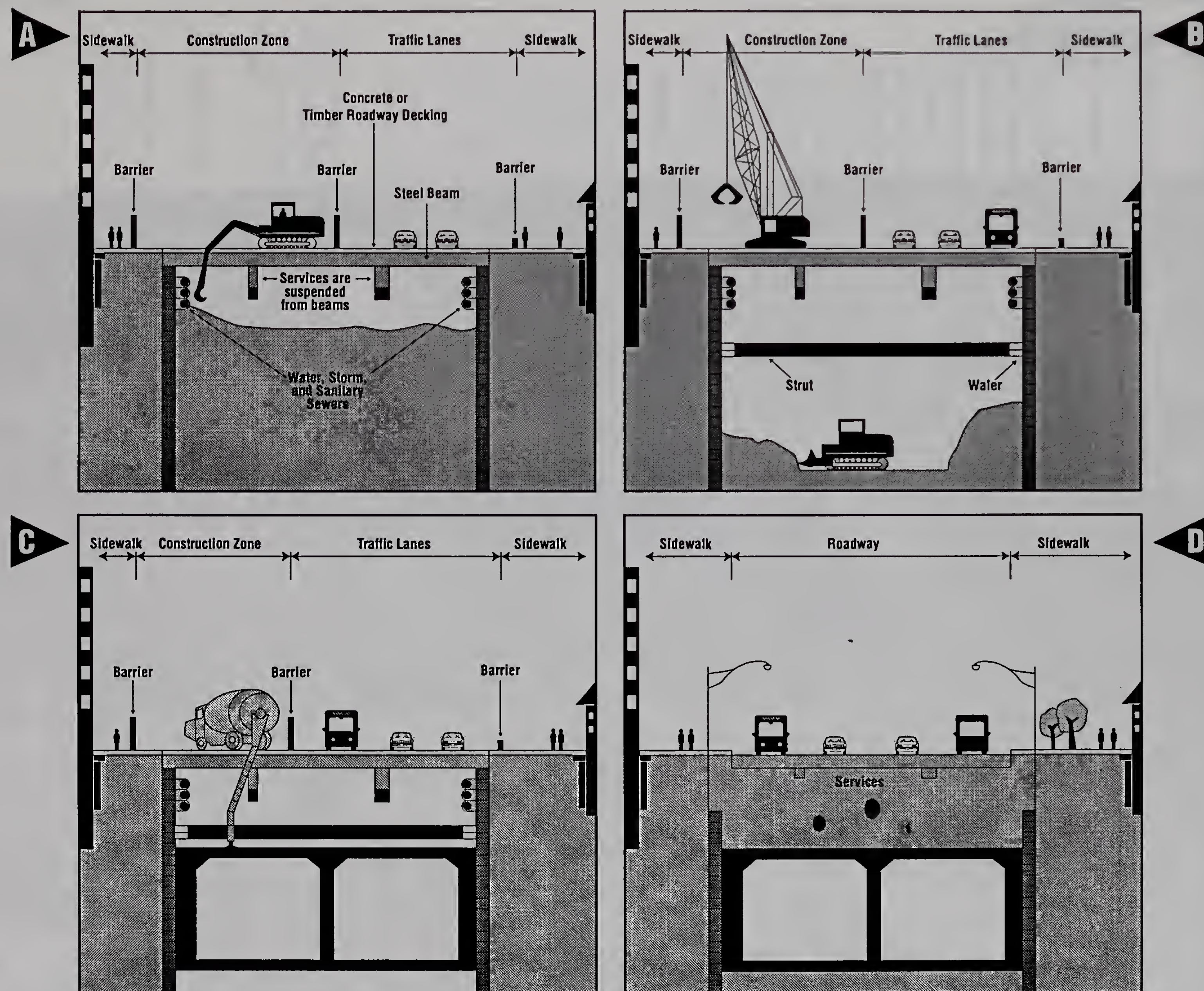


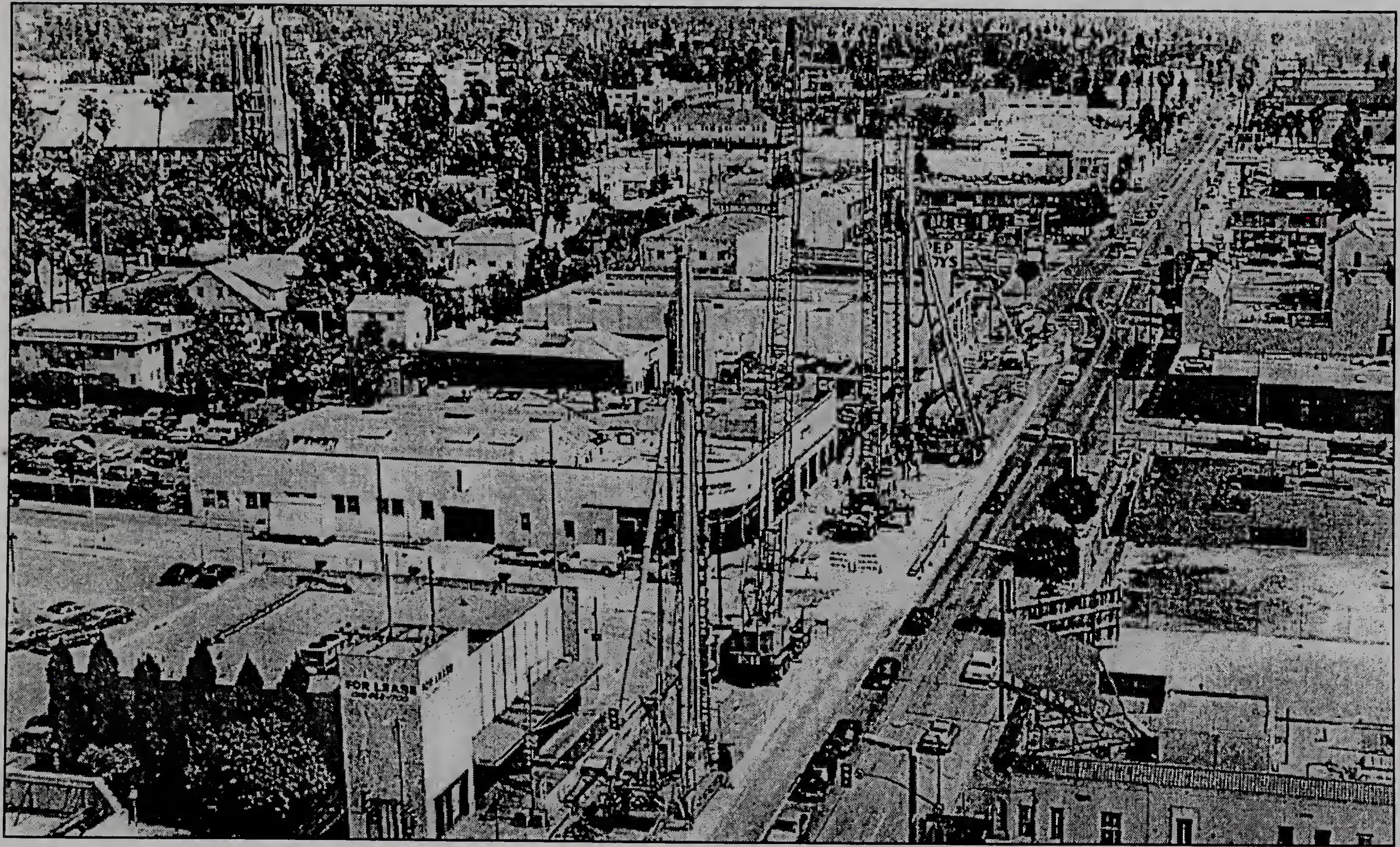
FIGURE 2-26

SEQUENCE FOR CUT-AND-COVER CONSTRUCTION

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.

J96-082.108 3rd St. (2/23/98)



Source: Dames & Moore
J96-082.115 1 mc2

FIGURE 2-27

SOIL CEMENT WALL AUGERS IN USE

Third Street Light Rail EIS/EIR

Alternatively, Line Section 1 could be constructed sequentially beginning at the subway portals to allow all subway construction debris to be transported underground via the finished portions of the subway to the portal. This staging of subway construction would eliminate the need to close traffic lanes on Third Street to allow construction vehicles to access the excavation site. However, it would extend the overall construction schedule by 12 to 24 months.

Phase B: Market Street to Stockton/Jackson

Line Section 2 would use the same construction techniques as Line Section 1 as follows:

- The shallow crossing of Market Street would be accomplished by a modified cut-and-cover construction technique that would allow excavation of the street to be completed within six weeks. The intersection would be excavated and decked, one quarter of the area at a time. During this six-week period, traffic would be limited to one or two lanes at the intersection of Third and Market. The remainder of construction would occur underground within the subway box structure.
- To minimize traffic disruption and ground deformation during excavation, the special excavation method identified for portions of Third Street would be employed on Geary and Stockton Streets to the Union Square station. Because the width of these streets is much narrower than Third, only one lane of traffic would be permitted during the six- to eight-week surface construction period. During this time, traffic and transit would be rerouted off of or away from Geary and Stockton in this segment (refer to Section 3.2.2). This segment would be completed in 18 months.
- The Union Square station would be constructed simultaneously with the subway on Geary Street. Cut-and-cover construction techniques would be used in the same sequence as described for the Moscone Center and Market Street stations. Because of the narrow width of Stockton Street, it would be necessary to close Stockton between Geary and Sutter for six to eight months. Excavation would then continue under a temporary roadway deck. Alternatively, half the subway station could be excavated at one time by installing a temporary intermediate support wall. This procedure would permit one lane of traffic on Stockton Street to be maintained during the peak and some of the off-peak in conformance with times designated for transporting construction debris.
- Twelve months after construction started on the Union Square station, construction of the mined tunnel north of Sutter Street, including the Chinatown station, would begin. The tunnel would remain in the street right-of-way and not travel below existing buildings. The only surface disruption would occur at the station entrances at Stockton and Clay where existing curb parking would be displaced. Construction debris would be transported back to the Union Square station excavation. The mined tunnel would require 18 months to complete.

Total construction time for Line Section 2 would be four and one-half years. This schedule would be extended 12 to 24 months if construction were staged sequentially starting at Market Street and much of the construction debris were transported underground via the new subway to the portal at Fourth and Bryant or Third and Bryant Streets.

Staging Areas

Construction equipment for the New Central Subway is expected to be stored on large vacant parcels south of Downtown at possible locations identified for construction of the IOS. The land under the I-80 freeway viaduct could be used as a supplemental area for storing construction equipment and materials.

2.5 CAPITAL COSTS

2.5.1 CAPITAL COST ESTIMATION METHODOLOGY

The capital cost methodology follows the FTA guidelines included in the *Procedures and Technical Methods for Transit Project Planning* (September 1990). Composite unit prices were developed for typical line sections of the trackway and stations for segments of the alternatives that can be reasonably analyzed at an aggregate level. Typical cost estimates were prepared on a "build-up" approach for selected typical trackway sections. The result is a cost per lineal foot for each of the trackway sections.

Systemwide estimates were developed for transit vehicles and the electrification system. Site-specific detailed engineering was used to develop capital costs for the new LRV maintenance facility, the Central Subway underground stations, and the intermodal terminal at the Caltrain Bayshore Station. 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.

2.5.2 CAPITAL COST SUMMARY

No Build/TSM Alternative

The No Build/TSM Alternative requires the purchase of 33 articulated diesel buses and seven articulated trolley buses (including spares) to meet 2015 demand. Existing MUNI bus storage and maintenance facilities could not accommodate the additional buses. As a result, a new 40-bus operations and maintenance facility would need to be constructed at the Western Pacific site or the Cargo Way site. **Table 2-11** summarizes the capital costs, totaling $53.8 million, for the No Build/TSM Alternative.

TABLE 2-11

CAPITAL COST ESTIMATE FOR THE NO BUILD/TSM ALTERNATIVE

DESCRIPTION	QUANTITY	COST
Buses		
a. Articulated Diesel Buses	33	$16.5 million
b. Articulated Trolley Buses	7	$ 7.0 million
Subtotal		$23.5 million
New Bus Operations and Maintenance Facility		
a. Land and Right-of-Way[1]		$24.9 million[2]
b. Facility for 40 Buses[3]		$ 5.4 million
Subtotal		$30.3 million
TOTAL COST		$53.8 million

Notes: (1) Pro-rated based on a 13.0-acre yard at the Western Pacific site or 17.5-acre yard at the Cargo Way site.
(2) Includes right-of-way, contingency, engineering and management, and project reserve costs.
(3) Pro-rated based on $22.4 million for the 165-bus facility planned for Islais Creek.
Source: ICF Kaiser

Light Rail Alternative

As indicated in **Table 2-12**, the total capital cost for the IOS, including the purchase of 26 additional LRVs, to accommodate 2015 demand and the construction of the initial phase for the new LRV maintenance and storage facility, is estimated at **$408.9** million (1997 dollars). The base capital cost estimates assumes that:

- light rail uses the Fourth Street bridge in both directions;

- high platforms are used for all surface stations;
- the **mixed-flow** design option is selected for the Third Street commercial core; and

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TABLE 2-12

LIGHT RAIL ALTERNATIVE CAPITAL COST SUMMARY

	INITIAL OPERATING SEGMENT		NEW CENTRAL SUBWAY	
DESCRIPTION	**QTY**	**COST**	**QTY**	**COST**
SYSTEM DATA		($000s)		($000s)
Route Length (Existing-New) - Route Meters	8973	0	3675	0
Track Length (New Only) - Track Meters	17386	0	5654	0
CONSTRUCTION COSTS				
Site – Demolition	960	223	0	0
- Utility Relocations/Modifications	8693	19482	3675	14694
- Street Restoration	8693	1839	3675	2088
- Traffic Signals	63	6300	7	700
- Structure Modif's and Underpinning	1	6317	2	3200
- Environmental Mitigations	5	1250	2	850
Trackway – At Grade (1 Track)	0	0	690	412
- At Grade (2 Track)	8193	8337	0	0
- Retained Cut/Fill	500	3160	0	0
- Ballast Mat (Vibration Control)	1	3414	0	0
Subway – Cut/Cover, Soil Cement Walls 1 Track	0	0	593	15190
- Cut/Cover, Soil Cement Walls 2 Tracks	0	0	1030	76903
- Mined Tunnel 1 Track	0	0	413	14828
- Mined Tunnel 2 Tracks	0	0	649	42125
Ventilation (Cut/Cover + Mined Tunnel)	0	0	2685	6100
Stations - At Grade	19	13815	1	400
- Underground	0	0	4	88497
Trackwork – Ballasted	16780	9547	690	392
- Direct Fixation	606	381	4964	3112
- Special, Turnouts, Turnback, Etc.	5	4048	1	640
Traction Power Supply	17386	17004	5654	5148
Signaling/Train Control	17386	8205	5654	8051
Communications/Fire/Life Safety	17386	4144	5654	2828
Urban Design/Landscaping/Park & Ride	1	7249	0	0
Art Commission Cost Allowance	17386	1912	5654	527
New LRV Maintenance Facility Yard & Shops - WP Site	1	49047	0	0
Light Rail Vehicles	26	76,248	3	9000
Subtotal CONSTRUCTION COSTS:		$243,674		$295,685
NON CONSTRUCTION COSTS				
Right-of-Way - Except New LRV Maintenance Facility	5	5381	0	0
Right-of-Way - New LRV Maintenance Facility	1	20500	0	0
Engineering & Management	0	50,783	0	77444
Subtotal NON-CONSTRUCTION COSTS		$76,664		$77,444
CONTINGENCY				
Contingency	0	62,499	0	95695
ESCALATION				
Escalation	0	0	0	0
PROJECT RESERVE				
Project Reserve	0	26,112	0	37056
Subtotal PROJECT RESERVE:		$26,112		$37056
TOTAL		$408,949		$505,880

Source: ICF Kaiser; *Conceptual Capital and Cost Estimates, Working Paper #5A;* November 1997; Revised August 1998.

- ballast mats **and, if necessary, at certain locations along Third Street where vibration impacts would be more substantial, floating slabs** are installed to mitigate the vibration impacts anticipated from operating the existing LRV fleet.

The total capital The total capital cost for the IOS includes $107.2 million (1997 Dollars) for the Phase 1 construction of the new LRV maintenance facility as follows:

- **Engineering and management;**
- **Right-of-way acquisition/lease;**
- **Preparation of the entire 13+acre site for construction (soil stabilization);**
- **Construction of yard storage tracks for approximately 60 LRVs;**
- **Construction of a maintenance shop building; and**
- **Contingency**

To complete the new maintenance facility, Phase 2 would add yard storage tracks and expand the shop building(s) to accommodate approximately 40 additional LRV's.

Construction of the New Central Subway, including three additional LRVs and the same base case assumptions identified for the IOS, would require $505.9 million (1997 dollars). The combined total capital cost estimate for the Light Rail Alternative is **$914.8** million.

2.6 OPERATING AND MAINTENANCE (O&M) COSTS

2.6.1 O&M COST ESTIMATION METHODOLOGY

The O&M cost model was developed based on MUNI's actual operating expenses for fiscal year 1995 (FY 1995) as reported in MUNI's FY 1995 Section 15 Report and Final Budget 1994-1995. O&M cost calculations accounted for the quantity of MUNI service provided for the No Project (existing), No Build/TSM, and Light Rail scenarios. For each alternative, bus and light rail input variables related to route miles, service frequencies, and travel times were derived from engineering and travel demand requirements. Operations inputs, such as revenue miles and hours per mode were calculated independently using operating plan models developed specifically for the Third Street Light Rail Project. The O&M costs do not include "reconciling items" such as leases and rentals and depreciation nor paratransit costs.

2.6.2 O&M COST SUMMARY

Compared with the No Project Alternative, total systemwide O&M costs increase for the No Build/TSM and Light Rail Alternatives. As indicated in **Table 2-13**, total annual systemwide O&M costs are approximately $10 million more for the No Build/TSM Alternative and the IOS than the No Project Alternative, reflecting the increased service to accommodate 2015 demand. The additional route miles and five minute peak service levels increase the annual O&M costs for the New Central Subway approximately $3.6 million over the IOS. The No Build/TSM Alternative and the Light Rail Alternative differ in bus and LRV O&M costs because of the use of articulated buses and light rail, respectively, to meet projected 2015 demand.

In 2003, the implementation year for the Third Street Light Rail Project, annual systemwide O&M costs would be similar for the No Project and No Build/TSM Alternatives, since 2003 demand is not expected to warrant substantially increased service for the No Build/TSM Alternative. Annual O&M costs for the Light Rail Alternative in 2003 are over $4 million greater than the No Build/TSM Alternatives, reflecting the increased costs to operate light rail and a new LRV maintenance facility.

2.7 ROLE OF THE EIS/EIR

2.7.1 DECISION AT HAND

The purpose of the EIS/EIR is to examine alternative transit improvements in the Corridor in terms of their potential environmental and socio-economic impacts and to compare the alternatives according to the

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TABLE 2-13

OPERATING AND MAINTENANCE COST SUMMARY

Alternative	LRT	MB	TB	CC	Total	Increment Over No Build
No Project (1998)	$62,990,885	$129,298,720	$79,697,015	$22,140,532	$293,127,122	NA
No Build/TSM (2003)	$62,990,855	$129,686,629	$78,697,015	$22,140,532	$293,515,031	NA
IOS: Bus Plan A (2003)	$73,533,532	$123,360,198	$78,697,015	$22,140,532	$297,731,277	$4,216,246
IOS: Bus Plan B (2003)	$73,533,532	$123,968,836	$78,697,015	$22,140,532	$298,339,915	$4,824,884
No Build/TSM (2015)	$62,990,855	$136,962,934	$81,267,023	$22,140,532	$303,361,344	NA
IOS: Bus Plan A (2015)	$75,638,373	$124,280,823	$81,267,023	$22,140,532	$303,326,751	($34,593)
IOS: Bus Plan B (2015)	$75,638,373	$125,020,972	$81,267,023	$22,140,532	$304,066,900	$705,556
New Central Subway: Bus Plan A (2015)	$82,109,790	$124,056,310	$78,664,024	$22,140,532	$306,970,656	$3,609,312
New Central Subway: Bus Plan B (2015)	$82,109,790	$124,189,872	$78,650,677	$22,140,532	$307,090,871	$3,729,527

Notes: LRT = Light Rail Transit MB = Motor bus TB = Trolley Bus CC = Cable car
Source: Prepared by Manuel Padron & Associates

following goals: 1) improved travel and mobility for transit riders; 2) improved access to employment opportunities and to other areas of the City and region; 3) facilitate economic revitalization of the Third Street commercial core; 4) minimize adverse environmental impacts; 5) coordinated landscape and transportation planning; 6) financial feasibility; and 7) political support in the affected communities and from City Commissions.

In addition to describing potential impacts and mitigation measures associated with each alternative, the Draft Environmental Impact Statement/Draft Environmental Impact Report (DEIS/DEIR) describes the trade-offs among the No Project, No Build/TSM, and Light Rail 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.

A 45-day public comment period on the DEIS/DEIR 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 to suggest to the San Francisco Public Transportation Committee (SFPTC) the preferred alternative.

Following the selection of the Preferred Investment Strategy, the Final Environmental Impact Statement/ Final Environmental Impact Report (FEIS/FEIR) is completed. The FEIS/FEIR incorporates and provides a summary of the comments and responses received during the public review process for the DEIS/DEIR, and may provide additional information on the preferred alternative. FTA and the City and County of San Francisco Planning Commission review the FEIS/FEIR to determine if all issues and/or comments received on the DEIS/DEIR have been addressed and if the document meets the requirements of the National Environmental Policy Act and California Environmental Quality Act. In addition, FTA determines if interagency agreements, developed as committed project mitigation measures, have been completed. The City Planning Commission will be asked to certify the FEIR as complete and fulfilling the requirements of CEQA.

After FTA review is completed, a Draft Record of Decision is prepared. The FEIS is submitted to the U.S. Environmental Protection Agency, which places a notice of availability of the FEIS for public review in the

Federal Register. Additionally, the FEIS is distributed to agencies that have previously commented on the DEIS/DEIR. No less than thirty days after the notice of availability is published in the *Federal Register*, FTA may sign the Record of Decision. SFPTC can then request from FTA a "Letter of No Prejudice," which states that local funds used to construct the initial phase of the Third Street Light Rail Project may serve as a local match for future federal grants for this project (if they are authorized).

2.7.2 REQUIRED PERMIT AND APPROVALS

Permits and approvals involving other local, state, and federal agencies will be required prior to project implementation. A list of these major approvals is provided in **Table 2-14.**

TABLE 2-14

AGENCY APPROVALS

Agency	Approval or Permit
San Francisco Transportation Authority	Funding a DEIS/DEIR. No less than thirty days after the notice of availability is published in the *Federal Register,* FTA may sign the Record of Decision. SFPTC can then request from FTA a "Letter of No Prejudice," for local sales tax (Proposition B) and State Transportation Improvement Program (STIP) funds
Metropolitan Transportation Commission (MTC) and California Transportation Commission (CTC)	STIP funding approval.
Advisory Council on Historic Preservation	Concurrence with 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.
Regional Water Quality Control Board	General Construction Activity Stormwater Permit.
Bay Area Air Quality Management District (BAAQMD)	Permits may be required for operation of paint booth and blowdown pits, etc. for the new LRV maintenance facility.
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 wire) must be submitted and approved by the CPUC**.
San Francisco Dept. of Public Health	Review and acceptance of site remediation plan in Maher Ordinance Area - Article 20.
San Francisco Planning Department.	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 Coastal Consistency review.
San Francisco Department of Public Works	Approval required for construction in streets and changes to sidewalk widths.
San Francisco Public Utilities Commission	Batch Industrial Wastewater Discharge Permit required for dewatering effluent discharge to the combined sewer system providing the quality of the effluent meets the NPDES General Permit discharge standards.
San Francisco Parking and Traffic Commission	Approval required for surface street changes, traffic operation changes, traffic control measures, and on-street parking changes.
San Francisco Public Transportation Commission	Approval required for municipal public transit realignments.
San Francisco Redevelopment Agency	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 Port Commission	Approval of Western Pacific site. Approval of transfer or lease of portion of Western Pacific or Cargo Way site to MUNI.
Bay Conservation Development Commission	Coastal Development Permit required for land use modifications within 100 feet of the Bay or for lands under BCDC jurisdiction according to the Coastal Zone Management Act.
Caltrans	Access Control Properties Review, Freeway Agreement Modification. **Permit to Encroach on Caltrans Right-of-Way**
U.S. Dept. of Transportation - U.S. Coast Guard	Navigable Waterway Crossing Approval
U.S. Army Corps of Engineers State Fish and Game Department U.S. Fish and Wildlife Service	Nationwide permit for underwater cable (Mission and Islais Creeks)

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3.0 TRANSPORTATION ANALYSIS

3.1 AFFECTED ENVIRONMENT

This section describes existing transit, traffic, freight, parking, and non-motorized transportation conditions in the Third Street Corridor (Corridor).

3.1.1 TRANSIT

Section 3.1.1 provides a discussion of the local and regional transit systems presently serving the Corridor. Planned transit improvements that may affect the Corridor are also described. Additional transit information is provided in Sections 2.2 and 2.3.

MUNI Transit System

<u>Bus System</u>

MUNI operates 79 bus lines seven days a week and, on an annual basis, carries over 211 million riders. Although the MUNI route network is a modified grid allowing multi-destinational travel, 54 of the 79 MUNI routes travel to the Central Business District, including 16 express routes. In general, service hours are from 5 a.m. until 1 a.m., with 12 routes operating on a 24-hour basis.

Within the Corridor, service from the southern end of the Corridor to Downtown is provided by diesel bus lines, particularly the 15-Third, the 9X-San Bruno Expresses, and the 9-San Bruno (refer to **Figure 2-2**). The 15-Third, which currently carries over 25,000 daily riders, operates between City College and North Beach between 5 a.m. and 1 a.m. (service between 1 a.m. and 5 a.m. is provided by the 91-Owl route, which overlays a majority of the 15-Third route). Although the 15-Third bus line has high daytime frequency (six to seven minute headways during peak periods), the line often operates irregularly with gaps in service.

The 9X-San Bruno Expresses (9X, 9AX, and 9BX) operate weekdays only, connecting Visitacion Valley with Downtown and Chinatown. The 9AX and 9BX offer peak period, peak direction service only, and the 9X provides reverse peak and midday service throughout the day. These express buses carry over 14,300 daily riders. From Visitacion Valley, they operate as express service along Highway 101 to Sixth and Bryant/Harrison Streets. They provide local service through the South of Market, Downtown, and Chinatown districts. The 9-San Bruno operates weekdays and weekends and provides local service between Visitacion Valley and Downtown to the Ferry Building, following a route along Bayshore Boulevard and Potrero Avenue rather than Highway 101.

In the northern portion of the Corridor, MUNI provides extensive route coverage, frequent service, and connections with the MUNI Metro light rail system and regional transit services. The 30-Stockton and 45-Union-Stockton trolley bus lines complement the local service provided by the 15 and 9X lines in the South of Market, Downtown, Chinatown, and North Beach districts. The 30 and 45 lines currently carry a total of more than 45,000 daily riders. Approximately 26,000 of these riders travel to and/or from points between Filbert Street to the north and Townsend and Fourth Streets to the south.

South of Mission Bay, MUNI crosstown service, provided by the 19-Polk, 22-Fillmore, 23-Monterey, 24-Divisadero, 29-Sunset, 44-O'Shaughnessy, and 48-Quintara/24th Street lines, connects the Corridor with other areas of the City. The 54-Felton, 56-Rutland, and the 42-Downtown Loop provide feeder (community) service within the Corridor. Existing bus routes serving the Corridor are shown in **Figure 3-1** (existing service frequencies for major Corridor bus lines are provided in **Table 2-3**).

A detailed description of the Corridor's seven primary bus routes and their current available capacity is provided below. 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 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 point where passenger demand is the highest, the number of peak hour passengers at this point was divided by the number of vehicles during the peak hours. Passenger and number of vehicle information was based on MUNI bus monitoring data for FY 1995-96.

<u>15 - Third Street</u>. This is MUNI's primary bus route in the Corridor. The route is operated using articulated motor coaches and serves City College of San Francisco, Downtown, Chinatown, North Beach and Fisherman's Wharf via Third Street, Kearny and Montgomery Streets, and Columbus Avenue. Within the Corridor, the route primarily follows Third Street and Geneva Avenue. It provides regional connections with the Caltrain Terminal at Fourth and Townsend Streets and comes within two blocks of Caltrain's station at Paul Avenue. The route also connects with the BART and MUNI Metro subway systems at both the Montgomery and Embarcadero BART Stations, as well as with BART's Balboa Park Station.

The route operates every five minutes during the a.m. peak period, every six to seven minutes during the p.m. peak period, and every ten minutes between these periods. Approximately 33 percent of the route's 24,200 daily boardings occur north of Market Street. Bus stops with heavy boarding and alighting activity north of Market Street include (in descending order of activity): First/Market Streets, Kearny/Geary Streets, Bush/Sansome Streets, Columbus Avenue/Green-Union Streets, and Powell/Bay Streets. Bus stops south of Market Street with heavy boarding and alighting activity include (in descending order of activity): Geneva Avenue/Balboa BART Station, Geneva Avenue/Mission Street, Third/Market Streets, Fourth/Townsend Streets, and Third Street/Palou Avenue. During the a.m. peak hour, the maximum load point occurs at First and Market Streets in the southbound (outbound) direction, with approximately 70 percent of the capacity used. During the p.m. peak hour, the maximum load point occurs at Fourth and Townsend Streets in the northbound (inbound) direction, with about 50 percent of the available capacity used.

<u>9X - San Bruno Express</u>. This line operates during the weekday peak periods, but in the reverse commuter direction only, except during midday when the route operates in both directions. It primarily connects the North Beach and Chinatown districts (Broadway/Kearny/Stockton Streets) to the Visitacion Valley and Excelsior districts (Geneva/Mission Streets) via Stockton and Kearny Streets, Highway 101, San Bruno Avenue, Bayshore Boulevard, and Geneva Avenue to Mission Street. This line provides service to the Powell and Montgomery BART 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 (the 9X-San Bruno Express does not run in the northbound direction during the a.m. peak period). 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 120 percent of capacity. About 63 percent of the route's 9,000 daily boardings occur north of Highway 101.

<u>9AX - San Bruno 'A' Express</u>. This line operates during the weekday peak periods and in the peak directions only. Like the 9X-line, it connects the North Beach and Chinatown districts (Broadway/Stockton Streets) to the Excelsior district (Geneva/Mission Streets) via Stockton Street, Highway 101, San Bruno Avenue, Bayshore Boulevard, and Geneva Avenue to Mission Street. This line also provides service to the Powell and Montgomery BART 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 130 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 135 percent of capacity. About 57 percent of the route's 3,400 daily boardings occur north of Highway 101.

J96-082.101-1 3rd St. (11/17/97)

FIGURE 3-1

EXISTING MUNI BUS ROUTES (NORTH CORRIDOR)

Source: ICF Kaiser Engineers, Inc.

Third Street Light Rail EIS/EIR

J96-082.101-2 3rd St. (111/17/97)

FIGURE 3-1 (CONTINUED)

EXISTING MUNI BUS ROUTES (SOUTH CORRIDOR)

Source: ICF Kaiser Engineers, Inc.

Third Street Light Rail EIS/EIR

9BX - San Bruno 'B' Express. This line operates during the weekday peak periods and in the peak directions only. It connects the North Beach and Chinatown districts (Broadway/Stockton Streets) to the Cow Palace area (Geneva Avenue/Santos Street) via Stockton Street, Highway 101, San Bruno Avenue, Bayshore Boulevard, Sunnydale Avenue, and Santos Street to Geneva Avenue. This line provides service to the Powell and Montgomery BART Stations. During the a.m. peak hour, the maximum load point occurs at Bayshore Boulevard and Arleta Avenue, with the bus line operating at about 100 percent of capacity. It also operates at about 100 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 3,400 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, Fourth Street to Townsend Street. It provides service to the Montgomery and Powell BART Stations. During the a.m. peak hour, the maximum load point occurs at Stockton and Sutter Streets in the northbound (inbound) direction, with approximately 60 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 80 percent of the available capacity used.

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 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 also occurs at this location in the southbound (outbound) direction, with about 85 percent of the available capacity used.

9 - San Bruno. This local route operates from Visitation Valley to the Ferry Terminal via Bayshore Boulevard, Potrero Avenue, and Market Street. The line serves the Civic Center, Powell, Montgomery and Embarcadero BART Stations as well as the Van Ness MUNI Metro station. During the a.m. peak hour, the maximum load point occurs at Potrero Avenue and 16th Street in the northbound (inbound) direction, with approximately 65 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 75 percent of the available capacity used. About 41 percent of the route's 16,600 daily boardings occur north of Market Street.

Light Rail System

MUNI also operates the MUNI Metro light rail system shown in **Figure 3-1**. The light rail service has various types of operations: on-street in mixed traffic conditions, surface operations in exclusive right-of-way, and inside a 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).

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

In January 1998, a light rail "shuttle" began operation from the Embarcadero Station along the MUNI Metro Extension to the Caltrain Terminal at Fourth and King Streets. Intermediate surface station stops are located at The Embarcadero/Folsom Street, The Embarcadero/Brannan Street, and King/Second Streets. In the spring or summer of 1998, MUNI will replace the shuttle with the extensions of the J-line (all day) and M-line (peak periods). In addition, the MUNI Metro Turnback, recently completed as an extension of the Market Street Subway east of the Embarcadero Station, allows turnback and temporary storage of MUNI Metro trains.

MUNI Metro rail lines provide weekday service generally between 5 a.m. and 1 a.m., Saturday and Sunday service between 6:00 a.m. and 1:00 a.m., with the exception of the J and N lines that end at 11:00 p.m. Metro service continues on surface portions of the routes and shuttle buses replace subway service until owl service begins. Metro owl service (late-night surface bus operation) is offered for the L and N lines, as well as the combined K, L, and M lines from 1:00 a.m. to 5:30 a.m. The J-Church route area is generally served by the 24-Divisadero, and the surface portion of the K 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 six lines is about 129,600 boardings, including 8,100 for the F-Market, 15,070 for the J-Church, 18,400 for the K-Ingleside, 26,850 for the L-Taraval, 23,820 for the M-Ocean View, and 37,400 for the N-Judah.[1]

MUNI Metro can be accessed by the bus lines serving the Corridor (15, 9, 9X, 9AX, 9BX) at the Downtown stations along Market Street. The bus lines cross Market Street at First, Third, or Fourth Streets, within a very short walking distance to The Embarcadero, Montgomery, or Powell Street Stations. The 15-Third and 54-Felton bus lines serve the M, K and J Metro service at the Balboa Park termini near San Jose Avenue. In addition, many other corridor bus lines, such as the 44-O'Shaughnessy, also connect with MUNI Metro.

Patronage Survey

In the fall of 1996, an in-depth passenger survey was conducted on bus lines in the Corridor.[2] The purpose of the survey was to obtain detailed information on the origins and destinations of passengers using the buses. This information, along with the number and location of passengers boarding and alighting throughout the day and the bus travel time, is important in the evaluation of changes to routes and the provision of new service. The survey was conducted on the 15-Third bus line; the 9X, 9AX, and 9BX-San Bruno Expresses; the 30-Stockton; and the 45-Union/Stockton.

The survey of passengers was accomplished through a self-completion, mail-back questionnaire that was printed in English, Spanish, and Chinese. The questionnaires were distributed to passengers boarding the 15-Third bus line, 9X, 9AX, and 9BX-San Bruno buses, and at selected bus stops within Downtown and Chinatown for the 30-Stockton and 45-Union/Stockton lines. Over 4,450 surveys were filled out and returned to MUNI. From the responses, characteristics of the bus patronage were developed and information regarding the origins and destinations of the trips was summarized.

According to the survey, the passenger characteristics of all lines surveyed are similar. Overall, 70 percent of the passengers do not have an automobile available to make the surveyed trip, 86 percent of the passengers are over 25 years of age, and 59 percent of the passengers earn less than $25,000 a year. Almost one-half of the passengers use some form of pass as their payment method. In addition, about one-half of the passengers ride the bus to and from work and one-half average about five round-trips per week.

[1] MUNI Short Range Transit Plan, 1996-2005, Ridership for Fiscal Year 1995-1996.
[2] San Francisco Municipal Railway, *Travel Demand Forecasting Results Working Paper #4*, December 1997; available for review in project file #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

From the survey, a detailed origin-destination matrix was developed for the Corridor's existing bus lines. The matrix was created to provide information on the trips that currently occur between the districts shown in **Figure 3-2** (the matrix was also used to assist in the development of 2015 patronage projections, as discussed in Section 3.2). The existing 15-Third bus line has three distinct trip patterns representing approximately 20 percent all 15-Third line trips: *within* the Visitacion Valley/Crocker Amazon districts; *between* the Downtown, Union Square, and Chinatown/North Beach districts; and *within* the Chinatown/North Beach district. The remaining 80 percent of the transit trips are distributed between the various districts along the Corridor, indicating that the 15-Third bus line currently provides a wide range of connections.

Overall, the origins with the greatest number of trips are Visitacion Valley-Crocker Amazon (25 percent of total trips) and Chinatown-North Beach (18 percent). Conversely, the destinations with the greatest number of trips on the 15-Third bus line are Chinatown-North Beach (21 percent) and Visitacion Valley-Crocker Amazon (19 percent).

<u>Transit Travel Times</u>

In order to determine the impacts due to changes in travel times, origin-destination pairs were examined. Origin and/or destinations selected were: Arleta Avenue/Bayshore Boulevard (near the end of the proposed Third Street light rail line), Third Street/Palou Avenue (the center of the Bayview Hunters Point residential and commercial district), Main/Market Streets (at the Embarcadero BART Station), Third/Market Streets (near the Montgomery BART Station), and Stockton/Clay Streets (at the end of the proposed New Central Subway line).

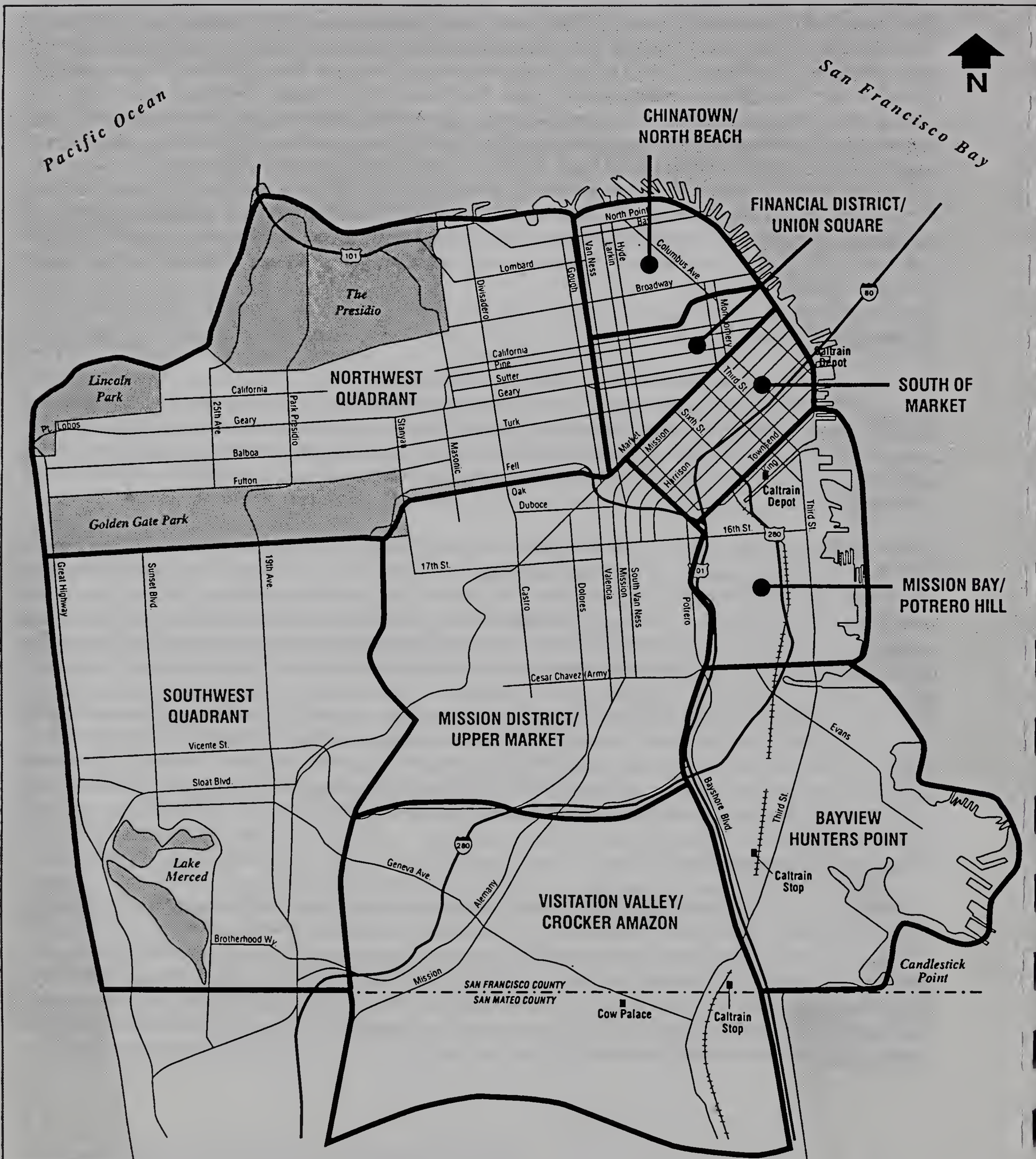
For the existing 15-Third bus line, the in-vehicle travel time between the endpoint of the line (Phelan Loop to North Point) is approximately 70 minutes during the a.m. peak period. Between Arleta Avenue/Bayshore Boulevard and Third/Market Streets, Stockton/Clay Streets, and Main/Market Streets, the total travel times (which include walk, wait and in-vehicle times) are currently 45 minutes, 54 minutes, and 48 minutes, respectively. Between Third Street/Palou Avenue and Third/Market Streets, Stockton/Clay Streets, and Main/Market Streets, the existing total travel times are 40 minutes, 45 minutes and 43 minutes, respectively.

For the existing 9X/9AX/9BX-San Bruno Expresses, the in-vehicle travel time between Arleta Avenue/Bayshore Boulevard and Kearny/Pacific Streets is approximately 30 minutes. In addition, the in-vehicle travel time between Arleta Avenue/Bayshore Boulevard and Kearny/Sutter Streets is 25 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.[3]

<u>Planned MUNI Improvements</u>

Several transit-related improvements are planned for implementation in the Corridor, including the extension of MUNI Metro to the Caltrain Terminal near at Fourth and King Streets, the implementation of the MUNI Metro Automated Train Control System (ATCS), replacement/expansion of the light rail fleet, signal pre-emption for the 15-Third bus line, new trolleys for the 30-Stockton and 22-Filmore bus lines, extension of the F-line historic street car, installation of the F-line/MUNI Metro Extension connector track, construction of a new bus maintenance facility near Islais Creek, and the potential Transbay Terminal relocation. Each of these projects is discussed in Section 2.2.1.

[3] Travel times derived from the August 1996, MUNI rotation sheets.



J96-082.105 3rd St. (12/18/97)

FIGURE

ORIGIN – DESTINATION DISTRIC

Third Street Light Rail EIS/E

Source: ICF Kaiser Engineers, Inc.

Regional Transit Services

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

Caltrain. Caltrain provides commuter rail service between Santa Clara and San Francisco Counties. Sixty trains run along the San Francisco Bay Peninsula each weekday and almost 21,000 people take Caltrain each day. Recent passenger origin and destination information indicates that of the total northbound weekday passengers, approximately 62 percent are destined for San Francisco.[4] 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 serve this station. Caltrain passengers who purchase a Peninsula Pass are able to transfer to any MUNI bus or the light rail "shuttle" (to the Embarcadero Station) at no charge. Approximately 11,300 daily passengers currently board and alight at this station.[5]

In addition to the terminal station, there are three Caltrain stations in the Corridor area. Caltrain's 22nd Street Station is located about five blocks west of Third Street, under the I-280 elevated freeway, between Iowa Street and Pennsylvania Avenue. The station is grade-separated from 22nd Street. Access to southbound trains is located west of the freeway and access to northbound trains is provided east of the freeway. Narrow paved walkways connect from 22nd Street to wooden stairways descending to the platform. Passengers are sheltered by the overhead freeway. Twenty-five of the 33 weekday trains destined for Downtown San Francisco stop at this station, and 27 of the 33 southbound trains stop at the station. MUNI's crosstown 38-Quintara-24th Street bus line provides service to the station via 22nd Street. Approximately 610 passengers board and alight at this station daily.

Caltrain's Paul Avenue Station is located two blocks west of Third Street near the Paul Avenue/Gould Street intersection. Like the 22nd Street Station, this station is grade-separated from Paul Avenue and has very basic improvements including a small shelter and a wooden staircase which provides pedestrian access. This station receives limited train service during the a.m. and p.m. peak periods. Only three of the weekday trains destined for downtown San Francisco stop at the Paul Avenue Station---one during the morning commute period and two during the evening period. Four of the southbound trains stop at this station---two during the morning peak and two during the evening peak. There are no midday or late-night stops provided at the station. MUNI's crosstown route 29-Sunset serves the station. Approximately 80 daily passengers board and alight at the station.[6]

Caltrain's Bayshore Station is located off of Tunnel Avenue, just southeast of Bayshore Boulevard. The station provides an open, wooden shelter on the west side of the tracks. Two pedestrian at-grade crossings are used to get across the railroad tracks from either the northbound or southbound platforms. There are no warning bells, lights or crossing guards for these two crossings. The parking lot for the Bayshore Station is on the east side of the tracks and adjoins the northern platform. There are approximately 45 parking stalls which are generally occupied throughout the day. No fee is charged to use the parking lot. Twenty-five of the weekday trains destined for downtown San Francisco stop at the Bayshore Station, and 27 of the southbound trains stop at the station. Approximately 470 passengers board and alight at this station daily.[7] This station is the proposed terminus station of the Third Street light rail line.

Bay Area Rapid Transit (BART). BART provides regional transit services, connecting San Francisco with Colma in the Peninsula and Pittsburg, Richmond, Fremont, and Dublin in the East Bay. In 1995, the average weekday ridership was almost 250,000 throughout the entire system. Connections to the Corridor

[4] Caltrain Short Range Transit Plan, FY 1995/1996 to FY 2004/2005, September 1995.
[5] Caltrain February/March 1996 Ridership Survey.
[6] Ibid.
[7] Ibid.

and Chinatown can be made via the Embarcadero, Montgomery, and Powell BART Stations along Market Street.

Alameda-Contra Costa Transit District (AC Transit). AC Transit is the primary bus transit operator for the East Bay, including Alameda and Contra Costa Counties. AC Transit operates 34 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. There are three routes which operate 22 hours per day, however, and one route that provides 24-hour service. In 1995, the total average weekday daily boardings for the transbay routes was approximately 12,900.[8]

Golden Gate Transit. Serving riders from Marin and Sonoma Counties, Golden Gate Transit brings more than 17,000 riders to San Francisco each weekday over a system of 19 commute express and eight local routes. Most routes serve either the Van Ness Corridor and Civic Center area, or the Financial district. Major transfer points to other operators can be made at the Transbay Terminal (two blocks east of the Corridor) and at the Ferry Building. Local routes provide late night service to San Francisco.

San Mateo County Transit District (SamTrans). SamTrans is the primary public transit operator for San Mateo County, with 86 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 and two routes that serve San Francisco State University, located on the west side of the City. Total average weekday ridership on the 11 routes serving downtown San Francisco is approximately 20,500 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.

Planned Regional Improvements

Several regional transit improvements are planned over the next five years, as described below.

Caltrain. Caltrain has a number of rehabilitation/replacement improvements scheduled over the next several years designed to maintain and improve the existing service. These include a series of track rehabilitation projects to replace and install continuously welded rail, tie replacement, curved rail replacement, surfacing, station area track rehabilitation, removal of fouled ballast, rail tip grinding and contouring, grade crossing rehabilitation, and bridge rehabilitation. Caltrain will also purchase new accessible cars, which are expected to be put in service by 1999.[10] In addition, Caltrain will perform substantial improvements to their central train control system. The primary benefit will be to allow trains to run in either direction on each track.

The Peninsula Corridor Joint Powers Board (JPB) has been involved with the study of extending Caltrain from its current San Francisco terminus at Fourth and Townsend Streets to a new terminus closer to Downtown. This potential project was studied in a DEIS/DEIR published in March of 1997. In the study, one principal relocation alternative was studied, in which the Caltrain Terminus is proposed to be relocated to an underground station at the site of the existing Transbay Terminal. Trains would operate underground from the general vicinity of the existing terminal to the new Downtown station. However, the JPB voted not

[8] Alameda-Contra Costa Transit District (AC Transit) Short Range Transit Plan, 1995-2005.
[9] San Mateo Transit District (SamTrans) Short Range Transit Plan, 1995/1996 - 2004/2005, September 1995.
[10] Draft Environmental Impact Statement/Draft Environmental Impact Report for the Caltrain San Francisco Downtown Extension Project, March 1997.

to complete the EIS/EIR and instead, decided to focus on near-term improvements to enhance the operating conditions of the trains. Therefore, the analysis in this study does not assume the completion of the Caltrain extension by 2015.

BART. In June 1996, BART and SamTrans adopted a project to extend BART from the town of Colma, through the cities of South San Francisco and San Bruno to the City of Millbrae and the San Francisco International Airport. Stations are proposed to be constructed in each of the cities and at the airport. A BART/Caltrain intermodal station is planned at Millbrae Avenue to facilitate passenger transfers between Caltrain and BART. SamTrans plans to revise its bus route system to provide new feeder bus routes to serve the new BART station. The BART extension is scheduled for completion in late 2001. BART is also expected to implement (by 2001) an Advanced Automatic Train Control (AATC) system. Once BART implements the AATC, system-wide headways will be reduced, e.g., transbay headways will be reduced from 2.25 minutes to 2.0 minutes.

3.1.2 TRAFFIC

Roadway Network

Existing Roadway Network

The Corridor contains major north-south roadways that link the southeastern quadrant of San Francisco with Downtown and provide connections to the Peninsula, the Bay Bridge, and the Golden Gate Bridge. In addition, the Corridor contains principal thoroughfares that distribute traffic in the Visitacion Valley, Bayview Hunters Point, Central Waterfront, Mission Bay, Downtown, and Chinatown districts (refer to **Figure 2-2**). The major roadways in the Corridor are described below.

Highway 101. 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 has ten traffic lanes. Between I-80 and the Golden Gate Bridge, Highway 101 is a six-lane surface street along Van Ness Avenue, Lombard Street, and Doyle Drive. The highway carries over 200,000 vehicles per day.

Interstate 280. I-280 is a ten-lane freeway connecting the Peninsula with the southwestern quadrant of the City. The freeway provides a direct connection to Highway 101 and terminates at surface streets in the South of Market area. In the Corridor, the freeway carries over 165,000 vehicles per day.

Interstate 80. I-80 provides the primary access to and from the East Bay. It connects directly with Highway 101 to the west of 8th Street. I-80 has ten lanes just west of and over the Bay Bridge.

Third Street. Third Street serves as the principal north-south arterial in the Corridor, extending northerly from its interchange with Highway 101 and Bayshore Boulevard to its intersection with Market Street. It is the main commercial street in the Bayview Hunters Point district and also serves as a through street and an access way to the industrial areas east located to the of Highway 101. At Market Street, Kearny Street extends northerly of Third Street.

South of Fourth Street/Mission Rock Road, Third Street generally has three 3.0-meter (10-foot) wide traffic lanes in each direction. It has a 1.2-meter (4.0-foot) wide center median, with breaks for left-turns at side streets. At intersections with major arterial roadways, separate left-turn lanes exist. At most side streets though, left-turn movements must be made from the inside through lanes. Much of the street has on-street parallel parking on both sides. Between Fourth Street/Mission Rock Road and King Street, Third Street has four lanes and operates two-way. Between Townsend and Market Streets, Third Street operates one-way in the northbound direction. It has four travel lanes and parking on both sides. During the a.m. peak period, parking is prohibited on the east side of the street to provide a fifth travel lane. Third Street carries between 13,000 and 22,000 vehicles per day. Third Street is designated as a Major Arterial and a Primary Transit Street in the Transportation Element of the San Francisco General Plan.[11] It is also designated as a Neighborhood Commercial Street and as a Citywide Bicycle Route.[12]

Bayshore Boulevard. Bayshore Boulevard is a four-lane arterial that parallels Highway 101 on the east from Cesar Chavez Street to Third Street. At Third Street, Bayshore Boulevard crosses Highway 101 and becomes a six-lane roadway, traversing Visitacion Valley and Little Hollywood as it continues south into San Mateo County. Left-turns are made onto side streets from exclusive left-turn lanes. Bayshore Boulevard's northbound and southbound lanes are separated by a center median. Bayshore Boulevard carries between 17,000 and 22,000 vehicles each weekday. It is designated as a Major Arterial, a Neighborhood Commercial Street, and a Citywide Bicycle Route.

Fourth Street. Fourth Street, between Third and Market Streets, is also designated as a Major Arterial. It is a three-lane roadway that operates in both directions (one northbound lane and two southbound lanes) between Third and Townsend Streets, and becomes a one-way (southbound), four-lane street between Market and Townsend Streets. Stockton Street is located north of Market Street directly across from Fourth Street. Fourth Street provides connections to the South of Market area directly from Stockton Street in Chinatown and Union Square. Fourth and Stockton Streets are both designated as Primary Transit Streets and Neighborhood Commercial Streets. Stockton is also designated as a local street.

Evans Avenue. West of Third Street, Evans Avenue is designated as a Major Arterial and carries about 10,000 vehicles per day. East of Third Street, Evans and Innes Avenues are both designated as Secondary Arterials in the San Francisco General Plan.[13] Evans Avenue is a four-lane street connecting to the Hunters Point Naval Shipyard (via Innes Avenue). The section of Evans Avenue between Third and Keith Streets has center landscaped medians.

Cesar Chavez Street. Cesar Chavez, west of Third Street, is designated as a Major Arterial and a Citywide Bicycle Route and carries 12,000 vehicles per day. It is a four-lane street that provides access to the industrial areas in the immediate vicinity, serving as a link to Highway 101 and the Mission district to the west, and connecting to the Central Waterfront, India Basin, and Hunters Point areas to the east. East of Third Street, Cesar Chavez is a four-lane street that provides access to Pier 80.

King Street. King Street is the recently completed new boulevard providing an east-west connection between The Embarcadero and new I-280 on and off-ramps at Fifth Street. It is a four-lane, two-way street with MUNI Metro tracks provided within an exclusive center median. King Street currently carries 17,000 vehicles per day east of Third Street. It is designated as a Major Arterial, Primary Transit Street, a Neighborhood Network Connection Street, and east of Third Street as a Citywide Bicycle Route.

The Embarcadero. The Embarcadero, along the eastern edge of the study area, currently has three continuous lanes in each direction between Howard and Broadway Streets, and two lanes in each direction south of Howard Street. An exclusive rail right-of-way for the MUNI Metro presently exists from Folsom

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[11] City and County of San Francisco Planning Department, San Francisco General Plan, Transportation Element adopted June 1995. A Major Arterial is defined as a crosstown thoroughfare whose primary function is to link districts within the city and distribute traffic from and to the freeways; these are routes generally of citywide significance; and of varying capacity depending on travel demand. A Primary Transit Street is defined as having high transit ridership, high frequency of transit routes, or surface rail operations.

[12] Ibid. 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 4 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. Citywide Bicycle Routes are discussed later in this chapter.

[13] Ibid. A Secondary Arterial is defined as a primarily intra-district route of varying capacity serving as a collector for the major thoroughfare and in some cases supplemental to the major arterial system.

Street south to King Street within the median. The future F-Line extension has an exclusive median right-of-way from Broadway Street to the north. Upon completion of the Mid-Embarcadero Replacement Project, there will be a continuous exclusive rail right-of-way the length of The Embarcadero. The Embarcadero is a designated Major Arterial, a Primary Transit Street, a Neighborhood Commercial Street, a Citywide Bicycle Route, as well as a freight traffic route.

Market Street. Market Street is the central spine of San Francisco's Downtown and South of Market districts and serves as the axis from which the two street grid systems diverge. It is a two-way, four-lane street and primarily serves the city as a transit corridor, providing rail and bus transit service on the surface and two levels of rail service, MUNI Metro and BART, underground. Market Street is designated as a Primary Transit Street, a Neighborhood Commercial Street, and a Citywide Bicycle Route.

Geary Street. Geary Street is an east-west street providing a connection from the Union Square area to the Richmond District. In Downtown, it is one-way in the westbound direction and has three-lanes. Geary Street is a Major Arterial, a Primary Transit Street, a Neighborhood Commercial Street.

Stockton Street. Stockton Street is a three-lane street extending north from Market Street, through Union Square, Chinatown, and North Beach to Fisherman's Wharf. Between Market and Sutter Streets, it is one-way in the southbound direction. North of Sutter Street, it is two-way with one northbound lane and two southbound lanes. It travels in a tunnel under Nob Hill between Sutter and Sacramento Streets. Stockton Street is designated as a Primary Transit Street, a Neighborhood Commercial Street, and a Citywide Bicycle Route.

Other Streets. In the Bayview Hunters Point district, several east-west streets are designated as Secondary Arterials, including: Cargo Way, Oakdale Avenue, Industrial Street, and Silver Avenue. These streets provide connections between Bayshore Boulevard and Third Street to the east into the industrial areas. Jamestown Avenue, which provides connections to Bay View Park and Candlestick Point State Recreation Area, is designated as a Recreational Street in the San Francisco General Plan.[14]

Planned Roadway Improvements

Several roadway improvements are planned for implementation in the Corridor, including improvements to the Mid-Embarcadero Roadway, the Bay Bridge approach and Terminal Separator ramps, King Street, the Third and Fourth Street bridges over Mission Creek, Illinois Street, Cesar Chavez Street, and Terry Francois Boulevard. Each of these roadway improvement projects is discussed in Section 2.2.2.

Traffic Volumes

Table 3-1 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 Third Street 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.

[14] Ibid. A Recreational Street is a special category of street whose major functions is to provide for slow pleasure drives and cyclist and pedestrian use; more highly valued for recreational use than for traffic movement. The order of priority for these streets should be to accommodate: pedestrians and hiking trails, cyclists, equestrians, and automobile scenic driving consistent with the topography and nature of the area.

TABLE 3-1

WEEKDAY TRAFFIC VOLUMES IN THE CORRIDOR

COUNT LOCATION		TRAFFIC VOLUME		
ROADWAY	LOCATION	DAILY (Approx.)	A.M. PEAK HOUR	P.M. PEAK HOUR
Highway 101	at Third Street	214,000	15,900	14,500
	at Cesar Chavez	261,000	17,900	13,600
Interstate 280	at Alemany	166,000	12,300	12,400
Interstate 80		249,400	18,400	17,600
Bayshore Boulevard	n/o Sunnydale	17,200	1,500	1,950
Bayshore Boulevard	n/o Arleta-Blanken	21,800	2,150	2,200
Third Street	n/o Carroll	15,000	1,350	1,650
	n/o Palou	17,200	1,700	1,750
	n/o Evans	13,000	1,350	1,250
	n/o Cesar Chavez	19,800	2,050	1,900
	n/o Mariposa	22,800	2,200	2,350
	n/o Fourth	18,800	2,050	1,700
	n/o Harrison (one-way)	22,000	2,500	1,900
Fourth Street	n/o Third Street	5,200	500	550
	n/o Harrison (one-way)	19,000	1,650	2,150
Sunnydale Avenue	w/o Third Street	3,200	250	400
Palou Avenue	e/o Third Street	3,500	300	400
Evans Avenue	w/o Third Street	9,500	1,000	900
Cesar Chavez Street	w/o Third Street	12,000	1,300	1,100
Mariposa Street	w/o Third Street	7,800	750	800
King Street	e/o Third Street	17,000	1,700	1,700
Geary Street	e/o Stockton Street	5,800	500	650
Stockton Street	n/o Geary Street	10,200	900	1,150

Note: "n/o" = north of, "w/o" = west of, "s/o" = south of, and "e/o" = east of.
Source: City and County of San Francisco, Department of Parking and Traffic, 1997.

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 could cause to the transportation network during these typical weekday periods.

Third Street Through Traffic Survey

In June 1997, a survey was conducted by MUNI and the DPT to determine the amount of through traffic that travels along Third Street between Gilman and Evans Streets. Public perception was that a substantial amount of the traffic passing through the Bayview Hunters Point area had origins and destinations outside of the area.

The survey consisted of inventorying northbound vehicle license plate numbers at two locations: as they passed Gilman Street and before they crossed Evans Street. Surveys were conducted for two hours during both the a.m. and p.m. commute periods. From the a.m. peak period survey, it was determined that about 9 percent of all vehicles and about 10 percent of the commercial vehicles use Third Street as a through route between Gilman and Evans Streets, i.e., they have origins and destinations outside of the Bayview area. During the p.m. peak period, it was found that approximately eight percent of all vehicles, including eight percent of commercial vehicles, use Third Street as a through route. These results indicate that over 90 percent of the vehicles that currently travel along this segment of Third Street are making localized trips, i.e., either the trip's origin or destination, or both, are within the Bayview Hunters Point area. In other words, if Third Street becomes congested, most drivers would not take other travel routes outside the Bayview Hunters Point area.

Intersection Levels of Service

This study evaluates the weekday peak hour operations of 40 signalized intersections that could be affected by the proposed alternatives. The study intersection locations were selected by the San Francisco Planning Department. In 1996 and 1997, the City's DPT observed traffic conditions and conducted a.m. and p.m. peak hour turning movement counts at each of the study intersections (plus at over 50 nearby unsignalized intersections) to assist in determining current service 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 5 seconds per vehicle), to LOS F, which signifies substantial delays (over 60 seconds per vehicle) and congestion. In urban settings, LOS E (over 40 seconds and under 60 seconds of delay per vehicle) is often the least tolerable condition acceptable (LOS criteria for signalized intersections are defined in detail in **Table E-6** in Appendix E).

City policy stipulates that if traffic generated by a proposed project, or by 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, then an effective mitigation measure should be developed to restore operations to LOS D, or better, conditions.

The Corridor was divided into several segments for analysis purposes (refer to **Figure 2-6**). Existing peak hour service levels at each of the signalized intersections, within each study segment, are presented in Tables E-8 through E-12 (refer to Appendix E). Signalized intersections currently operating at LOS D, E or F conditions are listed in **Table 3-2**. According to the DPT, each of the unsignalized intersections along the Corridor currently operates at acceptable LOS A or B conditions.

In Segment 1 (Caltrain Bayshore Station to the Highway 101 Overcrossing), all intersections typically operate at LOS C, or better, conditions. In Segment 2 (Highway 101 Overcrossing to Thomas Avenue), all study intersections currently operate at LOS B, or better, conditions. All Segment 3 (Thomas Avenue to Kirkwood Avenue) intersections also currently operate at LOS B, or better, conditions.

Almost all of the Segment 4 (Kirkwood Avenue to 16th Street) intersections currently operate at LOS C, or better, conditions. However, the Third Street/Evans Avenue intersection currently performs at LOS D conditions during both the morning and afternoon peak periods. In addition, the Third Street/Mariposa Street intersection performs at LOS D during the morning peak period.

All of the study intersections in Segment 5 (16th Street to King Street), except Third Street/King Street, currently operate at LOS C, or better, conditions during both peak hours. Third Street/King Street performs at LOS D during the morning peak hour.

Finally, in Segment 7 (King Street to Bryant Street along the New Central Subway), during the a.m. peak hour the Fourth Street/Bryant Street intersection performs at LOS D and the Third Street/Townsend Street intersection operates at LOS E. All other study intersections perform at LOS C, or better, conditions during the morning peak hour when northbound traffic flows are the heaviest. During the p.m. peak hour, all study intersections operate at LOS C, or better, except the Fourth Street/Brannan Street intersection which usually functions at LOS F conditions as outbound traffic peaks.

TABLE 3-2

INTERSECTIONS OPERATING AT LOS D, E, OR F CONDITIONS EXISTING CONDITIONS

INTERSECTION	A.M. PEAK HOUR	P.M. PEAK HOUR
Third/Evans	D	D
Third/Mariposa	D	B
Third/King	D	C
Third/Townsend	**E**	B
Fourth/Brannan	B	**F**
Fourth/Bryant	D	B
Source: City and County of San Francisco, Department of Parking and Traffic, October 1997.		

Traffic Travel Speeds

Average vehicle travel speeds were determined for two segments in the Corridor: along Bayshore Boulevard between Sunnydale and Hester Avenues and along Third Street between Jamestown Avenue and 16th Street. Existing average travel speeds, which account for delays at intersections and congested conditions, are summarized in **Table 3-3**.

TABLE 3-3

EXISTING TRAFFIC TRAVEL SPEEDS

ROUTE	PEAK PERIOD	AVG. SPEED (mph) / LOS
Bayshore Boulevard:		
Sunnydale to Hester	A.M.	21 / B
	P.M.	18 / C
Hester to Sunnydale	A.M.	24 / B
	P.M.	23 / B
Third Street:		
Jamestown to 16th	A.M.	28 / A
	P.M.	23 / B
16th to Jamestown	A.M.	25 / A
	P.M.	24 / B
Source: City and County of San Francisco, Department of Parking and Traffic, December 1997.		

Current peak period travel speeds along Bayshore Boulevard are between 18 and 24 miles per hour. On Third Street, peak period speeds average between 23 and 28 miles per hour.

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 Bayshore Boulevard and Third Street. Travel speeds, last measured for CMP purposes in 1992 and 1993 along Bayshore Boulevard and Third Street, south of China Basin, were generally two to seven miles per hour lower compared to the current travel speeds shown in **Table 3-3.** The speed increases are primarily due to substantially lower traffic volumes along Bayshore Boulevard and Third Street since the re-opening of the I-280 viaduct in 1993. 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-7** in Appendix E). Currently, average travel speeds on Bayshore Boulevard fall in the LOS B and C range during both peak periods. Travel speeds on Third Street are within the LOS A and B range during both periods.

Draw Bridge Operations

There are three draw bridges located within the Third Street Corridor. Street traffic operations are affected when one of these bridges is raised. According to recent data, the Islais Creek bridge was only raised four times in 1995.[15] When raised, this bridge stops traffic for four to five minutes.

The Third and Fourth Street bridges over Mission Creek, on the other hand, are operational 24-hours a day and stop traffic approximately three to five minutes when raised. Bridge tenders are on duty all day because, under Coast Guard protocol, a bridge must be raised within a one hour request. In 1995 and 1996 the Third Street bridge (Lefty O'Doul Bridge) opened an average of 44 times a month, with the lowest activity occurring in December and January and the highest activity in May through September. The bridge never raised more than nine times over the course of five consecutive weekdays in any one month. The average number of openings for the Fourth Street bridge (Peter Maloney Bridge) during the same period was 33 times a month. The raising of either bridge can occur at any time of day.

3.1.3 TRUCKS

Between Highway 101 and Islais Creek, the Corridor is predominantly situated in the middle of industrial land uses, except through the Bayview Hunters Point district (refer to **Figure 4-2**). A substantial amount of trucks travel on Third Street in this area. As shown in **Table 3-4**, a recent survey by the DPT showed that during the a.m. peak period trucks usually comprise 10 to 15 percent of the total traffic on Third Street. Truck levels drop during the p.m. peak hour, when about four to seven percent of the overall traffic are trucks. Approximately 50 percent of the trucks on Third Street have three or more axles and about 30 percent of trucks have four or more axles.[16]

The Port of San Francisco's cargo facilities are currently concentrated near the Islais Creek channel area. The cargo facilities at these locations rely almost completely on truck access to and from Third Street, Illinois Street, Cargo Way, I-280, and Highway 101. Container shipping facilities are concentrated at Piers 80 and 94-96. The South Container Terminal, located at Piers 90-96 between Islais Creek and India Basin, is currently in operation. However, the North Container Terminal, located at Pier 80 north of Islais Creek, is currently closed since there is not enough shipping demand to justify having both terminals open.

Within the Corridor, there are no signs which designate Bayshore Boulevard or Third Street as truck routes. However, the San Francisco General Plan identifies both roadways, as well as Evans Street, Cargo Way, and Cesar Chavez Street, as routes with significant truck traffic. Access between the cargo/industrial areas in the Corridor and the regional freeway facilities is primarily via Third Street and the Highway 101 ramps at Jamestown Avenue/Bayshore Boulevard and the ramps at Cesar Chavez Street. Access to I-280 is from the ramps off Cesar Chavez Street and off King Street.

[15] George Green, City of San Francisco Bridge Supervisor, bridge opening data for Third Street, Fourth Street, and Islais Creek Bridges collected between January 1995 and July 1996.
[16] 1993 Department of Parking and Traffic Truck Classification Counts.

TABLE 3-4

TRUCK TRAFFIC ALONG CORRIDOR

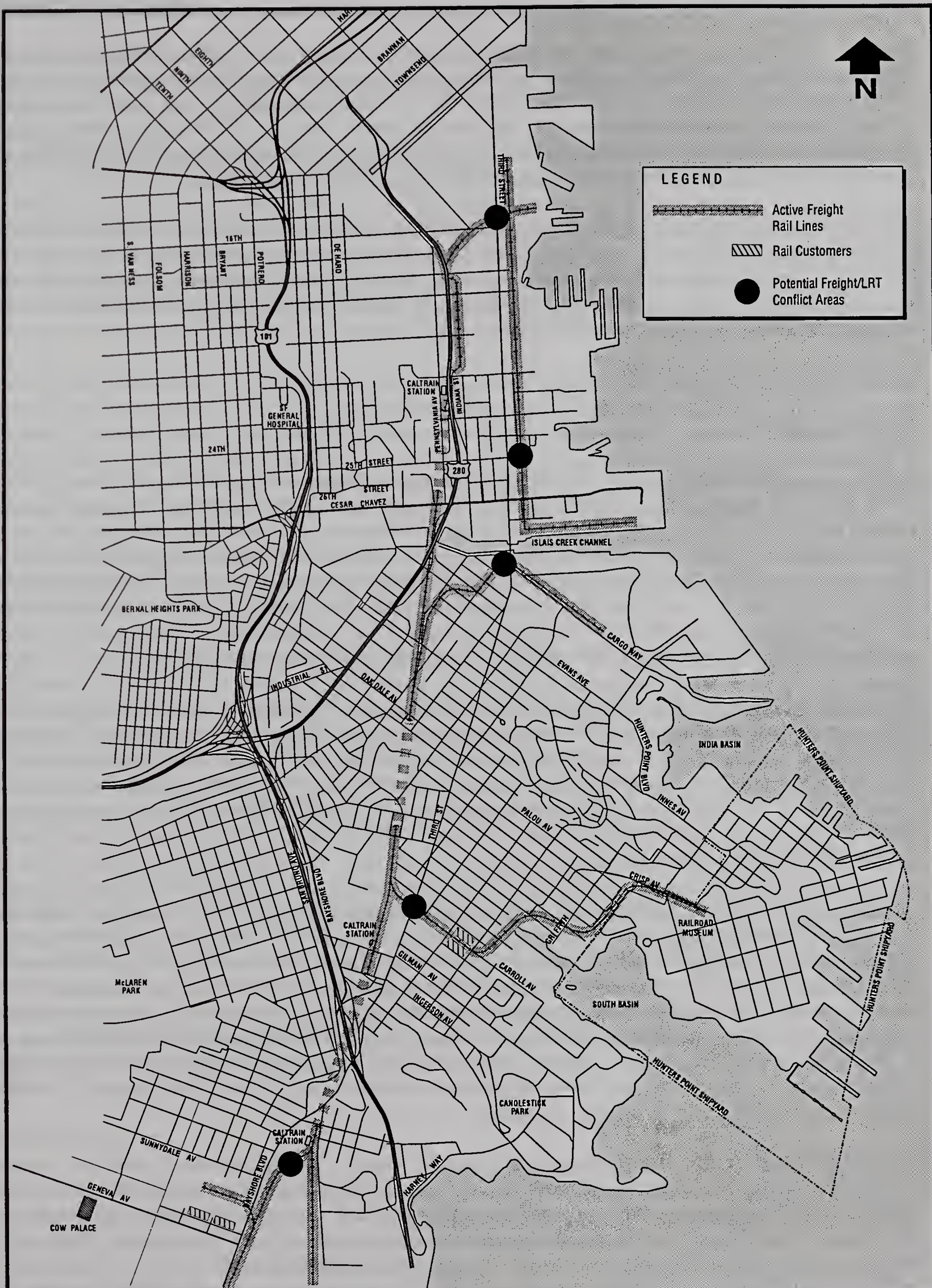
ROADWAY	A.M. PEAK HOUR TRUCK PERCENTAGE		P.M. PEAK HOUR TRUCK PERCENTAGE	
	NORTH-BOUND	SOUTH-BOUND	NORTH-BOUND	SOUTH-BOUND
Bayshore Blvd. at:				
Visitacion Avenue	9 %	9 %	4 %	5 %
Hester Avenue	6 %	12 %	4 %	7 %
Third Street at:				
Paul Avenue	13 %	18 %	4 %	4 %
Palou Avenue	8 %	14 %	4 %	5 %
Evans Avenue	7 %	10 %	6 %	5 %
Cesar Chavez Street	--	--	5 %	6 %
Mariposa Street	11 %	14 %	7 %	7 %
Fourth Street	5 %	--	5 %	3 %
Source: City and County of San Francisco, Department of Parking and Traffic, July 1996.				

All of the existing truck routes and weight restricted routes in the Corridor are in the Bayview Hunters Point district (refer to **Figure E-5** in Appendix E). Between Jamestown and Jerrold Avenues, a weight restriction limits trucks over 11,000 pounds from traveling on Third Street, however, this restriction is rarely enforced. Vehicles over 6,000 pounds are prohibited from traveling on Ingerson, Hollister, Thomas, Shafter, Revere, Quesada, and Palou Avenues east of Third Street. No commercial vehicles are allowed on Jamestown and Gilman Avenues east of Third Street.

As discussed previously, the license plate survey conducted in the Bayview Hunters Point area determined that during the a.m. peak period, 10 percent of the commercial vehicles that traveled on Third Street between Gilman and Evans Avenues were “through” trucks, i.e., they did not travel along a neighborhood cross-street or stop along Third Street. During the p.m. peak period, eight percent of all trucks were “through” trucks. These results indicate that 90 percent or more of the trucks traveling on Third Street are making locally-oriented trips and would not likely divert to other roadways if Third Street became congested.

3.1.4 RAILROAD

Figure 3-3 illustrates the active rail trackage within the Corridor. During the a.m. and p.m. commute periods, Caltrain operates Peninsula commuter trains, and during non-commute times the Union Pacific Railroad is allowed to run freight trains on the tracks. The Caltrain trackage approaches San Francisco in an alignment generally parallel to Highway 101 (south of the I-280/Highway 101 interchange). Caltrain's mainline consists of double tracks and automatic signal block signaling, allowing maximum speeds of 60 miles per hour for passenger trains and 40 miles per hour for freight trains. Two tunnels in the vicinity of South Bayshore have clearance restrictions to 4.9 meters (16 feet). Double-deck (stacked) freight car operation is prohibited, since it requires 6.1 to 6.9 meters (20 to 22.5 feet) of clearance. In addition to the height restrictions, freight operations are constrained because no rail yards exist within San Francisco. All San Francisco cargo is processed through the South San Francisco yard to the Oakland or Warm Springs (Fremont) yards in the East Bay. This operation takes approximately two days, adding time and cost to freight movements. Furthermore, freight operations must be conducted during midday and evening hours to avoid conflict with the operation of Caltrain's commuter trains on the same tracks.



J96-082.102 3rd St. (2/26/98)

FIGURE 3-3

ACTIVE FREIGHT RAIL LINES

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.

Existing rail freight operations require train movements across several roadways within the Corridor. Freight operations currently serve industries on or near Geneva Avenue, Bayshore Boulevard, Sunnydale Avenue, and Carroll Avenue, as well as the intermodal container transfer facility located by Cargo Way and at Pier 80 north of the Islais Creek channel. Periodic activity occurs at the Rail Museum within the Hunters Point Shipyard (once or twice a year). The spur track serving the industries along Geneva and Sunnydale Avenues traverses the proposed parking area for the Bayshore Intermodal Station.

The Port of San Francisco currently has an easement adjacent to the Union Pacific freight tracks south of the San Francisco/San Mateo County line. In the future, the easement's use would primarily be to provide a rail yard for double-stacked container trains. However, since the restricted clearance of the Caltrain tunnels physically prohibit passage of double-stacked trains, the tunnels would need to be heightened or installed with gauntlet tracks prior to the use of the easement.

3.1.5 PARKING

On-Street Parking

Parking conditions along the entire Corridor were surveyed during weekday afternoon periods in October 1996, April and August 1997. 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.) were conducted. To conservatively assess potential parking impacts resulting from the project alternatives, the following presents the highest parking occupancy counts, by block, of the three surveys as well as the lowest parking capacity observations, by block, of the three surveys. Existing parking conditions are summarized in Appendix E (**Tables E-13 through E-18**). Since Segment 6 would not have parking impacts resulting from the Project, it is not included in this discussion.

<u>Segment 1 - Bayshore Boulevard: Caltrain Bayshore Station to the Highway 101 Overcrossing</u>. Parallel parking is allowed on both sides of Bayshore Boulevard between Sunnydale Avenue and the Highway 101 overcrossing. Two-hour parking restrictions exist in the five blocks between Sunnydale and Tunnel Avenues, where abutting land use consists of commercial and industrial developments. There is currently space for about 195 vehicles to park on-street in Segment 1. Overall parking occupancy in the segment is about 31 percent, with usually no more than 50 percent of the available curbside occupied on any one block (refer to **Table E-13** in Appendix E).

<u>Segment 2 - Third Street: Highway 101 Overcrossing to Thomas Avenue</u>. Parallel parking is allowed on both sides of Third Street between the Highway 101 overcrossing and Thomas Avenue. Two-hour parking restrictions exist in the three blocks between Jamestown and Gilman Avenues and in the two blocks between VanDyke and Thomas Avenues where abutting land use consists of commercial developments. There is currently room for about 258 vehicles to park on-street in Segment 2. Overall parking occupancy in the 17 block segment is about 40 percent, with the occupancy along most of the blocks less than 50 percent (refer to **Table E-14** in Appendix E). Higher occupancies are experienced along the four blocks between Jamestown and Fitzgerald Avenues (64 to 100 percent occupancy) and the two blocks between Wallace and Underwood Avenues (57 to 70 percent occupancy).

<u>Segment 3 - Third Street: Thomas Avenue to Kirkwood Avenue</u>. Parallel parking is allowed on both sides of Third Street between Thomas and Kirkwood Avenues, except along the east side of the street between Palou and Oakdale Avenues where the curb lane is for trolley bus use only. Many of the parking spaces in the seven blocks between Thomas and McKinnon Avenues are regulated with 30-minute, or 1-hour, parking meters. A one-hour parking restriction exists between LaSalle and Kirkwood Avenues. The abutting land use throughout Segment 3 consists of commercial and institutional developments. There is currently room for about 116 vehicles to park on-street in Segment 3. Overall parking occupancy in the segment is about

59 percent, with the occupancy along most of the blocks between 45 and 65 percent (refer to **Table E-15** in Appendix E). The highest occupancy occurs in the block between Quesada and Palou Avenues, where often all of the 11 on-street parking spaces are used.

Segment 4 - Third Street: Kirkwood Avenue to 16th Street. In Third Street's 12 blocks between Kirkwood Avenue and Cesar Chavez Street, parallel parking is allowed along eight of the blocks. Parking is not permitted in the two blocks between Fairfax and Davidson Avenues and in the two blocks between Cargo Way-Arthur Avenue and Cesar Chavez Street. There is currently room for about 128 vehicles to park on-street in the southern section of Segment 4 (refer to **Table E-16** in Appendix E). Overall parking occupancy in this mostly industrial area is about 38 percent, with the occupancy only exceeding 50 percent on two blocks: between Kirkwood and Jerrold Avenues (a commercial area with 60 percent parking occupancy) and between Hudson and Galvez Avenues (64 percent).

The overall parking demand is much higher in the northern part of Segment 4. In Third Street's ten blocks between Cesar Chavez and 16th Streets, parallel parking is allowed along all of the long blocks except the single block between Cesar Chavez and 26th Streets. There is currently room for about 411 vehicles to park on-street in the northern section of Segment 4. Overall parking occupancy in this mostly industrial area is about 71 percent. The six blocks between 24th and Mariposa Streets accommodate 270 on-street parking spaces and usually between 80 and 99 percent of each of these block's spaces are occupied.

Under the Light Rail Alternative, a "loop" track is proposed around 18th, Illinois, and 19th Streets. There are eight existing parking spaces on the south side of 19th Street and five spaces on the north side of 18th Street. All of these 13 spaces are usually full during weekdays.

Segment 5 - Third and Fourth Streets: 16th Street to King Street. South of Mission Creek, Third and Fourth Streets lack curbs and parking is permitted on the roadway shoulders. Most of the parking is used by people who work north of Mission Creek. No parking limits apply and many vehicles are parked perpendicular to the roads. Third and Fourth Streets, between Mission Creek and Mission Rock Street, are often parked to capacity (about 240 vehicles) on any given weekday (refer to **Table E-17** in Appendix E). No parking limits apply to Third Street between 16th and Mission Rock Streets, where parking for about 129 vehicles is provided. This segment currently experiences 71 percent occupancy.

Segment 7 - Third and Fourth Streets: King Street to Bryant Street (New Central Subway). Parallel parking is allowed on both sides of Third Street between King and Bryant Streets and along both sides of Fourth Street between Townsend and Bryant Streets. Many of the parking spaces in Segment 6 are regulated with 30-minute, 1-hour, or 2-hour parking meters or limits. The abutting land use in Segment 6 consists of industrial, commercial and residential developments. There are currently about 155 on-street parking spaces in Segment 6. Overall parking occupancy in the segment is about 93 percent, with the occupancy along some of the blocks at 100 percent (refer to **Table E-18** in Appendix E). North of Bryant Street, on-street parking surveys were not conducted since none of the alternatives would affect parking in the area. Generally, though, on-street parking is usually fully occupied on Third Street north of Bryant Street.

Parking Summary

Table 3-5 summarizes the current parking conditions in each of the six segments discussed above. On the Corridor between the Caltrain Bayshore Station and Bryant Street, about 1,675 on-street parking spaces exist. Segment 4 comprises 33 percent of the Corridor's on-street parking spaces (552 spaces). Segment 5 provides 24 percent of the Corridor's spaces (397 spaces). The other segments each provide from 7 to 15 percent of the Corridor's on-street parking spaces.

Existing parking occupancy is about 65 percent on a corridor-wide basis. Parking occupancy is the lowest in Segment 1 (31 percent) and rises segment-by-segment from south to north. The highest occupancy is in Section 7 (93 percent).

TABLE 3-5

EXISTING PARKING CONDITIONS IN CORRIDOR
(Caltrain Bayshore Station to Bryant Street)

SEGMENT	APPROXIMATE NUMBER OF ON-STREET PARKING SPACES			NUMBER AND PERCENTAGE OCCUPIED	
	WEST	EAST	TOTAL	NO.	%
Segment 1 - Bayshore: Sunnydale to Hwy. 101	93	102	195	61	31%
Segment 2 - Third: Hwy. 101 to Thomas	134	124	258	104	40%
Segment 3 - Third: Thomas to Kirkwood	68	48	116	68	59%
Segment 4 - Third: Kirkwood to 16th Street	251	301	552	355	64%
Segment 5 - Third/Fourth: 16th Street to King	191	206	397	356	90%
Segment 7 - Third/Fourth: King to Bryant	73	82	155	144	93%
TOTAL CORRIDOR	**810**	**863**	**1,673**	**1,088**	**65%**

Source: City and County of San Francisco, Department of Parking and Traffic, October 1996; The Duffey Company, April 1997 and August 1997.

3.1.6 PEDESTRIANS

Third Street, between Bayshore Boulevard and Market Street, is designated as a Neighborhood Commercial Street in the San Francisco General Plan.[17] Other streets in the Corridor with the same designation include Bayshore Boulevard, 24th Street (from Third Street to Minnesota Street), Berry Street (from Fourth Street to The Embarcadero), The Embarcadero, Market Street, Stockton Street, and Geary Street. 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 San Francisco General Plan.[18] The existing pedestrian conditions in each of the Corridor segments, except for Segment 6, which would not have pedestrian-related impacts, are described below.

<u>Segment 1 - Bayshore Boulevard: Caltrain Station to the Highway 101 Overcrossing</u>. Bayshore Boulevard currently has 3.8-meter (12.5-foot) wide sidewalks along both sides of the street. The intersections at Sunnydale, Visitacion, Leland, Blanken, and Hester Avenues are signalized and have pedestrian crosswalks. This section of the Bayshore Boulevard consists of mixed land uses with residential at the northern end, a small commercial district centered around Leland Avenue and the existing MUNI bus stop, and industrial

[17] City and County of San Francisco Planning Department, San Francisco General Plan, Transportation Element, adopted June 1995. 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 4 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.

[18] 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.

uses at the southern end. With the current level of pedestrian use, sidewalk crowding conditions do not occur.

Segment 2 - Third Street: Highway 101 Overcrossing to Thomas Avenue. This section of Third Street has 3.0-meter (10-foot) wide sidewalks along both sides of the street. Signalized intersections, with crosswalks, are located at Jamestown, Ingerson, Paul/Gilman, Carroll, Yosemite, and Williams/VanDyke Avenues. This section of the Corridor consists of predominantly residential and institutional land uses to the south, and transitions to commercial and industrial uses in the central and northern areas. Pedestrian activity is most concentrated around the commercial sections of the street and at existing MUNI bus stops. Crowded pedestrian conditions seldom occur on the sidewalks in this segment.

Segment 3 - Third Street: Thomas Avenue to Kirkwood Avenue. This segment of Third Street also has 3.0-meter (10-foot) wide sidewalks along both sides of the street. The intersections of Third Street with Revere, Quesada, Palou, Oakdale, and McKinnon Avenues are signalized and have pedestrian crosswalks. This section of Third Street is the commercial core for the Bayview Hunters Point district and often has substantial numbers of pedestrians. The highest concentrations occur at the corners of Oakdale and Palou Avenues. There are often a large number of transit patrons that wait at this intersection's corners. The public uses at the Opera House and Lee Recreation Center (located on Oakdale Avenue) also attract pedestrians. In this section of Third Street, pedestrian crowding has not been observed to be problematic.

Segment 4 - Third Street: Kirkwood Avenue to 16th Street. Three-meter (10-foot) wide sidewalks continue along Third Street in this segment. Third Street's intersections with Jerrold, Innes, Fairfax and Evans Avenues; Cargo Way; and Cesar Chavez, 25th, 23rd, 22nd, 20th, 18th, Mariposa, and 16th Streets are all signalized and enable safe pedestrian crossings of Third Street. This section of Third Street is predominated by industrial land uses and a few retail outlets. The uses are generally auto-oriented and do not attract a great number of pedestrians.

Segment 5 - Third and Fourth Streets: 16th Street to King Street. Existing sidewalks on Third Street between Fourth and 16th Streets are 3.0 meters (10 feet) wide, except for a section on the east side of Third Street between Alameda and 16th Streets which currently has 4.7-meter (15.5-foot) wide sidewalks. No sidewalks exist on Third and Fourth Streets between their intersection with Mission Rock Road and the Mission Creek channel. Pedestrians walking along this route typically walk on the roadway's edge or along the shoulder.

South of the Mission Creek channel, the land uses are predominantly intensive industrial uses, with a recreational warehouse located towards the northern end of Third Street. North of Mission Creek channel, the China Basin Building houses a large office complex. To the north, lots are presently vacant or used for parking where the stub-ends to the I-280 freeway have been removed.

Segment 7 - Third and Fourth Streets: King Street to Bryant Street and New Central Subway Stations. The sidewalks on Third and Fourth Streets in this segment are about 3.0 meters (10 feet) wide. All intersections are signalized with pedestrian crosswalks across Third and Fourth Streets. 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 buses and the commuter train. The current pedestrian LOS near the Caltrain Terminal is LOS D.[19]

The proposed New Central Subway would have stations on Third Street between Clementina and Howard Streets (Moscone Station), on Third Street between Mission and Market Streets (Market Street Station), on

[19] Draft Environmental Impact Statement/Draft Environmental Impact Report for the Caltrain San Francisco Downtown Extension Project, March 1997.

Stockton Street near Post Street (Union Square Station), and on Stockton Street near Clay Street (Chinatown Station). All of these locations are characterized with heavy pedestrian traffic.

The sidewalk on the east side of Third Street between Clementina and Howard Streets is just over 3.0 meters (10 feet) wide. Building columns supporting upper floors are situated east of the sidewalk, and between the columns and the first floor building facade a 2.4- to 4.1-meter (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 4.3 meters (14 feet) wide.

On the east side of Stockton Street, both north and south of Post Street, the sidewalks are 4.6 meters (15 feet) wide. On the west side of Stockton Street and south of Post Street, the sidewalk abutting Union Square Park is 3.0 meters (10 feet) wide. On the north side of Post Street, the sidewalk is 4.6 meters (15 feet) wide within the public right-of-way. Near Clay Street, Stockton Street's eastside sidewalks are about 3.4 meters (11 feet) wide. North of Clay, Stockton's western sidewalk is 3.2 meters (10.5 feet) wide, and to the south, the sidewalk is 2.9 meters (9.5 feet) wide.

Bay Trail. A portion of the regional Bay Trail runs through the Corridor (see **Figure 3-4**). The Bay Trail is intended to provide continuous access to the San Francisco Bay's water edge and is an extension of the pedestrian promenade that was created along The Embarcadero in the Northeastern Waterfront. It connects in the north from the recently completed pedestrian promenade along The Embarcadero to Third Street via Berry Street. It crosses the Third Street bridge and swings eastward along Mission Rock Street to connect with China Basin Street. The path continues south on China Basin Street to its intersection with Illinois Street.

The route follows Illinois Street between Mariposa and 24th Streets, Third Street between 24th Street and Yosemite Avenue, Yosemite Avenue from Third Street to the Yosemite Slough, and continues south along the shoreline connecting back to Harney Way south of Candlestick Park. A portion of Evans Avenue, east of Third Street, is also designated as a Bay Trail route, indicating a potential extension to the Hunters Point Naval Shipyard. Sidewalks exist on the portions of the trail along city streets, except the section of Third Street immediately south of the Third Street bridge. An improved trail exists in the southern part of the Candlestick Point State Recreation Area where public access improvements have been made, but the northern section is unimproved. The Transportation Element of the San Francisco General Plan currently designates the Bay Trail through the project area.

The South Bayshore Element of the San Francisco General Plan identifies proposed routing for the Bay Trail along the shoreline through the Hunters Point Naval Shipyard. This trail connection would be implemented in conjunction with the San Francisco Redevelopment Agency plans for the redevelopment of the shipyard.

3.1.7 BICYCLES

The DPT recently completed the San Francisco Bicycle Plan. The plan was adopted in December 1996. The fundamental goal of the Bicycle Plan is to guide San Francisco in becoming a more "bicycle friendly" city. The report presents existing City policies, procedures, practices and infrastructure capabilities and constraints that affect bicycling (refer to Section 4.1). Recommendations for making bicycling 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, including bicycle lanes and paths, developed for integration into the City's General Plan.

The Bicycle Plan designates the following north-south oriented bicycle routes in the Third Street Corridor as follows (see **Figure 3-4**):

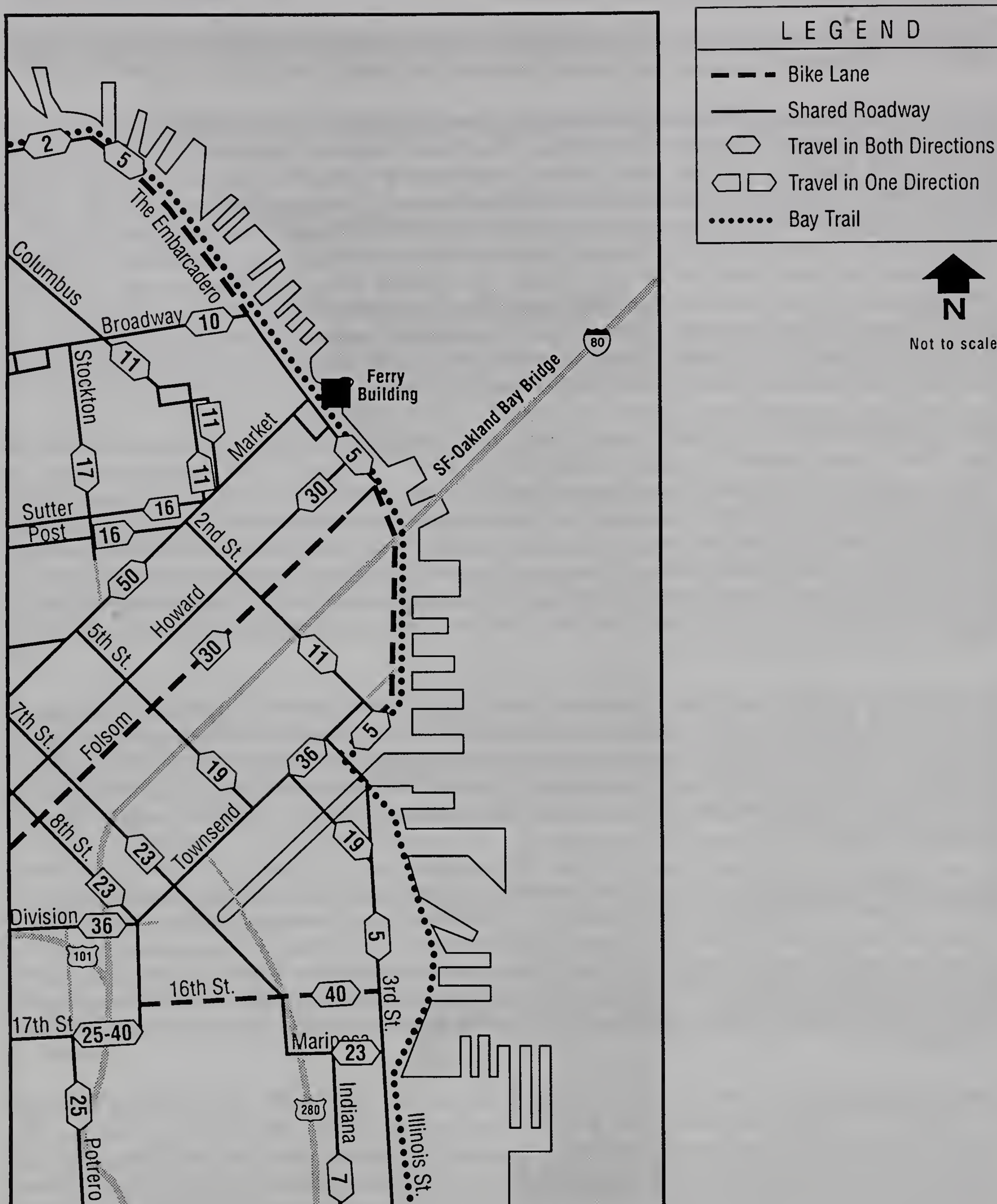
Route 5 (The Embarcadero/Third Street Corridor/Bayshore Boulevard). This 11.3-kilometer (7-mile) route extends along Bayshore Boulevard, Third Street, King Street, and The Embarcadero (in the southbound direction near Highway 101, the route follows Paul and San Bruno Avenues to avoid the highway overcrossing). Within the Corridor, the Bicycle Plan recommends 1.8-meter (6-foot) wide bicycle lanes on Third Street between China Basin and Bayshore Boulevard. The Bicycle Plan states that although this segment of Third Street serves a high amount of cargo trucking operations, it was recommended as a bicycle route because no other direct bicycle route exists. The Bicycle Plan also recognizes that the possible establishment of a light rail line on Third Street would compete with the bicycle lanes for street width and that the current width of the street cannot accommodate both light rail and bicycle lanes. Bicycle counts, recently conducted (July 1996) along Third Street near 16th Street by the DPT, showed that during weekday a.m. and p.m. peak hours almost 50 bicyclists travel on Third Street.

Route 7 (Indiana Street/Third Street/Phelps Street/Palou Avenue/Keith Street). According to the Bicycle Plan, Route 7 was designed to provide an alternative to Route 5 between Carroll Avenue and Mariposa Street. As stated in the Bicycle Plan, although Route 7 is a less direct north-south route in comparison to Route 5, it offers the advantage of generally following streets with much lower traffic volumes than Third Street and provides additional inter-route connections and additional neighborhood access. From the south, Route 7 begins at Third Street and Carroll Avenue (Route 805). It follows Carroll Avenue to Keith Street, Keith Street to Palou Avenue (Route 70), Palou Avenue to Phelps Street (across Third Street), and Phelps Street to Third Street. It then follows Third Street's Route 5 alignment between Phelps and Cesar Chavez Streets in order to cross Islais Creek.

At Cesar Chavez, Route 7 diverges from Route 5 and follows Cesar Chavez Street (Route 60) to Indiana Street. Indiana Street is the recommended route to Mariposa Street (Route 23), but between Cesar Chavez and 25th Streets, Indiana Street is one-way in the northbound direction. The Bicycle Plan notes that until a southbound bicycle lane is added to this segment of Indiana Street, Minnesota Street should be designated for southbound bicycles between 25th and Cesar Chavez Streets. Route 7 follows Mariposa Street to reconnect with Third Street.

Route 17 (Stockton Street). To serve the Chinatown, Union Square, and Financial districts, Route 17 follows Stockton Street between Broadway and the Sutter/Post Streets one-way couplet. This section of Stockton has heavy traffic volumes, as do parallel bicycle routes, but its tunnel provides access through Nob Hill, not available on parallel routes. Stockton Street is also centrally located between the routes on The Embarcadero and Polk Street. The Bicycle Plan recommends lane re-striping in the Stockton tunnel, perhaps removing one of the two southbound traffic lanes to enable striping northbound and southbound bicycle lanes.

Route 19 (Fifth Street). Route 19 follows Fourth Street between Third Street (Route 5) and Townsend Street (Route 36), along Townsend Street to Fifth Street, and along Fifth Street to Market Street. The Bicycle Plan acknowledges that the General Plan's Transportation Element classifies Fourth Street, between Third and Townsend Streets, as an important truck route, a Transit Important Street in the Transit Priority Streets Network, and a Major Arterial. The Bicycle Plan notes that provisions would need to be made to accommodate bicycles without interfering with the operation of the other primary transportation modes on this segment of Fourth Street. Each of the above routes is signed as a bicycle route. Several other bicycle routes intersect with Routes 5, 7, 17 and 19 in the Corridor, as shown in **Figure 3-4.**



J96-082.100a 3rd St. (7/21/98)

FIGURE 3-4

BICYCLE ROUTES AND BAY TRAIL IN THE THIRD STREET CORRIDOR

Third Street Light Rail EIS/EIR

(Revised 7/21/98)

Source: ICF Kaiser Engineers, Inc.

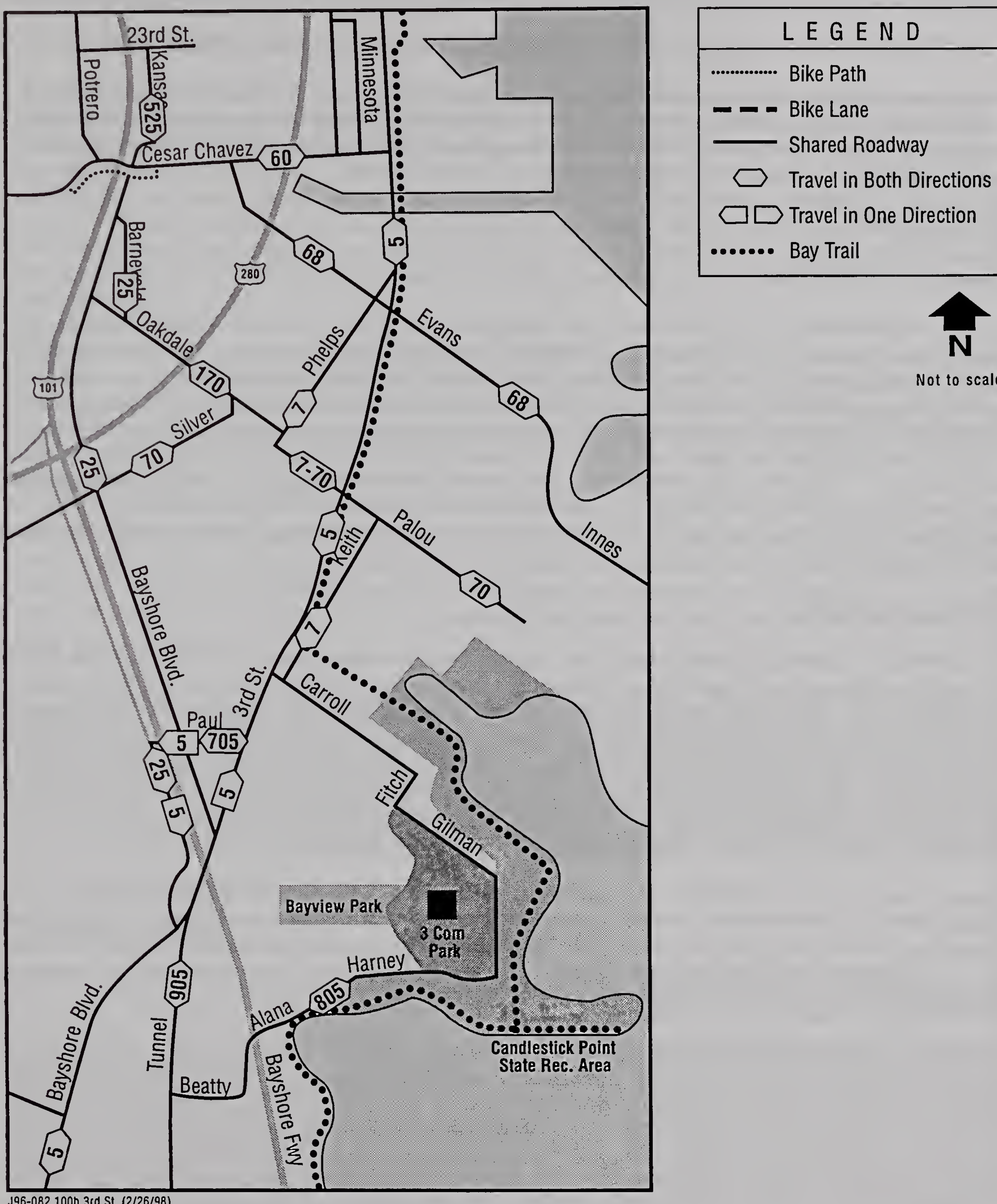


FIGURE 3-4 (cont'd)

BICYCLE ROUTES AND BAY TRAIL IN THE THIRD STREET CORRIDOR

Source: ICF Kaiser Engineers, Inc.

Third Street Light Rail EIS/EIR

3.2 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

This section identifies and evaluates the potential environmental consequences of each of the alternatives to transit, traffic, freight, parking, and non-motorized transportation. Mitigation measures that would reduce or avoid significant impacts are described. Where applicable, improvement measures that would reduce less-than-significant impacts are also identified.

3.2.1 TRANSIT

Future Transit Conditions

This section discusses the steps involved in the development of future year (2015) transit patronage and transit travel times for the No Project, No Build/TSM, and Light Rail Alternatives. Since the alternative transit services would be within an existing transit market in a fairly developed area, a simplified methodology was developed to estimate future transit patronage. The methodology involved the use of the comprehensive database of existing transit patrons, anticipated growth in employment and population in the Corridor and throughout the region, and travel time changes between existing conditions and between each of the options.[20] The forecasting methodology also assumed implementation of the detailed future transit operating plans as presented in Section 2.4 (more detailed information is provided in the *Detailed Definition of Alternatives, Working Paper #3*[21]). The following summarizes the patronage forecasting and travel time estimating approach.

<u>Growth in Transit Trips</u>

To determine the growth in transit trips in the Corridor between existing and 2015 conditions, the MTC regional travel demand model and land use assumptions from the San Francisco Cumulative 2015 Update to "Projections '96" were used (the Association of Bay Area Governments develops the "Projections" database, a source of projected employment and residential conditions throughout the Bay Area). To reflect recently modified projections within San Francisco, the overall database was revised in the spring of 1997. The modified model incorporates general revised growth forecasts throughout the entire Corridor, including three large-scale development proposals (Candlestick Mills retail/entertainment center at Candlestick Point, the Hunters Point Naval Shipyard redevelopment, and the proposed Mission Bay development).

Growth factors were developed between each of the study zones in the Corridor and larger zones in the region, based on each individual zone's expected increase in residences and employees.[22] Each origin-destination growth factor was then multiplied by the existing transit ridership across each origin-destination pair, as determined from the patronage survey. The resultant number of trips represents the projected increase in Corridor transit trips between 1996 and 2015 conditions.

It should be noted that ongoing planning efforts for all projects within the Corridor are using the same travel demand forecasting approach to determine future 2015 conditions. However, the transportation analysis for each of the projects assumes full buildout of the development under consideration, and utilizes assumptions for the rest of the City from the Update to ABAG "Projections '96" (which assumes that a portion of total development would occur by 2015). This methodology results in a worse-case assessment for each project. As a result, however, due to variations in the development assumptions, the future transit and traffic conditions may differ somewhat between these projects. The population and employment estimates assumed in the transit analysis are consistent with those estimates used in the traffic analysis.

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[20] San Francisco Municipal Railway, *Travel Demand Forecasting Results Working Paper #4*, December 1997; available for review in project file #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.
[21] San Francisco Municipal Railway, *Detailed Definition of Alternatives Working Paper #3*, October 1997; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.
[22] The study area for the 15-Third bus covers a 40-zone area, the study area for the Third Street Light Rail Project covers 31 zones, and a total of 125 zones were used for the regional area.

Transit Travel Times

Travel demand estimation uses travel times as a key component in mode choice, e.g., whether transit users traveling between point A and point B would use a certain bus route or chose to ride a light rail train. Travel times between origin-destination pairs consist of two components: "in-vehicle" travel times, which includes the time it takes transit to operate between two points (run time) and the time it takes for boarding and alighting at transit stations (dwell time); and "out-of-vehicle" time, which includes the walk or ride to/from the transit station, plus time spent waiting for the transit service to arrive at the station. In performing travel time estimates, more weight is given to "out-of-vehicle" time as compared to "in-vehicle" time since riders perceive greater inconveniences in walking and waiting times as compared to time spent in the transit vehicle.

Substantial changes in transit travel times between an origin and a destination can affect the transit rider's decision to continue to use the mode or switch to an alternative mode. To remain consistent with the Metropolitan Transportation Commission's travel forecasting model, the Corridor model assumed that for every one percent decrease in transit travel times, there is a 0.8 percent increase in that mode's transit trips.

Adjustments for 2015 Conditions

The development of No Build/TSM Alternative transit patronage and transit travel times was based on the steps identified above. "In-vehicle" travel times were adjusted to account for expected increases in dwell times due to additional passenger boarding and alighting, and increases in run times due to expected increased congestion along the Corridor. In addition, peak loads and load points of the proposed fleet's buses were considered.

For the IOS and New Central Subway, a similar process was used. The light rail travel times were estimated based on anticipated service routes, station locations, run times, and frequencies. The light rail ridership demand was based on travel time advantages and disadvantages compared with the No Build/TSM Alternative for each origin-destination pair. In addition, the ridership was adjusted to reflect shifts from the 15-Third to the light rail line and other bus lines, and from other bus lines to the light rail. It also reflects anticipated transfers between the light rail and buses and between the light rail and other light rail lines and BART. Finally, the ridership projections consider the maximum capacity of the proposed light rail vehicles (119 passengers per vehicle).

Ridership Projections

Table 3-6 presents the estimated typical weekday daily ridership projections for the No Build/TSM and Light Rail Alternatives (weekday p.m. peak hour ridership projections are provided in **Table E-2** in Appendix E). Projections are provided for the Corridor's primary bus lines, including the 15-Third (where applicable), the 9X/AX/BX-San Bruno Expresses, and the 30-Stockton and 45-Union/Stockton lines (the projected ridership shown for the 30 and 45 lines represent only those trips on the portion of the routes between Filbert and Townsend Streets since this segment would be affected by the proposed New Central Subway). 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 proposed Candlestick Mills retail/entertainment center, redevelopment of the Hunters Point Naval Shipyard, and development of the proposed Mission Bay project.

TABLE 3-6

**ESTIMATED WEEKDAY TRANSIT RIDERSHIP
EXISTING AND 2015 CONDITIONS**

LRT/BUS LINE	EXISTING	2015 NO BUILD/TSM	2015 IOS	2015 NEW CENTRAL SUBWAY
LRT Lines in Corridor:				
MUNI Metro Extension LRT (1)	n/a	11,240	9,050	2,020
Third Street LRT (2)	n/a	n/a	71,010	92,110
Subtotal	**n/a**	**11,240**	**80,060**	**94,130**
Bus Lines in Corridor:				
Line 15	25,050	75,530	n/a	n/a
Lines 9X, 9AX, 9BX	14,330	17,100	21,780	18,200
Lines 30, 45	26,640	31,770	31,770	25,880
Shifts from Line 15 (3)	n/a	n/a	4,480	4,480
Subtotal	**66,020**	**124,400**	**58,030**	**48,560**
TOTAL IN CORRIDOR:	**66,020**	**135,640**	**138,090**	**142,690**
Increase Over Existing:	n/a	69,620	72,070	76,670
Increase Over No Build/TSM:	n/a	n/a	2,450	7,050

Notes: (1) MUNI Metro Extension will operate with the L-Taraval to the Caltrain Terminal and the N-Judah light rail to Third and Mariposa.
(2) Third Street light rail will interconnect with the J-Church.
(3) Line 15-Third shifts to 43-Masonic, 9-San Bruno and/or 54-Felton routes.
Source: *Travel Demand Forecasting Results Working Paper #4,* San Francisco Municipal Railway, December 1997.

Transit Travel Times

Table 3-7 presents travel time comparisons for selected trips currently using the 15-Third bus service, 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.

No Project and No Build/TSM Alternatives

<u>Construction Impacts</u>

No construction impacts would occur under either of these alternatives.

<u>Operation and Cumulative Impacts</u>

By 2015, existing bus ridership demand in the Corridor would more than double over existing conditions, mostly due to the proposed Mission Bay development and new development anticipated in the Bayview Hunters Point and Financial District/Union Square/South of Market areas (refer to **Tables E-3, E-4** and **E-5** in Appendix E). Corridor ridership demand would increase by about 70,000 bus trips and about 11,000 rail trips (on the MUNI Metro Extension) over existing conditions (refer to **Table 3-6**). Of the new bus trips occurring on the 15-Third bus line and express buses combined, trips originating in Mission Bay would represent about 31 percent of the new trips, while trips originating in the Financial District/Union Square/South of Market and Bayview Hunters Point areas would represent 18 percent and 12 percent of the new trips, respectively. More modest ridership increases would occur in the Visitacion Valley/Crocker Amazon and Chinatown/North Beach districts.

TABLE 3-7

IN-VEHICLE/TOTAL TRANSIT TRAVEL TIMES FOR SELECTED TRANSIT TRIPS EXISTING AND 2015 CONDITIONS

ORIGIN-DESTINATION	TRANSIT TRAVEL TIME (minutes) (4)			
	EXISTING	2015 NO PROJECT & NO BUILD/TSM	2015 IOS	2015 NEW CENTRAL SUBWAY
Arleta/Bayshore - Third/Market (1)	36/45	42/51	31/44	27/40
Third/Palou - Third/Market (2)	26/40	30/44	24/38	19/33
Arleta/Bayshore - Stockton/Clay	42/54	49/61	n/a	30/44
Third/Palou - Stockton/Clay	32/45	36/50	n/a	22/37
Arleta/Bayshore - Main/Market (3)	36/48	42/54	29/42	n/a
Third/Palou - Main/Market	26/43	30/47	22/36	n/a

Notes: (1) Station is at Arleta/Raymond for IOS and New Central Subway.
(2) Station is at Montgomery for IOS.
(3) Station is at Embarcadero for IOS.
(4) First number represents in-vehicle travel times and second number represents total travel times.

Source: *Travel Demand Forecasting Results, Working Paper #4*, San Francisco Municipal Railway, December 1997.

The articulated motor coaches on the 15-Third bus line have a design capacity of 94 passengers (including both sitting and standing passengers). Based on the design capacity, there would be a demand for 25 buses during the a.m. peak hour, and for 23 buses during the p.m. peak hour. To accommodate this projected demand for transit service, additional buses and increases in service levels for the 15-Third would be required. This extension of service would require approximately 40 additional articulated buses (33 diesels and 7 trolley buses).

Typically, the existing a.m. peak load occurs in the northbound (inbound) direction, while the p.m. peak load occurs in the southbound (outbound) direction. Under the No Build/TSM Alternative, the northbound (inbound) peak load point would occur within Mission Bay (south of the Mission Bay channel), with approximately 3,900 passengers during the 7 a.m. to 9 a.m. peak period. The southbound (outbound) peak load point would also occur within Mission Bay (north of the channel), with approximately 3,600 passengers during the 4 p.m. to 6 p.m. peak period.

The proposed transit operating plan for the No Build/TSM Alternative is presented in Section 2.3. In general, total travel times (including walk, wait, and ride times) for the No Build/TSM Alternative would be about 4 to 6 minutes longer than the existing 15-Third travel time, due to the increase in congestion along the roadways (refer to Section 3.2.2) and the additional dwell times associated with the boarding and alighting of the additional bus riders.

Mitigation Measures

Under the No Project Alternative, substantial overcrowding would occur on all bus lines serving the Corridor, a significant impact prompting the need for 40 additional articulated buses (33 diesel and 7 trolleys). The No Build/TSM Alternative would add additional buses to the fleet and reduce headways on the 15-Third bus line, negating the need for any mitigating measures.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

As discussed in Section 2.4, construction of the IOS line would be divided into three segments along the Corridor. To limit traffic disruption along Bayshore Boulevard and Third Street, construction would occur first on one side of the street and then the other, requiring a minimum of two weeks per side of the street per block. Two travel lanes would be maintained in each direction along Bayshore Boulevard and Third Street, and existing parking lanes would often be used instead as a travel lane. As discussed in Section 3.2.2, reducing the number of lanes along these arterials from three to two through lanes in each direction would only marginally affect intersection performance and increase Corridor travel times, that is, unless the second lane is blocked frequently by buses stopping at bus stops. Buses stopped at bus stops adjacent to construction areas would reduce to one the number of possible lanes, thereby affecting traffic flow, particularly in the commute directions during peak periods.

Operation and Cumulative Impacts

For the IOS, by 2015 overall Corridor ridership would increase by 72,000 trips compared to existing conditions. The proposed light rail service would serve 71,000 trips per weekday in 2015. Almost all of the 15-Third bus riders from the No Build/TSM Alternative would shift to the light rail line and new riders would use light rail due to faster travel times and improved service reliability. About 4,500 of the previous 15-Third riders would shift to other bus lines, including the 9, 9X, 43, and 54-lines. Daily ridership on the MUNI Metro Extension terminating at the Caltrain Terminal or Third and Mariposa Streets would decrease by over 2,000 trips (compared to the No Build/TSM Alternative) as many Mission Bay riders would use the Third Street light rail service instead (**Table E-3** in Appendix E provides transit trip information for the Mission Bay project).

All of the above patronage projections assume that the Third Street light rail line operates in an exclusive right-of-way throughout the Corridor. However, Option 4 in the Third Street commercial core would require the light rail train to share a travel lane with automobiles and trucks. It was estimated that during peak traffic periods and in the peak direction of traffic flow (i.e., northbound in the morning and southbound in the evening), the mixed-flow conditions would add up to 90 seconds to the travel time of the light rail vehicle (less than 60 seconds of extra travel time would be added to a train traveling in the opposite, non-commute, direction) and reduce schedule reliability. This delay would decrease the number of patrons using light rail system by up to 500 trips per day.

For the IOS, there would be fewer trips on the Third Street light rail line to and from the Visitacion Valley/Crocker Amazon and Chinatown/North Beach districts compared to those made by bus under the No Build/TSM Alternative (refer to **Table E-4** in Appendix E). This change would primarily be due to light rail service not extending all the way into Chinatown as the 15-Third bus line currently does. Most patrons would likely use the 9-San Bruno Expresses, resulting in an increase in bus ridership, but there would be an overall decline in trips to and from Visitacion Valley/Crocker Amazon District (refer to **Table E-5** in Appendix E). Compared to the No Build/TSM Alternative, there would be an increase in transit trips to and from the Bayview Hunters Point district accompanied by a shift of transit riders from bus lines to the new light rail line. In addition, there would be a large decrease in trips between the Financial/Union Square/South of Market areas and Chinatown/North Beach as the IOS would not serve the areas directly. However, a substantial increase in trips to and from the Financial District, Union Square and South of Market areas and destined for the Mission Bay/Potrero Hill district would result under the IOS, due mostly to development around Moscone Center and in Mission Bay.

The light rail vehicles that would be used along the IOS would have a design capacity of 119 passengers per vehicle. Based on the design capacity of the light rail vehicle, there would be a demand for 22 light rail vehicles during the a.m. peak hour and 21 vehicles during the p.m. peak hour. To provide sufficient service to meet this demand, in addition to the IOS, the N-Judah would be extended to Third/Mariposa Streets and the L-Taraval would operate to the Caltrain Terminal at Fourth/Townsend Streets, supplementing J-Church service. This extension of service would require a total of 25 additional light rail vehicles.

For the IOS, the northbound (inbound) peak load point would occur in the South of Market area (The Embarcadero/Brannan Street), with approximately 4,300 passengers during the 7 a.m. to 9 a.m. peak period. The southbound (outbound) peak load point would also occur within the South of Market area (The Embarcadero/Folsom Street), with approximately 4,100 passengers during the 4 p.m. to 6 p.m. peak period.

Recent transit impact analysis conducted as part of the Candlestick Point Stadium and Retail/Entertainment Center EIR included a more refined estimate of trips generated by that project that would travel on the Third Street light rail under various development scenarios. The assessment indicates that the transit trips associated with the mall, the stadium and any secondary non-football events would be accommodated within the service provided by the Third Street light rail service.

The proposed transit operating plan for the IOS is presented in Section 2.4.1. In general, total transit travel times for the IOS would be about 6 to 12 minutes shorter than for the No Build/TSM Alternative. Though there would be slight increases in access times to the light rail stations (since there would be fewer stations than existing bus stops, requiring some passengers to travel an extra block or two along a sidewalk), there would be a substantial in-vehicle travel time savings (about 6 to 13 minutes) associated with the exclusive light rail right-of-way. For the mixed-flow option in the Third Street commercial core (Option 4), however, the peak period travel time savings would be up to 90 seconds less.

It should be noted that while most of the proposed IOS light rail stations would be within one or sometimes two blocks of existing loading points, the retained cut section between Meade and Jamestown Avenues would prohibit inclusion of a station within this area. An existing northbound bus stop is located on Third Street at Meade Avenue. This bus stop would be removed and a light rail station would be located at Jamestown Avenue, requiring passengers to travel an extra three blocks, or 275 meters (900 feet) along sidewalks. Due primarily to the topography of the area, however, this extra distance could be challenging for some patrons to traverse.

<u>Mitigation Measures</u>

No significant transit impacts would occur under the IOS. However, resulting less-than-significant impacts could be alleviated or reduced with the following improvement measures.

During construction of the IOS, two travel lanes *plus* separate bus pull-out areas should be maintained during peak periods in the commute directions along Bayshore Boulevard and Third Street, i.e., northbound during the a.m. period and southbound during the p.m. period. This may require temporarily relocating or closing bus stops.

A review of estimated 2015 service levels identified conditions where passenger demand could slightly exceed the capacity of the proposed light rail vehicles during portions of the day. In 2015, ridership projections include proposed developments in Mission Bay and the Hunters Point Shipyard that could generate a substantial number of transit trips in the Corridor. Since these developments are proposed to be phased and it is possible that the anticipated build-out would take longer than identified, ridership patterns on the light rail line should be monitored on an annual basis following implementation of the service. Increasing the number, frequency, and/or size (doubling) of trains through modification of the operating plan would allow an increased capacity in the future if warranted by passenger demand. Initially, MUNI should run a shuttle bus route linking the Meade/LeConte Avenues neighborhood area with the proposed Jamestown Avenue station to assist patrons in accessing the light rail line. MUNI should monitor the use of the shuttle to determine its long-term applicability.

Light Rail Alternative - New Central Subway

Construction Impacts

Construction of the New Central Subway would be accomplished in two phases: 1) Line Section 1 from Third/Fourth and King Streets up to Market Street, including the stations at Moscone Center and at Market Street; and 2) Line Section 2 crossing Market Street and following Geary and Stockton Streets to Stockton/Jackson Streets, including the Union Square and Chinatown stations. As discussed in Section 2.4, at most times when Line Section 1 construction is underway, 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. Line Section 1 construction would affect surface street operations for up to 18 months.

During construction of Line Section 2, the number of traffic lanes on Geary Street, and then on Stockton Street, would be reduced to just one lane for six to eight weeks (during excavation of the Union Square station, Stockton Street between Sutter and Geary Streets may need to be shut down to traffic completely for six to eight months), also resulting in congested traffic conditions throughout the construction period. Although traffic detour routes would be available, all vehicles continuing to travel along these roadways, including fixed route buses, would experience substantial delays. Furthermore, buses operating in the reduced number of lanes could further exacerbate traffic congestion by blocking an available through lane during bus stops. During construction of the subway across Market Street, transit line operations along Market Street could be affected for up to six weeks, including the historic F-line streetcar service.

Operation and Cumulative Impacts

Compared to existing conditions, by 2015 the overall Corridor ridership on the light rail system with the New Central Subway would increase by more than 76,000 trips per weekday. The proposed light rail line would serve over 92,000 trips per weekday in 2015, or 21,000 more daily riders than served by the light rail train in the IOS phase primarily due to the Chinatown and Union Square connections as well as the time savings gained in the proposed tunnel. In addition, there would be approximately 2,000 trips between the Moscone Center area and the Union Square/Chinatown area that would shift from other travel modes. Almost all of the 15-Third bus riders from the No Build/TSM Alternative would shift to the light rail line, and many of the 30-Stockton, 45-Union/Stockton and 9X-lines riders would also choose to use light rail instead of bus. About 4,500 of the previous 15-Third bus riders would shift to other bus lines, including the 9, 9X, 43, and 54-lines. Corridor daily ridership on the MUNI Metro Extension would decrease to about 2,000 trips due to the direct light rail connection between Mission Bay and Chinatown. Similar to the IOS phase, the light rail would attract less than 500 fewer daily trips under the mixed-flow lane option in the Third Street commercial core due to the 90 second increase in peak period, peak direction travel time and the decreased reliability in mixed-flow operations.

The origin-destination patterns resulting with the New Central Subway would be somewhat similar to those for the IOS phase (see above discussion and refer to **Tables E-4 and E-5** in Appendix E). However, the Chinatown-North Beach and Financial District/Union Square/South of Market districts would receive a direct light rail service connection to Third Street, which would substantially increase the number of riders using the light rail, and decrease the number of bus riders with origins or destinations throughout the Corridor. The greatest overall increases in transit trips would occur to and from the Chinatown/North

Beach, Financial District/Union Square/South of Market and Mission Bay/Potrero Hill districts when compared to the IOS. The Visitacion Valley and Bayview Hunters Point districts would see more modest increases in transit trips.

The light rail vehicles that would be used would have a maximum capacity of 119 passengers per vehicle. There would be a demand for 26 light rail vehicles during the a.m. peak hour and 24 light rail vehicles during the p.m. peak hour. To provide sufficient service to meet this demand, there would need to be two lines within the New Central Subway: one from the Caltrain Bayshore Station (southern terminus) to the northern terminus in Chinatown, and an additional line providing service between Chinatown and Third/Mariposa Streets to accommodate Mission Bay demand. Furthermore, the L-Taraval would be extended to the Caltrain Terminal at Fourth/Townsend Streets using the MUNI Metro Extension tracks. The New Central Subway would require an additional four light rail trains beyond the requirements for the IOS.

For the New Central Subway, the northbound (inbound) peak load point would occur within Mission Bay (at King and Fourth Streets), with approximately 4,400 passengers during the 7 a.m. to 9 a.m. peak period. The southbound (outbound) peak load point would occur within the South of Market area (at Third and Howard Streets), with approximately 4,700 passengers during the 4 p.m. to 6 p.m. peak period. The proposed transit operating plan for the New Central Subway is presented in Section 2.4.

In general, total travel times for the New Central Subway would be 11 to 17 minutes shorter than for the No Build/TSM Alternative. Though there would be slight increases in access times to the light rail stations (since there would be fewer stations than existing bus stops), there would be substantial in-vehicle travel time savings (about 11 to 19 minutes). The majority of this time savings would be due to the more direct route into the Downtown, North Beach and Chinatown districts through the New Central Subway, as well as the exclusive right-of-way from King Street south. For the mixed-flow option, during the peak periods the travel time savings would be 90 seconds less. Compared to the IOS phase, there would be overall travel time savings of four to five minutes.

Mitigation Measures

No significant transit impacts would occur under the New Central Subway. However, resulting less-than-significant impacts could be alleviated or reduced with the following improvement measures.

To alleviate some of the congestion that would result adjacent to construction of the New Central Subway, the DPT developed potential roadway detour routes for *non-transit* traffic, i.e., automobiles and trucks (see next section). Use of alternative routes by non-transit vehicles would reduce the level of congestion for all traffic, including buses, along roadways under construction for the New Central Subway.

For a number of reasons, it would not be feasible to re-route the 30-Stockton and 45-Union-Stockton electric trolley bus lines to alternative streets during construction of the New Central Subway, unless complete closure of a short roadway segment along a part of their route is necessary (e.g., Stockton Street between Sutter and Geary Streets). South of Market Street, Third and Fourth Streets carry the overhead wires for these buses to their turn-around point at Townsend Street. No parallel streets (except 11th Street) provide alternative overhead wires and the cost of installing temporary overhead wires and poles along parallel streets would be cost prohibitive. Although by the year 2000 all of MUNI's electric trolley buses are planned to be fitted with auxiliary power units (APUs), which would enable the buses to operate for short durations under battery power, the APUs are not designed to power buses for long distances and are not dependable in congested conditions when long traffic delays would occur.

Although service for the 15-Third, 9X-San Bruno Expresses, and 9-San Bruno lines are provided by diesel buses, which could be re-routed much easier than electric trolley buses, it is recommended that during construction of the New Central Subway these bus lines also continue to operate along their existing routes to provide service within their popular patronage corridors. MUNI should monitor the performance of all affected bus lines during construction, and if necessary, increase the number of buses to provide reliable service. Consideration should also be given to limiting traffic (with appropriate signing and traffic control personnel) along construction routes to transit, local deliveries, and construction vehicles only.

Construction of the New Central Subway's tunnel across Market Street could affect all transit line operations along Market Street, including the historic F-line streetcar service, for up to six weeks. All construction affecting the F-line should be undertaken during a six-week period when the number of riders and tourists using the line is typically low. During construction of the tunnel across Market Street at least one traffic lane in each direction on Market Street should be operational throughout weekday periods and one set of overhead wires in each direction should be maintained.

During construction of the New Central Subway along Geary Street (between Kearny and Stockton Streets), consideration should be given to re-routing the 38-Geary and 38L-Geary buses from Market Street to Sutter Street, Sutter Street to Stockton Street, and Stockton Street to Geary Street (west of the construction zone), if congestion levels became excessive.

During construction of the Union Square station, Stockton Street between Sutter and Geary Streets may need to be shut down to traffic completely for six to eight months, necessitating diversion of the 30-Stockton and 45-Union-Stockton lines. Several options exist for serving patrons with destinations or origins between Sutter and Townsend Streets or to/from Downtown, including running diesel shuttle buses along streets along north-south streets south of Sacramento Street, e.g., along Powell, Market, Third and Fourth Streets (the 30 and 45-lines could "loop" back from southbound to northbound Stockton Street along Clay, Kearny and Sacramento Streets); re-routing some buses along Clay and Sacramento Streets or Columbus, Montgomery and Sansome Streets to/from Downtown; or a combination of these and other options. Prior to final design of the New Central Subway, MUNI would need to further develop and refine the temporary transit operating plan.

A review of estimated 2015 service levels identified conditions where passenger demand could slightly exceed the capacity of the proposed light rail vehicles during portions of the day. The 2015 ridership projections consider proposed developments in Mission Bay and the Hunters Point Shipyard that could generate a substantial number of transit trips in the Corridor. Since these developments are proposed to be phased and it is possible that the anticipated build-out would take longer than identified, ridership patterns on the light rail should be monitored on an annual basis following implementation of the service. Increasing the number, frequency, and/or size (doubling) of trains through modification of the operating plan would allow an increased capacity in the future if warranted by passenger demand.

3.2.2 TRAFFIC

Future Traffic Conditions

This section discusses the methodology used to develop future year (2015) traffic projections and vehicle travel times for the No Project, No Build/TSM, and Light Rail Alternatives.

<u>Growth in Vehicular Traffic Trips</u>

The development of 2015 background traffic conditions was based on the Metropolitan Transportation Commission's (MTC's) regional travel demand model. The MTC's model is typically used to obtain estimates of future growth in San Francisco and throughout the nine county Bay Area. The model is able to quantify shifts in travel patterns due to changes in roadway configurations, land use, as well as in modal split (i.e., autos versus transit) due to anticipated improvements to transit access, as well as other factors such as traffic congestion and parking costs.[23,24]

MTC's model forecasts traffic volumes for street segments, but not for intersections. The traffic growth for each Corridor street segment (identified between MTC's 1995 and 2015 models) was added to existing traffic volumes to obtain 2015 No Project and No Build/TSM traffic projections. Then, based on existing travel patterns and proposed development access points, manual adjustments were made to develop 2015 peak hour turning movement projections for all of the Corridor's study intersections. The forecasts consider Mission Bay's proposed changes in the roadway network.

For the Light Rail Alternative, the overall future traffic levels along the Corridor would be expected to be similar to the No Project and No Build/TSM Alternatives. Although Bayshore Boulevard and Third Street would each lose one through lane in each direction, very little traffic diversion from the Corridor would occur since it was determined that 2015 traffic would continue to operate relatively uncongested south of King Street (see below). Most of the trips along Third Street would continue to be localized trips (however, under the options where only one travel lane existed in the Third Street commercial core, substantial traffic congestion would occur and neighborhood diversion impacts would be severe, as discussed below).

Under the Light Rail Alternative, the provision of light rail station platforms, on-street parking, and retained cut and fill sections would necessitate the restriction of some turning movements. Due to the proposed turn prohibitions, 2015 peak hour turning movements were manually redistributed to appropriate upstream and/or downstream intersections. Traffic volume adjustments were also made to account for the proposed Highway 101 northbound off-ramp relocation and traffic generated by the proposed improvements at the Bayshore Station.

Table 3-8 summarizes expected 2015 traffic volumes along selected Corridor roadway segments. In general, Bayshore Boulevard peak hour traffic volumes are expected to increase by about 23 to 53 percent. Some of this increase would be attributable to the proposed Universal Paragon Corporation development in Brisbane. From Highway 101 through the southern part of the Bayview Hunters Point district, Third Street's peak hour traffic volumes are expected to increase by about 32 to 44 percent. From the northern part of the district to near the Islais Creek channel, peak hour volumes are expected to increase by 59 to 80 percent, with much of this increase due to new traffic to/from the Hunters Point redevelopment. North of Cesar Chavez Street, Third Street's volumes are expected to increase 30 to 50 percent.

<u>Intersection Service Levels and Traffic Travel Speeds</u>

For each alternative, 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 E-8 through E-12** (refer to Appendix E) summarize study intersection service levels expected for the No Project, No Build/TSM, and Light Rail Alternatives. **Table 3-9** summarizes those

[23] Travel demand estimates were developed using the MTC regional travel demand model and land use assumptions from the San Francisco Cumulative 2015 Update to ABAG Projections '96. It should be noted that on-going projects (e.g., Mission Bay North Redevelopment Plan, Mission Bay South Redevelopment Plan, Transbay Terminal Redevelopment Plan, Mid-Market Redevelopment Plan, etc.) are using the same approach to determine future 2015 conditions. However, the transportation analysis for each of the projects assumes full build-out of the development under consideration, and utilizes assumptions for the rest of the city from the Update to ABAG Projections '96 (which assumes that a portion of total development would occur by 2015). This methodology results in a worse-case assessment for each project. As a result, however, at study intersections that are common between projects, analysis results may be slightly different due to variations in assignment of project-generated traffic for each project.

[24] It should be noted that during the peak shopping month of December, traffic generated by the proposed Candlestick Mills development could be 40 percent higher than traffic typically generated by the shopping mall during other times of the year. The Candlestick Point Stadium and Retail Project EIR, currently being prepared, assesses the transportation impacts associated with the project.

TABLE 3-8

2015 PROJECTED WEEKDAY TRAFFIC INCREASES

LOCATION	A.M. PEAK HOUR			P.M. PEAK HOUR		
	EXISTING	2015	INCREASE	EXISTING	2015	INCREASE
Bayshore Boulevard:						
n/o Sunnydale	1,500	2,300	53%	1,950	2,400	23%
n/o Arleta-Blanken	2,150	2,900	35%	2,200	3,000	36%
Third Street:						
n/o Carroll	1,350	1,950	44%	1,650	2,200	33%
n/o Palou	1,700	2,250	32%	1,750	2,350	34%
n/o Evans	1,350	2,150	59%	1,250	2,250	80%
n/o Cesar Chavez	2,050	2,700	32%	1,900	2,850	50%
n/o Mariposa	2,200	2,850	30%	2,350	3,350	43%
Source: City and County of San Francisco, Department of Parking and Traffic, October 1997.						

expected for the No Project, No Build/TSM, and Light Rail Alternatives. **Table 3-9** summarizes those study intersections expected to operate at LOS D, E, or F conditions in 2015. Note that it is considered a significant impact 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.

TABLE 3-9
INTERSECTIONS EXPECTED TO OPERATE AT LOS D, E, OR F CONDITIONS 2015 UNMITIGATED CONDITIONS

INTERSECTION	A.M. PEAK HOUR		P.M. PEAK HOUR		COMMENTS
	NO PROJECT & NO BUILD/ TSM	LRT	NO PROJECT & NO BUILD/ TSM	LRT	
Bayshore/Sunnydale	B	D	B	D	
Bayshore/Leland	A	F	A	D	
Bayshore/Arleta - Blanken	C	F	F	E	
Bayshore/Hester	B	B	D	D	
Third/Revere	A	B/F	B	C/F	LOS F for Bayview Options 2&3 only
Third/Quesada	A	B/F	B	C/F	LOS F for Bayview Options 2&3 only
Third/Palou	A	B/F	B	C/F	LOS F for Bayview Options 2&3 only
Third/Oakdale	A	B/F	B	C/F	LOS F for Bayview Options 2&3 only
Third/McKinnon	B	B/F	B	C/F	LOS F for Bayview Options 2&3 only
Third/Evans	D	F	D	E	
Third/Cesar Chavez	D	D	F	F	
Third/Mariposa	F	D	F	C	
Third/16th	C	C	D	D	
Third Berry	B	C	B	B/F	LOS F for Mission Bay Option 2 only
Third/King	D	D	F	F	
Fourth/King	F	F	F	E	
Third/Townsend	F	F	F	E	New Central Subway only
Third/Brannan	F	F	F	F	New Central Subway only
Third/Bryant	D	F	B	C	New Central Subway only
Fourth/Brannan	B	B	F	F	New Central Subway only
Fourth/Bryant	F	F	C	C	New Central Subway only
Source: City and County of San Francisco, Department of Parking and Traffic, October 1997.					

Table 3-10 summarizes existing average travel speeds and 2015 travel speeds for the No Project, No Build/TSM and Light Rail Alternatives.

TABLE 3-10

TRAFFIC TRAVEL SPEED COMPARISON

ROUTE	PEAK PERIOD	AVERAGE SPEED (mph) / LOS					
		EXISTING	2015 NO PROJECT & NO BLD/TSM	LIGHT RAIL OPTION 1 (2 LANES)	LIGHT RAIL OPTION 2 (1 LANE)	LIGHT RAIL OPTION 3 (1 LANE HYBRID)	LIGHT RAIL OPTION 4 (MIXED FLOW)
Bayshore Boulevard:							
Sunnydale to Hester	A.M.	21 / B	16 / C	15 / C	15 / C	15 / C	15 / C
	P.M.	18 / C	10 / D	18 / C	18 / C	18 /C	18 / C
Hester to Sunnydale	A.M.	24 / B	18 / C	19 / C	19 / C	19 / C	19 / C
	P.M.	23 / B	15 / C	17 / C	17 / C	17 / C	17 / C
Third Street:							
Jamestown to 16th	A.M.	28 / A	22 / B	16 / C	< 5 / F	< 5 / F	15 / C
	P.M.	23 / B	22 / B	16 / C	< 5 / F	< 5 / F	15 / C
16th to Jamestown	A.M.	25 / A	22 / B	10 / D	< 5 / F	< 5 / F	10 / D
	P.M.	24 / B	18 / C	9 / D	< 5 / F	< 5 / F	9 / D
Source: City and County of San Francisco, Department of Parking and Traffic, July 1998							

No Project and No Build/TSM Alternatives

Construction Impacts

No construction impacts would occur under either of these alternatives.

Operations and Cumulative Impacts

Under the No Project and No Build/TSM Alternatives, the roadway network in 2015 would be similar to existing conditions, with the exception of the roadway changes within the proposed Mission Bay development. Bayshore Boulevard and Third Street would retain their current number of traffic lanes. Peak hour traffic volumes would increase by 23 to 53 percent along Bayshore Boulevard and by 30 to 50 percent throughout most of Third Street, except near Evans Street where peak hour traffic volumes would increase by 59 to 80 percent.

By 2015, most of the study intersections would operate at LOS C, or better, conditions during both the a.m. and p.m. peak periods. Only a few intersections would remain at or degrade to LOS D conditions. LOS E or F conditions would occur at the following intersections under the No Project and No Build/TSM Alternatives:

- In Segment 4, Third Street/Cesar Chavez Street would degrade to LOS E during the p.m. peak hour;
- In Segment 5, Third Street/King Street would degrade to LOS F during the p.m. peak hour, and Fourth Street/King Street would degrade to LOS F during the a.m. peak hour and LOS E during the p.m. peak hour; and

- In Segment 7, Third Street/Townsend Street would remain at LOS E during the a.m. peak hour (its existing condition) but would degrade to LOS F during the p.m. peak hour, Third Street/Brannan Street would degrade to LOS F during the p.m. peak hour, Fourth Street/Brannan Street would remain at LOS F during the p.m. peak hour, and Fourth Street/Bryant Street would degrade to LOS F during a.m. peak hour.

As shown in **Table 3-10**, average peak hour travel speeds would be expected to decrease five to eight miles per hour along Bayshore Boulevard. The slowest average speeds would continue to be experienced in the northbound direction during the p.m. peak hour, when motorists would travel an average of 10 miles per hour between Sunnydale and Hester Avenues. This speed equates to a LOS D condition. On most of Third Street, average peak hour travel speeds would decrease one to six miles per hour, allowing motorists to travel an average of 18 to 22 miles per hour (LOS B and C conditions).

Mitigation Measures

Since the No Build/TSM Alternative would not degrade traffic operations in comparison to the No Project Alternative, no mitigation measures would be required. However, improvements to the above intersections would result in improved traffic operations. For potential improvement measures, see the "Mitigation" section for the Light Rail Alternative. Note that all of the LOS E and F intersections in Segments 5 and 7, except the Fourth Street/Brannan Street intersection, could not be reasonably mitigated and are therefore considered cumulative, unavoidable adverse impacts.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

As discussed in Section 2.4, construction of the IOS line would be divided into three segments along the Corridor. To limit traffic disruption along Bayshore Boulevard and Third Street, construction would occur first on one side of the street and then the other, requiring a minimum of two weeks per side of the street per block. Two travel lanes would be maintained in each direction along Bayshore Boulevard and Third Street, and existing parking lanes would often be used instead as a travel lane. As discussed in Section 3.2.2, reducing the number of lanes along these arterials from three to two through lanes in each direction would only marginally affect intersection performance and increase Corridor travel times, that is, unless the second lane is blocked frequently by buses stopping at bus stops. Buses stopped at bus stops adjacent to construction areas would reduce to one the number of possible lanes, thereby affecting traffic flow, particularly in the commute directions during peak periods.

It should be noted that the timeframe for construction of the IOS would coincide with the proposed construction schedules of other major projects in the Corridor, including the seismic retrofit of the San Francisco-Oakland Bay Bridge approaches, phases of the Mission Bay redevelopment, and potentially the Candlestick Mills retail/entertainment center. During some periods of construction, traffic congestion in the areas of the freeway ramps leading to the Bay Bridge, on Third and Fourth Streets through Mission Bay, and along Third Street near Candlestick Point would likely be substantially greater than current levels and could be greater than that analyzed for 2015 cumulative conditions, depending on what facilities are closed or reduced. The above projects are planned to be completed prior to 2015, except perhaps the latest phases of the Mission Bay redevelopment, and therefore would not affect the results of the 2015 analysis.

Operation and Cumulative Impacts

With the implementation of light rail, the inside traffic lane in each direction would be removed from segments of Bayshore Boulevard and Third Street. On these roadways, left-turn movements are currently made from the inside travel lanes. Reducing the number of through lanes from three to two in each direction would require that either left-turn movements from Bayshore and Third to individual cross-streets be made from exclusive left-turn lanes or not be allowed. Therefore, left-turn movements would only be allowed where left-turn lanes are added at key intersections, but left-turns from Bayshore and Third would be disallowed at several other intersections to accommodate center boarding platforms, on-street parking, and retained cut and fill sections. **Table 3-11** lists where left-turn movements from Third and Fourth Streets would be allowed under the IOS. Wherever left-turns are no longer permitted onto a specific side street, motorists wishing to access that side street via a left-turn would need to turn left into a nearby side street or make a U-turn downstream of the side street and then turn right into the side street from the opposite direction. A detailed discussion of proposed left-turn treatments is provided in Section 2.4.

The light rail trackway would be in the center of the street on a 10- to 15-centimeter (4-to 6-inch) raised median. Intersections would be re-graded to conform with the raised trackway. Except in retained cut or fill sections, movements (left-turn, through, and right-turn) from the side streets onto or across Bayshore Boulevard and Third Street would continue to be allowed. At these locations, new traffic signals would be installed. The DPT determined that all new signalized intersections would perform at LOS C, or better, conditions in 2015 during both the a.m. and p.m. peak periods.

Generally, it was determined that most, but not all, of Bayshore Boulevard's and Third Street's signalized intersections would continue to function acceptably with the removal of one traffic lane in each direction. On Third Street, the existing inside traffic lanes serve both through traveling and left-turning vehicles, and therefore do not provide the same amount of vehicle-carrying capacity as a dedicated through traffic lane. Thus, removal of the inside lanes and installation of exclusive left-turn lanes at major intersections would continue to enable acceptable traffic flow at most of the study intersections. However, somewhat degraded traffic operations would result in comparison to the No Project and No Build/TSM Alternatives. Providing only one through lane in each direction through the Third Street commercial core, however, would result in severe traffic congestion and diversion, as discussed later in this section.

The next sections describe, in more detail, the traffic impacts that would result under the IOS (refer to **Tables E-8 through E-12** in Appendix E, and **Tables 3-9 and 3-10**). For conceptual engineering drawings depicting the proposed roadway and intersection configurations, refer to the Project's Conceptual Engineering and Architectural Drawings.[25]

Segment 1 - Bayshore Boulevard: Caltrain Bayshore Station to the Highway 101 Overcrossing. This segment of Bayshore Boulevard would have two through traffic lanes in each direction and northbound and southbound left-turn lanes at Sunnydale Avenue and Arleta-Blanken Avenues. Left-turns would not be allowed from Bayshore onto Visitacion, Leland, Raymond, and Tunnel Avenues. Left-turns would continue to be disallowed, due to the median, to Hester Avenue. Left-turning and through movements would be allowed from all of the side streets, except Tunnel and Hester (south) Avenues, which is similar to current conditions. However, the proposed changes at Bayshore Boulevard/Hester Avenue (north) would allow westbound-to-southbound left-turns from Hester (north) onto Bayshore. The above turning restrictions would result in an increase in U-turn movements and in minor traffic diversions.

[25] San Francisco Municipal Railway, *Conceptual Engineering and Architectural Drawings for the Light Rail Alignment, Stations, and Maintenance Yard Options*, November 1997; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

TABLE 3-11

LOCATIONS WHERE LEFT-TURN MOVEMENTS WOULD BE PERMITTED FROM THIRD AND FOURTH STREETS FOR THE INITIAL OPERATING SEGMENT

INTERSECTION	NORTHBOUND LEFT-TURNS	SOUTHBOUND LEFT-TURNS	COMMENTS
Bayshore/Sunnydale	Yes	Yes	
Bayshore/Arleta - Blanken	Yes	Yes	
Third/Jamestown	No	Yes	
Third/Gilman-Paul	Yes	Yes	
Third/Carroll	Yes	Yes	
Third/Yosemite	No	Yes	
Third/Williams-VanDyke	Yes	Yes	
Third/Quesada	No	Yes	Bayview Options 1,2,3
	Yes	Yes	Bayview Option 4
Third/Oakdale	Yes	No	Bayview Options 1,2,3
	Yes	No	Bayview Option 4 (via Mendell)
Third/Newcomb	Yes	Yes	Bayview Option 4
Third/Jerrold	Yes	Yes	
Third/Hudson	No	Yes	
Third/Evans	Yes	Yes	
Third/Cargo Way	No	Yes	
Third/Cesar Chavez	Yes	Yes	
Third/25th Street	Yes	No	
Third/23rd Street	Yes	Yes	
Third/20th Street	Yes	Yes	
Third/Mariposa	Yes	Yes	
Third/16th Street	Yes	Yes	
Third/South	Yes	Yes	
Third/South Mall	Yes	Yes	
Third/North Mall	Yes	Yes	
Third/Mission Rock	Yes	Yes	
Third/Owens	Yes	Yes	
Third/King	Yes	No	
Fourth/Owens	Yes	Yes	
Fourth/Berry	No	No	
Fourth/King	Yes	No	
All other intersections between Sunnydale and King	No	No	

Source: City and County of San Francisco, Public Transportation Commission, Municipal Railway, November, 1997.

All of the intersections would perform at LOS D or better. It should be noted that while the reconfigured Bayshore Boulevard/Hester Avenue intersection would operate at LOS D (overall) during the p.m. peak hour, the southbound left-turn movement, which would occur from a single left-turn lane, would function at LOS F, causing substantial vehicle delays and back-ups along Bayshore Boulevard north of the Highway 101 overcrossing.

As a result of the proposed improvements at the Arleta-Blanken Avenues intersection, peak hour travel speeds Bayshore Boulevard would be between 15 and 19 mile per hour, resulting in acceptable LOS C conditions.

As a "worst case" condition, it was estimated that up to 300 peak hour vehicle-trips, including buses and automobiles, would be generated by the Caltrain Bayshore intermodal station during the a.m. and p.m. peak hours (it is likely that fewer peak hour trips would actually result due to the proposed parking capacity of 285 spaces in one or two parking levels and the frequency of connecting bus runs). These trips would degrade the Bayshore Boulevard/Sunnydale Avenue intersection from LOS B to D conditions.

Segment 2 - Third Street: Highway 101 Overcrossing to Thomas Avenue. This segment of Third Street would have two through lanes in each direction and left-turn lanes at Jamestown (southbound), Gilman-Paul (northbound and southbound), Carroll (northbound and southbound), Yosemite (southbound), and Williams/VanDyke (northbound and southbound) Avenues. Left-turning and through movements would be allowed from all of the side streets except Meade, LeConte, Keith, and Key Avenues. The proposed Keith Avenue extension (refer to **Figure 2-8**) would accommodate left-turns onto northbound Third Street from the three-block neighborhood west of Third and between Keith and Key Avenues. Access into this neighborhood from the south, however, would require motorists traveling northbound on Third Street to turn right (eastbound) onto a side street on the east side of Third Street and then enter the neighborhood directly via Jamestown Avenue, or by making a northbound-to-southbound U-turn at Paul Avenue. Left-turn movements prohibited from Third Avenue onto other streets in this segment would be made with an upstream or downstream U-turn movement or via a different side street. Traffic diversions would be minor and would not cause a substantial impact.

The Light Rail Alternative would minimally impact the study intersections in Segment 2. All intersections would operate at LOS C, or better, during both peak periods. The relocated off-ramp from northbound Highway 101 to Third Street should result in acceptable traffic operations.

Segment 3 - Third Street: Thomas Avenue to Kirkwood Avenue. As discussed in Section 2.0, four different light rail, traffic lane, and parking configurations are proposed for the Third Street commercial core.

Option 1 provides two traffic lanes in each direction throughout the segment (refer to **Figure 2-10**). Left-turn lanes would be provided from Third Street onto Quesada Avenue (southbound) and Oakdale Avenue (northbound). Left-turning and through movements would be allowed from all of the side streets. Traffic diversions would be minor and would not cause a substantial impact. All of the study intersections would operate at LOS B or better during the a.m. peak hour and LOS C or better during the p.m. peak hour. Since under Option 1 a substantial number of on-street parking spaces would be displaced (refer to Section 3.2.4), some motorists and those making deliveries may be inclined to double-park or stop their vehicle momentarily in the curb lane, thereby blocking a lane of traffic and causing deteriorated level of service conditions upstream.

Option 2 would reduce the number of through traffic lanes to one 4.9-meter (16-foot) wide lane in each direction (refer to **Figure 2-11**). Vehicular traffic would transition from two lanes to one lane in each direction between Jerrold and Kirkwood Streets (on the north) and between Thomas and Underwood Streets (on the south). Left-turn lanes would be provided from Third Street onto Quesada Avenue (southbound) and Oakdale Avenue (northbound). Left-turning and through movements would be allowed from all of the side streets.

Under Option 2, severe traffic congestion would result in both directions of Third Street during both the a.m. and p.m. peak periods, as well as during non-peak periods. All of the study intersections within the commercial core would operate at LOS E or F conditions. Bottlenecks would occur where the travel lanes transition from two to one, resulting in vehicular queues extending several blocks long and substantial traffic diversion along neighborhood streets in the Bayview Hunters Point neighborhoods. The congestion would be further exacerbated by on-street parking maneuvers from and to the single traffic lane. The slow-moving vehicle queues along Third Street would often block vehicles turning from side streets, potentially resulting in vehicles blocking the light rail tracks. Emergency vehicle response times would be significant reduced.

Option 3 would be similar to Option 2, but the single travel lane (in each direction) would be 4.3 meters (14 feet) wide to allow for additional curb parking (refer to **Figure 2-12**). It would have the same left-turn allowances and prohibitions as Option 2. It would also result in similar traffic impacts as those under Option 2.

Option 4 differs from the other three options in that light rail would share the inside two lanes of the reconfigured four-lane roadway with vehicular traffic (refer to **Figure 2-13**). In this concept, the inside traffic lane would transition into the light rail right-of-way north of Kirkwood and Thomas Avenues. In the transition blocks, the median would widen and the light rail would revert to mixed-flow operation. Due to the use of center station platforms, the location of left-turn lanes would differ from the other options. Northbound and southbound left-turns lanes would be provided from Third Street onto Quesada and Newcomb Avenues. Northbound-to-westbound movements onto Oakdale Avenue would be made by first turning onto Mendell Street and then left onto Oakdale Avenue. Under this option, left-turning and through movements would be allowed from all of the side streets.

Option 4's traffic diversions would be minor and would not cause a substantial impact. All of the study intersections would operate at LOS D, or better, during the a.m. peak hour and LOS C, or better, during the p.m. peak hour. Since traffic and light rail vehicles would share a common lane, it is likely that there would be an increased occurrence of light rail vehicle/automobile conflicts. In addition, this mixed-flow option would add up to 90 seconds to the light rail vehicle's one-way peak period travel time due to automobile interference, as discussed previously.

<u>Segment 4 - Third Street: Kirkwood Avenue to 16th Street</u>. This segment of Third Street would have two through lanes in each direction and left-turn lanes at Jerrold Avenue (northbound and southbound), Hudson Avenue (southbound), Evans Street (northbound and southbound), Cargo Way (southbound), Cesar Chavez Street (northbound and southbound), 25th Street (northbound), 23rd Street (northbound and southbound), 20th Street (northbound and southbound), and Mariposa Street (northbound and southbound). Left-turning and through movements would be allowed from all of the side streets in Segment 4. Traffic diversions would be minor and would not cause a substantial impact.

The Light Rail Alternative would result in LOS E or F conditions at two study intersections in Segment 4 primarily due to reduced intersection capacities. Under the No Build/TSM and No Project Alternatives, the Third/Evans Street intersection would operate at LOS D during both the a.m. and p.m. peak periods. Under the Light Rail Alternative, this intersection would degrade to LOS E during both periods. The Third Street/Cesar Chavez Street intersection would degrade from LOS E (under the No Project and No Build/TSM Alternatives) to LOS F during the p.m. peak hour.

Traffic to and from a maintenance facility at the Western Pacific site would not significantly impact the roadway system. The Third/25th Streets intersection would operate at LOS B conditions during both the a.m. and p.m. peak periods, with or without maintenance facility traffic. Similarly, with or without a maintenance facility located off of Cargo Way, the Third Street/Cargo Way-Arthur Avenue intersection would operate at LOS B conditions during both peak periods. In order to provide safe crossings of light rail vehicles across Third Street's northbound traffic lanes, a red light indication will stop traffic. In addition, a "Train Coming", or similarly denoted illuminated sign would warn motorists of a nearby train. Resulting traffic queues would have little impact on traffic flow.

Vehicular travel speeds were estimated for Third Street between Jamestown Avenue and 16th Street. As shown in **Table 3-10**, if one lane in each direction was removed from Third Street, the average travel speeds would decrease by 4 to 11 miles per hour compared to the No Project and No Build/TSM Alternatives. Average peak hour travel speeds would be between 9 and 16 miles per hour, resulting in LOS C and D conditions. Under the mixed-flow option in the Third Street commercial core (Option 4), traffic travel speeds would be slightly less (by zero to one mile per hour), also resulting in LOS C and D conditions.

Under the Third Street commercial core options that reduce the number of lanes to one in each direction (Options 2 and 3), the average travel speeds between Jamestown and 16th Streets would be less than five miles per hour during both peak periods. As discussed previously, substantial traffic congestion and diversion would result under the one-lane options. The LOS F conditions would violate the City's Congestion Management Program standard of LOS E.

Segment 5 - Third Street: 16th Street to King Street, and Fourth Street: Owens to King Street. Two light rail alignment options are proposed through Mission Bay (refer to **Figures 2-14 and 2-15**). Option 1 aligns both the northbound and southbound tracks along Owens and Fourth Streets. Option 2 aligns the southbound tracks along Owens and Fourth Streets and the northbound tracks along Third Street. Tracks crossing the Fourth Street bridge would share traffic lanes. Tracks crossing the Third Street bridge would be placed in an exclusive right-of-way.

Between 16th Street and a relocated Owens Street, Third Street would have two lanes in each direction and northbound and southbound left-turn lanes at 16th, South (new), South Mall (new), North Mall (new), Mission Rock, and Owens Streets. Between 16th and King Streets, Owens Street would have two travel lanes in each direction. Fourth Street would continue to have three travel lanes—two southbound lanes and one northbound lane, except between Berry and King Streets where four lanes are proposed.

Third Street would have two travel lanes in the southbound direction between Owens and King Streets. Under Option 1 (where both light rail tracks follow Fourth Street, see **Figure 2-14**), Third Street would have four travel lanes in the northbound direction between the bridges and King Street, and two travel lanes between Owens and the bridge. Under Option 2 (where the northbound light rail tracks would follow Third Street, see **Figure 2-15**), only two northbound travel lanes would exist so the light rail could be accommodated within an exclusive right-of-way.

Under Option 1, all of the study intersections would continue to operate similar to their No Project and No Build/TSM conditions. LOS F conditions would be expected to continue at Third/King Streets during the p.m. peak hour and at Fourth/King Streets during the a.m. peak hour. This latter intersection would operate a LOS E during the p.m. peak hour. Since traffic and light rail vehicles would share common lanes across the Fourth Street bridge, it is likely that there would be an increased occurrence of light rail/automobile conflicts.

Under Option 2, however, the Third/Berry Streets intersection would degrade from LOS B to F conditions during the p.m. peak hour due to the reduced number of northbound travel lanes. Vehicular queues would extend as far south as Owens Street. Traffic would divert to Owens and Fourth Streets, increasing congestion along both of these streets, as well as the King/Fourth Streets intersection. This situation would be even more problematic before and after major events at the new Giants ballpark, when traffic volumes in the area would be very high. Under Option 2, there would also be the potential for light rail/automobile conflicts on the common lane across the Fourth Street bridge.

Mitigation Measures

To alleviate the significant impacts of unacceptable intersection operations in the long-term under the IOS, the following mitigation measures are recommended:

- Third Street/Evans Street. This intersection would degrade to LOS E conditions during the a.m. and p.m. peak hours with the implementation of a light rail line. By eliminating the southbound left-turn lane and re-routing turns via Phelps Streets to Evans Street, the intersection's service level would improve to LOS D during both periods. This improvement would require signalization of the Phelps/Evans intersection and parking prohibition along Phelps and Evans Streets (parking for one vehicle would be eliminated on the south side of Evans Street, parking for three vehicles would be eliminated on the east side of Phelps Street, and parking would not be allowed on the west side of Phelps Street between 7 a.m. and 6 p.m.). Without the above improvements, left-turning traffic would predominantly shift to Cargo Way, deteriorating the Third Street/Cargo Way intersection to LOS E during the a.m. peak hour and LOS D in the p.m. peak hour.

- Third Street/Berry Street. Under Option 2 in Mission Bay (i.e., northbound light rail tracks along Third Street), this intersection would degrade to LOS F conditions during the p.m. peak hour due the inclusion of the light rail tracks within exclusive right-of-way. To enable LOS D or better conditions, an additional northbound traffic lane in Third Street would need to be provided by widening the roadway to the east or by enabling the added lane to share the light rail right-of-way, i.e., operate in mixed-flow conditions. The first option would require narrowing the 7.6-meter (25-foot) wide sidewalk proposed near the new Giants ballpark by about 1.4 meters (4.5 feet). The second option would require prohibiting northbound-to-westbound left-turns onto Berry Street.

It should be noted that cumulative unavoidable adverse impacts that cannot be reasonably mitigated are expected to occur by 2015 (with and without the light rail project), at Third Street/Cesar Chavez Street; Third Street/King Street and Fourth Street/King Street. Implementation of light rail would exacerbate their congested operations (e.g., Third Street/Cesar Chavez would deteriorate from LOS E to F conditions).

No mitigation measures have been developed for the one-lane options in the Third Street commercial core (Options 2 and 3). Both options would result in severe traffic congestion and diversion, as well as increased emergency response times. Average travel speeds could only be restored to LOS D or better conditions by providing two through lanes in each direction along Third Street.

Resulting less than significant traffic impacts could be alleviated or reduced with the following improvement measures.

During construction of the IOS, two travel lanes *plus* separate bus pull-out areas should be maintained during peak periods in the commute directions along Bayshore Boulevard and Third Street, i.e., northbound during the a.m. period and southbound during the p.m. period. This may require temporarily relocating or closing bus stops, or narrowing the two adjacent travel lanes.

Prior to construction, it is recommended that the IOS's construction schedule be coordinated with other ongoing or planned construction activities in the Corridor (e.g., seismic retrofit of Bay Bridge approaches, redevelopment at Mission Bay, and Candlestick Mills), to reduce the extent of traffic impacts during construction.

For the Third Street commercial core option retaining two traffic lanes in each direction (Option 1), in the long-term all of the remaining on-street parking spaces should be designated as short-term parking spaces and loading spaces to reduce the propensity of double parking. If Option 1 is selected, strict enforcement of parking and loading zones would be essential to maintain acceptable traffic flow along Third Street.

To alleviate vehicle delays and back-ups associated with the proposed single southbound left-turn lane from Bayshore Boulevard to Hester Avenue (north) the adjacent through travel lane (to Hester Avenue) should be delineated to serve both left-turning and through vehicles (if deemed feasible during final design). This would improve the left-turn movement's operation from LOS F to LOS C conditions. The inside left-turn lane would serve traffic destined for northbound Highway 101, while vehicles turning left from the shared adjacent lane would access northbound Third Street. Appropriate signing and channelization should accompany this improvement.

Increased light rail vehicle/automobile conflicts would likely result in areas of mixed-flow operations, e.g., on the Third and Fourth Street bridges and in the Third Street commercial core under the mixed-flow alternative (Option 4). Standard signalization, signing, and pavement markings should be installed to warn motorists of the mixed-flow operations.

Finally, with increased congestion near the draw bridges, bridge openings should be prohibited during weekday peak commute periods and during other periods of heavy traffic flow, e.g., before and after events at the proposed new Giants ballpark. This measure would need approval by the U.S. Coast Guard and the San Francisco Department of Public Works.

Implementation of the above intersection mitigation and improvement measures would increase average peak hour travel speeds along Bayshore Boulevard and Third Street (except through the Third Street commercial core for the one lane options, Options 2 and 3). As shown in **Table 3-12**, the recommended Bayshore Boulevard/Arleta-Blanken Avenue improvement measure would increase peak hour speeds along Bayshore Boulevard by one to three miles per hour, alleviating unacceptable LOS E conditions for northbound traffic during the p.m. peak hour.

TABLE 3-12

MITIGATED CONDITIONS TRAVEL SPEED COMPARISON

ROUTE	PEAK PERIOD	AVERAGE SPEED (mph)/LOS — LIGHT RAIL OPTION 1 (Two Lanes) Unmitigated	LIGHT RAIL OPTION 1 (Two Lanes) Mitigated	LIGHT RAIL OPTION 4 (Mixed Flow) Unmitigated	LIGHT RAIL OPTION 4 (Mixed Flow) Mitigated
Bayshore Boulevard:					
Sunnydale to Hester	A.M.	15 / C	No mitigation	Same as Option 1	
	P.M.	18 / C	No mitigation	Same as Option 1	
Hester to Sunnydale	A.M.	19 / C	No mitigation	Same as Option 1	
	P.M.	17 / C	No mitigation	Same as Option 1	
Third Street:					
Jamestown to 16th	A.M.	16/C	17/C	15/C	16/C
	P.M.	16/C	18/C	15/C	17/C
16th to Jamestown	A.M.	10/D	16/C	10/D	15/C
	P.M.	9/D	16/C	9/D	15/C

Source: City and County of San Francisco, Department of Parking and Traffic, July 1998

The recommended improvements at Third Street's intersections with Evans Street and Cesar Chavez Street would alleviate congestion at these intersections, thereby increasing average vehicle speeds between Jamestown and 16th Streets by one to seven miles per hour, resulting in LOS C conditions during both the a.m. and p.m. peak hours.

Light Rail Alternative - New Central Subway

Construction Impacts

Construction of the New Central Subway would be accomplished in two phases: 1) Line Section 1 from Third/Fourth and King Streets up to Market Street, including the stations at Moscone Center and at Market Street; and 2) Line Section 2 crossing Market Street and following Geary and Stockton Streets to Stockton/Jackson Streets, including the Union Square and Chinatown stations. As discussed in Section 2.4, at most times when Line Section 1 construction is underway, 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. Line Section 1 construction would affect surface street operations for up to 18 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 Line Section 2, the number of traffic lanes on Geary Street, and then on Stockton Street, would be reduced to just one lane for six to eight weeks (during excavation of the Union Square station, Stockton Street between Sutter and Geary Streets may need to be shut down to traffic completely for six to eight months), as discussed in Section 2.4. Potential detour routes during construction along these streets are illustrated in **Figures E-3 and E-4** (see Appendix E). During Line Section 2 construction of the subway across Market Street, traffic operations along Market Street could be affected for up to six weeks.

Operation and Cumulative Impacts

For the New Central Subway, 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, four through (one-way northbound) traffic lanes would be situated on the east side of the street and the light rail tracks and a curbside station would be located on the west side. As the light rail tracks transition toward the middle of the street en route to the subway portal, the two westside traffic lanes would transition further westerly, crossing the light rail tracks, so that from just south of Brannan Street to the portal, two traffic lanes would exist on either side of the tracks. No existing turning movements would be prohibited. With the inclusion of light rail and the elimination of on-street parking, this segment of Third Street would provide four traffic lanes at all times (note that it currently provides a fifth lane during the a.m. peak hour).

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

On Third and Fourth Streets, the light rail would travel in an exclusive 10- to 15-centimeter (four- to six-inch) raised right-of-way, except along the transition on Third Street between Townsend and Brannan Streets. All intersections would be re-graded to conform with the raised trackway.

It should be noted that cumulative unavoidable adverse impacts are expected to occur at Third Street/Townsend Street, Third Street/Brannan Street, Fourth Street/Brannan Street, and Fourth Street/Bryant Street. 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 New Central Subway. Implementation of light rail would exacerbate their congested operations.

With the New Central Subway, the Third/Bryant Streets intersection would degrade from LOS D to LOS F conditions during the a.m. peak hour. This is due to the acquisition of the fifth lane which is currently used during the heavy a.m. commute period.

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. The transportation safety considerations addressed in Section 2.0 for the IOS would also be incorporated into the design of the New Central Subway, as appropriate.

Mitigation Measures

To alleviate the significant impact of unacceptable intersection operations under the New Central Subway, the following mitigation measures are recommended:

- Third Street/Bryant Street: With the New Central Subway, the Third/Bryant Streets intersection would degrade to LOS F conditions during the a.m. peak hour due to the elimination of Third Street's fifth traffic lane (during the morning commute, this segment of Third Street consist of five travel lanes, one of which is used for on-street parking the rest of the day). Due to the proposed location and width of the subway portal, provision of a fifth lane would not be possible without substantial sidewalk narrowing or building displacement on one or both sides of Third Street. However, the intersection's a.m. peak hour performance could be improved to LOS D conditions by adding, via striping changes, a third eastbound-to-northbound left-turn lane from Bryant Street to Third Street. This improvement would require prohibiting parking on the north side of Bryant Street, between Third Street and a point about 60 meters (200 feet) to the west.

- Fourth Street/Brannan Street: Although the intersection of Fourth Street/Brannan Street currently performs at LOS F during the p.m. peak hour and would continue to do so under the Light Rail Alternative, the intersection's operation could improve to LOS D conditions by prohibiting parking on the north side of Brannan Street, thereby creating an exclusive westbound-to-southbound left-turn lane. On-street parking for up to six vehicles would need to be prohibited if this improvement were installed.

It should be noted that cumulative unavoidable adverse impacts, which cannot be reasonably mitigated are expected to occur by 2015, with and without the light rail project, at Third Street/Townsend Street, Third Street/Brannan Street, and Fourth Street/Bryant Street.

Resulting less-than-significant traffic impacts could be alleviated or reduced with the following improvement 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 through E-4** in Appendix E). Prior to final design, the DPT should select the most appropriate detour routes 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 should be advertised prior to construction in the appropriate media. When detours are initially implemented, traffic control police should monitor critical locations along the detours to promote uncongested traffic flow. All traffic detour measures should be implemented in coordination with other concurrent construction projects, e.g., Mission Bay Redevelopment, Candlestick Mills, etc.

3.2.3 TRUCKS

This section discusses the potential environmental consequences to truck movement under each of the alternatives.

No Project and No Build/TSM Alternatives

Construction Impacts

No construction impacts would occur under either of these alternatives.

Operation and Cumulative Impacts

By 2015, traffic is expected to increase by 30 to 80 percent throughout the Corridor (refer to **Table 3-8**). In relation to automobile traffic, the future proportion of trucks within the Corridor is expected to remain the same or decrease with the proposed redevelopment of Mission Bay and the Hunters Point Naval Shipyard.

The No Project and No Build/TSM Alternatives would not substantially 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

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

Light Rail Alternative - Initial Operating Segment

Construction Impacts

As discussed previously, travel speeds for both automobiles and trucks would be slightly slower along Bayshore Boulevard and Third Street during construction of each of the three segments of the IOS. During construction of the IOS, the parking lanes along Bayshore Boulevard and Third Street would at times be converted into traffic lanes to enable two travel lanes in each direction. 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 local side streets, or elsewhere outside the construction zone.

Operation and Cumulative Impacts

Impacts to truck movements from the implementation of the IOS could generally occur in three ways:

- prohibition of left-turn access due to the raised light rail median in the middle of the street;
- removal of on-street loading areas due to light rail platform locations; and
- increased travel times along the Corridor.

Most of Bayshore Boulevard and Third Street currently has a center, raised median separating the northbound and southbound traffic flows. However, at several locations, there exists gaps in the median to allow for left-turn access into driveways. These are found between Donner and Egbert Avenues, just south of Marin Street, between 26th and 25th Streets, between 21st and 20th Streets, between Mariposa and 16th Streets, and immediately north of 16th Street. There are also sections of the roadway where traffic is separated by painted double yellow lines, including between Fairfax and Davidson Avenues and between Marin and Cesar Chavez Streets. North of 16th Street, the raised median ends, and is replaced by painted double yellow lines to the bridge over Mission Creek. Two sets of double yellow lines separate the traffic flows between the bridge and Berry Street, and one set of double yellow lines run from Berry Street to King Street. One set of double yellow lines at these locations allow left-turns to be made across them, while two sets of double yellow lines prohibit left-turn movements.

Under the Light Rail Alternative, the light rail median would prohibit these mid-block left-turn movements. Trucks (and cars) wanting to turn left to access driveways would need to turn left upstream of the driveway and enter the site from a side street, if possible, or make a downstream U-turn maneuver and back-track to the driveway. The additional travel distance and turning maneuvers would somewhat delay truck operations for the few locations where mid-block left-turns are currently allowed, and could potentially impact traffic flow along Third Street if trucks temporarily block travel lanes while maneuvering into a driveway. The impact would be greatest for larger trucks, such as semi tractor-trailers, that have wider turning radii.

Provision of the light rail's station platforms and rail transitions would displace a substantial amount of on-street parking, including loading zones, especially in Segments 2, 3, and 4 (note that two of the Third Street commercial core options, Options 3 and 4, would increase the amount of parking and loading areas in Segment 3, see next section). The removal of existing on-street loading zones would require re-establishment of loading zones in areas where parking would be allowed on Bayshore Boulevard and Third Street, and/or on nearby side streets. If no convenient spaces are available, some drivers may decide to temporarily double-park their truck.

Trucks temporarily parking on cross-streets could make deliveries difficult from the truck to the business, or vice-versa, as the delivery person would be required to transport goods manually up to 60 meters (200 feet) or so. Presently, most deliveries along the Corridor only require transporting goods up to one-half of a block or about 30 meters (100 feet) from the truck to the business. In addition, truck use on neighborhood side streets would increase, potentially violating the existing truck and weight limit restrictions in some areas, such as the Bayview Hunters Point district.

Since the Light Rail Alternative would reduce the number of through lanes in each direction, double-parked trucks would substantially impact the capacity and operations of Third Street, Fourth Street, and Bayshore Boulevard. As discussed previously, implementation of light rail along Bayshore Boulevard and Third Street would decrease peak hour travel speeds for automobiles and trucks (refer to **Table 3-10).**

Mitigation Measures

No significant truck impacts would occur under the IOS. However, resulting less-than-significant impacts could be alleviated or reduced with the following improvement measures.

During construction of the IOS, a portion of the curb parking lanes remaining open in the construction area, and those just upstream or downstream of the construction area, should be converted to short-term parking and truck loading/unloading zones to enable truck loading and unloading to nearby businesses.

During the final design of the light rail project, areas for new permanent on-street loading zones should be identified along Bayshore Boulevard, Third Street, and appropriate side streets. Some of the new loading zones may need to displace existing parking spaces along the Corridor. The DPT should continue to monitor vehicular travel speeds along Bayshore Boulevard and Third Street and revise traffic signal timing plans to expedite traffic flow. In addition, on-street parking laws should be stringently enforced to alleviate double-parking.

Light Rail Alternative - New Central Subway

Construction Impacts

As discussed previously, during construction of the New Central Subway, 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.

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 through E-4** in Appendix E).

During construction of the New Central Subway, when portions of Third and Fourth 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 during construction along Geary and Stockton Streets. Access to the Moscone Center loading area would be maintained during construction along Third Street between Clementina and Howard Streets.

Operating and Cumulative Impacts

Provision of the light rail station platform on Third Street at King Street, the surface alignment along Third and Fourth Streets, and the location of 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 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.

Mitigation Measures

No significant truck impacts would occur under the IOS. However, resulting less-than-significant impacts could be alleviated or reduced with the following improvement measures.

During construction of the New Central Subway, a portion of the curb parking lanes remaining open in the construction area, or just upstream or downstream of the construction area, should be converted to short-term (including truck loading/unloading only) parking to enable truck loading and unloading to nearby businesses.

During final design of the New Central Subway, areas for new, permanent, on-street loading zones should 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.

3.2.4 RAILROAD

The existing active rail lines in the Corridor operate very few freight trains, which are anticipated to continue to operate in 2015. Union Pacific does not anticipate a substantial increase in movements, except at Pier 80,[26] where the Port of San Francisco is planning to expand freight activity. Rail access to Pier 80 currently requires crossing Third Street just north of 16th Street.

No Project and No Build/TSM Alternatives

Construction Impacts

No construction impacts would occur under either of these alternatives.

Operational and Cumulative Impacts

The freight tracks that currently provide access to Illinois Street and Pier 80 currently cross Third and 16th Streets at a 45-degree angle. As part of the proposed Mission Bay South Redevelopment project, the existing railroad alignment would be relocated within 16th Street's right-of-way. After leaving the mainline tracks immediately north of 16th Street, Pier 80-bound trains would travel east along 16th Street to reach Terry Francois Boulevard, east of Illinois Street. Trains would then turn north on Terry Francois Boulevard, and then reverse direction and travel south on Terry Francois Boulevard to reach Illinois Street. In the event that the Mission Bay South project removes the freight tracks crossing 16th Street, access to Pier 80 would be provided via a new freight bridge across Islais Creek to Illinois Street. Freight traffic would use the Cargo Way crossing of Third Street.

Freight operations would not be affected by the No Project and No Build/TSM Alternatives. Except for changes to the rail alignment at 16th Street or a new bridge across Islais Creek for access to Pier 80, access and operations would be similar to existing conditions.

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[26] Jill Simpson, Port of San Francisco, phone conversation, September 1997.

Mitigation Measures

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

Light Rail Alternative - Initial Operating Segment

Construction Impacts

All at-grade railroad crossings would remain operational throughout construction. No significant construction impacts would result.

Operation and Cumulative Impacts

According to the California Public Utilities Commission (CPUC), the light rail overhead traction power wire that crosses over the freight tracks should be 6.9 meters (22.5 feet) in elevation to allow double-stack trains to cross underneath. However, due to the height restrictions in the railroad tunnels to the south, the tallest trains currently serving the Corridor are no higher than 4.9 meters (16 feet), although in the future the Port of San Francisco intends to operate double-stacked container trains that would require the added clearance.

MUNI's intention is to secure an agreement with the Port of San Francisco that would allow the transit agency to build and operate the Third Street light rail system with a 5.8-meter (19-foot) high overhead traction power over the railroad crossings, which is a technically sufficient and safe clearance height for all freight train equipment currently able to enter San Francisco through the existing Caltrain railroad tunnels. As part of the agreement, MUNI would be responsible for raising the traction power wires to 6.9 meters (22.5 feet) if and when necessary to accommodate double-stacked container trains.

The proposed new light rail vehicle maintenance and storage facility on either the eastern or western portion of the abandoned Western Pacific rail yard site would require both inbound and outbound light rail vehicles to cross over the Illinois Street freight rail tracks (at 25th Street) leading to Pier 80. The increased light rail and auto activities associated with the maintenance and storage facility could potentially impact freight rail movements to Pier 80. However, unless the freight rail activity at Pier 80 increases substantially, the conflicts and delays to Pier 80 freight traffic would not be significant. The crossing of the light rail and the freight rail tracks would be controlled by interlocking signals. The interlocking signals would ensure that only one rail movement has the right-of-way. The intersection would be designed in accordance with the CPUC's General Order 143-A, "Safety Rules and Regulations Governing Light Rail Transit" and the "Manual on Uniform Traffic Control Devices."

As discussed in Section 5.0, in order to provide access to the optional Cargo Way maintenance and storage facility, the Quint Street freight lead would need to be shifted slightly to the southwest, a realignment that would require the acquisition of an industrial building at Quint and Arthur Streets. It is estimated that the acquisition would cost $1 million and involve the relocation of employees associated with the building.

The proposed intermodal station at the Caltrain Bayshore Station would not impede upon the existing Port of San Francisco easement adjacent to the freight tracks. The intermodal station (refer to **Figure 2-7**) would, however, require the abandonment, removal or relocation of the spur track located south of Sunnydale Avenue. An abandonment or removal of the spur track would impact about six rail freight customers currently served by the spur and would eliminate the potential for use by other businesses with access to the spur track. Abandonment or removal of the spur could significantly impact the operations of affected businesses due to increased costs for truck deliveries.

Mitigation Measures

To mitigate the potentially significant impact of eliminating freight rail access via the spur track, MUNI has consulted with Universal Paragon Corporation, the major property owner in the area, and with the Union Pacific and will consult with the affected industries to negotiate a satisfactory solution. Alternatively, MUNI is considering design options for the intermodal facility that would incorporate the existing spur track alignment. The design options would require at-grade automobile and pedestrian crossings of the spur track to access the station and would constrain the number of on-site parking spaces and bus bays.

Light Rail Alternative - New Central Subway

Construction Impacts

No construction impacts would occur under this alternative.

Operation and Cumulative Impacts

No railroad impacts would occur under the New Central Subway.

Mitigation Measures

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

3.2.5 PARKING

Future Parking Conditions

The following assessment is based on current parking demands and supplies in the Third Street Corridor and considers parking which would be generated by 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.

No Project and No Build/TSM Project Alternatives

Construction Impacts

No construction impacts would occur under either of those alternatives.

Operation and Cumulative Impacts

The proposed Mission Bay project will re-orient Fourth Street, south of Mission Creek, in an alignment parallel to Third Street. Fourth Street will extend southerly to its new terminus (and intersection) at 16th Street. Owens Street will be extended and will connect Third and Fourth Streets. Owens Street's intersection with Third Street will be located about 370 meters (1,200 feet) north of Third Street's intersection with Mission Rock Street.

As part of the collaborative planning efforts between the developers of the Mission Bay project and the City and County of San Francisco, and in light of the future transportation needs required by the Mission Bay development and those required by the Project, it was determined that on-street parking should be removed along Third Street between Mariposa and King Streets and along Fourth Street between Owens Street (future) and King Street. On-street parking will also be prohibited along Owens Street between Third and Fourth Streets.

Currently, Third and Fourth Streets within Mission Bay lack curbs and motorists park parallel to the travel lanes or at 90-degrees on the roadway shoulders. The collaborative decision to prohibit parking along segments of Third and Fourth Streets will displace parking for about 467 vehicles (note that about 377 vehicles presently park on these street segments).

Although the Mission Bay development will provide new on-street parking spaces along several existing and planned roadways, e.g., along Fourth Street between Owens and 16th Streets (about 400 spaces during non-peak periods) and on Owens Street west of Fourth Street (about 60 spaces), it will also displace existing on-street parking along other roadways besides Third and Fourth Streets. Overall, however, within Mission Bay there will be a net gain of about 40 more parking spaces than currently exists.

Nevertheless, increased on-street parking demand is expected within Mission Bay in the future, and with only a slightly increased supply, it is likely that spillover parking demand may cause motorists to seek parking in Segment 4 and within the Potrero Hill area. It should be noted that most residential streets within Potrero Hill currently do not have parking restrictions.

The No Build/TSM Alternative would not displace any additional parking spaces, other than those that would be displaced under the No Project Alternative. Although additional bus service would be proposed under the No Build/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

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

Light Rail Alternative - Initial Operating Segment

Construction Impacts

As discussed in Section 2.4, construction of the IOS would be divided into three segments. To limit traffic disruption, construction would occur first on one side of the street and then the other, requiring a minimum of two weeks per side of the street by block. Two travel lanes would be maintained in each direction along Bayshore Boulevard and Third Street, with the outside lanes often replacing the existing parking lanes. 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 side streets.

Operation and Cumulative Impacts

With the implementation of light rail, parking would generally be retained throughout the Corridor except in areas adjacent to light rail station platforms, in the transition areas before and after the platforms, and where additional room is needed to accommodate left-turn lanes (refer to the *Conceptual Engineering and*

Architectural Drawings).[27] The following sections discuss the approximate number and location of on-street parking spaces that would be impacted under the IOS phase. **Table 3-13** quantitatively summarizes the parking impacts on a segment-by-segment basis (**Tables E-19 through E-25** in Appendix E provide quantified parking information on a block-by-block basis). Although individual parking spaces are not delineated along much of the Corridor, estimates were made of overall parking capacities based on field measurements and observations.

TABLE 3-13

FUTURE PARKING CONDITIONS IN CORRIDOR
(Caltrain Bayshore Station to Bryant Street)

	APPROXIMATE NUMBER OF ON-STREET PARKING SPACES			ON-STREET PARKING OCCUPANCY	
SEGMENT	NO. PROJECT & NO BUILD/ TSM ALTERNATIVES	PLUS OR [MINUS] DUE TO LIGHT RAIL	FUTURE TOTAL WITH LIGHT RAIL	EXISTING NUMBER OF SPACES OCCUPIED	SURPLUS OR [SHORT-FALL]
Initial Operating Segment:					
Segment 1 - Bayshore: Sunnydale to Hwy. 101	195	5	200	61	139
Segment 2 - Third: Hwy. 101 to Thomas	258	[116]	142	104	38
Segment 3 - Third: Thomas to Kirkwood					
Option 1: Two lanes	116	[46]	70	68	2
Option 2: One lane	116	[41]	75	68	7
Option 3: One hybrid lane	116	23	139	68	71
Option 4: Mixed-flow lanes	116	15	131	68	63
Segment 4 - Third: Kirkwood to 16th Street	552	[213]	339	355	[16]
Segment 5 - Third: 16th Street to King, and Fourth: Owens to King	0*	0*	0	377*	[377]*
New Central Subway:					
Segment 7 - Third/ Fourth: King to Bryant	155	[87]	68	144	[76]
Subway Stations	n/a	[10-11]	n/a	10-11	n/a

Note: *Due to Third Street Light Rail Project and Mission Bay development.
Source: The Duffey Company, September 1997

Segment 1 - Bayshore Boulevard: Caltrain Bayshore Station to the Highway 101 Overcrossing. The Light Rail Alternative would have very little impact to on-street parking in Segment 1 (refer to **Table E-19** in Appendix E). A new parking area would replace an existing bus zone between Arleta/Blanken and Tunnel Avenues, which would no longer be needed under this alternative, but parking would not be affected elsewhere. About five parking spaces would be added in the area between Arleta/Blanken and Tunnel Avenues. As shown in **Figure 2-7**, a 285-space parking garage is proposed to serve the Bayshore station by 2015. It was estimated that parking demands would rarely exceed 250 spaces.

[27] San Francisco Municipal Railway, *Conceptual Engineering and Architectural Drawings for the Light Rail Alignment, Stations, and Maintenance Yard Options*, November 1997; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

Segment 2 - Third Street: Highway 101 Overcrossing to Thomas Avenue. The Light Rail Alternative would add a total of about 19 on-street parking spaces to four blocks and remove a total of about 135 parking spaces from 11 different blocks in Segment 2 (refer to **Table E-20** in Appendix E). All or almost all of the on-street parking areas in the four blocks between Jamestown and Fitzgerald Avenues, in the two blocks between Donner and Bancroft Avenues, and in the one block between VanDyke and Underwood Avenues would be displaced. Based on current parking occupancy, noticeable parking shortfalls (the difference between available future spaces and existing parking occupancy) would exist in the four block segment and in the one block segment (combined, these five blocks would displace 69 parking spaces and 53 parked vehicles).

All of the parked vehicles displaced due to parking removal between Jamestown and Fitzgerald Avenues could be accommodated nearby on Third Street (within the two blocks south of Jamestown and the two blocks north of Fitzgerald) and along the side streets east of Third Street where on-street parking is typically available. Similarly, vehicles displaced between Wallace and Underwood Avenues could be accommodated on Third Street one block to the north and one block to the south and along under-used side streets. Parking located on side streets could replace the number of spaces lost along Third Street, however, it would be less convenient for patrons of Third Street businesses, as well as for delivery vehicles.

Overall, the Light Rail Alternative would displace about 116 parking spaces in Segment 2. Based on current occupancy, surplus parking spaces exist within two blocks or less of the affected areas on Third Street and along close-in side streets. Parking located on side streets could replace the number of spaces lost along Third Street, however, it would be less convenient to patrons of Third Street businesses.

Segment 3: Third Street - Thomas Avenue to Kirkwood Avenue. As discussed in Section 2.4, four conceptual plans containing different lane, parking, sidewalk, and streetscape configurations are being considered for the revitalizing Third Street commercial core between Thomas and Kirkwood Avenues. Each concept results in different parking impacts based on the option's proposed light rail track alignment, light rail platform types (side or center) and locations, vehicular left-turn lane locations and lengths, vehicular travel lane widths, sidewalk widths, and the location of existing driveways along Third Street. Two of the concepts reduce the number of on-street parking spaces along Third Street and two concepts increase the number of spaces.

There are currently about 116 on-street parking spaces on Third Street between Thomas and Kirkwood Avenues. Current parking demand is generally about 59 percent, with the occupancy along most of the blocks between 45 and 65 percent. The highest occupancy is typically in the block between Quesada and Palou Avenues, where often all of the 11 on-street parking spaces are used. Local on-street parking demand in this segment will likely increase substantially as successful redevelopment occurs in the area.

Option 1 (two lanes in each direction) would displace about 46 parking spaces (refer to **Table E-21** in Appendix E). Some parking would be displaced from every block, except between Newcomb and McKinnon Avenues. Parking would be completely eliminated between Palou and Oakdale Avenues and a shortfall would occur in the three blocks between Oakdale and Revere Avenues. **Figure 2-10** in Section 2.4.1 shows where on-street parking would be allowed.

Option 2 (one lane in each direction) would displace about 41 parking spaces (refer to **Table E-22** in Appendix E). Some parking would be displaced from all nine blocks, except between Newcomb and McKinnon Avenues. Parking would be completely eliminated between Palou and Oakdale Avenues. In comparison to Option 1, four less parking spaces would be eliminated between Revere and Palou Avenues and one less space would be eliminated between Oakdale and Newcomb Avenues. **Figure 2-11** shows where on-street parking would be permitted.

Option 3 (one hybrid lane in each direction) would have narrower sidewalks than Option 2, thereby providing added pavement to allow 23 new spaces to the existing on-street parking supply (refer to **Table E-23** in Appendix). As shown in **Figure 2-12**, new parking spaces would be added in the blocks between Shafter and Revere Avenues, Quesada and Palou Avenues, and Oakdale and Newcomb Avenues. About eight or nine spaces would be added to each of these three blocks. About two spaces would be eliminated between McKinnon and LaSalle Avenues.

Option 4 (one lane plus one mixed-flow lane in each direction) would add about 15 new parking spaces in the commercial core (refer to **Table E-24** in Appendix E). About nine new spaces would be added in the block between Quesada and Palou Avenues and about eight spaces would be added between Oakdale and Newcomb Avenues. Three spaces would be added between McKinnon and LaSalle Avenues. About five spaces would be eliminated in the two blocks between Thomas and Revere Avenues, **Figure 2-13** in Section 2.4.1 shows where on-street parking would be allowed in Option 4.

In summary, on-street parking losses would occur under Options 1 and 2. Based on current side-street parking occupancies, however, the side streets could accommodate most of the displaced parking spaces from Third Street, but parking on side streets would be less convenient to patrons of the Bayview Hunters Point businesses and to delivery and pick-up service. Options 3 and 4 would add new parking areas to Third Street.

<u>Segment 4 - Third Street: Kirkwood Avenue to 16th Street</u>. In the south part of Segment 4 (between Kirkwood Avenue and Cesar Chavez Street), the Light Rail Alternative would displace some parking spaces in the four blocks between Kirkwood and Galvez Avenues, but would not displace any parking in the eight blocks between Galvez Avenue and Cesar Chavez Street because parking is currently prohibited along four of these blocks, and no station platforms or left-turn lanes are proposed in the other four blocks (refer to **Table E-25** in Appendix E). Between Kirkwood and Jerrold Avenues, parking would not be allowed on the east side of Third Street to accommodate a northbound left-turn lane. Parking would not be allowed on the west side of Third Street between Jerrold and Innes Avenues and between Innes and Hudson Avenues, but new parking would be added on the east side of this latter block since the existing bus stop zone would be removed. Parking would no longer be allowed on either side of Third Street between Hudson and Galvez Avenues. Combined, 36 parking spaces and 13 parked vehicles would be displaced from these four blocks.

Over one-half of the displaced vehicles could park in the typically unused spaces between Jerrold and Hudson Avenues. Other on-street parking is available on Third Street south of Kirkwood Avenue and north of Galvez Avenue, as well as along side streets. Between Galvez Avenue and Cesar Chavez Street, the Light Rail Alternative would add about six parking spaces in total to Third Street between Burke Avenue and Cargo Way-Arthur Avenue due to the elimination of a bus stop.

In the north part of Segment 4 (between Cesar Chavez and 16th Streets), the Light Rail Alternative and the proposed Mission Bay development would displace about 182 parking spaces. Ten spaces would be displaced in the two blocks between Cesar Chavez and 25th Streets, but based on current parking occupancy a surplus of 17 on-street spaces would still remain within these two blocks. Conversion of an existing bus zone to parking would add six parking spaces between 25th and 24th Streets. If one of the Western Pacific sites is selected as the light rail maintenance yard, light rail tracks would extend easterly on 25th Street. During final design, it would be determined if the light rail alignment would displace areas used for parking along 25th Street.

The largest amount of parking loss in Segment 4 would occur along Third Street between 24th and 16th Streets. About 172 of the existing 340 on-street parking spaces would be displaced within these seven blocks. Based on current parking occupancy, the Light Rail Alternative and the Mission Bay development would displace about 101 parked vehicles. Much of this parking serves industrial uses. While most of the vehicles displaced between 24th and 22nd Streets could be accommodated two blocks farther to the south (between 26th and 24th Streets), those 71 vehicles displaced from north of 22nd Street could not easily be accommodated elsewhere on Third Street. Based on side street parking occupancies, however, some of the displaced parking spaces could be accommodated on Illinois, Tennessee, and/or Minnesota Streets.

The proposed light rail "loop" track along 19th, Illinois, and 18th Streets would displace all eight parking spaces on the south side of 19th Street and all five spaces on the north side of 18th Street between Third and Illinois Streets. These spaces are typically fully-occupied during weekdays. Reserve parking capacity exists on Illinois Street to accommodate displaced vehicles.

Overall, the Light Rail Alternative and the Mission Bay development would displace about 130 parking spaces on Third Street throughout Segment 4 (plus 13 spaces on 19th and 18th Streets), but based on current occupancies, surplus parking could accommodate many of the displaced vehicles.

<u>Segment 5 - Third Street: 16th Street to King Street, and Fourth Street: Owens to King Street</u>. See discussion under "No Project and No Build/TSM Alternatives".

<u>Mitigation Measures</u>

No significant parking impacts would occur under the IOS. San Francisco has a "transit first" policy, and the displacement of existing automobile parking spaces is not considered a significant impact requiring mitigation. However, resulting less-than-significant impacts could be alleviated or reduced with the following improvement measures.

To discourage long-term parking along Bayshore Boulevard and Third Street during construction of the IOS phases, all on-street parking spaces retained during segment construction should be delineated as short-term spaces. As part of pre-construction activities, the recommended long-term parking improvement measures should be implemented to create additional public parking throughout the Corridor, prior to construction of the surface light rail line. A transportation demand management (TDM) program should be developed by the contractor to encourage ridesharing (e.g., carpooling, vanpooling, buses, etc.) to reduce parking demand during construction.

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 should be considered during the development of the project's final plans.

In addition, in areas where parking shortfalls would occur in the future due to increased parking demand, new spaces could be provided on side streets (through re-striping and/or curb modifications) and/or in off-street parking lots adjacent to the Corridor. For example, in the Third Street commercial core option that provides two through lanes in each direction on Third Street (Option 1), 46 existing parking spaces would be displaced. Based upon a field review of existing side street roadway and parking configurations, however, over 70 new parking spaces could be gained on close-in side streets by reconfiguring the existing parallel parking on the side of commercial businesses and institutional uses to perpendicular parking (90-degrees). In some cases, it would be necessary to widen a side street to one side and narrow its adjacent sidewalk to enable perpendicular parking. Opportunities also exist on or near Third Street to convert vacant or under-used land into off-street parking lots, particularly south of Palou Avenue, where several sites could serve this purpose. It is suggested that before or during final design, MUNI, the DPT, and the Redevelopment Agency jointly coordinate the development of a parking plan, including consideration of off-street parking, for the revitalizing Third Street commercial core.

All parking loss between 24th and Mariposa Streets could be rectified by converting parallel parking to 90-degree parking on one side of some or all of the following streets: Illinois, Tennessee, and Minnesota Streets. On some blocks of these streets, one side of the block is already used for 90-degree parking. It is recommended that MUNI and the DPT develop a parking management plan for this segment of the Third Street Corridor.

Light Rail Alternative - New Central Subway

Construction Impacts

Construction of the New Central Subway would be accomplished in two phases: 1) Line Section 1 from Third/Fourth and King Streets up to Market Street, including the stations at Moscone Center and at Market Street; and 2) Line Section 2 crossing Market Street and following Geary and Stockton Streets to Stockton/Jackson Streets, including the Union Square and Chinatown stations. As discussed in Section 2.0, within each phase's construction zones, all on-street parking would be prohibited. 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 side streets.

Operation and Cumulative Impacts

The New Central Subway alignment would impact on-street parking along Third and Fourth Streets between King Street and the proposed subway portals (Segment 7), in the Union Square parking garage, as well as near the proposed Chinatown station entrances.

Segment 7 - Third and Fourth Streets: King Street to Bryant Street (New Central Subway). The proposed location of the light rail tracks, platforms, and subway portal on Third Street would remove about 64 of the existing 87 on-street parking spaces between King and Bryant Streets (refer to **Table E-26** in Appendix E). All of the parking on the east side of Third Street would be removed. On the west side, parking would be removed between King Street and to a point about 60 meters (200 feet) south of Brannan Street. North of this point, about 23 on-street parking spaces would be retained on the west side of Third Street.

On Fourth Street, all on-street parking (about 23 spaces) would be eliminated from the west side between Townsend and Bryant Streets. Parking would be retained on the east side of the street in these blocks.

Overall, the New Central Subway would displace about 87 parking spaces in Segment 7. Since on-street parking spaces in Segment 7 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.

New Central Subway Stations. The New Central Subway would have four subway stations: Moscone Center, Market Street, Union Square, and Chinatown. The escalators, elevators and stairs serving the Moscone Center, Market Street and Union Square stations are proposed to be located within existing sidewalk areas, so parking would not be affected. However, due to the narrow right-of-way of Stockton Street in Chinatown, a portion of the street's curbs and sidewalks would need to be extended to accommodate the station's entries. Eight on-street parking spaces and a loading area would be eliminated due to the extensions. Most of these parking spaces are metered. One of the spaces is located in front of the Post Office and is reserved for government vehicles. Parking in this area is often at full-occupancy. In addition, two or three parking spaces would be eliminated in the Union Square parking garage due to the proposed underground pedestrian connection (50 additional spaces would be displaced if the bypass tunnel option were constructed).

Mitigation Measures

No significant parking impacts would occur under the New Central Subway. San Francisco has a "transit first" policy, and the displacement of existing automobile parking spaces is not considered a significant impact requiring mitigation. However, resulting less-than-significant impacts could be alleviated or reduced with the following improvement measures.

During construction of the New Central Subway, it is recommended that signs denoting alternative parking areas (e.g., public parking garages) 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 should be considered during the development of the project's final plans.

3.2.6 PEDESTRIANS

This section describes the potential environmental consequences to pedestrian circulation under each of the alternatives.

No Project and No Build/TSM Alternatives

Construction Impacts

No construction impacts would occur under either of these alternatives.

Operation and Cumulative Impacts

Under the No Project and No Build/TSM Alternatives, the sidewalks along the Corridor would not be changed with the exception of those within the Mission Bay area. No sidewalk improvements would be undertaken within the Third Street commercial core and a pathway would not be provided to the waterfront near the proposed maintenance facility at the Western Pacific site (if the eastern side were used). No sidewalk narrowings would occur either. Within Mission Bay, 3.7-meter (12-foot) wide sidewalks would be provided along Third and Fourth Streets as part of the proposed Mission Bay redevelopment project.

Mitigation Measures

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

Light Rail Alternative - Initial Operating Segment

Construction

During construction of the IOS, the sidewalks on both sides of Bayshore Boulevard and Third Street would remain open. All sidewalks would remain open at their existing widths, except in areas where installation of left-turn lanes and station platforms would necessitate narrowing Third Street's sidewalks, and in areas where sidewalks may be widened (see discussion below). During construction of these sidewalk improvements, no more than 1.8 meters (6 feet) of the existing sidewalk, measured from the curb, would be barricaded off for construction activities for up to two weeks. Some pedestrian crosswalks across Bayshore Boulevard and Third Street would need to be temporarily closed, but pedestrians would be re-routed through a nearby crosswalk or facilitated across the street by traffic control personnel.

Operational and Cumulative Impacts

Under the Light Rail Alternative, traffic signals would be installed at most of the existing unsignalized intersections along the Corridor. Pedestrian crossing push buttons, "walk/don't walk" lights, and crosswalks would be provided at the new traffic signals to enable safe pedestrian movements. The signals would be timed to allow the average pedestrian to cross the entire street (Bayshore Boulevard, Third Street, and Fourth Street) at once, without having to first cross to the light rail median and wait for second "walk" indication before walking to the other side of the street.

As discussed in Section 2.4, MUNI is considering two design options for the station platforms: high and hybrid low platforms (refer to **Figures 2-16A/B/C**). High platforms conform with the existing LRV fleet and would provide the most comprehensive accessibility for all MUNI patrons, in particular individuals with disabilities, by providing level boarding at all doors, eliminating any special operational or procedural considerations to accommodate wheelchair users, and eliminating all steps into the vehicle which may be difficult to negotiate for seniors and other individuals with ambulatory disabilities. However, as noted in Section 2.4, the high platforms have less community support than the hybrid low platforms because of the high platform's visually intrusive features, including its height (which obstructs visual connections across the street), and longer ramp lengths, as well as their inability to allow adjacent left-turn lanes or some parking on station area blocks.

While the hybrid low platforms are favored by the community because of the platform's less visually-intrusive design and the ability to allow left-turn lanes or parking, the hybrid low platforms would provide level boarding for wheelchair users and others with mobility impairments solely at the front door of the light rail vehicles. Under the IOS, two-car light rail trains are only expected to operate at the four proposed Mission Bay stations. If hybrid low platforms were installed at these four stations, a wheelchair user in the second car of a two-car train who wanted to disembark would require the MUNI operator to stop twice at the same station. In this way, the wheelchair user in the second car could alight at the platform's mini-high boarding area. It should be noted that elsewhere in MUNI's light rail system, trains currently have to make a second stop at key wayside surface stops in order to enable a wheelchair user to alight. The Americans with Disabilities Act (ADA) requirements do not preclude double stopping to board and alight disabled passengers.

The low level side platforms, based on current design and width limitations, would provide a relatively narrow secondary access ramp to the high boarding area and a narrow alcove area for the second door of the light rail vehicle, potentially causing some pedestrian crowding. In some locations as currently designed, the secondary access ramp would not meet ADA grade specifications. At the request of the MUNI Accessibility Advisory Committee, MUNI is considering a design modification which would provide an ADA-compliant ramp and a wider alcove area. This alternative design would reduce sidewalk widths by 0.3 meters (1 foot).

At center loading platforms, in order to accommodate a high boarding area, the entry ramp onto the platform would be relatively narrow, potentially causing congestion on the platform due to the high occupancy levels anticipated, particularly in Mission Bay. Lastly, because the center loading low level platform design would be a departure from platforms used elsewhere in the MUNI system, and because it requires a somewhat ambiguous path of travel, it may be difficult for visually impaired riders to negotiate.

With the implementation of light rail, there would be changes to Third Street's sidewalk widths at some locations where left-turn lanes and station platforms are provided, as well as in the Third Street commercial core. Generally, accommodation of some left-turn lanes and station platforms would necessitate narrowing Third Street's sidewalks on either side by 0.3 meters (1 foot), from 3.0 meters to 2.7 meters (10 feet to 9 feet). Sidewalks through the commercial core would generally be expanded or stay the same, depending upon which design option is selected.

Under Option 1 in the Third Street commercial core (two traffic lanes in each direction), the sidewalk widths would remain approximately 3.0 meters (10 feet) wide (refer to **Figure 2-10**), except where left turn lanes are provided, requiring the sidewalks to be narrowed to 2.7 meters (9 feet). In most areas, pedestrians on the sidewalk would not be buffered by a row of parked cars, making pedestrians feel more exposed to the traffic flows on Third Street and therefore walking closer to buildings and further from the curb, and reducing the sidewalk's effective width. Because the sidewalks would not be widened, there would be less opportunity for landscaping and pedestrian amenities.

In Option 2 (one traffic lane in each direction), sidewalks would be widened on all blocks throughout the segment. But with just one lane in each direction, significant traffic impacts would occur as previously discussed. Sidewalks would be widened to about 4.3 meters (14 feet) (refer to **Figure 2-11**). For pedestrians, the widening would provide greater freedom of movement and a greater sense of separation from the auto traffic on Third Street, particularly on the blocks that have a buffer of parked cars. Widening the sidewalks could enable street landscaping and businesses to display merchandise or for cafes to serve food.

Option 3 (one hybrid traffic lane in each direction) would reduce the number of travel lanes to one in each direction (again resulting in significant traffic impacts), but would retain on-street parking throughout the commercial core area, including at station areas. As a result, sidewalk widening to 3.7 meters (12 feet) would occur on a limited number of the blocks (refer to **Figure 2-12**). Sidewalk widenings would result in greater opportunity for landscaping and increased space for pedestrian circulation.

Option 4 (one traffic lane and one mixed lane in each direction) would allow for the opportunity to consistently increase sidewalks to 3.7 meters (12 feet) throughout the segment (refer to **Figure 2-13**). This sidewalk widening would result in greater space for pedestrian circulation, allow greater distance between pedestrians and traffic on Third Street, provide a buffer of parked cars for pedestrian safety, and would permit businesses greater flexibility in use of the sidewalk area for permitted sidewalk displays or cafes.

The Bay Trail follows Illinois Street between Mariposa and 24th Streets. A light rail "loop" track is proposed around 18th, Illinois, and 19th Streets. The sidewalks on both sides of Illinois Street would be about 4.6 meters (15 feet) wide. Bay Trail users would primarily use the eastern sidewalk, but those on the western sidewalk would cross the light rail tracks twice (at Illinois Street's corners with 18th and 19th Streets). Light rail train velocities around the corners would be slow and the trains would yield to sidewalk traffic, similar to automobiles turning right. No significant impacts would result.

<u>Mitigation Measures</u>

No significant pedestrian impacts would occur under the IOS. However, it is recommended that if hybrid low platforms are selected, all LRVs and stations should be delineated to instruct wheelchair users to board and alight the first car of multiple car trains.

Light Rail Alternative - New Central Subway

Construction Impacts

During construction of the New Central Subway, the sidewalks on both sides of Third Street, Market Street, Geary Street, and Stockton Street would remain open, except during excavation of the 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 during construction. Some pedestrian crosswalks across 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.

Operation and Cumulative Impacts

Under the New Central Subway, the sidewalks on Third and Fourth Streets between Townsend and Brannan Streets would need to be narrowed on one side, and at three 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.

In order to retain parking on the west side of Third Street between Townsend and Brannan Streets, and on the east side of Fourth Street between these streets, the existing sidewalks (west side on Third Street and east side of Fourth Street) would need to be reduced from 3.0 meters (10 feet) wide to 26.2 meters (8 feet) wide. With the reduction in sidewalk width, moderate pedestrian crowding would occur during peak periods, particularly along Third Street's sidewalks before and after major events at the new Giants 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. Provision of stairways, escalators, and elevators would substantially reduce the effective sidewalk widths near three of the four proposed subway stations, potentially resulting in crowded pedestrian conditions near the access points and along the adjacent sidewalks.[28]

Access to the proposed Moscone Center 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 2-19A**). The existing public sidewalk is just over 3.0 meters (10 feet) wide. The sidewalk's effective width would be between 0.4 and 0.9 meters (1.3 and 3.0 feet) adjacent to the subway access points, creating pedestrian overcrowding. Without mitigation, the resulting sidewalk width would not conform with ADA guidelines nor meet the 1.8-meter (6-foot) minimum clear space policy contained in San Francisco's Downtown Streetscape plan. Pedestrians would therefore walk along the private sidewalk in the adjacent building's outdoor arcade (between the building's columns and its first floor), within a 2.4- to 4.0-meter (8- to 13-foot) wide sidewalk area.

[28] The standard width required for subway station stairway facilities, including the stairs, walls, and curb clearance is 2.1 meters (6.8 feet). The standard width required for subway station escalator facilities, including the escalator, walls, and curb clearance is 2.5 meters (8.3 feet). The standard width required for subway station elevator facilities, including the elevator and curb clearance, is 2.6 meters (8.6 feet). Stand-alone facilities are proposed for the New Central Subway stations to reduce sidewalk impacts (e.g., a combined stairway/escalator facility would require additional sidewalk space).

Access to the proposed Market Street station would be via two sets of stairs, two sets of escalators, and an elevator on both sides of Third Street between Mission and Market Streets (refer to **Figure 2-19A**). The existing sidewalks on both sides are about 4.3 meters (14 feet) wide. Both sidewalk's effective widths would be between 1.7 and 2.2 meters (5.6 and 7.2 feet) adjacent to the subway access points, potentially creating pedestrian overcrowding during peak periods.

Access to the proposed Union Square station would be provided by two sets of stairs, one escalator, and one elevator on the east side of Stockton Street near Post Street and by one escalator on the west side of Stockton Street (refer to **Figure 2-20**). 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 4.6 meters (15 feet) wide, so the east side sidewalk's effective width would be between 2.0 and 2.5 meters (6.6 to 8.2 feet) adjacent to the subway access points. The west side sidewalk, which is also 4.6 meters (15 feet) wide, would have its effective width reduced to 2.1 meters (6.9 feet) near the escalator. Pedestrian overcrowding would occur during peak conditions.

Due to the narrow widths of Stockton Street's sidewalks near Clay Street (2.9 to 3.4 meters, or 9.5 to 11 feet) and since neither of Stockton's curb lanes are used as travel lanes for traffic, the Chinatown subway station's access points would be situated in extended sidewalks, thereby not reducing the existing effective sidewalk widths (refer to **Figure 2-23A**). However, the extended sidewalks would impact on-street parking, as previously discussed. No significant impacts to pedestrian circulation would occur in the vicinity of the Stockton/Clay intersection.

<u>Mitigation Measures</u>

Pedestrian circulation could be impacted significantly near the proposed Moscone Center station's access points. To alleviate significant pedestrian impacts, MUNI should secure an easement with the two adjacent property owners granting irrevocable public access and maintenance of a minimum sidewalk width within the private outdoor arcade. MUNI should pursue the easement during design of the IOS to reserve its future use.

During final design, consideration should be given to using narrower stairways and escalators, and/or to permanently prohibiting parking along the west side of Third Street between Mission and Market Streets (Market Street station) to enable provision of wider sidewalks on both sides of Third Street, as well as maintaining the existing number of travel lanes. Consideration should also be given to widening Stockton Street's sidewalks near the proposed Union Square station and/or using narrower stairways and escalators. Trade-offs between pedestrian circulation impacts and traffic and parking impacts should be further evaluated during final design.

Resulting less than significant pedestrian impacts could be alleviated or reduced with the following improvement measures.

During excavation of the subway stations, access to all abutting businesses should be maintained either through the existing sidewalk area or via temporary access ways, e.g., ramps, planking, etc. Signs should be installed indicated that the businesses are "open during construction." All temporary access ways should be in compliance with the ADA.

With the reduction of the sidewalks on the west side of Third Street and the east side of Fourth Street from 3.0 meters (10 feet) wide to 2.4 meters (8 feet) wide between Townsend and Brannan Streets, moderate pedestrian crowding would occur during peak periods, particularly along Third Street before and after major events at the new Giants ballpark. To reduce the amount of pedestrian crowding, an alternative to narrowing the sidewalks would be to prohibit on-street parking, thereby restoring the existing sidewalks or providing wider sidewalks on both sides of Third and Fourth Streets between Townsend and Brannan Streets. However, it should be noted that this measure would displace 31 on-street parking spaces, including loading zones. It may also require realignment of the proposed light rail line and the location of the subway portals, causing other impacts. This alternative could be further evaluated during final design.

During final design, elevators should 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 should be located so as not to block sight lines for motorists exiting the adjacent parking garage. Likewise, the proposed elevators on both sides of Third Street just south of Stevenson Street should be relocated, either to the north side of Stevenson Street, further south along Third Street, or instead along Stevenson Street. Consideration should also be given to locating elevators inside adjacent private buildings or plazas. In all cases, efforts should 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 should be given to the locations of stairways and escalators.

3.2.7 BICYCLES

Most of Third Street is designated as a Bicycle Route, consistent with the City's adopted Bicycle Plan. Bicyclists typically travel in the 3.0-meter (10-foot) wide outside travel lanes, sharing the lanes with motorists. With the current moderate traffic levels and extra traffic capacity provided with three through lanes in each direction, bicycle travel generally occurs without major impedance or safety problems.

As bicycle travel becomes more common in the Corridor, the potential for conflicts between motorists and bicyclists could increase. While the width of the outside travel lane would remain at a minimum of 3.0 meters (10 feet) (except under some of the Third Street commercial core options), the reduction in the number of lanes would result in greater use of the outside travel lane by motorized vehicles and more competition for the limited space between bicycles, autos, and trucks. There would also be less opportunity for bicyclists to maneuver to avoid sudden obstacles, such as the door opening at a parked car. The impacts associated with each of the alternatives are discussed below.

No Project and No Build/TSM Alternatives

<u>Construction Impacts</u>

No construction impacts would occur under either of these alternatives.

<u>Operation and Cumulative Impacts</u>

Under the No Project and No Build/TSM Alternatives, the San Francisco's Bicycle Plan recommendation of providing 1.8-meter (6-foot) wide bicycle lanes on Third Street between Mariposa and Bayshore Boulevard could be accomplished by removing at least one traffic lane (or perhaps a traffic lane in each direction) and/or removing on-street parking along Third Street. In developing alternative bicycle lane designs, the environmental impacts associated with traffic lane and/or on-street parking removal would need to be assessed (the potential traffic impacts of reducing the number of travel lanes has been assessed within the context of the addition of a light rail line).

As part of the Mission Bay development, a signed bicycle route is proposed along Fourth Street between the Mission Bay Channel and Mariposa Street. Bicyclists will be accommodated, adjacent to a parking lane, in a 5.2-meter (17-foot) combined travel and bicycle lane during the non-peak periods. During peak periods and in the peak traffic directions, on-street parking will be prohibited and bicyclists will share a 4.6-meter (15-foot) curb lane with traffic. Under the No Build/TSM Alternative, bicyclists would share Third Street's outside 3.0-meter (10-foot) lanes with an increased number of 15-Third and other buses. Bicycling would be inconvenient within the narrow shared lanes.

Mitigation Measures

No significant bicycle impacts would occur under the No Project and No Build/TSM Alternatives. Under both alternatives, bicycle lanes could be striped on both sides of Third Street between Arthur Street/Cargo Way and Cesar Chavez Street, where on-street parking would continue to be prohibited under both alternatives. The bicycle lane would not continue beyond this segment unless additional on-street parking is removed.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

As discussed previously, the IOS would be constructed on a roadway segment-by-segment basis, requiring the curb parking lane to be used as a travel lane to maintain at least two travel lanes in each direction along Bayshore Boulevard and Third Street. Due to the reduction from three to two in the number of travel lanes, the curb or outside travel lane would become more congested with automobiles, trucks, and buses, and would pose a greater challenge for bicycle travel.

Operation and Cumulative Impacts

The provision of light rail tracks and platforms along Third Street would require the removal of one traffic lane in each direction, ultimately resulting in two traffic lanes in each direction, and the retention of on-street parking, where feasible. Generally, the typical roadway cross-section along Third Street would consist of 3.0-meter (10-foot) wide traffic lanes, 2.4-meter (8-foot) wide parallel parking lanes, and 3.0-meter (10-foot) wide sidewalks, except in the Third Street commercial core where four options are being considered. It would not be possible to provide both the proposed light rail system and designated bicycle lanes along Third Street unless all or almost all of the on-street parking was removed and many sidewalks were narrowed, and/or only one traffic lane in each direction was provided. Although Third Street could still be signed as a bicycle route and overall traffic speeds would decrease, most portions of the street would be inconvenient for bicycling since riders would need to share a 3.0-meter (10-foot) wide traffic lane located adjacent to parallel on-street parking areas.

Within the Third Street commercial district, four roadway cross-sections are under study. As discussed in Section 2, each of the options between Thomas and Kirkwood Avenues would have different outside traffic lane widths. All four options would have some on-street parking along both sides of Third Street. Option 1 (refer to **Figure 2-10**) would provide two traffic lanes in each direction, with a right-hand travel lane width of 3.0 meters (10 feet). The sidewalks would retain their 3.0-meter (10-foot) width. Bicycling within the shared lane would be inconvenient due to the narrow lanes and the presence of parked cars.

Option 2 (refer to **Figure 2-11**) would provide only one through traffic lane in each direction, causing significant traffic impacts as previously discussed, but the lanes would each be 4.9 meters (16 feet) wide and most of the sidewalk segments would be widened an extra 1.2 meters (4 feet). Bicyclists could share this wide roadway more safely with vehicles, especially since average vehicle speeds would be well under five miles per hour through the congested nine-block segment.

Option 3 (refer to **Figure 2-12**) would have only one through traffic lane in each direction, again resulting in significant traffic impacts, but the lanes would be 4.3 meters (14 feet) wide with additional on-street parking. Sidewalks would remain 3.0 meters (10 feet) wide in some segments, but would be increased to 3.7 meters (12 feet) along six block faces. Bicyclists would benefit with the 4.3-meter (14-foot) wide shared lane, but conflicts could still arise even though the average vehicle travel speeds through the commercial core would be under five miles per hour.

Finally, Option 4 (refer to **Figure 2-13**) would have two through traffic lanes in each direction, with the inside lanes serving both light rail vehicles and automobile traffic. The outside lanes would generally be 3.4 meters (11 feet) wide and adjacent to 2.4-meter (8-foot) parking lanes. Sidewalks would be widened to 3.7 meters (12 feet). Under this option, more vehicles would likely use the outside lanes to avoid sharing the inside lanes with the light rail train. Overall, bicycling within the shared lane would be inconvenient due to the narrow lanes and the presence of parked cars in the outside lane.

Mitigation Measures

The San Francisco Bicycle Plan recommends 1.8-meter (6-foot) wide bicycle lanes on Third Street between China Basin and Bayshore Boulevard. With the implementation of light rail, the installation of bicycle lanes would not be possible and bicycle travel would be constrained, resulting in a potentially significant impact.

The Bicycle Plan identifies another Priority 1 bicycle route (Route 7), designed to provide an alternative to the proposed Third Street route (Route 5) between Carroll Avenue and Mariposa Street. Although Route 7 is less direct than Route 5, it is recommended that Route 7 be upgraded to provide an alternative to Route 5 between these streets. Route 7 would be safer for bicyclists and "it offers the advantage of generally following streets with much lower traffic volumes than Third Street and provides additional inter-route connections and additional neighborhood access" according to the Bicycle Plan. Increased bicycle signing and establishment of bicycle lanes on this route, as well as on other nearby streets, could be explored to further enhance alternatives to Third Street. It is also recommended that bicycle lanes be striped on both sides of Third Street between Arthur Street/Cargo Way and Cesar Chavez Street, where on-street parking would continue to be prohibited under the Light Rail Alternative. **Since Route 7 terminates at Carroll Avenue (from Keith Street), consideration should be given to extending Route 7 along Carroll, Jennings, and Gilman Avenues to Third Street's intersection with Gilman/Paul Avenues, where other bicycle routes meet. South of Gilman Avenue, opportunities to improve bicycle circulation along Third Street and Bayshore Boulevard should be further explored. For example, if found feasible during final design of the light rail system, bicycle lanes could be striped on both sides of Bayshore Boulevard.**

Many bicycle riders would still prefer traveling along Third Street **and Bayshore Boulevard in lieu of alternative, less direct routes.** The Bicycle Plan states a goal of installing racks on MUNI motor coaches, trolley coaches, and possibly LRVs (light rail vehicles)." Thus, it is recommended that MUNI consider establishing a policy providing for the accommodation of bicycles on the Third Street light rail vehicles. Similar "bikes on transit" programs are used elsewhere in the United States, although they often limit the number of bicycles on LRVs to two per vehicle and sometimes only permit bicycles on board during non-commute periods. Resulting less-than-significant bicycle impacts could be alleviated or reduced with the following improvement measures.

During construction of the IOS, every effort will be made to retain a wide curb or outside travel lane to facilitate bicycle use. Where this is not possible, signage should be erected to indicate temporary alternative routes for bicyclists.

To provide a safer bicycling environment within the Third Street commercial core, extra pavement could be dedicated to the outside travel lane rather than extending the sidewalk from its current 3.0-meter (10-foot) width for Option 4 (mixed-flow option). This improvement measure would not be compatible with the one-lane options (Options 2 and 3) since it would result in significant traffic impacts, nor the two-lane option (Option 1), which retains the existing 3.0-meter (10-foot) wide sidewalk. Under the mixed-flow option, the sidewalks would not be widened an extra 0.6 meters (2 feet), but instead the difference would be applied to the outside traffic lane, resulting in a 4.0-meter (13-foot) wide lane, adjacent to a 2.4-meter (8-foot) wide parking lane, that could more conveniently accommodate both bicycles and vehicles. It should be noted, however, that many Bayview Hunters Point residents prefer wider sidewalks.

Under the Light Rail Alternative, bicycle actuation devices (detectors) should be placed at all new and existing traffic signals along the proposed light rail alignment. Appropriate pavement markings and/or signing should be installed in locations where a bicycle would typically cross the light rail tracks at a skewed angle.

Light Rail Alternative - New Central Subway

Construction Impacts

As discussed previously, during construction of the New Central Subway 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 would be challenging. During construction along Geary and Stockton Streets, only one lane would be maintained at times, also posing greater risks for bicyclists.

Operation and Cumulative Impacts

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 3.0 meter (10-foot) wide outside travel lanes. Bicyclists would not be significantly impacted. Similarly, the traffic lane widths on Fourth Street, between King and Bryant Streets, would generally remain the same as they currently are.

No impacts to bicyclists are foreseen near the proposed Moscone Center, 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.

Mitigation Measures

No significant bicycle impacts would occur under the New Central Subway. To alleviate or reduce a less-than-significant impact, it is recommended that during construction of the New Central Subway, every effort will be made to retain a wide curb or outside travel lane to facilitate bicycle use. Where this is not possible, signage should be erected indicating temporary alternative routes for bicyclists.

4.0 AFFECTED ENVIRONMENT

4.1 LAND USE

4.1.1 ADOPTED PLANS AND POLICIES

Adopted land use goals and policies that currently guide development along the Project (including the New Central Subway area) are contained in the various Elements and Area Plans which comprise the San Francisco General Plan. Adopted plans of the San Francisco Redevelopment Agency, the Port of San Francisco, the San Francisco Department of Parking and Traffic, MTC and BCDC also guide development in the project area. In addition, under the federal Coastal Zone Management Act (CZMA), local projects that would affect the coastal zone and that 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 Third Street Light Rail Project are described below, as well as relevant regional plans adopted by BCDC and MTC. Specific objectives and policies relevant to this project are listed in Appendix B.

City and County of San Francisco

This section describes various elements of the City and County of San Francisco's General Plan, as well as specific Area Plans, that contain adopted land use goals and policies which currently guide development in the Third Street Corridor. (These plans and associated environmental review documents are available for public review at the City Planning Department, 1660 Mission Street in San Francisco). The General Plan Elements reviewed below include the Commerce and Industry Element, the Transportation Element and the Environmental Protection Element. The Area Plans reviewed are the Central Waterfront, Chinatown, Downtown, Mission Bay, the Northeastern Waterfront, Rincon Hill, South Bayshore, and South of Market Plans. This section also describes Redevelopment Plans that have been adopted in the study area. Descriptions are also provided for San Francisco's recently adopted Bicycle Plan, the San Francisco County Transportation Authority's Strategic Plan, and the Port of San Francisco's Draft Waterfront Land Use Plan.

<u>General Plan</u>

<u>Commerce & Industry Element.</u>[1] The Commerce and Industry Element of the San Francisco General Plan guides both the public and private sector in making decisions related to economic growth and change in the City. 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 Plan are continued economic vitality, social equity, and environmental quality in the City and County of San Francisco.

<u>Transportation Element.</u>[2] The Transportation Element of the San Francisco Master Plan focuses on meeting the travel needs of residents and visitors, and improving the environment. A rail transit line linking the Third Street and Geary Corridors has been included in this element since the 1970s. 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)

[1] City and County of San Francisco, City Planning Department. *Commerce & Industry Element of the General Plan.* Adopted June, 1978, amended June, 1997.
[2] City and County of San Francisco, City Planning Department. *Transportation Element of the General Plan.* Adopted June, 1978, amended June, 1997.

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 21.1, which 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 a future rail/fixed guideway transit corridor along Third Street that connects with rail transit along the Geary Corridor, as well as the Chinatown/North Beach Corridor.

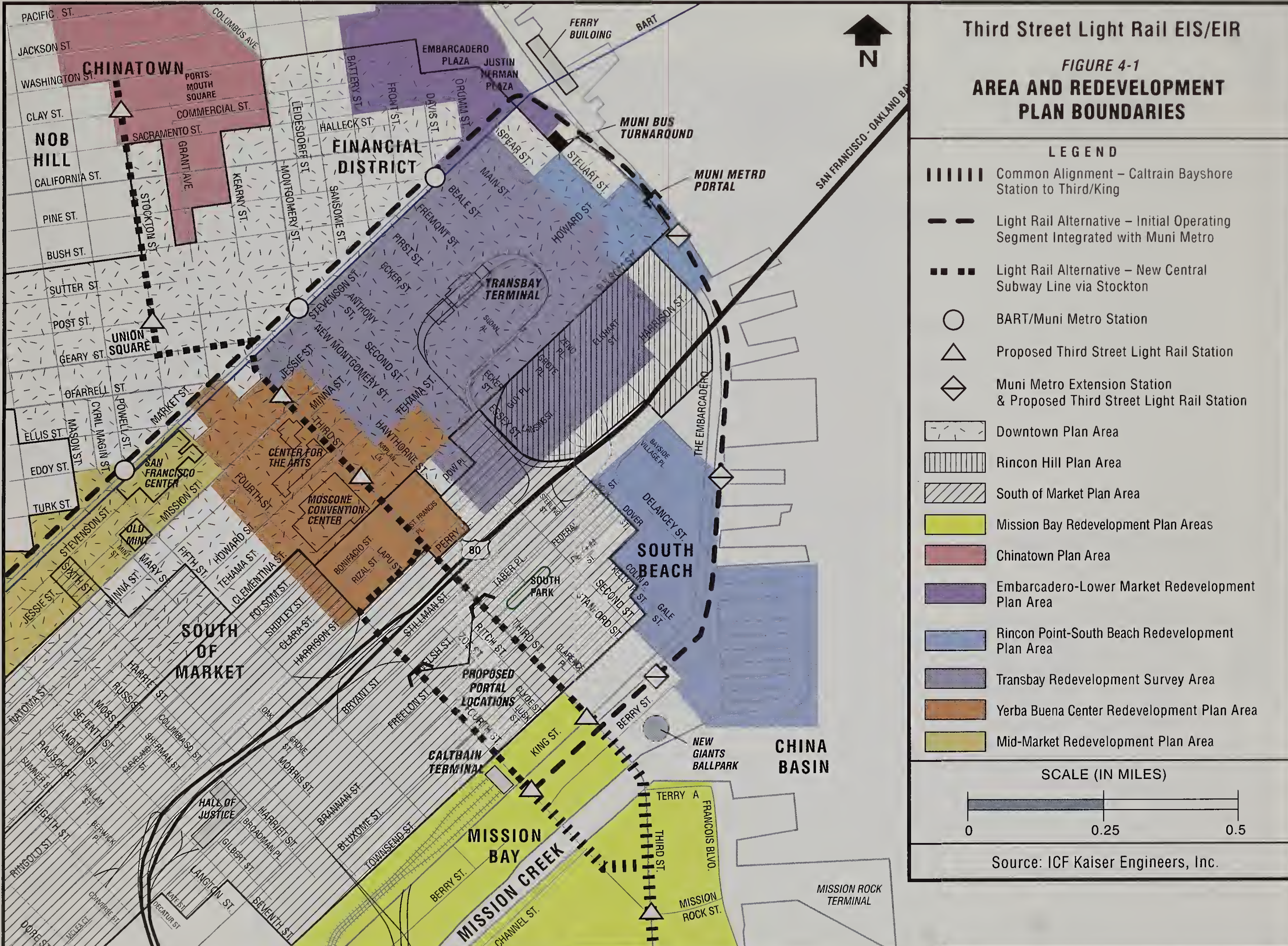
Environmental Protection Element.[3] The Environmental Protection Element addresses the impact of urbanization, including the use of oil and gas resources and the production of hazardous waste, on the natural environment. The element has three sections: the first section addresses natural resource conservation, the second transportation noise and the third is an energy management plan. While the element does not specifically address the Third Street Light Rail 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.

Area Plans

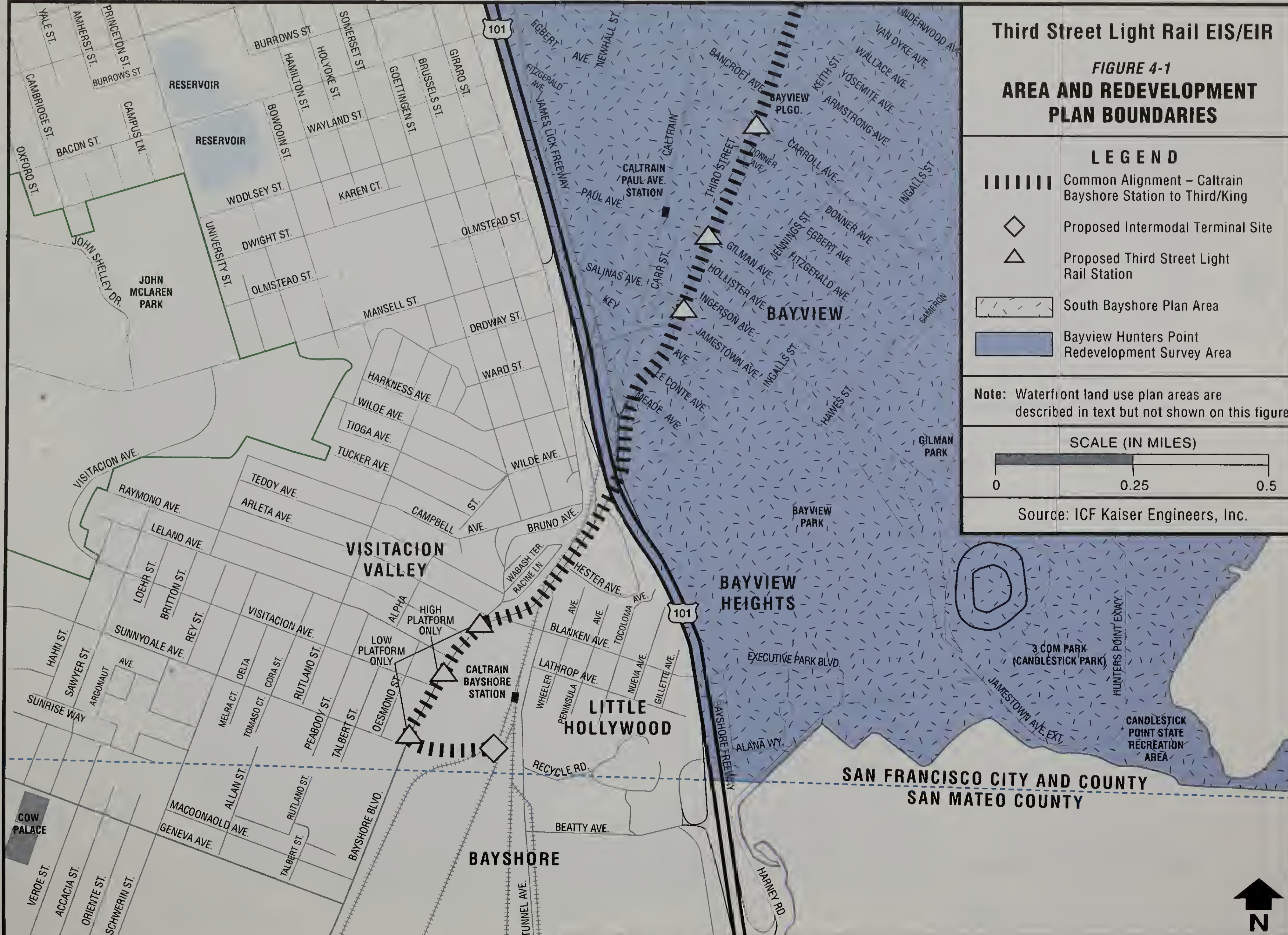
Central Waterfront.[4] The Central Waterfront Plan addresses the waterfront area from Mission Creek and Townsend Street on the north to Islais Creek on the south. South of 17th Street the plan area extends inland to the 280 Freeway, and north of 17th Street to the 101 Freeway. The plan area also includes the Showplace Square area to the west. Part I of the Central Waterfront plan contains objectives and policies for the Showplace Square, Central Basin, North Potrero, Islais Creek and Lower Potrero subareas. Objectives for the Mission Bay subarea are contained in Part II of the Plan, published separately as the Mission Bay Plan. All three project alternatives lie within the Central Waterfront Plan Area. The objectives and policies of the plan are designed to: 1) increase employment opportunities for the City's unemployed and underemployed residents; 2) enhance the working environment to stimulate business growth; and 3) improve the appearance and attractiveness of the area. The plan includes a policy to extend a light rail vehicle line through the Central Waterfront along the Third Street Corridor to the Southern Pacific Depot and the proposed Embarcadero rail line. The boundaries for the Central Waterfront Plan Area, as well as for the additional planning areas discussed below, are shown on **Figure 4-1**.

The Central Waterfront Area Plan is currently in the process of being amended to make it consistent with the Port of San Francisco's Waterfront Land Use Plan, discussed below. The majority of the proposed amendments update information on cargo industry trends and the Port's maritime facilities in the plan area. Since the Port's Waterfront Land Use Plan designates most of this area to remain in ship repair, cargo and other maritime uses, there are few proposed changes in land use policy, except for two areas: 1) a portion of Pier 70 (the area nearest Illinois Street including three historic Union Iron Works buildings); and 2) the former Western Pacific property adjacent to Pier 80. The amendments proposed for the Central Waterfront Plan are consistent with the Waterfront Land Use Plan and with BCDC's regional Seaport Plan and would allow these two areas to be developed for either maritime or non-maritime use. The Western Pacific property is one of the two sites proposed for the new LRV maintenance facility.[5]

[3] City and County of San Francisco, City Planning Department. *Environmental Protection Element of the General Plan.* Adopted 1973, amended August, 1995.
[4] City and County of San Francisco, City Planning Department. *Central Waterfront Area Plan.* Adopted July, 1980, amendments pending.
[5] Memorandum from Douglas Wong, Executive Director of the Port of San Francisco, to Members of the Port Commission. September 17, 1997.



J96-082.86 3rd St. (1/7/98)



Third Street Light Rail EIS/EIR

FIGURE 4-1

AREA AND REDEVELOPMENT PLAN BOUNDARIES

LEGEND

- Common Alignment – Caltrain Bayshore Station to Third/King
- Proposed Intermodal Terminal Site
- Proposed Third Street Light Rail Station
- South Bayshore Plan Area
- Bayview Hunters Point Redevelopment Survey Area

Note: Waterfront land use plan areas are described in text but not shown on this figure.

SCALE (IN MILES)

0 0.25 0.5

Source: ICF Kaiser Engineers, Inc.

J96-082.89 3rd St. (1/7/98)

Chinatown.[6] 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 Street to Bush Street). The New Central Subway lies partially within the Chinatown planning 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.

Downtown.[7] The IOS lies for the most part on the periphery of the Downtown Plan area, but runs through the plan area along Market Street, between The Embarcadero and the light rail northern terminus. The New Central Subway bisects the Downtown Plan area. The Downtown Plan Area is one of the City's most flexible areas, permitting almost every type of use except for manufacturing and automotive services. 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.

Since adoption in 1973 of the "Transit First" transportation policy, the Downtown Element and the General Plan, as a whole, call for accommodating future job growth 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.

Mission Bay.[8] The Mission Bay Plan addresses an area of approximately 120 hectares (300 acres) bounded by Townsend, Mariposa and Seventh Streets and China Basin. The IOS would run through the entire length of this plan area. The Mission Bay Plan, originally adopted as an element of the City's General Plan, envisioned an area with a balanced mixture of residential and commercial uses linked by an extensive open space system. The plan also called for establishing a separate right of way for MUNI Metro light rail vehicles.

The Mission Bay project, located within the plan area, was approved by the City in 1991. The project plan provided for almost 464,500 square meters (5 million square feet) of office space, 83,600 square meters (900,000 square feet) of industrial and institutional space, and 8,700 residential units. The Catellus Development Corporation, the developer of the Mission Bay project, withdrew from its original development agreement with the City and has proposed, in conjunction with the San Francisco Redevelopment Agency, a new development program. Two related redevelopment plans, Mission Bay South and Mission Bay North Redevelopment Plans, are currently undergoing environmental review. These plans call for construction of 3,000 new housing units north of China Basin and 3,000 new housing units south of China Basin.

In addition, a retail complex with 55,700 square meters (600,000 square feet) of commercial retail and entertainment space would be constructed north of China Basin, next to the new Giants ballpark. A new University of California at San Francisco (UCSF) campus would be constructed on 17.4 hectares (43 acres) along Fourth Street, north of 16th Street. The plan also calls for at least 15 hectares (38 acres) of

[6] City and County of San Francisco, City Planning Department. *Chinatown Area Plan*. Adopted February, 1987, amended July, 1995.
[7] City and County of San Francisco, City Planning Department. *Downtown Plan*. Adopted November, 1984, amended March, 1997.
[8] City and County of San Francisco, City Planning Department. *Mission Bay Plan*. Adopted January, 1990, amended September, 1990.

open space and two acres for community services, including an elementary school and police and fire stations. Adoption of these plans, as proposed, would require amendments to various elements of the San Francisco General Plan, and would replace the current Mission Bay Plan.

Northeastern Waterfront.[9] The Northeastern Waterfront Plan area extends south from Municipal Pier in the Fisherman's Wharf area to Pier 46 in North China Basin. The Northeast Waterfront Plan's primary goals are to: 1) maintain and expand maritime uses where piers are structurally sound; 2) develop open space and water-oriented recreation uses on land no longer needed for maritime purposes; 3) develop inland areas for residential and office use, and 4) reintegrate the waterfront with the rest of the City. This last goal is to be accomplished by removing physical barriers (such as the Embarcadero Freeway) that separate the plan area from the rest of the City, landscaping The Embarcadero to make it a more attractive connector to other portions of the waterfront, and siting rail transit, as well as pedestrian and bike paths, to reduce the volume of traffic on the existing roadway. The plan includes a policy to establish a transit line between the South of Market area and the Fisherman's Wharf area, which primarily would make use of existing railroad tracks, including those on The Embarcadero, and which would connect to numerous other transit lines and to a parking facility at the southern end.

The Northeastern Waterfront Area Plan, like the Central Waterfront Area Plan, is currently being amended to make it consistent with the Port of San Francisco's Waterfront Land Use Plan. Many of the proposed amendments provide updated information on land use and land use trends in the plan area, such as the transition of adjacent inland areas from industrial and maritime support uses to office, residential and commercial uses.

Rincon Hill.[10] Rincon Hill is a twelve-block area located between Folsom Street and the Bay Bridge, and between Steuart and Second Streets. The IOS runs along the eastern periphery of the plan area. The Rincon Hill Plan contains objectives and policies to transform the industrial area into mixed use neighborhoods in order to maximize future residential development. The plan proposes office, recreation, service retail and housing uses. The residential subarea proposed in the plan is an "L" shaped area on the southeastern periphery of the plan area. The remainder of the plan area is intended for commercial/industrial use, except for two pockets of residential development south of Folsom and a third area at Harrison and Essex. Retention and adaptive reuse of older structures is encouraged, as is in-fill development with commercial and industrial uses.

South Bayshore.[11] The Third Street Corridor would divide the South Bayshore Plan Area into two subareas--one lying west of Third Street and the other east of it. The South Bayshore area, commonly known as Bayview Hunters Point, is bounded by Bayshore Boulevard to the west, the San Francisco Bay to the east, Army Street and Islais Creek to the north, and the County line to the south. The plan recognizes that the South Bayshore area is at a critical juncture as growth in San Francisco proceeds in a southeasterly direction toward the plan area. The principal objectives for land use in the plan area are to: 1) achieve a favorable balance among residential, industrial, commercial and open space uses; 2) stimulate development in underused and declining areas; protect the area's low-scale physical character; and 3) increase pedestrian-oriented neighborhood commercial and social activities. The principal objective for transportation planning for the area is to provide the transportation services necessary to maintain the economic vitality of South Bayshore and improve the livability of residential neighborhoods. A primary goal of the plan is to develop a system "for the easy movement of people and goods, taking into account the anticipated needs of both local and through traffic." To accomplish this objective, Policy 4.3 states that

[9] City and County of San Francisco, City Planning Department. *Northeastern Waterfront Area Plan.* Adopted January, 1977, amendments pending.
[10] City and County of San Francisco, City Planning Department. *Rincon Hill Area Plan.* Adopted July, 1985, amendment pending.
[11] City and County of San Francisco, City Planning Department. *South Bayshore Plan.* Adopted February, 1970, comprehensive revision July, 1995.

"Special consideration should be given to a light rail system along Third Street as the nucleus for public transit improvements and for stimulating wider public transit usage and social/economic revitalization."

South of Market.[12] The South of Market Area (SOMA) is an economically, socially, and culturally diverse plan area of approximately 140 hectares (350 acres). SOMA is an irregularly shaped area extending roughly from Mission Street on the north to Townsend on the south, and from the 101 Freeway on the west to First Street on the east. The proposed New Central Subway would lie within the boundaries of the South of Market plan area.

Primary goals of the City's South of Market Area 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. The plan states that, on the whole, SOMA is well served by transportation facilities; freeways, 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 than others, particularly for mass transit. 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 the core of the western portion of SOMA.

Redevelopment Plans

Hunters Point Shipyard Redevelopment Plan.[13] A redevelopment plan for reuse of the Hunters Point Shipyard was adopted in July 1997, and a Draft EIR was published in November 1997. The Shipyard, situated on San Francisco Bay at the eastern edge of the Bayview Hunters Point neighborhood, occupies approximately 200 hectares (500 acres). Under the preferred reuse plan, the shipyard would have over 3,000 jobs, 1,100 new housing units and a resident population of 2,860 by 2010. By 2025, the shipyard would have a total of over 6,400 jobs, 1,300 housing units and a population of as many as 3,150 persons.

Hunters Point Redevelopment Plan.[14] The Hunters Point Redevelopment Project, lying roughly between Mendell, Galvez, Oakdale Streets and Hunters Point Boulevard, is approximately one block east of Third Street. The plan, which is essentially built-out, proposed housing and support services (such as shopping, public and institutional uses) to serve low- and moderate-income households. Approximately 2,600 dwelling units--a combination of market rate, subsidized, and cooperative housing--have been built. Approximately 18 acres of land for park/recreation purposes and 4.5 hectares (11 acres) of land for educational uses also were developed as part of this redevelopment project.

India Basin Industrial Park Redevelopment Plan.[15] The India Basin Industrial Park Redevelopment Project abuts the proposed project corridor immediately to the east. The plan area boundaries are approximately Arthur Street to the north, Third Street to the west, Galvez to the south, and Jennings to the east. The redevelopment area, which contains a major postal facility on Evans Street, has essentially been built out, and the redevelopment plan for the area expires in 1999.[16] The plan proposed two separate industrial districts for the area--District 1, south of Evans Street, was proposed for light industry and District 2, lying for the most part north of Evans Street, was proposed for major industry. The plan also proposed up to

[12] City and County of San Francisco, City Planning Department. *South of Market Area Plan.* Adopted February, 1990, amended July, 1995.
[13] San Francisco Redevelopment Agency. *Hunters Point Shipyard Redevelopment Plan.* Adopted July, 1997.
[14] San Francisco Redevelopment Agency. *Hunters Point Redevelopment Plan.* Adopted January, 1986, amended December, 1994.
[15] San Francisco Redevelopment Agency. *India Basin Industrial Park Redevelopment Plan.* Adopted January, 1969, amended December, 1994.
[16] Erwin Tanjuaquio, Associate Planner, Technical Services Division, San Francisco Redevelopment Agency, personal communication. August, 1997.

196,000 square feet of land for retail and business service purposes. Residential uses are not permitted in the redevelopment project area.

Bayview Industrial Triangle Redevelopment Plan.[17] This small redevelopment project, bounded by Third, Phelps and Kirkwood Streets was created in 1980, but it was never funded. Although new developments in this area must be consistent with the redevelopment plan in effect for the area, no redevelopment funding is available at present for such projects. The redevelopment area abuts the Corridor, with Third Street as the eastern boundary of the redevelopment area.

Rincon Point-South Beach Redevelopment Plan.[18] The Rincon Point-South Beach (RP-SB) Redevelopment Plan Area is made up of two non-contiguous subareas; the Rincon Point subarea extends roughly from Mission Street to Harrison Street along the waterfront, and the South Beach subarea extends from Bryant Street to the entrance of the China Basin Channel. The IOS would run through the South Beach subarea and along the eastern perimeter of the Rincon Point subarea. The primary goals of the RP-SB plan are to: 1) remove substandard building in order to encourage private development of mixed-income housing; 2) create two new waterfront parks, including a small boat marina; 3) reroute and improve The Embarcadero; and 4) preserve and reuse for commercial purposes historic buildings in the plan area. Approximately 2,000-3,500 dwelling units are proposed for the two subareas. Commercial space is to be oriented toward neighborhood serving operations. Commercial and residential spaces have been completed in much of the project area or are under construction. The boat harbor has been completed and work will continue on the open space areas in the near future.

Yerba Buena Center Redevelopment Plan.[19] Yerba Buena Center is a 35-hectare (87-acre) combined rehabilitation and new development project located between Market, Harrison, Second, and Fourth Streets. The New Central Subway would run through this redevelopment area. The Yerba Buena Redevelopment Plan proposes mixed-use development around the Yerba Buena Gardens, incorporating major hotel, office, housing, retail, recreational and cultural uses. The plan designates 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." Major elements of the plan which have been completed include the Moscone Convention Center, The Center for the Arts/Yerba Buena Gardens, The Museum of Modern Art, three major hotels, 1,800 residential units, and commercial retail establishments. Future development plans include a children's entertainment and child care complex, an entertainment/retail complex, a Mexican Museum, a 44,128-square meter (475,000-square foot) office tower, and two residential/hotel sites. Expansion of the Moscone Convention Center is also proposed within this area.

Embarcadero-Lower Market Redevelopment Plan.[20] The Embarcadero-Lower Market Redevelopment Plan Area, also know as the Golden Gateway Redevelopment Area, addresses an area of approximately thirty blocks, primarily between Sacramento Street and Broadway to the north and south, and Battery Street and the former Embarcadero Freeway corridor to the west and east. The IOS would run through this redevelopment area.

The Golden Gateway Redevelopment Plan, adopted almost 40 years ago, has been fundamentally built out.[21] Implementation of the plan began in the early 1960s. A major objective of the plan was to establish a residential area between Sacramento and Clay and Battery and Ferry Park just west of The Embarcadero.

[17] San Francisco Redevelopment Agency. *Bayview Industrial Triangle Redevelopment Plan.* Adopted 1980.
[18] San Francisco Redevelopment Agency. *Rincon Point-South Beach Redevelopment Plan.* Adopted January, 1981, amended December, 1994.
[19] San Francisco Redevelopment Agency. *Yerba Buena Center Redevelopment Plan.* Adopted April, 1966, amended November, 1994.
[20] San Francisco Redevelopment Agency. *Embarcadero-Lower Market Redevelopment Plan.* Adopted May, 1959, amended November, 1995.
[21] Tom Conrad, Principal Planner, Technical Services Division, San Francisco Redevelopment Agency. Personal communication. August, 1997.

The Plan proposed 1,654 multifamily dwelling units, with a density of 160-300 persons per net acre. Approximately 1,400 dwelling units have been created to date. The plan proposed a maximum of 27,100 square meters (292,000 square feet) of commercial development for the area; six office towers (the Embarcadero Center) with commercial uses at the lower levels comprise the core of the redevelopment project area today. The redevelopment area also includes a large hotel and several open spaces, the largest of which is Justin Hermann Plaza.

San Francisco Bicycle Plan[22]

The City and County of San Francisco Department of Parking and Traffic (DPT) recently completed the San Francisco Bicycle Plan. This plan was adopted in December 1996. 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 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 entire length of the Corridor along Third Street is a designated as Bike Route 5. For Route 5, the Bicycle Plan recommends the creation of a six-foot-wide, marked bike lane on each side of Third Street from China Basin to Bayshore Boulevard. A six-foot-wide bicycle lane is also recommended along the entire length of The Embarcadero. At varying points along the Embarcadero Roadway where there is no on-street parking, the plan states that bicycle lanes five feet in width would be acceptable. The plan states that, wherever possible, streets selected for bike routes were those without transit or heavy truck traffic. In some parts of the City, however, geography or other factors necessitated selecting routes with transit or heavy truck traffic. The plan makes reference to the proposed IOS alignment along Third Street and acknowledges that it does not appear that the width of Third Street can accommodate both bike lanes and light rail tracks. The plan states that DPT has informed MUNI that Third Street is part of the bicycle route network shown in the City’s Transportation Element and in its Bicycle Plan. The plan also acknowledges that although Third Street has been identified by the Port of San Francisco as a major route for cargo trucking, given the present level of cargo truck traffic on the street and the lack of other direct routes for alternatives, Third Street has been selected as a bicycle route for this area.

Three additional bike routes are also designated in the Bicycle Plan in the vicinity of Third Street. Route 7 is intended as an alternative to Route 5 between Carroll Avenue and Mariposa Street. This route generally follows streets with lower traffic volumes than Third Street, provides additional inter-route connections and better neighborhood access. The route begins at Third Street and Carroll Avenue and proceeds to Keith Street, then to Palou Avenue, Phelps Street, Third Street, Cesar Chavez, and then along Indiana to Mariposa Street. Route 7 rejoins Third Street at Mariposa. Route 17 follows Stockton Street between Broadway and the Sutter/Post Street one-way couplet. This route is intended to serve Chinatown, Union Square and the Financial District. Route 19 follows Fourth Street between Third Street and Townsend Street, along Townsend to Fifth and along Fifth to Market. The Bicycle Plan acknowledges that Fourth Street (between Third and Townsend) is classified in the Transportation Element as an important truck route, a Transit Important Street and a Major Arterial. The Bicycle Plan notes that provisions would need to be made to accommodate bicycles on this segment of Fourth Street without interfering with the operation of other primary transportation modes.

[22] City and County of San Francisco, Department of Parking and Traffic. *San Francisco Bicycle Plan.* Adopted December, 1996.

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 San Francisco County Transportation Authority prepared a Strategic Plan in 1993[23], which is to be updated every two years, to verify funding commitments to specified transportation improvement projects. The 1995 Strategic Plan Update identifies the Third Street Light Rail Project as one of four major programs or projects to which over 70 percent of the Proposition B revenues will be committed over the next nine years.[24] In addition, in June 1995 the San Francisco County Transportation Authority passed a resolution adopting the Four Corridor Plan, effectively designating the Bayshore Corridor as the top priority for fixed guideway projects funded with Proposition B revenues. The Four Corridor Plan identifies four corridors--Bayshore, Van Ness, Geary and North Beach--to be upgraded with fixed guideway transit lines over a 20-year period. The Bayshore Corridor is listed as Phase One of the long range plan to construct rail transit in all four corridors. All of the projects will be funded, at least in part, by Proposition B funding.[25]

The Four Corridor Plan recommends that the Bayshore Corridor (Third Street) rail line begin at the 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/Kearney Streets to a terminus near California Street. The plan recommends that, if leveraged funds are 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 states that this portion of the line (the IOS) could be constructed with Proposition B funds alone.[26]

The Port of San Francisco Waterfront Land Use Plan[27]

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 12-kilometer (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. The EIR for this plan was certified in January 1997, and the Port Commission adopted the plan in 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 must be consistent with the state, regional, and local regulations which now govern waterfront land use. The principal plans and regulations for which amendments will be proposed and considered include the City's General Plan and Planning Code, as well as the BCDC plans described below.

The Waterfront Land Use Plan Area is divided into five subareas: 1) the Fisherman's Wharf waterfront; 2) the Northeast waterfront; 3) the Ferry Building waterfront; 4) the South Beach/China Basin waterfront; and 5) the Southern waterfront. Segments of both the proposed IOS and the proposed New Central Subway would lie within the Ferry Building and South Beach/China Basin subareas of the plan area. In addition, both the Cargo Way and Western Pacific maintenance facility sites are in the Waterfront Plan Area.

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: 1) a working waterfront; 2) a revitalized port; 3) a diversity of activities for residents and visitors; 4) improved access to and along the

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[23] San Francisco County Transportation Authority. *Strategic Plan.* May, 1993.
[24] San Francisco County Transportation Authority. 1995 *Strategic Plan Update.* October, 1995.
[25] San Francisco County Transportation Authority. *The Four Corridor Plan.* June, 1995.
[26] San Francisco County Transportation Authority, Resolution 95-22. June 19, 1995.
[27] Port of San Francisco. *Waterfront Land Use Plan.* Adopted June, 1997.

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 San Francisco Bay, a band of land 100 feet from the shoreline of San Francisco 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 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. The Waterfront Special Plan Area extends from Hyde Street Pier to India Basin and includes all areas within the jurisdiction of the Port of San Francisco. Thus, the CZMA effectively extends BCDC's area of jurisdiction, for certain projects, beyond the 30-meter (100-foot) band of shoreline specified in the McAteer-Petris Act.[28]

San Francisco Bay Plan[29]

The San Francisco 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. 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 30 meters (100 feet) from the shoreline of the San Francisco Bay, saltponds, managed wetlands and certain specified waterways. Portions of the Third Street Corridor--roughly between China Basin and Market Street--are within the plan's area of jurisdiction. The Western Pacific and the Cargo Way maintenance facility locations would be within the BCDC 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[30]

The San Francisco Waterfront Special Area Plan (Special Area Plan), developed by BCDC, is an amendment to the Bay Plan. The Special Area Plan does not supersede either the Bay Plan or the

[28] Blanchfield, Jeff. Chief Planner, BCDC. Personal communication, November, 1997.
[29] San Francisco Bay Conservation and Development Commission. *San Francisco Bay Plan.* Adopted January, 1969, amended November, 1995.
[30] San Francisco Bay Conservation and Development Commission. *San Francisco Waterfront Special Area Plan.* Adopted April, 1975, amended March, 1996.

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 30-meter (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 Third Street Corridor lies within the plan boundaries at various points, generally between China Basin and Market Street. In addition, the two maintenance facility sites under consideration are within this plan area. The plan contains no specific policies or recommendations about transportation services in general or the Third Street Light Rail Project in particular.

The San Francisco Waterfront--Piers 7 through 24--Total Design Plan[31]

The San Francisco Waterfront Total Design Plan (Total Design Plan) is another amendment to the Bay Plan. 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.

Draft San Francisco Bay Area Seaport Plan[32]

The San Francisco Bay Area Seaport Plan (Seaport Plan) was developed by MTC and BCDC. The Seaport Plan is the maritime element of MTC's Regional Transportation Plan, as well as being a part of the San Francisco Bay Plan. MTC uses the Seaport Plan in making decisions about project funding and in managing the metropolitan transportation system. BCDC uses the plan for guidance in decisions on permit applications, consistency determinations and related matters. While the Seaport Plan does not specifically mention the Third Street Light Rail Project, the plan does include the overarching goal of providing for integrated and improved surface transportation facilities between San Francisco Bay ports and terminals and other regional transportation systems. To this end, the plan includes a policy that states, "Bay Area ports, local governments and marine terminal operators should make the best use possible of existing ground transportation facilities and should mitigate the adverse effects of increased traffic at existing and proposed marine terminal facilities."

Metropolitan Transportation Commission

1994 Regional Transportation Plan[33]

The Regional Transportation Plan is the long range plan for Bay Area transportation projects and is essentially a transportation budget for the region. The plan only includes transportation projects that can be built with funds available over the twenty-year time frame of the plan. Goals and objectives from the Regional Transportation Plan are aimed at improving mobility, promoting equity for system users,

[31] San Francisco Bay Conservation and Development Commission. *The San Francisco Waterfront -- Piers 7 through 24 -- Total Design Plan.* Adopted June, 1980, amended August, 1990

[32] San Francisco Bay Conservation and Development Commission and the Metropolitan Transportation Commission. *Draft San Francisco Bay Area Seaport Plan.* February, 1996.

[33] Metropolitan Transportation Commission. *1994 Regional Transportation Plan.* June, 1994, amended September, 1996.

enhancing sensitivity to the environment and supporting economic vitality regionwide. The plan includes a fixed guideway extension in its baseline assumptions for transit improvements in San Francisco. The plan states that the extension is assumed to be Bayshore light rail transit (now referred to as the Third Street Light Rail Project) and that it is expected to be locally funded as a County sales tax project.

4.1.2 PROPOSED PLANS AND PROJECTS IN THE CORRIDOR

There are a number of major developments proposed for construction in the southeastern quadrant of San Francisco and in the Downtown area by 2015. In addition, the San Francisco Redevelopment Agency is conducting studies on several proposed new Redevelopment Plan Areas in the Corridor. **Figure 4-1** shows the locations of these major proposed developments and redevelopment areas, which are described below.

Proposed Bayview Hunters Point Redevelopment Plan

The Redevelopment Agency has begun the process of preparing a Redevelopment Plan for an area that will encompass almost the entire South Bayshore area. The Bayview Hunters Point Redevelopment Project will extend from Cesar Chavez Street on the north to the City/County line on the south, and from the 101 Freeway on the west to San Francisco Bay on the east. This new redevelopment area encompasses the entire Bayview Hunters Point community, except for the three pre-existing Redevelopment Plan Areas: the Bayview Industrial Triangle, the India Basin Industrial Park, and the Hunters Point Shipyard Redevelopment Plan areas **(refer to Figure 4-1)**. The Bayview Hunters Point Redevelopment Project, however, will incorporate the existing Hunters Point Redevelopment Plan Area, which encompasses the subsidized housing developments on the hill west of the shipyard. The new redevelopment plan area is being annexed to the Hunters Point Redevelopment Project in order to ensure that residents of this area are represented on the Project Area Committee (PAC) that has been created for the project. The 21-member PAC has both an advisory and a decision-making role in the redevelopment project. The primary focus of the Bayview Hunters Point Redevelopment Plan will be on revitalizing the Third Street Corridor, as well as the industrial areas to the north and south of Bayview Hunters Point. An EIR is currently being prepared for the proposed Redevelopment Plan.[34] In addition, a ballot initiative passed in June 1997 has enabled the City to move forward on a proposal for a new 74,000-seat football stadium to be built at Candlestick Point, which lies within the redevelopment survey area. The proposal would also include an associated 130,000-square meter (1.4-million square foot) shopping-restaurant-movie theater complex adjacent to the new stadium. The proposal is currently undergoing environmental review.

San Francisco Executive Park Development

The adopted South Bayshore Area Plan contains a subarea plan for San Francisco Executive Park, located northwest of Candlestick Point. The subarea plan includes up to 157,900 square meters (1.7 million square feet) of office space, a 350 room hotel, 4,180 square meters (45,000 square feet) of retail space, approximately 600 units of housing, and development of a 10.5-hectare (26-acre) hillside park and system of hillside trails. The only component of the plan that has been built to date is the office space, although the first phase of residential construction has been approved. A fraction of the office space permitted in the subarea plan has actually been built to date, but it is assumed that the remaining office, retail, and residential elements will be built by 2015. Buildout of the Executive Park Complex will add an estimated 5,000 jobs to the area.[35]

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[34] Erwin Tanjuaquio, Associate Planner, Technical Services Division, San Francisco Redevelopment Agency. Personal communication. August, 1997.

[35] Keyser Marston Associates. Draft Memorandum to the San Francisco Redevelopment Agency, *Cumulative Growth Scenario for Year 2015.* August 27, 1997.

Proposed Mission Bay Redevelopment Plans

As mentioned previously in the discussion of the Mission Bay Plan Area, two related redevelopment plans for Mission Bay are currently undergoing environmental review--the proposed Mission Bay North Redevelopment Plan and the proposed Mission Bay South Redevelopment Plan. The Redevelopment Plan for Mission Bay North addresses the 26.3-hectare (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. The redevelopment plans proposed for Mission Bay South and North are described below.

Proposed Mission Bay South Redevelopment Plan

The Regents of the University of California have selected Mission Bay South as the site for a new 17.4-hectare (43-acre) campus. The first phase of campus construction will most likely occupy approximately four acres along 16th Street, just east of I-280. Construction is projected to begin in 1998. The campus is expected to employ approximately 9,000 workers.

The redevelopment proposal for Mission Bay South surrounding the planned UCSF campus site proposes approximately five million square feet of office and industrial space ringing the campus. This space is envisioned as spin-off research and development space for biotechnology firms. In addition, 23,200 square meters (250,000 square feet) of the Mission Bay South area will be for retail uses, and a 500-room hotel is also planned for this subarea. The plan projects that employment associated with the retail, office and industrial uses will represent an additional 12,000 jobs. The plan also proposes 3,000 housing units, to be located north of the campus. Approximately one-third of these housing units will be priced below market level. An open space buffer zone will be created immediately north of the campus to separate it from the residential area. Land for an elementary school and police and fire facilities will be donated to the City as part of the Plan, as well. At least 15 hectares (38 acres) of open space will be created throughout the entire Mission Bay area.

Proposed Mission Bay North Redevelopment Plan

The Mission Bay North Redevelopment project will consist of three major phases, with the first phase projected to begin construction in mid-1998 and to open 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 new Giants ballpark. (The ballpark, located northeast of Mission Bay, is not part of Mission Bay.) A total of 55,700 square meters, (600,000 square feet) of retail/commercial space is proposed for this area, including 32,500 square meters (350,000 square feet) for a retail complex close to the ballpark. Approximately four acres along the north shore of the channel will be in open space. Completion of the Mission Bay Redevelopment Plans, as well as preparation and certification of the Redevelopment Plan EIR are projected to occur within the next 18 months. An Owner Participation Agreement between the City and Catellus will also be negotiated in the near future.

Giants Ballpark

The final EIR for this project has been certified and the project has been approved by the City.[36] The ballpark will be located between Second and Third Streets, just north of Mission Creek channel and Pier 46B. The ballpark will have a capacity of approximately 40,000 and is expected to open in Spring 2000. The 5.3-hectare (13-acre) site includes a playing field, stadium seating and commercial space.

[36] City and County of San Francisco, City Planning Department. *San Francisco Giants Ball Park at China Basin Environmental Impact Report* (Case File No. 96.176E).

Proposed Caltrain System Improvements Project

The Peninsula Corridor Joint Powers Board, the tri-county agency that runs the Peninsula Commute Service (Caltrain), voted in August 1997 to complete the Draft EIS/EIR currently in progress for the Caltrain system improvements project, as well as to broaden its focus. The Draft EIS/EIR will examine ways in which Caltrain can increase its ridership, such as through system electrification, upgrades, or possible connection with the MUNI rail system. A previous proposal to extend Caltrain rail service to Downtown San Francisco is not expected to be implemented, since San Francisco's Mayor and Board of Supervisors recently voted not to complete the Draft EIR for that project, arguing that the cost (estimated at $650 million) would be prohibitive.[37]

Proposed Transbay Redevelopment Plan

The reconfiguration of the Terminal Separator Structure and the removal of the Embarcadero Freeway have provided additional vacant land with great potential for enhanced land use and transportation opportunities in the Transbay Terminal area. To facilitate new development in this vicinity, the area bounded roughly by the Embarcadero, Market Street, Third Street and Bryant Streets has been designated a redevelopment survey area. A Draft EIR is being prepared for the proposed Transbay Redevelopment Plan. The Redevelopment Plan envisions a new regional transit and commercial center for the Transbay area, as well as an educational/cultural campus, several mixed use residential neighborhoods and an integrated system of parks, plazas and pedestrian ways.[38]

Alternatives for upgrading or relocating the 60-year old transit building at First and Mission Streets have been studied by a Policy Advisory Committee representing the transit agencies with operations in the existing Transbay Terminal facility, in cooperation with the City and County of San Francisco. The existing Transbay Terminal and ramps need extensive renovation in order to meet current seismic and building codes. In addition, the existing building's layout does not allow for efficient facility operations. Among the alternatives being evaluated as part of this planning effort are the options of constructing a new or upgraded facility at the present site or building a new terminal between Main and Beale Streets, north of Folsom Street. MTC is expected to decide on terminal location in 1998.

A proposal for an entertainment complex within the Transbay Redevelopment Survey Area is also under review. The proposed Rincon Entertainment Center/U.S. Postal Service project originally included a multiplex theater, retail uses, a residential component and possible office uses. The project was proposed for an area bounded by Folsom, Spear, Harrison and Beale Streets, and was to be funded by private sources. The project is currently on hold while the project description is being revised.

Proposed Mid-Market Redevelopment Plan

The Mid-Market Street Redevelopment Survey Area was designated by the Board of Supervisors in December 1995. The 44-hectare (109-acre) survey area extends from Fourth Street on the east to Octavia Street on the west and zigzags along the Market Street Corridor. At present, the major elements of the plan have not yet been determined, although the plan is expected to focus on development of several large vacant parcels in the plan area, such as those at Seventh and Mission and Eighth and Mission, and on historic preservation and seismic retrofitting issues in the area. A Draft EIR is currently in preparation for the redevelopment plan.

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[37] Peninsula Corridor Joint Powers Board. Resolution No. 1997-38. August 7, 1997.

[38] San Francisco Redevelopment Agency; City and County of San Francisco, City Planning Department; and Simon Martin-Vegue Winkelstein Moris. *Transbay 20/20 Concept Plan*. December, 1996.

Proposed Roadway Improvements in Bayview Hunters Point

The City and County of San Francisco is studying alternative access routes for trucks and other vehicles to get to and from the former Hunters Point Naval Shipyard to U.S. Highway 101, possibly involving a bridge to the proposed Candlestick Mills project area and/or a Carroll Avenue extension. Clearly, such a project may lessen congestion in the more northerly intersections (e.g., Third/Evans or Highway 101/Cesar Chavez) in this segment and add vehicles at more southerly intersections (e.g., Bayshore/Arleta-Blanken or Third/Carroll).

4.1.3 EXISTING LAND USES IN THE CORRIDOR

A broad range of land uses exist along the Third Street 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 4-2** illustrates current generalized land uses.

Visitacion Valley/Little Hollywood (Excelsior District)

Starting at the southern end of the Corridor at the Caltrain Bayshore Station, the land use is predominantly industrial, with some vacant land south of the County line. Along Sunnydale and the east side of Bayshore Boulevard south of Blanken Avenue, the use is exclusively industrial buildings, including Schlage Lock and the former Pacific Lithograph facility. On the west side of Bayshore Boulevard, the land uses transition from industrial south of Visitacion to commercial between Visitacion and Arleta Avenues, with a few buildings containing residential uses above commercial.

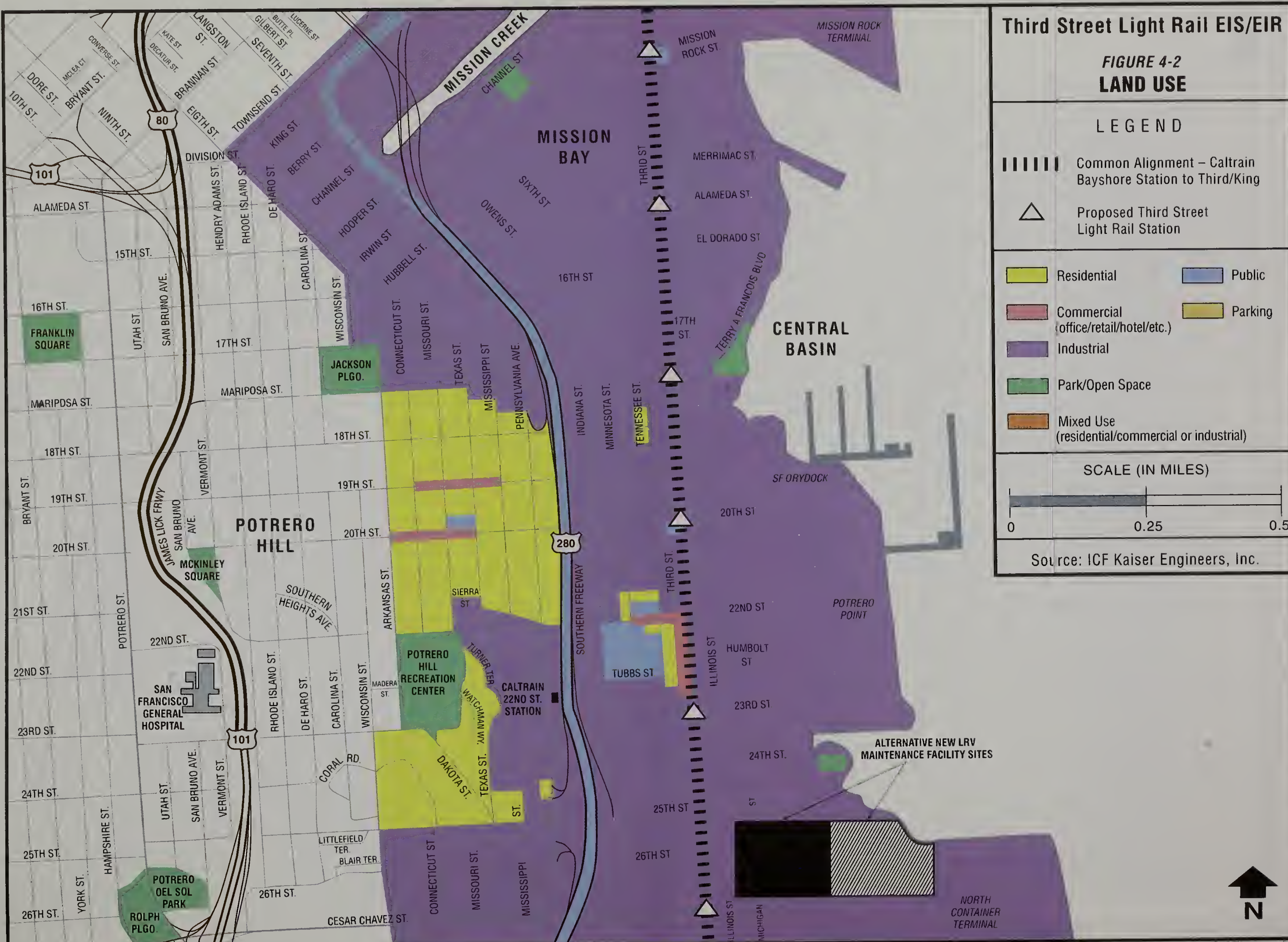
From Arleta/Blanken Avenue to Hester Avenue, the land use shifts to single family attached and detached residential uses on both sides of the corridor, with the exception of a grocery store on the triangular parcel between Blanken and Tunnel Avenues. The residential use includes the Bayshore Heights development, under construction along Hester Avenue. Between Hester Avenue and the Bayshore Freeway, steep hillsides separate Bayshore Boulevard from residential uses above on the west and a motel to the east.

Bayview Hunters Point (South Bayshore District)

From the crossing of Highway 101 to Evans Street, the primary uses along Third Street are residential, industrial, and commercial buildings, including some mixed use buildings with residential uses above ground floor commercial use. Churches and institutional uses also are prominent uses in this part of the Third Street Corridor, including the Bay View Playground, a library, and the Bayview Opera House, all located on the east side of Third Street.

South of Jamestown Avenue, land uses are primarily residential with the exception of a small motel and mortuary on the west side of Third. From Jamestown Avenue north to Armstrong Avenue, the uses on the west side are primarily a mix of modern and older industrial buildings, some occupied and some vacant. Exceptions are the Concord Missionary Baptist Church between Fitzgerald and Gilman Avenues, and a limited number of two or three story buildings containing residences over neighborhood commercial uses. The east side of Third Street in this segment is mostly commercial, with some residential land use interspersed. Between Key and Jamestown Avenues is the prominent St. Paul of the Shipwreck Catholic Community Church and school, and further north there is a large medical office complex. The Bay View Playground and Martin Luther King Jr. Pool occupy the blocks between Carroll and Armstrong Avenues. The Southeast Health Center is located across Keith Street from the playground and a block east of Third Street.

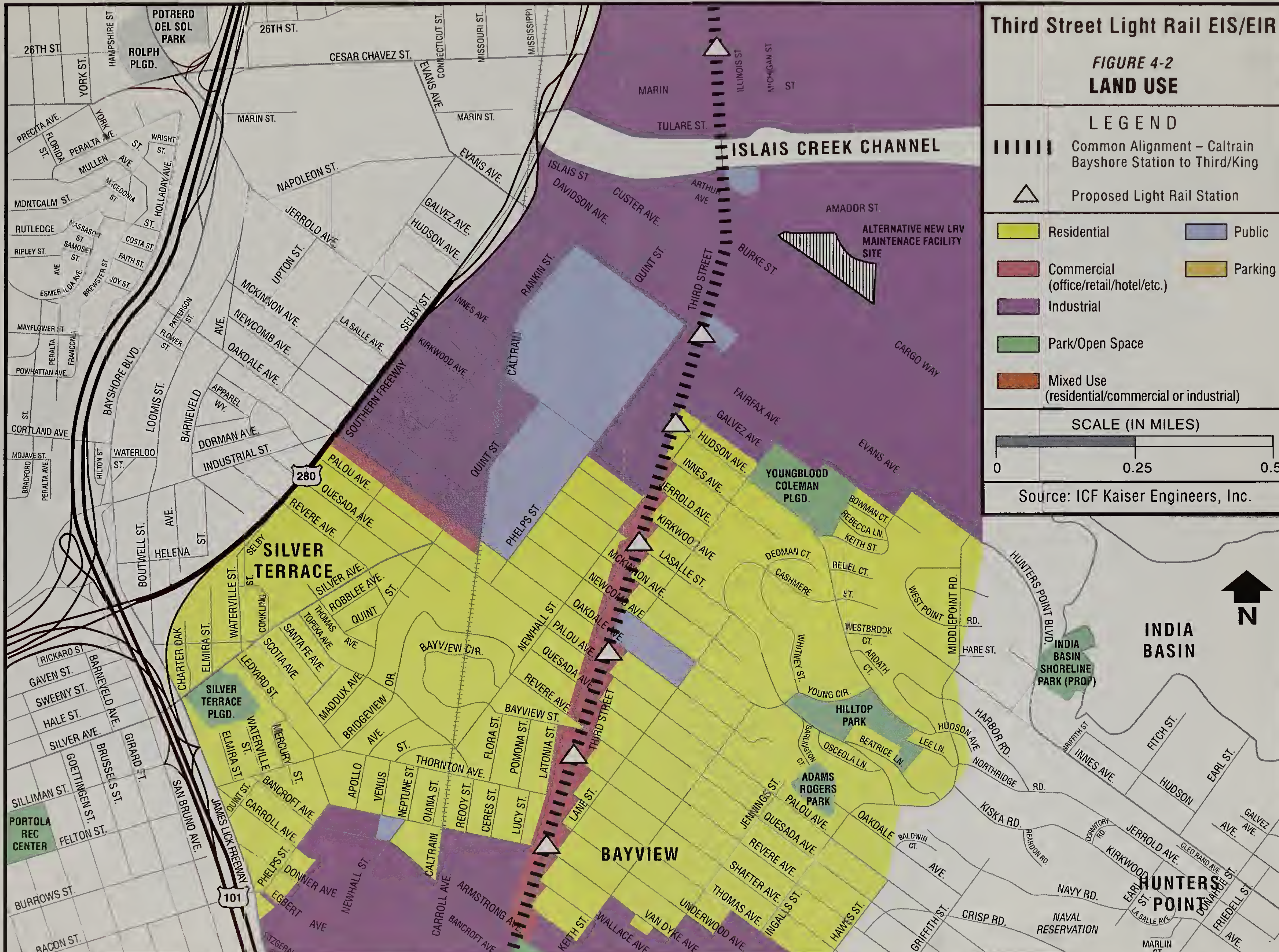
J96-082.55 3rd St. (11/10/97)



Third Street Light Rail EIS/EIR

FIGURE 4-2
LAND USE

J96-082.54 3rd St. (11/11/97)



J96-082.53 3rd St. (11/10/97)

Third Street Light Rail EIS/EIR

FIGURE 4-2

LAND USE

LEGEND

- Common Alignment – Caltrain Bayshore Station to Third/King
- Proposed Intermodal Terminal Site
- Proposed Light Rail Station
- Residential
- Commercial (office/retail/hotel/etc.)
- Industrial
- Park/Open Space
- Mixed Use
- Public
- Parking

SCALE (IN MILES): 0, 0.25, 0.5

Source: ICF Kaiser Engineers, Inc.

J96-082.52 Mc4

From Yosemite Avenue north to Fairfax Avenue, the predominant land use is small scale commercial buildings, some with residential uses above. Churches and community facilities are interspersed, including the Bayview Hunters Point Senior Center at Yosemite Avenue and the Islam Center at Revere Avenue. The area from Revere Avenue north to Jerrold Avenue is the primary retail commercial center of the Bayview Hunters Point community. It contains banks and retail stores, with parking lots interspersed. A new Bayview District Police Station recently opened on Williams Avenue, approximately a quarter mile west of Third Street. The new station is adjacent to the newly constructed Portola Place residential development which includes 250 housing units. South of Williams Avenue, uses on the cross streets are primarily industrial; to the north the land uses are primarily residential.

On the east side of Third Street, uses include the Branch Library at Revere Avenue, various retail and office spaces, and the Bayview Opera House. The Opera House plaza at Newcomb Avenue is adjacent to the Joseph Lee Recreation Center and a San Francisco School District Facilities Management building. The Providence Baptist Church is on the southeast side of McKinnon Avenue, and the Super Save Grocery and parking lot occupy the block between McKinnon and LaSalle Avenues. The Bayview Hunters Point Foundation Mental Health Clinic is situated at Jerrold Avenue and St. John Missionary Baptist Church fills the block between Jerrold and Innes Avenues.

The two blocks south of Evans Avenue on the east side of Third Street are dominated by the Bayview Plaza Shopping Center, redeveloped on the periphery of the India Basin Industrial Park. North of Evans Avenue, the Gloria R. Davis Academic Middle School is also located at the entrance to the India Basin Industrial Park, which contains a variety of industrial uses in modern buildings east of the corridor. This includes the major US Post Office facility between Evans and Cargo Way. A fire station is located just southeast of the Islais Creek bridge. A community recycling center is located at the intersection of Cargo Way and Amador, at one of the alternative locations for a new MUNI Metro maintenance facility that would serve the proposed light rail system. From Evans Avenue north to Islais Creek along Third Street, the uses to the west are primarily industrial, with the exception of the modern two story Bay Park complex used as office space for several community service agencies.

Central Waterfront Segment Along Third Street (Potrero District)

As shown on **Figure 4-2**, from Islais Creek north to 23rd Street, land uses along and near Third Street are almost exclusively industrial in nature. Several parcels contain large vehicle storage yards on the west side of Third Street. Further north, land uses remain predominantly industrial, with several commercial buildings and one building containing residential uses over commercial at 22nd Street. The recently closed (relocated) Potrero Police Station is located at 20th Street. Several large Esprit office buildings are located several blocks west of Third Street in this segment, as is a major MUNI diesel bus maintenance facility. Residential uses, in an area known as "Dogpatch," are interspersed with industrial ones along Minnesota and Tennessee Streets.

Land uses are also industrial on the east side of Third Street in this segment, including several three to four story multi-tenant buildings between 23rd and 20th Streets which contain a broad variety of small businesses. Two newly constructed live-work buildings are located along or near Third Street in the vicinity of Mariposa Street. The only remaining ship repair business in San Francisco is located along the waterfront several blocks east of the corridor, as is PG&E's Potrero Power Station. A large sand and gravel yard and transfer facility is located between Mariposa and 16th Streets on the east side of Third Street. Two industrial buildings and vacant rail yards are located on the parcel south of 16th Street adjacent to I-280.

Mission Bay Segment Along Third Street (Potrero District)

From 16th Street north to Mission Creek Channel, the land to the west of Third Street is primarily vacant with the exception of several industrial trucking/warehouse buildings. Interim uses include vehicle storage and the Mission Bay golf driving range. A small houseboat community is located along Mission Creek Channel. Parking lots represent a temporary use in the triangle between Third and Fourth Streets. On the north side of Mission Creek Channel, the large China Basin office building dominates the block between Third and Fourth Streets and south of Berry Street.

The area to the east of Third Street is industrial, dominated by two large concrete and gravel plants and an electrical supply business. The Esprit outlet store is located a block east of Third Street in this segment. A mixture of maritime uses predominate along the waterfront on Piers 48 through 64.

Much of the Mission Bay area along the Corridor is slated for redevelopment. Anticipated uses include relatively high density housing and relocation of research facilities of the UCSF campus. When UCSF activity shifts to the site, other related research and development uses are likely to be developed adjacent to the campus site.

South of Market and Downtown (Potrero, Financial District, and Union Square/Downtown Retail Districts)

Land use north of Mission Rock Street (at the intersection of Third and Fourth Streets) is shown in **Figure 4-2**. 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-280 ramps at Fourth Street, the San Francisco Recreational Vehicle Park, and the Caltrain Terminal west of Fourth between King and Townsend Streets. East of Berry and Third Streets is also the planned location of the new Giants ballpark.

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, 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 predominate, 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 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.

Approaching Market Street, land uses are exclusively commercial on both sides of Third Street, including a hotel, office buildings, a large parking structure, and a development site on the east side of Third Street at Mission, currently used for parking. The Corridor from Market Street to the Stockton Tunnel traverses the Union Square retail and office center, which includes a variety of small and larger retail commercial buildings, some with office space above retail, as well as Union Square and several large hotels. The Union Square below-grade garage and multi-story Sutter-Stockton garage are also in this segment of the Corridor.

Chinatown

Land use along Stockton Street north of the Tunnel exit at Sacramento Street remains primarily commercial, with some buildings containing residential uses over commercial. Cross streets have primarily residential and residential over ground floor commercial use. A preschool and several community service agencies are located in a multi-story building at the southwest corner of Stockton and Sacramento. Other exceptions to the primary land uses include a US Post Office and several schools, including the Chinese Central High School. The St. Mary's Chinese Catholic Center is at the northeast corner of Stockton and Clay Streets and the Sun Yat-Sen Memorial Hall is on the east side of Stockton Street. The Chinese Playground, on Sacramento Street just east of Stockton, is the only open space along the Corridor north of Union Square.

4.2 SOCIOECONOMIC CHARACTERISTICS

The socioeconomic characteristics described for the project 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 light rail alignment plus up to 457 meters (1,500 feet) around proposed stations. The data presented are primarily from the 1990 U.S. Census. Although this information is somewhat dated, there have not been any developments that have significantly changed the general information that is reflected in this data. Similarly, income data also is dated, but the relative relationship between neighborhoods probably remains constant.

The IOS alignment passes through ten census tracts[39], proceeding approximately from the Bayshore Station in the south to Third and King Streets (Segments 1 through 5), where it links with existing tracks along King Street and The Embarcadero (Segment 6) that provide the connection to the Market Street subway. The census tracts in the first five segments of the Corridor are as follows:

Segment		Census Tracts
1	Caltrain Bayshore Station to Highway 101	610, 264
2	Highway 101 to Thomas Avenue	233, 234
3	Thomas Avenue to Kirkwood Avenue	230, 232, 231
4	Kirkwood Avenue to 16th Street	609, 226
5	16th Street to King Street	607

The New Central Subway (Segment 7) includes census tracts 179.01, 176.02, 180, and 178 south of Market Street as well as seven census tracts on the north side of Market Street -- 123, 121, 119, 118, 117, 114, and 113.

4.2.1 POPULATION

San Francisco has distinctive demographic characteristics. Relative to other cities in California, it is more densely populated, with a population of approximately 724,000 in only 12,690 hectares (49 square miles). The central city of a region containing over six million people, San Francisco contains about 12 percent of the regional population. Between 1980 and 1990, San Francisco's population increased 6.6 percent; the regional population growth was twice that rate. Compared to regional population characteristics, San Francisco's population is older on average. Fourteen percent of the residents are under 16 compared to 20

[39] San Francisco 1990 Census tract boundaries are presented in the San Francisco Master Plan, Residence Element, page III.1.28.

percent in the region, and 15 percent are over the age of 65, somewhat above regional and state proportions for elderly population.

The Corridor is more residential in the southeast, and it becomes primarily industrial and commercial as it approaches Downtown. As a result, most of the population is in Segment 1 (16,017) and Segment 3 (21,244), as illustrated in **Table 4-1,** with fewer people residing in Segment 2 (4,195), Segment 4 (794), and Segment 5 (136). The entire Corridor including Third Street, Downtown, and Chinatown has 74,420 residents, or about 10 percent of the City's population.

TABLE 4-1

POPULATION, RACE, HISPANIC ORIGIN AND AGE BY SEGMENT: 1990

Segment	Population	% Black	% White	% Asian	% Hispanic	% under Age 16	% over Age 65
1	16,017	24%	20%	49%	13%	23%	12%
2	4,195	58%	10%	25%	10%	26%	12%
3	21,244	67%	9%	19%	7%	26%	14%
4	794	27%	61%	10%	7%	11%	10%
5	136	24%	76%	0%	0%	26%	17%
7	32,034	7%	44%	46%	5%	8%	21%
San Francisco Total	723,959	11%	54%	29%	13%	14%	15%

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. Segment 6 is excluded because it represents a portion of the corridor with existing track where no new construction is proposed.
Source: U.S. Census 1990 and Gabriel-Roche, Inc.

The five segments that make up the Corridor between Visitacion Valley and the Caltrain Terminal have a high proportion of minority residents (see **Table 4-1**). According to the 1990 Census, 50 percent of this portion of the Corridor is Black, 31 percent is Asian, 15 percent is White, and 10 percent is Hispanic. These proportions contrast with the racial distribution of San Francisco residents, who are less than 11 percent Black and 53.6 percent White. The highest proportion of Black residents is found in Segments 2 and 3 (58 and 67 percent, respectively), while most of the Hispanic population resides in Segments 1 and 2. Asians form the predominant population group in Segment 1; whereas, Segments 4 and 5 have mostly White populations.

The average populations of this portion of the study corridor is younger than that of the City (see **Table 4-1**). Many families who reside in this portion of the Corridor have children. The percentage of the population aged 16 years or less is 25 percent, as compared to 14 percent citywide. The population over 65 years of age is 12 percent, less than the citywide average of 15 percent.

Segment 7, with a population of over 32,000, is the area that would be affected by the New Central Subway. Population characteristics here are quite different from the IOS segments. Several census tracts along Stockton Street are over 85 percent Asian. The population of the segment as a whole is over half minority. Twenty-one percent of the population of Segment 7 is at least 65 years old, and eight percent under the age of 16.

4.2.2 HOUSING AND HOUSEHOLD CHARACTERISTICS

Most of the census tracts south of the Caltrain Terminal contain more than 60 percent owner-occupied housing units, except for two tracts on the east side of Third Street, 231 and 226. In general, the owner-occupancy rate is much higher in the Corridor than citywide. In 1990, the vacancy rate in the Corridor was about six percent. There were much higher vacancy rates at the north end of the Corridor, which may be explained by some recently completed units which had not yet been occupied at the time of the census. The average household size in Segments 1-5 is 3.3 persons, substantially higher than the citywide average of 2.3 persons. The percentage of single occupant households is only 20 percent, as compared with 39 percent for San Francisco as a whole. The largest average household size is in Segment 1, at 3.6 persons **(Table 4-2).** Only about one percent of the population lived in group quarters.

TABLE 4-2

HOUSING CHARACTERISTICS BY SEGMENT: 1990

Segment	# of Units	% Owner Occupied	Average HH Size	Vacancy Rate	% Over-crowded	% with 5> units
1	4,601	63%	3.6	5%	24%	16%
2	1,270	51%	3.4	5%	21%	12%
3	7,257	52%	3.1	7%	17%	11%
4	299	30%	3.4	14%	7%	46%
5	32	100%	1.4	41%	47%	0%
7	20,073	5%	1.6	14%	16%	89%
San Francisco Total	328,471	34%	2.3	7%	10%	42%

Note: Overcrowded is defined as more than one person per room. Segment 6 is excluded because it represents a portion of the corridor with existing track where no new construction is proposed.
Source: U.S. Census 1990 and Gabriel-Roche, Inc.

In Segments 1, 2, and 3, only 11-16 percent of the housing units are in structures with five or more units, in contrast to the City as a whole, where 42 percent of units are in buildings containing five or more units. Overall, much of the housing is one and two-family rowhouses built in the 1910s-1940s. While many homeowners have lived in the area for some time, others have moved from other sections of San Francisco in search of affordable home ownership opportunities.

As would be expected, the housing situation in Segment 7 (New Central Subway) is different from Segments 1-5. In Segment 7, only about five percent of the housing units is owner-occupied, and about 12 percent of the population lived in group quarters. The census reported a high vacancy rate in this segment of 14 percent, which reflected several large new (and not yet fully occupied) developments south of Market and units damaged in the Loma Prieta earthquake. The average household size in this segment is 1.6 persons, and about 60 percent of the households are composed of single occupants.

The vast majority (89 percent) of the housing units in Segment 7 (which includes Chinatown) are in buildings with five or more units. Approximately 16 percent of the households in this segment are considered to be overcrowded.

4.2.3 EMPLOYMENT

According to Census and ABAG data, there were approximately 385,000 employed residents of San Francisco in 1990 (see **Table 4-3**). San Francisco serves as a major employment hub for the Bay Area. The 555,000 jobs in San Francisco represent almost 19 percent of the regional job total, in contrast to only 12 percent of the residents. With 308,000 of the San Francisco employed residents working in the City and the remaining 77,000 commuting to jobs elsewhere, almost 250,000 residents of other counties commute to jobs in San Francisco.

TABLE 4-3

RESIDENT EMPLOYMENT CHARACTERISTICS BY SEGMENT: 1990

Segment	# Residents Employed	% Mgmt.	% Tech.	% Service	% Oper.*	% Unemployed
1	7,003	14%	31%	24%	21%	8%
2	1,445	20%	38%	20%	17%	13%
3	7,436	15%	40%	21%	17%	15%
4	436	24%	31%	27%	15%	8%
5	14	100%	0%	0%	0%	0%
7	15,955	27%	34%	20%	13%	9%
San Francisco Total	384,662	35%	34%	16%	9%	6%

Note: Segment 6 is excluded because it represents a portion of the corridor with existing track where no new construction is proposed.
Source: U.S. Census 1990 and Gabriel-Roche, Inc.
*Oper. stands for operators, craft workers, fabricators, and laborers.

There were 16,334 employed residents counted by the 1990 Census in Segments 1-5. The largest group (36 percent) worked in technical jobs, followed by 23 percent in service jobs. The unemployment rate was 12 percent, double the overall rate for San Francisco. In Segments 2 and 3, the Bayview Hunters Point neighborhood, unemployment rates were 13 to 15 percent in 1990. The closure of the Hunters Point Naval Shipyard in the 1970s cost the area over 10,000 jobs and particularly affected the retail economy of Bayview Hunters Point. Additional housing and industrial development in the India Basin area have helped, but the local economy is still in need of additional jobs and economic base.

The San Francisco Planning Department issued a set of neighborhood profiles in 1997 for 16 areas, summarizing a variety of statistical sources. According to the neighborhood profile for Bayview Hunters Point, which includes Segments 2 and 3, the major type of employment in this neighborhood is industrial, followed by various types of government employment. In the profile for Potrero, which includes Segments 4 and 5, the major type of employment is again industrial, followed by almost equal numbers of office and government jobs. These segments include the Mission Bay project area, where substantial job growth is anticipated during the next 20 years.

In the census tracts crossed by Segment 7 (New Central Subway), 15,955 were employed people in 1990, with 34 percent in technical jobs, 27 percent in management and 20 percent in service jobs. The unemployment rate along this segment was nine percent. This is fifty percent higher than the citywide unemployment rate, but less than half the unemployment rate of Bayview Hunters Point (Segments 2 and 3).

4.2.4 FISCAL AND ECONOMIC CHARACTERISTICS

Household Characteristics

Average household incomes in all of the Third Street Light Rail segments were considerably below the City average of $48,932 in 1990, as shown in **Table 4-4**. Because of larger household sizes, the per capita income was also generally lower than the citywide figure of $19,695. As shown in **Table 4-4,** Segments 1-5 showed the lowest per capita incomes and the highest levels of poverty; 23 percent of the residents were below the poverty line. The lowest average incomes were in Segments 2 and 3, especially in Tract 231 of Segment 3, where 42 percent of residents were in poverty and the average household income was $23,267.

About 43 percent of the households did not own vehicles, and the median household income was only $15,089 in Tract 231. Median incomes in most tracts of all segments were generally between $23,000-$36,000. Approximately 25 percent of the households in the IOS corridor did not own any private vehicles.

TABLE 4-4

ECONOMIC CHARACTERISTICS BY SEGMENT: 1990

Segment	Average HH Income	Per Capita Income	% Below Poverty	% Without Vehicle
1	$37,527	$10,493	17%	17%
2	$30,852	$9,615	27%	24%
3	$31,400	$10,275	26%	30%
4	$41,100	$14,130	27%	45%
5	$36,875	$15,948	0%	0%
7	$26,917	$15,604	20%	72%
San Francisco Total	$48,932	$19,695	13%	31%

Note: Segment 5 data is affected by very small population. Segment 6 is excluded because it represents a portion of the corridor with existing track where no new construction is proposed.
Source: U.S. Census 1990 and Gabriel-Roche, Inc.

In Segment 7, the average household income was $26,917, and the average per capita income was $15,604. Twenty percent of the residents were below the poverty line, and 72 percent did not own vehicles. The median household incomes ranged from a low of $9,000 in Tracts 114, 115, and 178 to a high of $41,465 in Tract 179.01, which included new development in the South Beach area of the South of Market waterfront.

Fiscal Environment

The proposed project is located in the City and County of San Francisco. The 1996-97 General Fund budget for San Francisco was $1,475 million, and the total budget including capital and enterprise accounts was $3,167 million. This represents an increase of 2.4 percent over the previous budget.

Sources of the General Fund are primarily various taxes and state subventions. Approximately 22 percent of the General Fund came from property taxes, 10 percent from business taxes, and seven percent from sales 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, the 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 1996-97 budget summary, 35 percent of the General Fund is allocated to public safety activities, 22 percent goes to human welfare and neighborhood development, 19 percent goes to community health, and the remainder is allocated to a variety of programs and activities, including general administration, culture and recreation, and public works, transportation, and commerce.

4.2.5 NEIGHBORHOODS AND BUSINESSES

Visitacion Valley/Little Hollywood

As shown on **Figure 4-2**, the Visitacion Valley neighborhood, part of the Excelsior District, lies along the southern boundary of San Francisco west of Bayshore Boulevard and the Bayshore Freeway. While having the highest ratio of home ownership in the Corridor, it is also the home of several subsidized housing developments. Visitacion and Leland Avenues serve as the primary retail commercial areas of the neighborhood. Most retail establishments are small and do not provide a full range of neighborhood services. With the exception of industrial uses on the east side of Bayshore Boulevard, there has been little public or private investment in the neighborhood in recent years.

The Little Hollywood neighborhood is in the triangular area east of Bayshore Boulevard, west of the Bayshore Freeway, and just north of the County line. Racially mixed, this approximately 15 square block area primarily contains detached single family homes built in the 1930s. Blanken Avenue provides access through the neighborhood to San Francisco Executive Park, an office commercial district on the east side of the freeway. The new Bayshore Heights residential development is on Hester Avenue at the north end of the neighborhood.

Bayview Hunters Point

Like Visitacion Valley, Bayview Hunters Point (see **Figure 4-2**) contains a mix of attached and detached single family homes, many of which are owner occupied. This neighborhood also has a considerable amount of public housing, mostly east of Third Street. The majority of the population in this segment is Black. The primary residential areas include the Silver Terrace area located to the east of the Bayshore Freeway and west of Third Street (from Williams Avenue north to Oakdale Avenue) and the Bayview and Hunters Point areas, to the east of Third Street. The latter two are separated by the South Basin East industrial area.

The Bayview Hunters Point neighborhood is San Francisco's South Bayshore Planning Area. The area plan for the district described the land use pattern and problems of the Third Street corridor in the following terms:

> "While South Bayshore's general land use pattern is already established, the district nonetheless lacks the vitality and vibrancy that exist in most other San Francisco districts. This is most visible in the retail sector along Third Street. To some extent, this is caused by the low density demographic structure of South Bayshore, its low building scale, and a lack of development in many areas... Hunters Point Shipyard, the largest industrial area in the district, has not been fully utilized since its closure as a naval ship repair facility in 1974."

Surveys conducted as part of the South Bayshore planning process indicated that: "... very few South Bayshore residents shop regularly on Third Street, the district's primary commercial area, even though it is centrally located in relation to the residential neighborhoods. Shoppers are deterred by the general unattractiveness of many portions of the street, the lack of variety in essential neighborhood-serving retail uses, the empty storefronts, the overconcentration of liquor stores, and related loitering."[40]

[40] San Francisco Redevelopment Agency, Draft South Bayshore Plan, December 1994, Page II.9.14.

Considerable study has been devoted to developing strategies to revitalize the Third Street commercial core. Adding more households and employment opportunities are seen as key to increasing the market for retail activity along this part of the Corridor. At the north end of this area, the modern Bayview Plaza Shopping Center, the India Basin Industrial Park, and Bay Park office complex represent modern commercial and industrial uses, all assisted through the redevelopment process.

Central Waterfront

The Central Waterfront covers the area between China Basin and Islais Creek. This part of the Corridor is dominated by industrial uses, mostly low intensity distribution functions such as wholesaling and storage. Maritime uses and a large MUNI maintenance facility also are key uses. Uses tend to be large scale, with a considerable amount of underutilized land, including the Mission Bay area, which is planned for large scale redevelopment. With the exception of scattered areas along Tennessee, Minnesota, and Indiana Streets ("Dogpatch"), there is little residential use in this segment of the Corridor.

South of Market and Downtown

In recent years, the South of Market district **(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 and in the South Beach area along The Embarcadero. These uses co-exist with remaining industrial uses that range from business services to clothing manufacturing to artisans. The Moscone Convention Center, San Francisco Museum of Modern Art, and Yerba Buena Center are also contributing to the transformation of the South of Market area.

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 a high density residential district, a neighborhood-and regional-serving specialized shopping district, a center of religious and social service functions, and a visitor destination. Stockton and Grant Streets are the center of retail and community service functions, with residential uses above and along the crossing east-west streets from Sacramento to Pacific Streets. Approximately 10,000 to 15,000 residents live in the district, many of them elderly and/or recent immigrants.

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 light rail alignment as well as the public services provided by these facilities. **Figure 4-3** indicates the location of these facilities.

Third Street Light Rail EIS/EIR

FIGURE 4-3

PUBLIC FACILITIES ALONG THIRD STREET CORRIDOR (SHADED AREA ONLY)

LEGEND

- Common Alignment – Caltrain Bayshore Station to Third/King
- Light Rail Alternative – Initial Operating Segment Integrated with Muni Metro
- Light Rail Alternative – New Central Subway Line via Stockton
- BART/Muni Metro Station
- Proposed Third Street Light Rail Station
- Muni Metro Extension Station & Proposed Third Street Light Rail Station

- Community Center
- Cultural Facility
- Fire Department
- Health Ctr./Hospital
- Park/Playground
- Post Office
- School

SCALE (IN MILES)

0 0.25 0.5

Source: ICF Kaiser Engineers, Inc.

N

J96-082.48 3rd St. (11/6/97)

Third Street Light Rail EIS/EIR

FIGURE 4-3

PUBLIC FACILITIES ALONG THIRD STREET CORRIDOR (SHADED AREA ONLY)

LEGEND

- Common Alignment – Caltrain Bayshore Station to Third/King
- Proposed Third Street Light Rail Station
- Park/Playground

SCALE (IN MILES)

0 0.25 0.5

Source: ICF Kaiser Engineers, Inc.

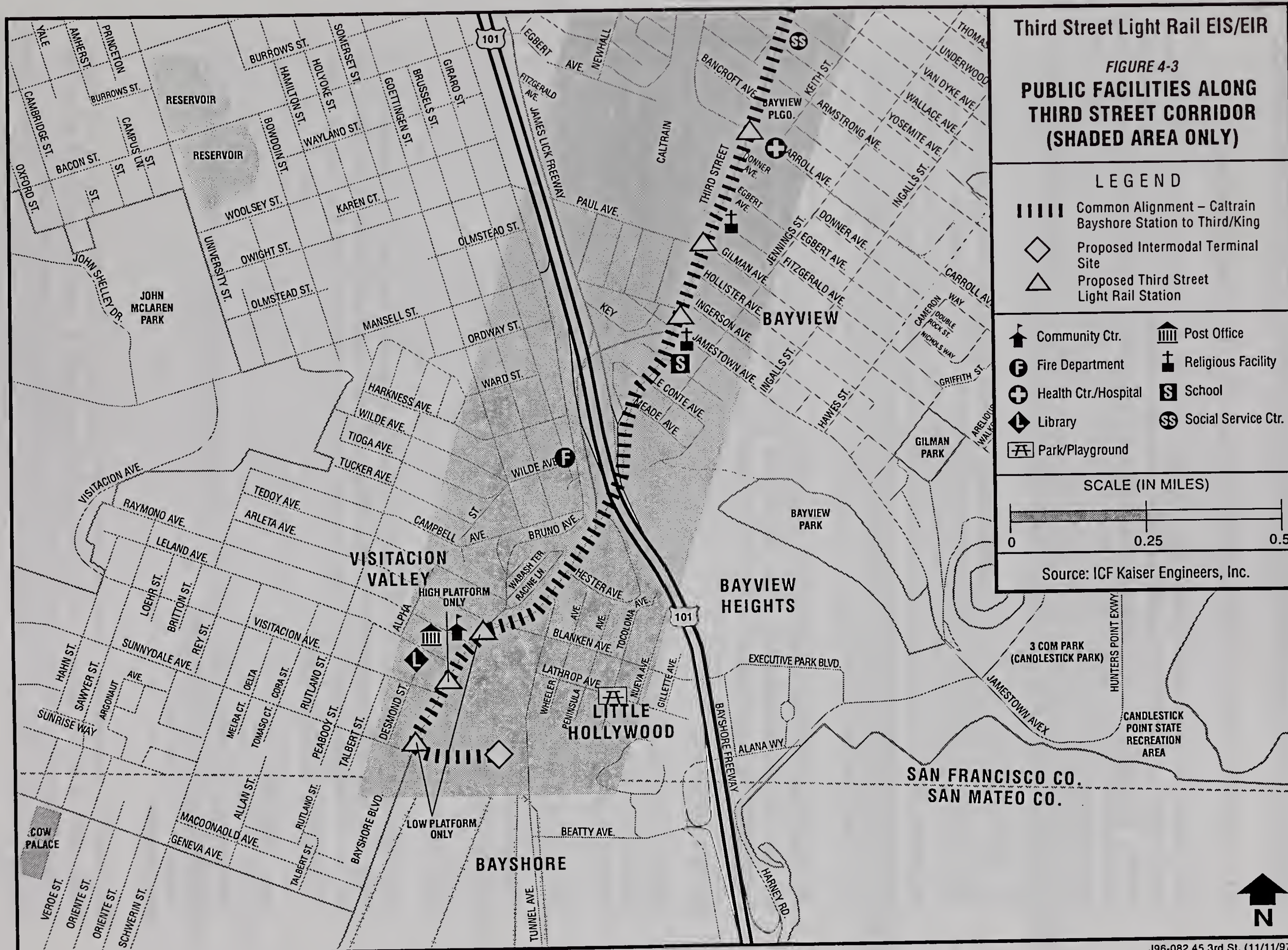
J96-082.47 3rd St. (11/11/97)

Third Street Light Rail EIS/EIR

FIGURE 4-3

PUBLIC FACILITIES ALONG THIRD STREET CORRIDOR (SHADED AREA ONLY)

J96-082.46 3rd St. (11/14/97)



Third Street Light Rail EIS/EIR
FIGURE 4-3
PUBLIC FACILITIES ALONG THIRD STREET CORRIDOR (SHADED AREA ONLY)
LEGEND
Common Alignment – Caltrain Bayshore Station to Third/King
Proposed Intermodal Terminal Site
Proposed Third Street Light Rail Station
Community Ctr.
Fire Department
Health Ctr./Hospital
Library
Park/Playground
Post Office
Religious Facility
School
Social Service Ctr.
SCALE (IN MILES)
0
0.25
0.5
Source: ICF Kaiser Engineers, Inc.
BAYVIEW
BAYVIEW HEIGHTS
VISITACION VALLEY
LITTLE HOLLYWOOD
BAYSHORE
SAN FRANCISCO CO.
SAN MATEO CO.
JOHN MCLAREN PARK
BAYVIEW PARK
GILMAN PARK
3 COM PARK (CANDLESTICK PARK)
CANDLESTICK POINT STATE RECREATION AREA
COW PALACE
CALTRAIN
THIRD STREET
JAMES LICK FREEWAY
BAYSHORE FREEWAY
HIGH PLATFORM ONLY
LOW PLATFORM ONLY
N
J96-082.45 3rd St. (11/11/97)

4.3.1 EXISTING PUBLIC AND COMMUNITY FACILITIES WITHIN THE CORRIDOR

The 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 4-5** lists those facilities that are within one block of the proposed light rail alignment. 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 EXISTING POLICE, FIRE, AND EMERGENCY SERVICES

The Corridor contains several police and fire stations. Emergency response services are provided by the San Francisco Fire Department, which assigns medical personnel to local fire stations. Beginning in FY 97-98, the Fire Department also will be responsible for ambulance dispatch, which has been operated by the Department of Public Health. **Table 4-5** identifies the location of the police and fire stations within one block of the proposed light rail alignment.

4.3.3 PARKS AND RECREATIONAL FACILITIES

The Third Street Corridor includes parks, playgrounds, recreational centers, public squares, and open spaces as indicated in **Figure 4-3**. Those that are near the proposed light rail alignment or sites for the proposed light rail maintenance and storage facility are identified in **Table 4-6**.

Bayview Playground

This 3.43-acre park operated by the San Francisco Recreation and Park Department is in a residential area bordered by Third Street, Keith Street, Armstrong and Carroll Avenues and contains a children's playground, an indoor swimming pool, and baseball and softball fields.

Warm Water Cove

This small waterfront park is located at the foot of 24th Street and provides visitor access to Bay views and a fishing pier. This Port property is only minimally maintained and is littered.

Islais Landing

Islais Landing is the first in a series of open space areas to be developed on public land bordering Islais Creek. The initial 1,580 square-meter (17,000 square-foot) open space area, located on the south side of the Creek immediately west of Third Street, contains 86 newly-planted native trees, historical information, and a landing for canoes and kayaks.

Agua Vista Park

This small waterfront park located along Terry Francois Boulevard near Mariposa Street provides visitors access to Bay views and a fishing pier.

South Park

Surrounded by residences and commercial uses, South Park lies midblock between Third and Second Streets south of Bryant Street. The 0.34-hectare (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.

TABLE 4-5

PUBLIC AND COMMUNITY FACILITIES WITHIN THE CORRIDOR

FACILITY	ADDRESS	JURISDICTION	ACTIVITY
Visitacion Valley			
Visitacion Valley Community Center	50 Raymond	Private	Facility devoted to youth services, senior activities, child care, and classes
Visitacion Valley Library	45 Leland	City	Branch library
Post Office	68 Leland	Federal	Postal services
Station 44	1298 Girard	City	Fire house
Bayview Hunters Point			
St. Paul of the Shipwreck	1122 Jamestown and Third/Key	Private	Catholic church and school
Bret Harte School	1035 Gilman	SF Unified School District	Elementary School
Concord Missionary	Third/Fitzgerald	Private	Baptist church
Southeast Health Center	Keith/Bancroft	City	Facility for ambulatory health care
Bayview Hunters Point Senior Center	Third/Yosemite	Private	Senior day center/meals
Post Office	Third/Wallace	Federal	Postal services
Potrero Station	Williams/Newhall	City	Police station
Islam Center	Third/Revere	Private	Islamic religious facility
Anna Walden Library	5075 Third	City	Branch library
Bayview Hunters Point Foundation Youth Services	5015 and 5815 Third	Private	Crisis intervention, substance abuse program, criminal justice program
Bayview Opera House	Third/Newcomb	Private	Community cultural and educational center
Southeast Campus	1800 Oakdale	City	City College branch
Providence Baptist	Third/McKinnon	Private	Baptist church
St. John Missionary	Third/Jerrold	Private	Baptist church
Third Street Clinic	4301 Third	Private	Mental health prevention, detection, and treatment programs
Social Security Admin.	Third/Galvez	Federal	Social security case management
Gloria Davis Academic	Third/Evans	SF Unified School District	Middle school special program
Bayview Hunters Point Network for Elders	3450 Third	Private	Facility serves the needs of facial elders and their facilities
Station 25	3305 Third	City	Fire house owned by the Port and operated by the San Francisco Fire Department

TABLE 4-5 (CONTINUED)

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	Howard between Third and Fourth	City	Exhibit halls and meeting rooms
Museum of Modern Art	Third/Hunt	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
Chinatown			
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
Commodore Stockton School	950 Clay	SF Unified School District	Elementary school
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

TABLE 4-6

LOCATION OF PARKS AND RECREATIONAL FACILITIES IN THE CORRIDOR

FACILITY	ADDRESS	JURISDICTION	ACTIVITY
Visitacion Valley			
Visitacion Valley Playground	Leland/ Cora	SF Recreation & Park Dept.	2.3 acres includes playground and softball field
Little Hollywood Playground	Lathrop/ Tocoloma	SF Recreation & Park Dept.	1 acre includes picnic facilities
Bayview Hunters Point			
Bayview Playground	Third/ Armstrong	SF Recreation & Park Dept.	3.43 acres includes swimming pool, playground, baseball and softball fields
Joseph Lee Recreation Center	Oakdale/ Mendell	SF Recreation & Park Dept.	1.84 acres includes indoor basketball, tennis courts, playground, and recreational classes
Youngblood Coleman Playground	Galvez/ Mendell	SF Recreation & Park Dept.	2.3 acres includes indoor and outdoor basketball, softball and soccer fields, tennis and volleyball courts, recreational classes
Central Waterfront			
Islais Landing	Arthur at Third	Port	17,000 sq. ft. open space and boat landing
Warm Water Cove Park	Foot of 24th Street	Port	39,600 sq. ft undeveloped waterfront park with picnic tables and fishing pier
Agua Vista Park	Terry Francois/ Mariposa	Port	0.5 acres includes a fishing pier
South of Market/Downtown			
South Park	64 South Park	SF Recreation & Park Dept.	0.85 acres includes a playground
Yerba Buena Gardens	Mission/ Third	San Francisco Redevelopment Agency	Landscaped gardens, cafes, area for outdoor exhibits/performances
Union Square	Stockton/ Geary	SF Recreation & Park Dept.	2.6-acre public plaza and underground garage
Chinatown			
Chinese Playground	Sacramento/ Waverly	SF Recreation & Park Dept.	25,724 sq. ft playground
Woh Hei Yuen Recreation Center	Jackson/ Powell	SF Recreation & Park Dept.	New two-story community center and small park
Portsmouth Square	Kearny/Clay	SF Recreation & Park Dept.	(to be provided)

Yerba Buena Gardens

This 2.2-hectare (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 Entertainment Center (under construction), and Mission Street, contains an outdoor area for staging performances and a memorial to Dr. Martin Luther King, Jr.

Union Square

Union Square, bounded by Geary, Powell, Post, and Stockton Streets, represents the heart of the San Francisco Downtown retail core. The 1.1-hectare (2.6-acre) public plaza is maintained by 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, the San Francisco Ticket Box Office Service operates a ticket booth for Bay Area cultural performances. Union Square is elevated above street level to cover a 1019-vehicle underground parking garage administered by the Department of Parking and Traffic.

Chinese Playground

This 3,320 square-meter (35,724 square-foot) children's playground is one-half block from the proposed alignment for the New Central Subway.

4.4 CULTURAL RESOURCES

Cultural resources include buildings, sites, districts, structures or objects having historical, architectural, archeological, cultural or scientific importance. The term "historic property" is used to designate a resource that is listed or eligible to be listed on the National Register of Historic Places. Detailed information on cultural resources is available for public review at the San Francisco Planning Department. Technical reports include: Historic Property Survey Report; Historic Architectural Property Report; and Archaeologic Resources Investigation Report.

4.4.1 REGULATORY FRAMEWORK

This study is prepared in order to comply with NEPA; CEQA; Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended; and Section 4(f) of the National Transportation Act. The first step in complying with each of these laws is an identification of cultural resources and an evaluation of historic significance. Historic properties are the buildings, districts, structures, objects, and sites that are listed on or eligible for listing on the National Register of Historic Places (NRHP) and the California Register of Historic Resources (CRHR). Properties listed or formally determined eligible for the NRHP, California Historical Landmarks, and properties of local significance designated under a local preservation ordinance are also included in the CRHR. Section 106 of the National Historic Preservation Act of 1966 (16 USC 470 et. seq.) and the Advisory Council on Historic Preservations' implementing regulations require federal agencies to inventory historic properties that may be affected by a proposed action, assess impacts based on the Act's "criteria of effect" and mitigate effects that are adverse (36 CFR Part 800).

4.4.2 AREA OF POTENTIAL EFFECTS (APE)

The Area of Potential Effects (APE) is defined in the Advisory Council regulations as "the geographical area or areas within which an undertaking may cause changes in the character or use of historic properties, if any such properties exist." [Section 800.2(c)] The APE was established in correspondence between the California Office of Historic Preservation and Leslie T. Rogers, Department of Transportation, Federal Transit Administration (30 July and 31 October 1997 [see also Appendix F]). In the IOS south of King Street, the Light Rail Alternative would be built in the center of the street right-of-way where electric streetcar lines have run in the past. For this reason, the APE for historic properties has been drawn to include the street only, except in those areas where property acquisitions are proposed (refer to Section 5.2). In the vicinity of the proposed New Central Subway, the APE for historic properties has been drawn to include properties facing the alignment north of Brannan Street where cut-and-cover and mined tunnel construction for the light rail project is proposed. The property boundaries for the electric substation and proposed maintenance facility locations are also included in the APE.

The archaeological study area and APE consist of the Stockton Street alignment from Washington Street to Geary Street; Geary Street to Kearny Street; Market Street crossing at Kearny Street; Third Street from Market Street to the portal location between Bryant and Brannan Streets; the connection from Third to Fourth Streets at Harrison Street; and Fourth Street between Harrison Street and the portal location between Bryant and Brannan Streets. The APE width conforms to the right-of-way footprint of these roadways. Also included are the maintenance facility sites at both Western Pacific, located at Pier 80, and Cargo Way.

4.4.3 HISTORIC PROPERTIES WITHIN THE APE

There are 165 properties within the APE, as shown in **Table 4-7**. These include buildings, structures (e.g., bridges), objects (e.g., Lotta's Fountain), and linear features (e.g., street lights, Stockton Tunnel). In addition, there are six historic districts, listed in **Table 4-8**, of local or national importance.

Of the 165 properties identified, 59 have been previously evaluated as eligible for the NRHP/CRHR; three have been previously evaluated as ineligible for the NRHP/CRHR; 38 are greater than 45 years of age and appear to be eligible or may become eligible for the NRHP/CRHR; 37 are greater than 45 years of age and appear ineligible for the NRHP/CRHR; and 28 are less than 45 years of age, do not appear to possess exceptional significance, and appear ineligible for the NRHP/CRHR. Although properties must ordinarily be at least 50 years old to be eligible for the NRHP, under State Office of Historic Preservation (SHPO) guidelines, properties 45 years old or more should be evaluated because of the lag time between resource identification and the date that planning decisions are made.

Of the previously evaluated properties, two appeared to warrant a change in NRHP status. These are the H.L. Nishkian Bridge located over Islais Creek on Third Street and the building at 216 Stockton Street. Constructed in 1950, the H.L. Nishkian Bridge was previously evaluated and considered ineligible (NRHP status code 5) by Caltrans in its 1983 bridge survey. At that time, it was only 33 years old, and less than the 50-year threshold for evaluation. It has been re-evaluated because it is now almost 50 years old. The H.L. Nishkian Bridge now appears to be individually eligible under criterion C as an outstanding example of Moderne-style architecture (NRHP status code 3S). 216 Stockton was previously evaluated as individually eligible (NRHP status code 3S). It was re-evaluated because its facade has since been remodeled. This remodeling has resulted in a loss of integrity, and the property is now ineligible (NRHP status code 6).

4.4.4 KNOWN ARCHAEOLOGICAL RESOURCES WITHIN APE

Several methods were used to identify archaeological resources within the APE. These methods consisted primarily of archival research, literature review, and a records search with the Northwest Information Center. Research began with the examination of the early San Francisco maps relevant to the light rail alignment. Although several sources were utilized, the major collections at the Bancroft Library and Giannini Hall Library Map Room, both in Berkeley, were most useful.

TABLE 4-7

HISTORIC PROPERTIES WITHIN THE APE

							Initial Operating Subtotal	New Central Subway Subtotal	Maintenance Facilities Subtotal	Total
Segment:	1	2	3	4	5	6	1-6	7		
Number of Properties Previously Evaluated as eligible for the NRHP/CRHR	0	0	0	0	2	0	2	57	0	59
Number of Properties Previously Evaluated as ineligible for the NRHP/CRHR	0	0	0	1	0	0	1	2	0	3
Number of Previously Evaluated Properties that were Re-evaluated and now appear eligible or may become eligible for the NRHP/CRHR	0	0	0	1	0	0	1	0	0	1
Number of Previously Evaluated Properties that were Re-evaluated and now appear ineligible for the NRHP/CRHR	0	0	0	0	0	0	0	1	0	1
Number of Properties that are 45 years of age or older that appear to be eligible or may become eligible for the NRHP/CRHR	0	0	0	0	0	0	0	38	0	38
Number of Properties that are 45 years of age or older that appear to be ineligible for the NRHP/CRHR	0	1	0	1	0	0	2	35*	0	37*
Number of Properties that are less than 45 years of age (appear ineligible for the NRHP/CRHR)	3	1	0	0	0	0	4	24	0	28

* Includes one property (401-425 Third Street) that, due to loss of integrity, appears ineligible for the NRHP but is likely eligible for the CRHR. The use of the term "appear to be eligible" refers to uncertainty of eligibility until the State Historic Preservation Office has concurred with individual property evaluation forms completed for the analysis.

The United States Coast Survey (USCS) maps, dating from 1852/1853, 1857/1859 and 1869, were used to pinpoint the location of the original Bay shoreline and marshlands, areas that were filled and cut back, and early features and structures. The Sanborn Insurance Company maps, dating from or updated to 1887, 1899, 1905, 1913, 1950, and 1988, were studied in order to assess the type of neighborhoods the alignment passed through and to identified the important businesses along the roadways.

TABLE 4-8

HISTORIC DISTRICTS WITHIN THE APE *

	Interim Operating Segment Subtotal	Central Subway Segment Subtotal	Maintenance Facilities Subtotal
Located in Segment:	1-6	7	
Lower Nob Hill Apt. Hotel District		X	
District 1: Powell Street Corridor		X	
District 2: Retail-Shopping District		X	
District 6: New Montgomery and Market Street District		X	
Chinatown: LPAB Case Report 1994		X	
Kearny-Market-Mason-Sutter Conservation District		X	
Total Districts located in Segment	0	6	0

* Of the six districts previously identified, only the Lower Nob Hill Apartment Hotel District has been determined eligible for the NRHP/CRHR; the other five districts have been locally identified.

Historical research was conducted at the Bancroft Library at the University of California in Berkeley as well as at the Main Public Library San Francisco History Room, the California Historical Society in San Francisco and the San Francisco Maritime Library. Materials reviewed at the above facilities consisted of journals, magazines, official documents, newspaper clippings, pamphlets, manuscripts and books. In addition, one thesis and several major cultural resources survey reports were particularly useful. These included Gerald Dow's thesis entitled "San Francisco: A History of Change" (1973) as well as "Tar Flat, Rincon Hill and the Shore of Mission Bay Archaeological Research Design and Treatment Plan for SF-480 Terminal Separation Rebuild" by Mary Praetzellis et al. (1993); "The Yerba Buena Center" by Roger and Nancy Olmsted et al. (1979); and "Yerba Buena Convention Center" by Roger and Nancy Olmsted et al. (1977).

Numerous volumes of the *San Francisco City Directory*, dating from the 1850s until the early 1900s, were reviewed in order to obtain the operating dates of major businesses and hotels along the project alignment. Information concerning the planking, grading, sewering, and paving dates of the roadway alignment was obtained from the 1859 through 1906 volumes of the *San Francisco Municipal Reports*.

Materials relating to prehistoric and historic archaeological resources and resource potentials along and within the project alignment were reviewed. Major sources were in-house reports, records and maps as well as those on file at the Historical Resources Information System Northwest Information Center at Sonoma State University in Rohnert Park (File Nos. 97-380 and 97-8H). The *National Register of Historic Places* and the *California Historical Landmarks* were also reviewed.

Information concerning the alignment description was obtained from the 1852/1853, 1857/1859, and 1869 United States Coast Survey maps and the Sanborn Insurance maps published and/or corrected to 1887, 1899, 1905, 1913, 1950, and 1988. The operating dates of the businesses along the alignment were gathered from various years of the *San Francisco City Directory* including those issued by Henry Langley (1858-1895) and Crocker-Langley (1896-1928).

As indicated in earlier cultural resources reports bordering the alignment, many dwellings and commercial buildings dating from the 1860s to the early 1880s were, to a great extent, the same as depicted on the first-available 1887 Sanborn map:

> Certainly between the 1860s and the date of these Sanborn maps structures were remodeled. The open spaces on the blocks seen on the 1869 (USCS) map became filled by 1887. Although the structures in the 1887 Sanborn maps were remodeled from time to time as the uses of these buildings changed, the nature of the remodeling was usually a matter of adding on rather than replacing (Olmsted et al. 1977:103).

Information concerning the planking, grading, sewering, and paving dates was gleaned from the *San Francisco Municipal Reports*. The significance of this information lies in the fact that "once a street has been paved, there is little chance for cultural materials to be deposited. Paving a street is analogous to putting a lid on a jar. Nothing can be removed or added until the lid is taken off" (Wirth Associates 1979:44).

It should be noted that except for a few gutted and reconstructed buildings, every structure fronting the roadway alignment was destroyed during the 1906 earthquake and fire. As a result, the present-standing buildings are representative of the twentieth century.

Prehistoric Archaeological Sensitivity

Based on a review of information and on the professional evaluation of the archaeologist, much of the project APE has moderate to low potential for containing subsurface, prehistoric cultural resources. Based on the analysis of existing documentation, only four alignment sections have a high probability for harboring archaeological deposits. They include:

- Third Street, between Mission and Howard Streets, where cultural deposits associated with CA-SFr-114 could exist; and
- Three sections on Third Street, between Folsom and Harrison Streets, between Harrison and Bryant Streets, and within the Crossover, between Third to Fourth Streets, immediately south of Harrison Street, where cultural materials associated with CA-SFr-2 could be present.

CA-SFr-2, the only known prehistoric archaeological site clearly situated within the project APE, is located at Third and Harrison Streets. The site is a shell midden deposit that was first documented by Nelson in 1909 and cultural materials, including human remains, were recovered from a depth of 1.8 meters (6 feet) below the ground surface (Rudo 1982:20). The site is located immediately northeast of the large, prehistoric marsh associated with Mission Bay and the mouth of Mission Creek.

CA-SFr-114, a prehistoric midden site, is located on the north side of Howard Street between Third and Fourth Streets, and is situated adjacent to and possibly extends into the project APE. Discovered at a depth of 2.7 to 4.3 meters (9 to 14 feet), the site has yielded radiocarbon dates and diagnostic artifacts that indicate the site was occupied between 1,950 and 1,250 years ago. Pastron (1990:2) suggests that the site deposits, which include human burials, are potentially eligible for nomination to the National Register of Historic Places.

Historical Archaeological Sensitivity

Most of the project APE has a low potential for containing subsurface, historical archaeological resources. The alignment analysis has revealed a complex and varied historical development of the project cultural setting and many potential historical sites front the project alignment; however, no compelling evidence, which would suggest that archaeological components extend into the APE, was encountered during these investigations. Only four of the project segments have a moderate sensitivity for containing historical archaeological materials. They are:

- Two sections on Stockton Street, between Washington and Clay Streets and between Clay and Sacramento Streets, where unidentified, circa 1850, wood-framed structures once stood;
- Third Street, between Market and Mission Streets, where Happy Valley 49er camp remains could be present; and the
- Crossover, between Third and Fourth Streets, immediately south of Harrison Street, where features, deposits, and artifacts associated with post-1850s commercial and residential use of the area may exist.

No part of the project APE has a high potential for the presence of historical archaeological resources.

Western Pacific Maintenance Facility

The Western Pacific property is situated on land that was reclaimed from Islais Creek Cove between 1910 and 1967. Geographically, the mouth of the Cove stretched 2.1 kilometers (1.3 miles) across, from approximately 23rd and Maryland Streets on the Potrero Point Peninsula in the north to Evans Avenue and Jennings Street on the Hunters Point Peninsula in the south (USCS 1869; Sanborn Index Map 1900).

According to the 1883 USCGS map, the depth of the inner Islais Creek Cove waters varied from 30 centimeters (1 foot) at mean low tide to 1.8 meters (6 feet) at mean high tide, while east of present-day Third Street, in the outer open waters, the depth fluctuated between 1.2-meters (4 feet) at mean low tide and 2.7 meters (9 feet) at mean high tide. Because of its overall shallowness, only scow schooners, barges, and vessels that drew barely a few feet of water could enter the Cove, as illustrated in Goodard's 1868 birdseye view of San Francisco.

The north and west sides of the property are located on land that was created during the earliest Islais Creek Cove reclamation projects. Until the turn of the century, the 25th Street alignment extended only as far east as Minnesota Street and the Bay. During the early 1900s, however, 25th Street and bayfill had progressed four more blocks east to just across Illinois Street. Beyond this point the 25th Street alignment became incorporated into the *Western Pacific Railroad* (1910-1978) jetty and freight slip (USGS 1895, 1915; USCGS 1899; Sanborn Index Map 1900; Sanborn 1914:Maps 636, 637).

On December 17, 1909, the Harbor Commission established a fairway across the San Francisco Bay between 25th Street and the Oakland Mole in order to insure an unobstructed course for Western Pacific Railroad's transbay cargo traffic (*San Francisco Call* 1909b:17). The Western Pacific Railroad's transbay cargo traffic (*San Francisco Call* 1909b:17). The Western Pacific then created a landfilled jetty, which projected into the Bay from Illinois Street to Delaware Street. The railroad freight slip or pier, which was constructed at the end of the jetty, measured 600 feet in length on the north side and 375 feet in length on the south side. By 1914 a 1-story, wood-framed dwelling had been constructed on the jetty near the west end of the freight slip, while three small, 1-story, wood-framed sheds and an office building were situated in the southeast corner of 25th and Illinois Streets (Sanborn 1914: Map 635; USMC 1939:54). Twentieth-century Sanborn maps indicated that several small, 1-story, wood-framed sheds, storage and office buildings continued to be scattered along the jetty at various places during various years. Today, all that remains are a few pilings at the end of the former jetty (*San Francisco Examiner* 1983:zA2).

Following the construction of the Western Pacific railroad jetty, the tidelands to the south began to be filled. The Sanborn maps indicate that by 1919 the landfill had progressed as far south as the intersection of 26th and Georgia Streets; the 1929 Sanborn maps continue to show the same configuration as did local 1930s street maps (CSAA 1937; Gousha 1938). By 1942, however, fill had advanced nearly to Army Street (recently renamed Cesar Chavez Street) on the south and roughly to Maryland Street on the east (USGS 1942). By the end of the decade the shoreline had become more bulbous in shape, curving northeast from around Marin and Illinois Streets to Maryland Street and up to Delaware and 26th Streets. A dirt road led from Illinois and Marin Streets to the northeast corner of the landfill, just south of the jetty and slip (USGS 1947, 1950). Because the 1950 Sanborn maps indicate the fill area was still tidelands and because USGS maps show no structures on the recently reclaimed land, it is likely that the dirt road was built in order to reach a newly-established City garbage dump. Evidently, throughout the 1940s and early 1950s, refuse contributed heavily to filling much of this section of the Bay (Dow 1973:170).

By 1956 the landfill's contour had become more squared off and stretched from Illinois Street, just south of Marin Street, directly east to between Delaware and Massachusetts Streets. The shoreline then proceeded north to approximately 26th Street, at times forming little jetties that projected out as far east as the New York Street alignment. Several buildings appear to have been constructed on the landfill by around the mid-1950s and at least three roadways were extended out across the newly reclaimed land including Army Street (USGS 1956a, 1956b).

The southeastern portion of the site is located on Pier 80/North Container Terminal. The history of the Pier's construction began in 1957 when the Harbor Commission submitted a bill to the California legislature that would authorize $50 million in bonds for improvements to the Waterfront. The following year the San Francisco Port Bond Law, as it came to be known, was approved by the voters. More than half the money was slated for the construction of the Pier 80 Terminal (Dow 1973:169; PSF 1971:29). The northern and eastern sides of the new terminal are bordered by the Bay. The southern boundary would eventually stretch from the Bay (waterfront line) west to Illinois Street, creating the north bank of the outer Islais Creek Channel. The western edge of Pier 80 extends north on Illinois, east on Marin, north on Michigan, east on Cesar Chavez, north on Maryland, east on 26th and then north on Massachusetts Streets to the Bay (PSF 1971: Port Map; Sanborn 1988: Maps 635, 636, 637).

Pier 80 covers 27.5 hectares (68 acres), 8.9 hectares of which had already been reclaimed by City garbage dump refuse during the 1940s and 1950s. Approximately 4,300,000 cubic yards of fill material were used to create the additional 18.6 hectares (46 acres) of new land and to bring the 8.9 hectares (22 acres) of old fill up to City grade. The project began in September 1963 (Dow 1973:170, 172).

> Before the area emerged from the bay, a substantial foundation had to be established to underlie the fill. This required the removal of four million cubic yards of bay floor material. Enormous trenches were dug to a depth of 135 feet around the bay perimeter of the site. These were designed to contain the sand dike which would contain the existing mud and the new fill.
>
> The complex sand dike began rising from the trenches with the placement of 500,000 tons of rock in three different sizes. At the bottom, 45,000 tons of bonding rock was placed in a two-foot layer. This layer was then covered with 3,600,000 tons of sand secured in place by 300,000 tons of class "B" rock, and finally 80,000 tons of riprap was placed upon the rock. The layer of riprap measured two feet thick.

> All excavation to a depth of minus 85 feet was accomplished with two 1,500-cubic-yard suction dredges with 24-inch heads. When further excavation was required, a Washington Crane with a 5-yard clamshell scoop was used.
>
> Approximately 2,500,000 cubic yards of the material was "Salvaged" and dumped at India Basin (Boblitt Debris Dike) where another fill project was in progress. The new compacting sand, which was used to replace the old, was dredged from Presidio Shoals, which lie off the Marina District just east of the Golden Gate Bridge.
>
> Construction included driving 5,001 timber piles and 4,683 pre-stressed concrete piles, then building a mile-long, 78-foot-wide dock around the perimeter of the fill. Buildings and railroad tracks were then added (Dow 1973:170-171).

When completed in 1967, Pier 80 was capable of simultaneously berthing eight freighters along its wharves which totaled one mile in length. The $27 million facility also contains open storage areas for 8,000 containers as well as four transit sheds that provide a million square feet of cargo storage (PSF 1967:42; 1971:29, 44).

Cargo Way Maintenance Facility

The archaeological information for Cargo Way is summarized from a previous, extensive, cultural resources study as part of the Application for Certification (Volume 2) by the San Francisco Energy Company (July 1994) for a cogeneration facility on a portion of the same site. This document describes the history of the site back to the late 1800s when the site was submerged into the Bay and the surrounding land was occupied by dairymen, butchers, and cattle dealers. Butchertown, as it was known, was built primarily on wooden piles and planks over mud flats and marsh. The waste lots were filled in the 1960s and reclaimed as dry land. The Cargo Way site was formerly used for parking for the grain elevator business to the south of Islais Creek.

4.5 VISUAL AND AESTHETIC RESOURCES

The visual character of the Corridor reflects the built-up features of San Francisco's urban landscape. The built-up area is interspersed with undeveloped areas, open spaces, waterways, plazas, and parking lots typical of an urban environment. Overhead utilities and signage as well as freeway overpasses, bridges, and elevated roadways punctuate the visual landscape. Views from vantage points along Bayshore Boulevard, Third Street, and Stockton Street are summarized for each segment of the Corridor. Views are recorded as foreground, middle-ground or background. Generally, foreground views are of within 0.4 kilometers (one-quarter mile) of the viewer; middle-ground views are within 1.6 kilometers (one mile); and the background views are beyond one mile.

4.5.1 SEGMENT 1 - CALTRAIN BAYSHORE STATION TO HIGHWAY 101 OVERCROSSING

The southern end of the Corridor in Visitacion Valley lies in a bowl that has a patchwork of one-story and three-story residences climbing the hilly terrain to the north and a broad open area, much of it undeveloped, to the south. The visual landscape is accentuated by overhead wires and light standards that demarcate the ridgeline and the street alignments ascending the hills to the north. Bayview Hill, crowned by a radio antenna and a cluster of tall trees, forms the prominent visual feature on the north. In the distance to the south, San Bruno Mountain, its transmitter towers and power lines punctuate the horizon. The Bayshore

Caltrain station lies in the base of the bowl where tracks and overhead telecommunications wire converge into the tunnel under Bayview Hill. Low-level industrial structures line the foreground view **(Figure 4-4).**

4.5.2 SEGMENT 2 - HIGHWAY 101 OVERCROSSING TO THOMAS AVENUE

In this segment, Third Street curves and descends along the slope of Bayview Hill. The hill is speckled with pastel-colored houses. To the north, Bayview Hunters Point spreads over the ridge that forms the spine of Hunters Point **(Figure 4-5)**. A collage of low-level businesses and residences define the landscape visual character, interspersed with light standards and utility poles and a few rooflines of industrial and residential buildings reaching above two stories. A cluster of trees along Third Street, which is otherwise devoid of landscaping, identifies the location of Bayview Playground. In the distance, Port cranes and unused granary storehouses as well as a PG&E smokestack are clearly visible in the horizon to the northeast.

4.5.3 SEGMENT 3 - THOMAS AVENUE TO KIRKWOOD AVENUE

The Third Street commercial core of Bayview Hunters Point fronts Third Street for nine blocks. The foreground view is defined by the light and dark hues of two- and three-story commercial/residential buildings and parked cars **(Figure 4-6)**. The gray wall of the Bayview Cultural Center and commercial buildings are exposed to the street without the benefit of landscaping. Instead, light poles, street signs, utility standards, and, at Palou, trolley bus overhead wire are dominant features in the foreground landscape. Along side streets, the view to the west is broken by the I-280 viaduct. Occasionally, a church spire pierces the western horizon. In the distance, Potrero Hill, the Bay Bridge, and Yerba Buena Island are visible.

4.5.4 SEGMENT 4 - KIRKWOOD AVENUE TO 16TH STREET

The industrial waterfront between Islais Creek and Mission Bay is dominated by industrial facilities and three-story commercial and residential buildings. Third Street in this segment is devoid of landscaping, thereby creating a hard edge to the texture of the streetscape. To the west, Potrero Hill steeply ascends from the flat terrain, adding greenery and providing visual relief to the foreground view. Port loading cranes and the PG&E power plant can be seen as dominant vertical features in the distance to the east behind the industrial structures.

4.5.5 SEGMENT 5 - 16TH STREET TO KING STREET

The Mission Bay area is situated on a flat, open expanse extending the length of this segment. Views stretch in each direction to distant landmarks, such as Sutro Tower and Twin Peaks to the west and the Bay Bridge to the north. Intermediate views of Potrero Hill on the south and the Port cranes on the east are dominated by large warehouses and industrial buildings, along the perimeter of Mission Bay. To the north, the Mission Creek lift bridges, including the historic **Third Street and** Fourth Street **bridges**, frame the China Basin building, which creates a visual barrier to the South of Market warehouses beyond **(Figure 4-7)**. Downtown high-rises define distant views. The I-280 viaduct and the screen and utility standards of the Mission Bay golf driving range stand in contrast with the otherwise flat terrain.

4.5.6 SEGMENT 6 AND SEGMENT 7 - KING STREET TO DOWNTOWN/CHINATOWN

Downtown skyscrapers form the backdrop for views in these segments. From South Beach/South of Market, the view to the north is interrupted by billboards and signs and low-rise commercial buildings, and the I-80 viaduct **(Figure 4-8)**. Bay Bridge ramps and support towers also break the view of Downtown.

Figure 4-4
Caltrain Bayshore Station in Visitacion Valley

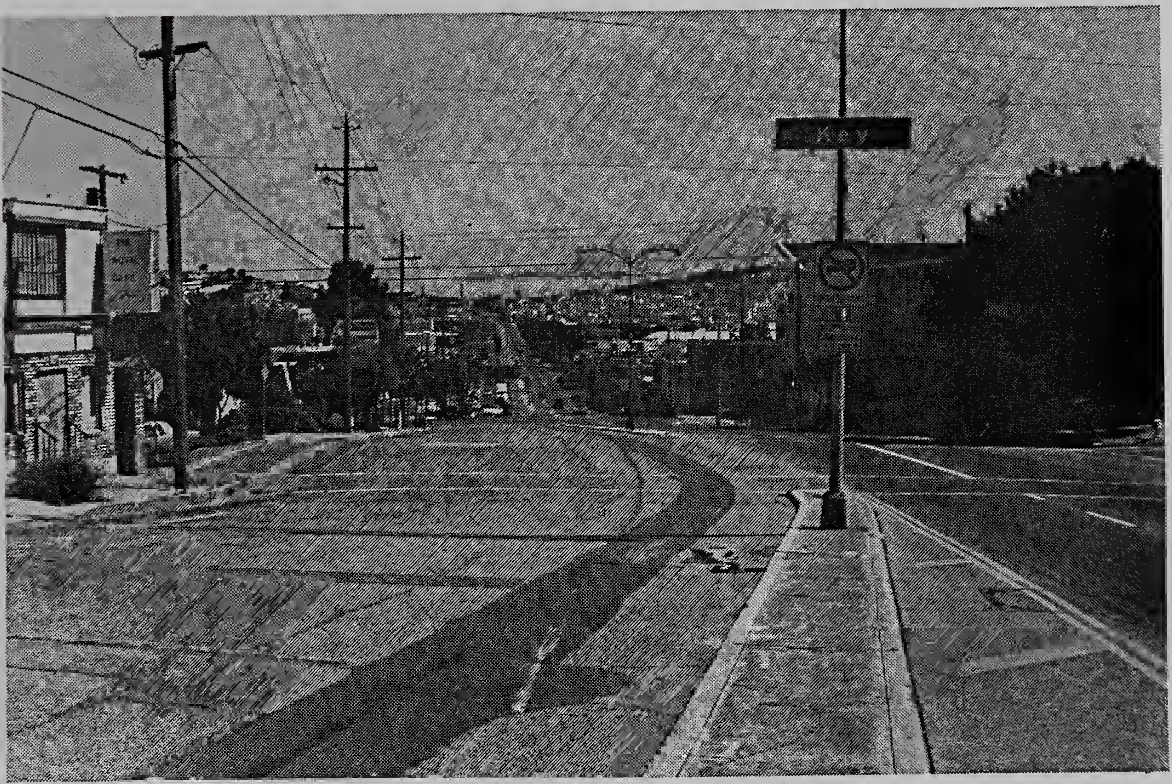


Figure 4-5
Bayview District looking north along Third Street at Key Avenue intersection

Figure 4-6
Third Street commercial core looking north along Third Street at Palou Avenue intersection

Figure 4-7
Fourth Street Bridge looking north along Fourth Street from Channel Street intersection

Figure 4-8
Third Street looking north from Brannan Street intersection

Figure 4-9
Chinatown looking north along Stockton Street from Clay Street

From Chinatown, Nob Hill and the cluster of commercial structures and mid-rise housing define the view toward Downtown **(Figure 4-9).** Open spaces, such as Union Square and Yerba Buena Gardens, moderate the visually-confining pattern of Downtown high-rise development **(Figure 4-10).** In addition, views that are blocked by buildings are often opened up by the rectilinear street grid and, in Chinatown, by the narrow streets. The expanding Bay vistas as seen from Chinatown contrast with the multitude of colors and textures provided by the markets along Stockton Street.

4.5.7 WESTERN PACIFIC MAINTENANCE FACILITY SITE

The Western Pacific site represents a broad, vacant parcel of land that is surrounded by low industrial buildings. Directly to the south loom the Port's cranes and light standards **(Figure 4-11).** The view to the east, partially obstructed by Pier 80, opens onto the Bay, providing a stark contrast in color and texture with the landscape's dirt and grass covered surroundings. The low-rise industrial buildings permit unobstructed views of Potrero Hill, crowned by trees, to the west and of the abandoned granaries at Cargo Way to the south. Beyond, Bayview Hunters Point residences and businesses spread over the distant hills in a patchwork of colors. The vacant parcel is littered, and abandoned parked cars distract from the scenic vistas of the Bay.

4.5.8 CARGO WAY MAINTENANCE FACILITY SITE

The Cargo Way site is flat and largely undeveloped although a recycling center and piles of debris occupy a portion of the site. To the north, concrete grain storage towers (no longer in use), shipping cargo cranes operating on Pier 92, and a television transmitter punctuate the skyline. To the east are views of an industrial area and the Bay. Modern industrial buildings form a visual wall that partially blocks views of the Bayview Hunters Point ridge line to the south.

4.6 UTILITIES

The Third Street Corridor has extensive underground and above ground utilities that parallel and intersect the Corridor. The primary utilities serving the Corridor are: 1) City and County of San Francisco Clean Water Program underground sewer system; 2) City and County of San Francisco Water Department potable water lines **and San Francisco Fire Department auxiliary water lines**; 3) Pacific Gas and Electric (PG&E) underground natural gas lines and electrical lines and ducts (above and below ground); and 4) Pacific Bell underground telecommunications lines. Although Pacific Bell has the most extensive network of underground telecommunications cables, MCI, Sprint, and AT&T also have a limited number of underground cables in the Corridor.

Table 4-9 lists the major utility lines in the Corridor that could be affected by the implementation of the Third Street Light Rail Project. The major utilities identified lie within or cross the right-of-way for the proposed light rail alignment and facilities. A complete listing of utilities in the Corridor is presented in the Project capital cost estimates.[41]

[41] San Francisco Municipal Railway, *Conceptual Capital Cost Estimates, Working Paper #5A*, November, 1997, in Project File 96.281E available for review at the Department of City Planning, 1660 Mission Street, San Francisco.

Figure 4-10
Union Square looking north along Stockton Street at Geary Street

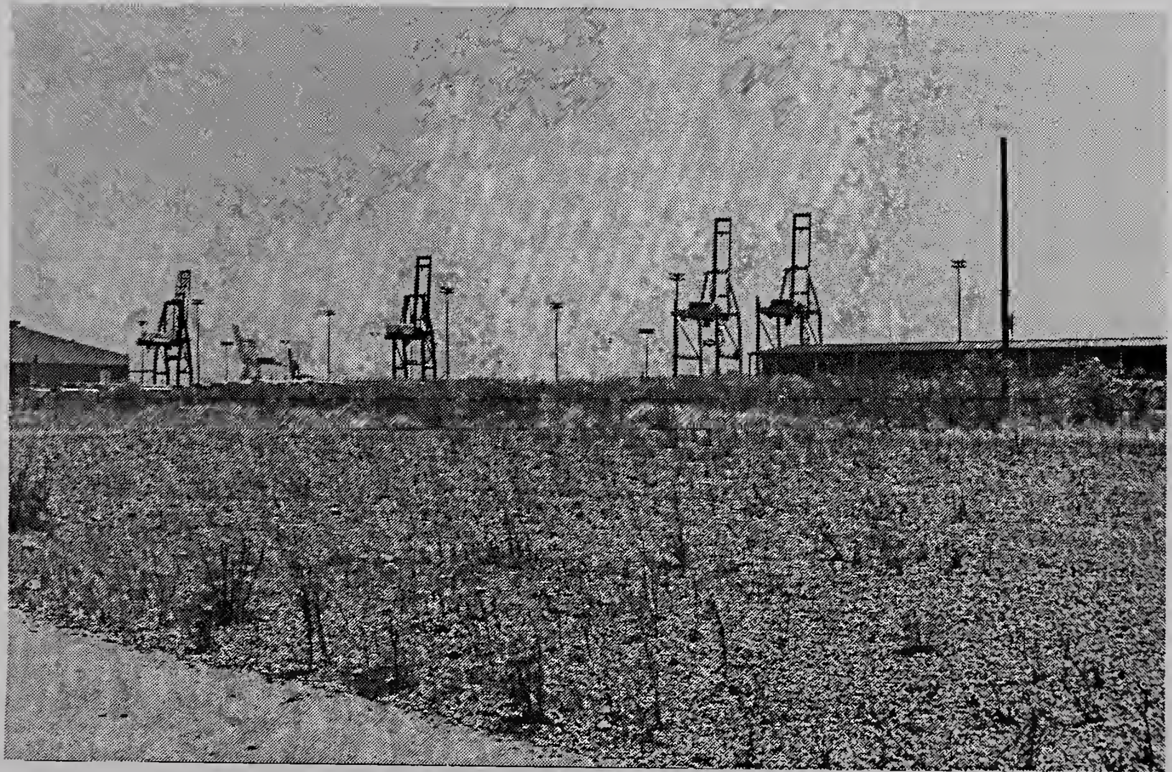


Figure 4-11
Western Pacific site – east end – looking southeast

TABLE 4-9

MAJOR UTILITY LINES IN THE THIRD STREET CORRIDOR

UTILITY	ITEM	LIMITS
Segment 1:	**Sunnydale/Bayshore Station to Highway 101 Overcrosing**	
Sewer (underground)	12" VCP	Hester to Blanken
Gas (underground)	20" CI pipe	Hester to San Bruno
Gas (underground)	24" CI pipe	San Bruno to Sunnydale
Electrical (above ground)	110 kv line	San Bruno to Raymond
Segment 2 and 3:	**Highway 101 Overcrossing to Kirkwood Avenue**	
Sewer (underground)	15" VCP 12" VCP 18" VCP 12" VCP 18" VCP 2' X 3' RC	Jamestown to Key Key to Bayshore Fwy. Jerrold to Revere Thorton to Van Dyke Bancroft to Egbert Palou to Salinas
Gas (underground)	6" CI pipe 4" PL pipe 8" CI pipe	Shafter to Gilman Innes to Palou Palou to Revere
Segment 4:	**Kirkwood Avenue to 16th Street**	
Sewer (underground)	3'-6" X 5' 12" VCP 7' RCP 2'-6" X 3'-9" 2'-6" X 3'-9" 7'-6" RCP 2' X 3' RC 10" 18" VCP 16" VCP 2'-6" x 3'-9" concrete 3'-6" X 3'9" concrete 3'-6" X 5'3" concrete 3' X 4'-6" concrete 3' X 4'-6" concrete	Cesar Chavez to Tulare Cesar Chavez to Tulare Islais Creek & Cargo Way Burke to Custer Custer to Davidson Davidson to Evans Evans to Fairfax 16th to 17th Mariposa to 18th 18th to 23rd Mariposa to 18th 18th to 19th 19th to 22nd 23rd to 26th 26th to Cesar Chavez
Potable Water (underground)	12" pipe 8" pipe 16" pipe 16" pipe	Islais Creek to Cargo Way Cargo Way to Burke Cargo Way to Burke 18th to 23rd
Gas (underground)	30" CI pipe	18th to 22nd
Electrical (above ground)	115 kv line 115 kv line	19th to 20th 22nd to 23rd
Segment 5:	**16th Street to King**	
Sewer (underground)	3' X 5' brick 2'-6" X 3'-9" concrete 6'-6" circular 2'-6" X 3'-9" concrete 2'-6" X 3'-9" concrete 2' X 3' concrete 18" VCP 12" VCP	King to Berry Berry to Mission Rock King to Channel Channel to Mission Rock Mission Rock to 16th Mission Rock to 16th Mission Rock to 16th Mission Rock to 16th

CI Cast Iron PVC Polyvinyl Chloride Pipe RCP Reinforced Concrete Pipe VCP Vitrified Clay Pipe RC Reinforced Concrete PL Plastic

TABLE 4-9

MAJOR UTILITY LINES IN THE THIRD STREET CORRIDOR (Cont.)

UTILITY	ITEM	LIMITS
Segments 6 and 7:	**Third/King to Stockton/Jackson**	
Sewer (underground)	3' X 5' brick	Bryant to Welsh
	3' x 5' brick	Brannan to Townsend
	3' x 5' brick	Townsend to King
	Small active duct	Bryant to Brannan
	3' x 5' brick	Sutter to Post
	3' x 5' brick	Post to Geary
	3' x 5' brick	Stockton to Grant
	3' x 5' brick	Grant to Kearny
	3' x 5' brick	Market to Clementina
	15" VCP	Market to Jessie
	3' x 5' brick	Perry to Bryant
	3' x 5' brick	Bryant to Brannan
	3' x 5' brick	Brannan to King
	8' North Point sewer	4th/Howard to 2nd/Mission
Potable Water (underground)	8" pipe	Grant to Kearny
	8" pipe	Market to Clementina
	16" pipe	Market to Clementina
	8" pipe	Harrison to Bryant
Auxiliary Water (underground)	12" pipe	Market to Clementina
Gas (underground)	4" PL pipe	Post to Geary
Electrical (underground)	Medium RC box	Between Stevenson and Mission
	3"/6" active duct	Between Stevenson and Mission
	Medium RC box	Between Mission and Howard
	3"/6" active duct	Between Mission and Howard
	Small RC box	Between Howard and Folsom
	Medium RC box	Between Howard and Folsom
	3"/6" active duct	Between Howard and Folsom
	Small RC box	Between Folsom and Harrison
	Medium RC box	Between Folsom and Harrison
	3"/6" active duct	Between Folsom and Harrison
	Small RC box	Between Post and Geary
	3"/6" active duct	Between Post and Geary
	Small RC box	Between Stockton and Grant
	Medium RC box	Between Stockton and Grant
	Small RC box	Between Grant and Kearny
	Medium RC box	Between Grant and Kearny
	Medium RC box	Between Geary and Stevenson
	3"/6" active duct	Between Geary and Stevenson
	Small RC box	Between Stevenson and Mission
CI Cast Iron PVC Polyvinyl Chloride Pipe RCP Reinforced Concrete Pipe VCP Vitrified Clay Pipe RC Reinforced Concrete PL Plastic		

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 Bayshore Station is at an elevation of approximately 4 meters (13 feet) San Francisco City Datum (SFCD). SFCD is equal to +2.63 meters (8.616 feet) National Geodetic Vertical Datum (commonly referred to as mean sea level). The Third Street surface alignment (Segments 1 through 5) crosses several low-lying valleys separated by hills; elevations range from approximately 49 meters

SFCD (160 feet) near Bayview Ridge at Highway 101 to approximately 0 meter SFCD (0 foot) at Mission Creek.[42] The New Central Subway alignment terminates in the north in the Nob Hill/Chinatown area of San Francisco at an elevation of approximately 39 meters SFCD (128 feet).[43] The topography along the subway alignment slopes gently downward south from Nob Hill. It reaches an elevation of approximately 0 meter SFCD (0 foot) in the flat-lying area south of Market Street near Mission Creek. The approximate surface elevations along the Light Rail Alternative are presented in **Table 4-10**.

TABLE 4-10

APPROXIMATE SURFACE ELEVATIONS ALONG LIGHT RAIL ALTERNATIVE ALIGNMENT

Location	Segment	Approximate Elevation (meters, SFCD)	Approximate Elevation (feet, SFCD)
Initial Operating Segment			
Fourth/Third and King streets (Mission Creek)	5	0	0
Third and 20th Streets (Potrero Hill)	4	7	23
Third Street and Islais Creek Bridge	4	0	0
Third and Revere streets	3	22	72
Third and Yosemite streets	2	4	13
Third Street and Highway 101	2	49	161
Bayshore Station	1	4	13
New Central Subway (Ground Surface Elevations)			
Stockton and Washington streets	7	31	102
Stockton and Sacramento streets	7	39	128
Stockton and Geary streets	7	15	49
Kearny and Market streets	7	10	33
Third and Bryant streets	7	2	7
Fourth and Bryant streets	7	0	0

Notes: SFCD = +2.63 meters (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.

The maintenance facility site at the Western Pacific Railroad site is located northeast of the intersection of Cesar Chavez and Maryland Streets near Islais Creek. The elevation of the site ranges from approximately 5.6 to 0.6 meters SFCD (18.3 to 2.0 feet).[44] The elevation at the maintenance facility alternative site at Cargo Way ranges from more than 6 to -2.0 meters SFCD (more than 20 to -6.6 feet).[45]

4.7.2 GEOLOGY

The City and County of 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 Quaternary sedimentary deposits or artificial fill. Bedrock in the area consists of highly deformed fractured Jurassic to Cretaceous-aged sedimentary rocks, cherts, shales, greenstones, and

[42] U.S. Geological Survey. San Francisco South Quadrangle, California 7.5 Minute Series, (Topographic). 1980.
[43] ICF Kaiser. Preliminary Plans and Profile, Central Subway Alignment, Stockton/Third/Fourth Streets. 1 October, 1996.
[44] Dames & Moore. Preliminary Geotechnical Evaluation Site Development at Western Pacific Site Metro East Maintenance Facility, MUNI Third Street Light Rail. 6 May, 1997.
[45] San Francisco Energy Company. Application for Certification, Volume I, submitted to California Energy Commission. July, 1994.

serpentine of the Franciscan Formation.[46] 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.[47,48]

Along the IOS, beginning at the southern end, the Caltrain Bayshore Station is underlain by surficial deposits (alluvial/colluvial sediments); the alignment then encounters bedrock in the Bayview area where the alignment crosses Highway 101. Surficial deposits are encountered in the Hunters Point Bayview area. Artificial fill is encountered from Hudson Avenue to approximately 23rd Street. Bedrock is encountered from approximately 23rd Street to 19th Street on the eastern flank of Potrero Hill.

Along the New Central Subway alignment, bedrock is encountered from the northern end of the alignment in the Nob Hill/Chinatown area, south to approximately Geary Street.[49,50] Dune sand deposits are encountered from Geary and Sutter Streets to approximately Harrison Street. The northbound Third Street tunnel and surface alignment is within surficial deposits to approximately Townsend Street. The southbound Fourth Street tunnel and surface alignment are within artificial fill.

The material underlying the Western Pacific Railroad maintenance facility site consists of artificial fill (ranging in thickness from 1.8 to 13 meters (6 to 43 feet)) underlain by Bay Mud (ranging in thickness from 5 to 15 meters (18 to 48 feet)).[51] The Cargo Way site is underlain by about 3 to 13 meters (10 to 43 feet) of artificial fill. The fill is underlain by Bay Mud ranging in thickness from 12 to 19 meters (40 to 61 feet).

Bedrock

Bedrock is present in the study area at depths ranging from over 76 meters (249 feet) to outcropping at the surface.[52] 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 project area consist of graywacke, cherts, and shales in the Bayview area; sheared serpentine and shale in the Potrero Hill area; and graywacke sandstones in the Nob Hill area.[53] Locally, bedrock has been crushed and sheered through geologic and tectonic processes making their engineering properties variable.[54]

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.[55] Thickness of the sand in the study area along Third Street are approximately 30 meters (98 feet).[56] 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.

[46] Schlocker, J. Geology of the San Francisco North Quadrangle, California, U.S. Geological Survey, Professional Paper, 782. 1974.
[47] Ibid.
[48] 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.
[49] ICF Kaiser. Preliminary Plans and Profile, Central Subway Alignment, Stockton/Third/Fourth Streets. October 1, 1996.
[50] Geotechnical Consultants, Inc. Geotechnical Report for MUNI Metro East Facility, LRT Extension, San Francisco, California. 11 August, 1993.
[51] Dames & Moore. Preliminary Geotechnical Evaluation Site Development at Western Pacific Site Metro East Maintenance Facility, MUNI Third Street Light Rail Project. 6 May, 1997.
[52] 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.
[53] Schlocker, J. Geology of the San Francisco North Quadrangle, California, U.S. Geological Survey, Professional Paper, 782. 1974
[54] Ibid.
[55] Ibid.
[56] Lee & Prasker. Geotechnical Report, Idealized Subsurface Profiles, San Francisco Museum of Modern Art, San Francisco, California. 14 August, 1990.

Saturated dune sand is susceptible to liquefaction; unsaturated, well compacted sand provides moderate to high shear strength, when confined.[57]

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.[58] The practice of creating land by placing fill on tidal flats along the eastern margins of San Francisco began in the 1800s.[59] Fill was placed on mudflats and in estuaries within the South of Market, Mission Bay, and Islais Creek areas of the light rail alignment. Along The Embarcadero, a seawall was constructed in the 1880s to stabilize the shoreline and allow the placement of fill to create the current landmass.[60] The character of the fill varies significantly depending on the source of the material. The thickness of the fill varies from an average of 3 meters (10 feet) north of Mission to over 18 meters (59 feet) south of Mission Creek.[61]

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.[62] 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.[63] Thickness of the Bay Mud range to over 30 meters (98 feet) in the study area.[64] 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 in the study area such as Islais Creek and Mission Creek. These undifferentiated deposits can range up to 9 meters (29 feet) in thickness in the eastern portion of San Francisco.[65] The engineering characteristics of these materials is highly variable depending on the nature and origin of the deposits.[66]

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[57] Schlocker, J. Geology of the San Francisco North Quadrangle, California, U.S. Geological Survey, Professional Paper 782. 1974.
[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] Ibid.
[61] Schlocker, J. Geology of the San Francisco North Quadrangle, California, U.S. Geological Survey, Professional Paper, 782. 1974.
[62] Ibid.
[63] 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.
[64] Lee & Praszker. Geotechnical Report, Idealized Subsurface Profiles, San Francisco Museum of Modern Art, San Francisco, California. 14 August, 1990.
[65] Schlocker, J. Geology of the San Francisco North Quadrangle, California, U.S. Geological Survey, Professional Paper 782. 1974
[66] Ibid.

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.[67] There are no known active faults that traverse the study area; however, several nearby active faults could impact the area. Significant regional faults which could serve as sources of seismic activity include the San Andreas Fault, located approximately 13 kilometers (km) (8 miles) west of Downtown; the Hayward Fault, located approximately 15 km (9 miles) east of Downtown; the Calaveras Fault, located approximately 40 km (25 miles) east of Downtown; and the San Gregorio Fault, located approximately 22 km (14 miles) west of Downtown. Inactive faults, within the City of San Francisco, are unlikely to generate earthquakes. Numerous other active faults in northern California can generate earthquakes. Active faults in the Bay Area are presented in **Table 4-11.**

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 100 km (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.[68]

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 each segment of major faults.[69,70] 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.[71] Major faults proximate to the study area, their M_{max}, return interval, and distance from Downtown San Francisco are presented in Table 4.7.2. The Working Group on California Earthquake Probabilities has estimated that there is a 67 percent probability that one or more large earthquakes (M_L 7 or greater) will occur along the San Andreas, Hayward, or Calaveras faults during the 30-year period 1990 and 2020.[72]

The Bay Area faults with the greatest slip rates include the San Andreas Fault, Hayward 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 8.[73]

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.[74] The DBE is defined as the seismic event that has a 10 percent chance of exceedance in 50 years.[75] It is specific to a project location and is based on the M_{max} of earthquakes for all faults located

[67] Perkins, J. and J. Boatwright. *The San Francisco Bay Area - On Shaky Ground*, Association of Bay Area Governments. April, 1995.
[68] Ibid.
[69] California Department of Conservation, Division of Mines and Geology. California Fault Parameters, San Andreas Fault Zone. 1996
[70] California Department of Conservation, Division of Mines and Geology. California Fault Parameters, San Francisco Bay Area Faults. 1996
[71] Peterson, M. California Department of Conservation, Division of Mines and Geology. Personal communication with Baseline Environmental Consulting. 22 November, 1996
[72] U.S. Geological Survey. Working Group on California Earthquake Probabilities. Probabilities of Large Earthquakes in the San Francisco Bay Region, California, U.S. Geological Survey Circular 1053. 1990
[73] Sydnor, R. California Department of Conservation, Division of Mines and Geology, personal communications with Baseline Environmental Consulting. 21 November, 1996.
[74] Uniform Building Code. International Conference of Building Officials. 1994
[75] Ibid.

TABLE 4-11

MAJOR SAN FRANCISCO BAY AREA EARTHQUAKE FAULTS AND THEIR MAXIMUM MOMENT MAGNITUDE

Fault Name	Length (km)	Length (mi)	Slip Rate (mm/year)	Maximum Magnitude (M_{max})	Return Interval (years)	Nearest Distance (from Downtown San Francisco) (km)	Nearest Distance (from Downtown San Francisco) (mi)
San Andreas-Peninsula Segment	88	55	17±3	7.1	400	13	8
San Andreas-North Coast Segment	322	200	24±3	7.6	NA		17
San Andreas-Santa Cruz Segment	37	23	14±3	7.0	400	77	48
Northern Hayward	43	27	9±1	6.9	167		9
Southern Hayward	43	27	9±1	6.5	167	24	15
Entire Hayward	86	53	9±1	7.1	167	15	9
San Gregorio	129	80	5±2	7.3	400	22	14
Northern Calaveras	52	32	6±2	6.8	146	40	25
Rogers Creek	63	39	9±2	7.0	222	40	25
Concord-Green Valley	66	40	6±3	6.9	176	38	24

Notes: km = kilometers.
mi = miles.
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.

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. These parameters for this project would require evaluation using the upcoming UBC 1997 standards which vary from the 1994 standards.[76,77]

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.[78] 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.[79]

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.[80] The Association of Bay Area Governments (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.[81] The areas of high amplification are those where the underlying geologic materials consist of artificial fill, dune sand, and surficial (alluvial/colluvial) sediments. The areas of highest risk include Mission Bay and Islais Creek area, which are underlain by Bay Mud. The two new LRV maintenance facility sites are located in the areas of highest groundshaking risk. The areas of lower amplification are those underlain by bedrock.

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.[82] 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 settlement, sand boils, and lateral spreading within the study area during the 1989 Loma Prieta Earthquake.

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[76] Ibid.
[77] Sydnor, R. California Department of Conservation, Division of Mines and Geology. Personal communications with Baseline Environmental Consulting. 21 November, 1996.
[78] Perkins, J. and J. Boatwright. *The San Francisco Bay Area - On Shaky Ground,* Association of Bay Area Governments. April, 1995.
[79] Ibid.
[80] Ibid.
[81] Association of Bay Area Governments. On Shaky Ground City Maps, City of San Francisco. October, 1995.
[82] 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.

4.8 HYDROLOGY AND WATER QUALITY

4.8.1 REGULATORY FRAMEWORK

The US Environmental Protection Agency (USEPA) 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, USEPA 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. USEPA is currently drafting regulations addressing construction activities from soil disturbances of less than five acres. In California, USEPA has delegated the program to the State Water Resources Control Board (SWRCB) and the California Regional Water Quality Control Boards (RWQCB).

The SWRCB 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.

The City and County of San Francisco's combined sewer system collects storm water and sewage and conveys the combined flows to wastewater treatment facilities; therefore, construction operations which drain to the sewer system are not required to comply with the general permit requirements for non-point source discharges or preparation of SWPPPs.[83] However, under San Francisco Ordinance 19-92 Section 118 and 123, discharges of materials, including soil, sand, or gravel which can obstruct the sewers is prohibited.[84] Best Management Practices (BMPs) must be implemented at construction sites to ensure that unauthorized discharges do not occur. During construction activities for the project, best management practices for non-point source discharge control will be required.

The groundwater underlying the study area and the surface waters of San Francisco Bay constitute the receiving waters which could be affected by the Light Rail Alternative. 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 1995, to implement state and federal laws requiring the preservation and enhancement of water quality.[85] 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

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[83] Lee, T. Section Engineer, San Francisco Department of Public Works, Bureau of Environmental Regulation and Management, personal communication with BASELINE. 25 November, 1996.
[84] Ibid.
[85] California Regional Water Quality Control Board, San Francisco Bay Region. Water Quality Control Plan, San Francisco Bay Basin (Region 2). 1995

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.[86]

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.[87,88]

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.[89] 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 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 Department of Public Works (DPW), Bureau of Environmental Regulations and Management (BERM), regulates the discharge and potential discharge of industrial wastewater, including dewatering effluent, to the combined sewer system under the Industrial Waste Ordinance and DPW Order No. 158170. 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.[90] The requirements specify analytical requirements 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 required, permits to perform batch wastewater discharges will be required.

4.8.2 EXISTING SURFACE WATER WITHIN THE CORRIDOR

The climate of the study area is characterized by near-shore Mediterranean conditions. The mean annual temperature in San Francisco is 10° Celsius. Rainfall is variable throughout the City of San Francisco and generally increases with elevation westward of the study area. The range of average annual rainfall within the study area varies from approximately 56 centimeters (cm) (22 inches) in the southern portion of the

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[86] Ibid.

[87] Loiacono, J. Section Manager, Environmental Engineering, San Francisco Department of Public Works, Southeast Water Pollution Control Plant. Personal communication with BASELINE. 20 November, 1996.

[88] City and County of San Francisco Department of Planning. San Francisco Waterfront Land Use Plan, Draft Environmental Impact Report. 1996

[89] 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.

[90] City and County of San Francisco, Department of Public Works, Bureau of Environmental Regulation and Management. Requirements for Batch Wastewater Discharges. 11 April, 1994.

project near Visitacion Valley, to 51 cm (20 inches) per year on the northern portion of the project area near Nob Hill/Chinatown.[91] More than 90 percent of the rainfall occurs between November and April.[92]

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 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 of San Francisco's combined 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. The only portions of the study area that are not currently connected to the combined sewer system is the east side of The Embarcadero between Mission Street and Broadway, Terry Francois Boulevard, and a portion of the landward Port property**, including the Western Pacific site for the proposed light rail maintenance facility**.[93] In that area, surface water runoff is currently directed to the Bay. The planned reconstruction of the Mid-Embarcadero Roadway Project, scheduled to begin in 1998, will connect that portion of the roadway to the combined sewer system.[94] The Mid-Embarcadero Roadway Project will include construction of MUNI trackways.

The new LRV maintenance facility site at the Western Pacific property is undeveloped and unpaved. Runoff from paved parking areas and roof drains are connected to the combined sewer system. Runoff from the unpaved areas either percolate to the shallow groundwater through infiltration or flow into the storm sewer drains in the street during heavy storms. The new LRV maintenance facility site at Cargo Way is entirely unpaved (except for approximately 20,000 square meters of the San Francisco DPW Bioremediation Site). Rainwater predominantly infiltrates to the shallow groundwater, although some portions of the site may flow into off-site street storm sewer drains during heavy storms.

The only perennial surface waters in the study area are Islais Creek and China Basin Channel (also known as Mission Creek). Islais Creek is located near the central portion of the alignment and is approximately 1,525 meters (4,996 feet) long and 90 to 120 meters (295 to 393 feet) wide. The light rail alignment crosses Islais Creek via an existing bridge between Evans Avenue and Cesar Chavez Street. Mission Creek is located near the north-central portion of the alignment and is approximately 1,525 meters (4,996 feet) long and about 60 meters (197 feet) wide. The light rail alignment crosses Mission Creek via existing bridges between Channel and Berry Streets.

Both Islais and Mission creeks are tidal channels. They are both remnants of historic streams that drained the eastern portion of San Francisco before the streams were channelized.[95]

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[91] 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

[92] Ibid.

[93] Loiacono, J. Section Manager, Environmental Engineering, San Francisco Department of Public Works, Southeast Water Pollution Control Plant. Personal communication with BASELINE. 20 November, 1996**; Wong,M., Project Manager, Utilities Engineering Bureau, San Francisco Public Utilities Commission, telephone conversation, June 1998**.

[94] Ibid.

[95] City and County of San Francisco Department of Planning. Mission Bay Final Environmental Impact Report, Volume 1 and 2, Case No. 86.505E. 1990.

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.[96] 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 and Islais Creeks.[97,98]

4.8.3 FLOODING/TSUNAMIS

The City and County of 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.[99] The study area elevations range from approximately 48.8 meters San Francisco City Datum (SFCD) (159.9 feet) where the light rail alignment crosses Highway 101 in the Bayview District, to 0 meter SFCD (0 feet) where the light rail alignment crosses Mission and Islais Creeks.[100,101] Elevation at the Western Pacific site ranges from approximately 0.6 to 5.6 meters SFCD (2.0 to 18.3 feet).[102] Elevation at the Cargo Way site ranges from more than six to -2 meters SFCD (more than 20 to -7 feet).[103,104] San Francisco City Datum is equal to +2.63 meters National Geodetic Vertical Datum (NGVD) (8.616 feet).

The 100-year high tide (the height which is equaled or exceeded with an average frequency of once every 100 years) would reach an elevation of approximately -0.6 meters SFCD (-2.0 feet).[105] Therefore, the Cargo Way site could be expected to be partially inundated by a 100-year, or less, high tide, if it were not graded. Inundation of the remainder of the study area from a 100-year high tide would not be expected.

The projected sea level rise in the San Francisco Bay is estimated to be approximately 0.38 meter (1.25 feet) in the next 100 years.[106] An increase of 0.38 meter (1.25 feet) of the 100-year high tide (currently -0.2 meter SFCD (-0.7 foot)) would result in an elevation of about +0.18 meter SFCD (0.59 foot); this could cause additional flooding during a 100-year high tide at the Cargo Way site.

Portions of the study area are located near the landward edge of an area designated as possibly being inundated by tsunamis, waves generated by earthquakes.[107] 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 2.26 meters (7.40 feet) at the Golden Gate.[108] The narrow mouth of the Golden Gate limits the extent of tsunami

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[96] Loiacono, J. Section Manager, Environmental Engineering, San Francisco Department of Public Works, Southeast Water Pollution Control Plant. Personal communication with BASELINE. 20 November, 1996.
[97] Ibid.
[98] 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.
[99] Federal Emergency Management Agency. National Flood Insurance Program, Community Status Book. January, 1997.
[100] U.S. Geological Survey. San Francisco North/South Quadrangle, California, 7.5 Minute Series, (Topographic). 1973 and 1980
[101] U.S. Geological Survey. San Francisco South Quadrangle, California, 7.5 Minute Series, (Topographic). 1980
[102] U.S. Geological Survey. San Francisco North Quadrangle, California, 7.5 Minute Series, (Topographic). 1973.
[103] San Francisco Energy Company. Application for Certification, Volume I. Submitted to California Energy Commission. July, 1994.
[104] Dames and Moore. Phase II Site Characterization/Risk Assessment, Union Pacific Railroad Army Street Site, San Francisco, California, 20 June, 1989.
[105] Mission Bay Plan FEIR, Volume 2, page VI.L.9 and Volume 4, page XV.J.4
[106] Titus, J., and V. Narayanan. The Probability of Sea Level Rise, U.S. Environmental Protection Agency, EPA 230-R-95-008. October, 1995.
[107] 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
[108] 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.

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 1.7 meters (5.6 feet) near the Ferry Building, 1.5 (4.9 feet) meters near China Basin, 1.5 meters (4.9 feet) near Islais Creek, to 1.3 meters (4.3 feet) near Candlestick Point. Therefore, assuming mean sea level water elevation, -2.63 meters SFCD (-8.62 feet) at the time of a tsunami, portions of the Cargo Way site below an elevation of -1.1 meters SFCD (-3.6 feet) could experience partial inundation from a tsunami with a 100-year return period. Given the surface elevation at the lowest portion of the remainder of the project area is approximately 0 meter SFCD (0 foot) near Mission and Islais Creeks, inundation of the site from a 100-year tsunami is unlikely.

4.8.4 GROUNDWATER

The study area is underlain by four groundwater basins as defined by the U.S. Geological Survey.[109] South to north they are the Visitacion Valley Basin, South Basin, Islais Valley Basin, and Downtown Basin. The basins are separated by hills (bedrock outcrops) along the eastern portion of San Francisco and occupy the intervening valleys. Segment 1 of the Light Rail Alternative is located in the Visitacion Valley Basin; Segment 2 and the southern portion of Segment 3 are located in the South Basin; Segment 3 and Segment 4 are located in the Islais Creek Basin; and the northern portion of Segment 4 and Segments 5 and 6 are located in the Downtown Basin. The basin boundaries along the alignment generally correspond to Highway 101 for the Visitacion Valley/South boundary; Revere Avenue for the South/Islais Valley boundary; and 20th Street for the Islais Valley/Downtown boundary.

Depths to groundwater in the study area are highly variable due to geologic and geographic conditions. Groundwater occurs at depths along the New Central Subway alignment ranging from approximately 12 meters (39 feet) below ground surface near Kearny and California streets, to 5.5 meters (18 feet) below ground surface near Third and Howard Streets.[110] In the Mission Bay and Islais Creek areas, groundwater occurs less than about 1 meter (3 feet) below ground surface.[111] Near the Bay, groundwater levels may be influenced by tidal activity.

Groundwater at the Western Pacific site is approximately 2 to 4 meters (7 to 13 feet) below ground surface.[112] Groundwater at the Cargo Way site occurred approximately 1.5 to 6 meters (5 to 20 feet) below ground surface during a subsurface investigation in 1994.[113] Due to the proximity of the Cargo Way site to Islais Creek, groundwater levels may be tidally influenced.

In each groundwater 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 lowland and valleys (discharge areas).

This pattern can vary locally by 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.[114]

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[109] 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
[110] Lee & Praszker. Geotechnical Report, Idealized Subsurface Profiles, San Francisco Museum of Modern Art, San Francisco, California. 14 August, 1990.
[111] City and County of San Francisco Department of City Planning. Mission Bay Final Environmental Impact Report, Volume 1 and 2. 1990
[112] Dames and Moore. Preliminary Geotechnical Evaluation, Site Development at Western Pacific Railroad Site, Metro East Maintenance Facility, MUNI Third Street Light Rail Project. 6 May, 1997.
[113] San Francisco Energy Company. Application for Certification, Volume I, submitted to California Energy Commission. July, 1994.
[114] San Francisco Water Department. Draft Groundwater Master Plan. July, 1996.

The dominant source of groundwater recharge in the Downtown Basin (Segments 5, 6, and 7) is leakage from the high density of sewer and water delivery pipes 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 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 predominant source of groundwater recharge in the remaining groundwater basins is precipitation; and the predominant discharge is groundwater flow to the Bay.[115]

The only known uses of groundwater in the Downtown Basin are limited non-potable uses such as fountains and HVAC systems. No known uses of groundwater have been identified in any of the remaining groundwater basins in the study area. Potential future uses of groundwater in the Downtown Basin have been identified for non-potable uses only, because of the historic industrial development and the density of identified contaminated sites. Insufficient information is available for the remaining basins underlying the study area to determine if there is a potential for potable or non-potable uses.[116] Groundwater quality along the light rail alignment near Mission and Islais Creeks, including the new LRV maintenance facility sites, is known to be saline due to its proximity to the tidal channels.[117,118]

4.9 BIOLOGICAL AND WETLAND RESOURCES

The Build and No Build/TSM Alternatives traverse urban areas where the natural vegetation and associated wildlife habitat have been eliminated to accommodate development. The light rail alignment is contained within existing right-of-ways at the ground surface; within existing subsurface transportation corridors; along tunnels to be constructed at depths of 60 to 80 feet below the ground surface; or in industrial areas (new maintenance facility sites).

Identification of the biological resources occurring in the study area involved a review of available information for the study area and field reconnaissance surveys. Prior to conducting the reconnaissance surveys, available literature was reviewed to determine information on general resources in the area, and the distribution and habitat requirements of special-status species that have been recorded or are suspected to occur in the San Francisco area. Information reviewed included a record search of files maintained by the California Natural Diversity Data Base (CNDDB), which provides mapping of sensitive natural communities and occurrences of special-status species in the state. Field reconnaissance surveys were conducted in November 1996 and July 1997, performed by automobile along roadway corridors and on foot for the new maintenance facility sites. A discussion of general vegetative cover and common wildlife and the potential for sensitive resources, such as special-status species and wetland resources, is provided below.

4.9.1 VEGETATION

Vegetative cover in the study area is limited to ruderal (weedy) cover and landscape plantings. Landscaping has been planted along the light rail alignment, either as street trees along sidewalks or shrubs in median strips. Vegetation on the maintenance facility sites is either absent where pavement covers the ground surface or is composed of non-native annual grasses and ruderal species, such as yellow-star thistle and sweet fennel.

[115] Ibid.
[116] Ibid.
[117] San Francisco Energy Company. Application for Certification, Volume I, submitted to California Energy Commission. July, 1994.
[118] Dames & Moore. Phase II Site Characterization/Risk Assessment, Union Pacific Railroad Army Street Site, San Francisco, California. 20 June, 1989.

Extensive street tree plantings have recently been made along the Third Street Corridor, on both the east and west sides of the street. More than 270 trees are located along the east side of Third Street from Mission Creek to the Highway 101 overpass, and more than 280 trees are located on the west side of the street. In addition, the median strips from south of Le Conte to Sunnydale Avenues contain about 40 trees and shrub plantings. Along Market Street, trees line the sidewalks eastward to The Embarcadero; no trees are located along or adjacent to the tracks. Along The Embarcadero from Market to Folsom Streets, the west side of the street contains mature trees. From Folsom Street to Second Street, palms have recently been planted on either side of the new rail tracks. From Second Street along King Street to Fourth Street, trees have been planted on the eastern side of the street and adjacent to the newly installed tracks. Along those portions of the New Central Subway line that would be at the street level, there are about a dozen trees along either side of Third Street from King to Bryant Streets. North of Market Street, three trees are planted in the ground and eleven are in pots along Geary Street, and seven are planted in the ground along the west side of Stockton Street between Sutter and Post Streets.

4.9.2 WILDLIFE

Urban development and human activity in the study area limit its value to native wildlife species. Most wildlife species in the study area are common to urban habitat. These include: black rat, Norway rat, house mouse, rock dove (pigeon), European starling, house finch, and English sparrow. Street trees provide resting places for common bird species, but the constant vehicle and pedestrian activity limits their use for nesting. California brown pelicans (*Pelicanus occidentalis*) occur near the China Basin Channel and are listed as endangered under the Federal Endangered Species Act.

The invertebrate, fish, and water-dependent wildlife species present in the study area are common to the margins of San Francisco and San Pablo Bays. The estuarine habitat of the Mission Creek channel is mostly degraded, and the shoreline habitat is limited in extent. The high numbers of grebes, cormorants, herons, and certain species of diving ducks observed in the Mission Creek channel during previous bird surveys by the Mission Bay Conservancy consistently indicate that the channel may provide important fish habitat. Pacific herring spawn near the mouth of the channel during the months of December through March. Currently, a local commercial Pacific herring fishery specializes in herring roe. In addition to their economic value, herring are an important species in the ecology of San Francisco Bay because herring, along with sardines and anchovies, are a primary food source for salmon and other sport fish. No threatened or endangered fish species are known to inhabit the waters of Mission Creek channel nor the San Francisco Bay estuary in the vicinity of the study area.

A wide range of bird species is present, although the numbers of individuals of most species are low. Most of the bird species observed in the channel are present in the San Francisco Bay area during fall and winter, and leave in early spring to breed elsewhere. One species that was sighted frequently, the brown pelican, is listed as endangered by both the state and federal governments. The peregrine falcon, sighted once foraging over the channel, is listed as endangered by both state and federal agencies. None of these species (or any other birds) were observed to nest in the vicinity of the channel. From a regional wildlife management perspective, the Mission Creek channel provides minimal support for wildlife and is not capable of sustaining significant populations of the species observed because of the lack of suitable breeding habitat and contamination from past sewage overflows.

4.9.3 SPECIAL-STATUS SPECIES

Special-status species[119] 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. 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 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 CNDDB, three special-status plant species have been reported within one mile of the study area: adobe sanicle (*Sanicula maritima*), alkali milk vetch (*Astragalus tener* var. *tener*), and Diablo helianthella (*Helianthella castanea*). Adobe sanicle is listed as rare by the state, and is maintained on list 1B (rare and endangered in California and elsewhere) by the CNPS, typically occurring in coastal prairie, meadows, and grassland habitat. Alkali milk vetch and Diablo helianthella have no state or federal listing, but are maintained on list 1B by the CNPS. Alkali milk vetch typically occurs in grassland and vernal pool habitat. Diablo helianthella generally occurs in native grassland and scrub habitat. No special-status animal species have been reported from the study area by the CNDDB. Due to the extent of past disturbance and absence of suitable habitat, no populations of special-status plant or animal species are believed to occur in the study area. The California brown pelican (endangered species) has been observed near China Basin Channel. The area does not provide critical habitat for pelicans, but does provide resting and foraging habitat for pelicans and other shore birds.

4.9.4 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 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

[119] 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.

Corps and CDFG have jurisdiction over modifications to stream channels, river banks, lakes, and other wetland features.[120]

Jurisdictional authority of the CDFG over wetland areas is established under §1601-1606 of the Fish and Game Code, which pertains to activities that would disrupt the natural flow or alter the channel, bed, or bank of any lake, river, or stream. The Fish and Game Code stipulates that it is "unlawful to substantially divert or obstruct the natural flow or substantially change the bed, channel or bank of any river, stream or lake" without notifying the Department, incorporating necessary mitigation, and obtaining a Streambed Alteration agreement. The Wetlands Resources Policy of the CDFG states that the Fish and Game Commission will "strongly discourage development in or conversion of wetlands...unless, at a minimum, project mitigation assures there will be no net loss of either wetland habitat values or acreage."

A preliminary wetland assessment was conducted during the field reconnaissance surveys 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 limited to the Mission Creek and Islais Creek channels. Existing bridges would be used at the crossing locations of these channels along the Third and/or Fourth Street alignments.

4.10 HAZARDOUS MATERIALS

This section describes hazardous materials[121] that could be encountered in the study area. 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 a detailed technical report,[122] 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. 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 EIRs/EISs prepared for projects in the study area, were obtained from the following sources: San Francisco Department of Public Works, Bureau of Construction Management, Site Assessment and Remediation Division, San Francisco Local Oversight Program, and the State Department of Toxic Substances Control (DTSC). An independent regulatory records database search, which included federal, state, and local data bases, was also conducted by Environmental Data Resources, Inc. (1996) as part of this investigation.

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

[120] 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.

[121] 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).

[122] No. 96.218E, Hazardous Materials Technical Report by Baseline Environmental Consulting. Available for review at Planning Dept., 1600 Mission St. June, 1997

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.

Agencies enforcing these regulations in San Francisco include: the US 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 major 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 workplans, 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.[123]

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 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 the four characteristics of 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.

[123] Applicability and implementation of remedial action oversight must comply with the requirements in the Health and Safety Code, Section 512.

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 which 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; and 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 City and County of 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 RAIL ALTERNATIVE 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. The 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 shown in Appendix C-1 for each of the locations where soil quality data have been reviewed in the study area.

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. A summary of the analytical (chemical and physical) results is provided in the Appendix C-1.

There may be sources of contaminants from historic or current land uses or artificial fill in these areas 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 Hazardous Materials Technical Report.[124]

Much 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 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 described below.

Segment 1 - Caltrain Bayshore Station to Highway 101 Overcrossing

Historic industrial land uses were identified primarily in the areas from Sunnydale Avenue to Blanken Avenue. Uses included a railyard, gas and oil facility, spray painting, auto repair, door lock manufacturing, and lithographic facility.[125] Of these land uses, the railyard and door lock manufacturing operations are still in operation. Other current land uses include a carwash, auto supply/repair, and retail stores. The area between Blanken Avenue and Highway 101 has been residential for the past 70 years with some commercial uses including a motel and retail stores.[126,127]

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[124] Project File No. 96.281E, Hazards Technical Report, available for review at Planning Department, 1660 Mission St.
[125] BASELINE Environmental Consulting. Sunnydale Sewer Improvement Project Background Studies and corresponding in-house Sanborn Maps. November, 1995.
[126] Ibid.
[127] Olmsted, Roger and Nancy. San Francisco Bayside Historical Cultural Resource Survey. April, 1982.

Third Street Light Rail EIS/EIR

FIGURE 4-12

POSSIBLE DISPOSAL OPTIONS FOR EXCAVATED SOILS

LEGEND

- Common Alignment – Caltrain Bayshore Station to Third/King
- 1851 Shoreline (Article 20) Boundary
- Light Rail Alternative – Initial Operating Segment Integrated with Muni Metro
- Light Rail Alternative – New Central Subway Line via Stockton
- BART/Muni Metro Station
- Proposed Third Street Light Rail Station
- Muni Metro Extension Station & Proposed Third Street Light Rail Station

Possible disposal site options for excavated soils:

1 Hazardous Waste
2 Designated Waste
3 Non-hazardous Waste
4 Area underlain by fill that may be a California hazardous waste, irrespective of individual soil sampling at limited locations

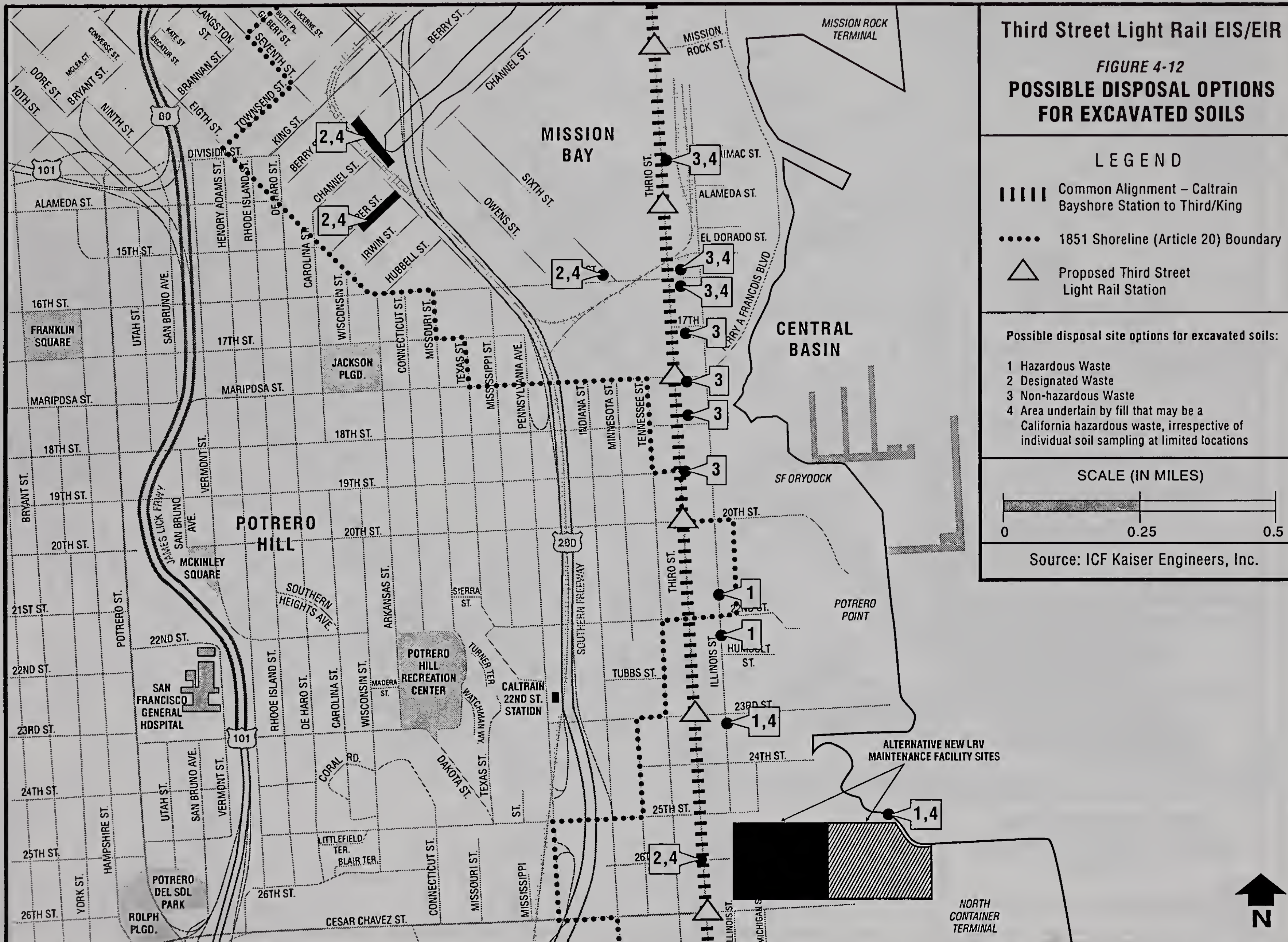
SCALE (IN MILES)

0 0.25 0.5

Source: ICF Kaiser Engineers, Inc.

Source: ICF Kaiser Engineers, Inc.

J96-082.74 3rd St. (2/27/98)



J96-082.75 3rd St. (2/27/98)

J96-082.76 3rd St. (11/12/97)

Third Street Light Rail EIS/EIR

FIGURE 4-12

POSSIBLE DISPOSAL OPTIONS FOR EXCAVATED SOILS

LEGEND

- Common Alignment – Caltrain Bayshore Station to Third/King
- 1851 Shoreline (Article 20) Boundary
- Proposed Intermodal Terminal Site
- Proposed Third Street Light Rail Station

Possible disposal site options for excavated soils:

1 Hazardous Waste
2 Designated Waste
3 Non-hazardous Waste
4 Area underlain by fill that may be a California hazardous waste, irrespective of individual soil sampling at limited locations

SCALE (IN MILES)

0 0.25 0.5

Source: ICF Kaiser Engineers, Inc.

J96-082.77 3rd St. (11/12/97)

Soil quality data were available from four locations along Segment 1 (Appendix C-1 and **Figure 4-12**). The samples collected south of Raymond Avenue contained metals, VOCs (TCE, PCE, cis-12 dichloroethylene, 111-trichlorethane), and TPH.[128,129,130] Of these contaminants, chromium, selenium, vanadium, PCE, and TCE were reported at concentrations greater than the corresponding acceptance thresholds for a Class III facility. One sample contained TCE at a concentration greater than 20 times the amount that would render it a RCRA waste. Based on these data, the excavation activities within portions of this segment could encounter soils with hazardous levels of VOCs.

Soil quality data were not available for areas north of Raymond Avenue. However, historic and current land uses in the remaining portion of Segment 1 consisted primarily of dwellings, retail stores, and a motel.[131] These land uses would not likely have affected soil quality.

Three locations along this segment were identified as having had groundwater investigations. Groundwater depths at the southernmost portion of this segment ranged from 1.8 to 3.4 meters (6 to 11 feet) below ground surface (bgs).[132,133,134,135] Groundwater samples collected from this segment contained benzene, TCE, PCE, and metals (chromium and zinc). Benzene, TCE, and PCE concentrations were reported at levels exceeding the BWWD requirements.

Segment 2 - Highway 101 Overcrossing to Thomas Avenue

Past and current land uses identified in this segment consist of a mix of residential and commercial uses[136,137]; current commercial uses include a truck/brakes/muffler shop, dry cleaners, a pole line hardware shop where minor welding is performed on the premises, and retail stores.[138,139] During the site reconnaissance, several junk yards were evident along the segment. Three facilities were registered as California hazardous waste generators and two facilities as federal hazardous waste generators[140] **(Table 4-12)**.

Subsurface soils at Carroll Avenue and Third Street consist of fill material to a depth of 1.8 meters (6 feet) below ground surface (bgs). Fragments of serpentine rock were identified in the fill material and in borings. Although the fill material within Segment 2 was not analyzed for asbestos, samples of serpentine fragments collected adjacent to Segment 2 were analyzed for asbestos. The samples did not contain reportable concentrations of asbestos. [141]

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[128] Environmental Data Resources (EDR) Inc. The Environmental Data Resources Corridor Study Report (database research). November 5, 1996.
[129] Dames & Moore. Draft Report Geotechnical and Environmental Investigation, Sunnydale Sewer Improvement Project, San Francisco, CA. September 20, 1996a.
[130] Treadwell & Rollo. Interim Remedial Investigation, Schlage Lock/Pacific Lithograph, San Francisco, CA. November 1, 1995.
[131] BASELINE Environmental Consulting. Sunnydale Sewer Improvement Project Background Studies and corresponding in-house Sanborn Maps. November, 1995.
[132] Treadwell & Rollo. Interim Remedial Investigation, Schlage Lock/Pacific Lithograph, San Francisco, CA. November 1, 1995.
[133] Recon. Groundwater Monitoring Data for Tuntex Property. May, 1995.
[134] San Francisco Local Oversight Program (LOP). 2598 Bayshore Boulevard Leaking Underground Fuel Storage Tank Case File. January 24, 1995.
[135] BASELINE Environmental Consulting. Sunnydale Sewer Improvement Project Background Studies and corresponding in-house Sanborn Maps. November, 1995.
[136] Olmsted, Roger and Nancy. San Francisco Bayside Historical Cultural Resource Survey. April, 1982.
[137] BASELINE Environmental Consulting. Sunnydale Sewer Improvement Project Background Studies and corresponding in-house Sanborn Maps. November, 1995.
[138] Ibid.
[139] Mathews, Ron, Kortick Manufacturing (Pole line facility). Personal correspondence with R. Del Rosario, BASELINE Environmental Consulting. January, 1997.
[140] Environmental Data Resources (EDR) Inc. The Environmental Data Resources Corridor Study Report (database research). November 5, 1996.
[141] Camp, Dresser & McKee (CDM). Environmental Assessment and Geotechnical Study, Yosemite Sewer Replacement Project, San Francisco, CA. May, 1993b.

TABLE 4-12

IDENTIFIED HAZARDOUS WASTE GENERATORS/FACILITIES

REFERENCE NUMBER	SITE NAME	LOCATION	GENERATOR TYPE (CALIFORNIA/ FEDERAL)
Segment 2			
1	1X Coca Cola USA	5800 3rd Street	California
2	Allwood Door Company	6000 3rd Street	California
3	Pacific Telephone & Telephone Company	6150 3rd Street	California
4	The Twigs	5700 3rd Street	Federal
5	Dewey Pest Control	6300 3rd Street	Federal
Segment 4			
6	A Super X Service	1601 Innes Street	California
7	America Computer Graphics Incorporated	3450 3rd Street Suite 1B	Federal
8	TGC Truck Repair	3240 3rd Street	Federal
9	Pacific Coast Bus Service	2833 3rd Street	Federal
10	Leo's Tire & Brake	2230 3rd Street	California
11	Frost Company	2350 3rd Street	Federal
12	Color III Lab	560 19th Street	California/Federal
Segment 5			
13	Bay Area Super Shuttle	700 16th Street	Federal
Segment 7			
14	South Park Press Incorporated	236 Ritch Street	California/Federal
15	Remarkable Restorations	123 Freelon Street	California/Federal
16	Marina Auto Paint	585 Bryant Street	California/Federal
17	K&P Auto Body Incorporated	564 Bryant Street	Federal
18	Seoul Auto Body Shop	538 Bryant Street	Federal
19	Pacific Bell	690 Folsom Street	Federal
20	Indigo America Booth #225	747 Howard Street	California
21	AGFA-c/o Rathe Productions Booth	747 Howard Street	California
22	Hotel Meridien	50 3rd Street	Federal
23	Brooks Cameras	45 Kearny Street	California/Federal
24	Wang Laboratories Incorporated	30 Grant Avenue	Federal
25	Jung Design	47 Kearny Street #802	California
26	1X Hanford Freund Company	165 Post Street	California
27	1X 150 Post Street Incorporated	150 Post Street	California
28	Fotron Max Photo Lab	1021 Stockton Street	Federal

Notes: The information provided is based on a regulatory database search conducted by EDR (1996).
California and Federal data obtained from Hazardous Waste Information Systems (HWIS) and Resource Conservation and Recovery Act (RCRIS) database, respectively (EDR, 1996). The database identified California and Federal hazardous waste generators and hazardous waste treatment, storage, and disposal facilities in the project area. The database sources are the California Environmental Protection Agency and US Environmental Protection Agency.

Soil samples collected at Armstrong Avenue and Third Street contained two metal species of concern. Vanadium was reported at concentrations exceeding the acceptance threshold for a Class III facility, and chromium was reported at greater than 10 times the limit that would render it a California hazardous waste.[142] It is possible that the soil could contain soluble chromium above threshold levels for hazardous wastes. Releases of TPH from leaking underground storage tanks (USTs) were reported at three sites along this segment. However, the regulatory database indicated that either remedial action was completed or remediation was deemed unnecessary.[143]

Groundwater quality data were available from two sites in Segment 2. Groundwater samples collected north of Armstrong Avenue contained metals, including nickel at a concentration greater than the BWWD requirements. Corresponding groundwater elevation measurements ranged from 1.5 to 3.7 meters (5 to 12 feet) below ground surface.[144,145]

Segment 3 - Thomas Avenue to Jerrold Avenue

Historic and current land uses in this segment consist of dwellings and various commercial uses that probably do not include the use of hazardous materials, such as liquor stores, markets, salons, and restaurants.[146] An auto parts store is located north of Palou Avenue. In 1993, approximately 35 gallons of flammable liquids from a 55-gallon drum spilled at 1633 Newcomb Avenue. Subsequent investigations have not yet been performed to identify the degree of impact to subsurface soils or groundwater.[147]

Limited soil quality data were available for this segment of the Corridor. A subsurface investigation was conducted at one location. A release of TPH as gasoline from a leaking UST was reported south of Revere Avenue, at 5144 Third Street. However, the regulatory database indicated that remedial action was either completed or was deemed unnecessary for the site.[148]

No groundwater quality data were available for Segment 3. The general historic and current land uses throughout this segment consisted primarily of dwellings/flats. Therefore, the quality of dewatered groundwater throughout this area could potentially be at levels less than the BWWD requirements; if the quality of the water were within BWWD limits, no treatment would be required for discharge to the sewer; however, chemical and physical analyses would be required for confirmation.

Segment 4 - Jerrold Avenue to 16th Street

Various types of industrial historical land uses were identified along Segment 4 between Hudson Avenue and Cargo Way. Types of industrial uses included battery manufacturing, sheet metal works, auto parts storage and wrecking, gas and oil station, foundry, blacksmith, paint shop, and spray painting room.[149] Current land uses are similar to historic uses, including a gas station, auto wrecking yard, and an auto repair (currently identified as a body shop). Several portions of the segment have recently been developed into commercial land uses, including the India Basin Industrial Park and Bayview Plaza (located between Burke Street and Galvez Avenue). These two sites consist of office spaces and retail shops. A fenced open

[142] Dames & Moore. Draft Report, Geotechnical and Environmental Investigation, Yosemite/Egbert Sewer Project, San Francisco, CA. October 16, 1996b.
[143] Environmental Data Resources (EDR) Inc. The Environmental Data Resources Corridor Study Report (database research). November 5, 1996.
[144] Ibid.
[145] Dames & Moore. Draft Report, Geotechnical and Environmental Investigation, Yosemite/Egbert Sewer Project, San Francisco, CA. October 16, 1996b.
[146] Olmsted, Roger and Nancy. San Francisco Bayside Historical Cultural Resource Survey. April, 1982
[147] Department of Toxic Substances Control. 1633 Newberry Street Case File. February 6, 1997.
[148] Environmental Data Resources (EDR) Inc. The Environmental Data Resources Corridor Study Report (database research). November 5, 1996.
[149] Geo/Resource Consultants, Inc. Islais Creek Pump Station Project Southeast Water Pollution Control Plant, San Francisco, CA, Site History Review. December, 1989.

lot at the corner of Fairfax and Third Streets appeared to contain stockpiles of debris. One facility was identified as a California hazardous waste generator and another as a federal hazardous waste generator.[150]

Previous land uses north of Islais Creek, including a Shell Oil petroleum bulk plant, situated between Cesar Chavez and Marin Streets, have caused a regional impact of TPH in subsurface soil and groundwater.[151] Other historic industrial land uses reported north of the Islais Creek channel included aboveground tanks, gas/oil storage, power equipment, paint activities, Bethlehem Ship Building, and a steel mill depot. Immediately south of 16th Street, past industrial uses included auto storage, a metal rolling mill, garbage dumping, and well casing manufacturing.[152,153,154,155]

Currently, the land uses throughout this segment include auto parts/dismantlers, truck repair shops, auto repair, auto paint and body shops, auto dismantlers, lathe shop, scrap metal, gas stations, warehouses of unknown storage, industrial equipment rental, printing ink operations, and tile manufacturing.[156] One facility was identified as a California hazardous waste generator, three facilities as federal hazardous waste generators, and one facility as both a California and federal hazardous waste generator[157] (refer to **Table 4-12**).

Soil samples were collected at three locations between Fairfax Avenue and Burke Street; the samples contained metals (lead, copper, nickel) and TPH at levels of concern. At two of the locations, total and soluble lead and copper were reported at concentrations greater than the limits that would render it a California hazardous waste. [158,159] At the third site, soluble lead was greater than the acceptance threshold for a Class III disposal facility.[160] Four sites were reported as having had releases of TPH from leaking USTs along this segment. The remedial action was either completed or deemed unnecessary by the regulatory agencies for the remaining three sites.[161,162] Based on the available data, excavation activities within this portion of Segment 4 could encounter soils with hazardous levels of metals during excavation. Two sites along Segment 4 from Jerrold to Islais Creek provided groundwater quality data. South of Evans Avenue, the groundwater contained benzene concentrations greater than the BWWD requirements.[163] In 1994, free product (fuel), identified at this site, was removed, although the investigation suggested that the plume may have migrated toward Third Street.[164]

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[150] Environmental Data Resources (EDR) Inc. The Environmental Data Resources Corridor Study Report (database research). November 5, 1996.
[151] Robert B. Kitchen Associates. Summary of Area and Site Specific Environmental Data, Loomis Armored Inc., San Francisco, CA. August 14, 1995.
[152] Ibid.
[153] ERM-West, Inc. *The Industry History of the Proposed Mariposa Facilities Project Area.* August, 1989.
[154] City and County of San Francisco, Department of City Planning. Mission Bay Final Environmental Impact Report, Volume I and Mission Bay Draft Environmental Impact Report, Volume 3 (Appendices). 1990.
[155] BASELINE Environmental Consulting. Site History Report, Islais Creek Storage/Transport Facility, San Francisco, CA. August, 1989.
[156] Micheletos, Diane. American Industrial Center. Personal correspondence with R. Del Rosario, BASELINE Environmental Consulting. January 27, 1997.
[157] Environmental Data Resources (EDR) Inc. The Environmental Data Resources Corridor Study Report (database research). November 5, 1996.
[158] Geo/Resource Consultants, Inc. Final Soil/Groundwater Investigation Report, Islais Creek Pump Station, San Francisco, CA, Site History Review. December, 1990.
[159] BASELINE Environmental Consulting. Waste Assessment Report, Islais Creek Transport/Storage Project, Contracts B, D, and E, and Rankin Pump Station and Sewer Improvement Project, Contracts 1, 2, and 3, San Francisco, CA. March, 1994a.
[160] San Francisco Local Oversight Program (LOP). 3800 Third Street Leaking Underground Fuel Storage Tank Case File. January 24, 1997b.
[161] Geo/Resource Consultants, Inc. Final Soil/Groundwater Investigation Report, Islais Creek Pump Station, San Francisco, CA, Site History Review. December, 1990.
[162] Environmental Data Resources (EDR) Inc. The Environmental Data Resources Corridor Study Report (database research). November 5, 1996.
[163] San Francisco Local Oversight Program (LOP). 3800 Third Street Leaking Underground Fuel Storage Tank Case File. January 24, 1997b.
[164] Ibid.

Soil quality data were available from nine areas along this segment. Subsurface soils and groundwater immediately north of Islais Creek are regionally impacted with TPH due to previous land uses.[165,166] The soil samples collected south of Cesar Chavez Street contained TPH as diesel, TPH as gasoline, benzene, xylenes, and metals (chromium, cobalt, copper, nickel, vanadium, and zinc). Chromium, nickel, vanadium, benzene, xylenes, and diesel were reported at levels greater than the acceptance threshold for a Class III facility. In addition, the samples contained total chromium and nickel at levels exceeding ten times the limit that would render it a California hazardous waste for chromium VI and nickel, respectively.[167,168]

Soil samples collected south of 26th Street contained TPH as diesel, total recoverable petroleum hydrocarbons, cadmium, chromium, lead, nickel, zinc, xylenes, and semi-VOCs including 2 methyl naphthalene and naphthalene.[169] Concentrations of TPH as diesel, chromium, lead, and nickel were greater than the acceptance threshold for a Class III facility; in addition, these metals were at levels greater than ten times the limit that would render it a California hazardous waste for chromium VI, lead, and nickel, which indicates that they could potentially be a hazardous waste.

Due to the limited available data between 20th and 24th Streets, soil samples collected one block east of the corridor, along Illinois Street, were evaluated. The soil samples from Illinois Street contained metals (chromium, nickel, and lead). In addition, chrysotile serpentine rock and serpentine fragments in fill material along Illinois Street were identified.[170] A sample collected at 2.0 to 2.1 meters bgs contained five percent asbestos. Therefore, the fill material identified at portions of the Corridor may also contain serpentine fragments with hazardous levels of asbestos. Five sites located north of 19th Street, south of Mission Bay, were reported as having had unauthorized releases of TPH from leaking USTs. However, the regulatory database indicated that remedial action was either completed or was deemed unnecessary for the site.[171]

The groundwater quality in areas north of Islais Creek was reported to be regionally impacted with TPH due to previous land uses.[172] One groundwater sample collected immediately north of Marin Street contained oil and grease at levels exceeding the BWWD requirements. In addition, free product (fuel) was identified in several borings and monitoring wells located both within and east of the study area. One monitoring well, located east of the study area (888 Marin Street), contained up to two inches of Bunker C free product (heavy oil). Furthermore, oil booms (to contain fuel floating on the water surface) and free product were observed in Islais Creek channel in 1994 at the Third Street bridge. Oil was reportedly emanating from the north channel embankment.[173]

Segment 5 - 16th Street to King Street

Mission Bay is an area of historic industrial use. Several known land uses at Mission Bay include an unauthorized dump, a junk yard, metal salvage, a paint company, a boiler house, a railyard, an incinerator,

165 Robert B. Kitchen Associates. Summary of Area and Site Specific Environmental Data, Loomis Armored Inc., San Francisco, CA. August 14, 1995.
166 A Shell Oil petroleum bulk plant operated between Cesar Chavez and Marin streets. In November 1991, piping which ran south along Illinois Street from the bulk plant still contained oil.
167 Robert B. Kitchen Associates. Summary of Area and Site Specific Environmental Data, Loomis Armored Inc., San Francisco, CA. August 14, 1995.
168 BASELINE Environmental Consulting. Phase II Site Assessment, Block 202, Lots 1, 16, and 17, Block 203 - Lot 13, San Francisco, CA. July, 1994b.
169 Tetra Tech. Underground Storage Tank Closure Report for Former Muni Yard, 3000 Third Street, San Francisco, CA. April, 1996.
170 ERM-West, Inc. Hazardous Materials Monitoring and Management Plans, Mariposa Facilities Project. January 31, 1992.
171 Environmental Data Resources (EDR) Inc. The Environmental Data Resources Corridor Study Report (database research). November 5, 1996.
172 Robert B. Kitchen Associates. Summary of Area and Site Specific Environmental Data, Loomis Armored Inc., San Francisco, CA. August 14, 1995.
173 Ibid.

a scrap metal yard, a sand/gravel yard, a train engine house, an antimony shop, a glass works, a boat building, and oil coal and lubricant storage.[174] South of King Street, a former gas site (the gas is of undetermined form) was situated east of Third Street.[175]

Along Segment 5, the current land use on the east side of the Third Street, between Fourth and 16th Streets at Mission Bay, includes a gravel plant and warehouses (San Francisco Supply, and unknown storage); the area along the west side is vacant land, with two large vegetated soil piles. The remaining portion of this segment consists of vacant land and commercial uses including a hockey stadium, warehouses, parking lots, and China Basin Landing commercial units. Soil samples collected from this segment contained metals and several semi-VOCs, including polynuclear aromatic hydrocarbons (PNAs) (refer to **Figure 4-12**). Of these compounds, chromium, lead, mercury, and vanadium were reported at concentrations in excess of the acceptance threshold for a Class III facility. In addition, lead and mercury were reported at concentrations greater than ten times the limit that would render it a California hazardous waste.[176] The sum of the reported PNA concentrations was greater than 10 mg/kg.

Unauthorized releases of waste oil and/or TPH from leaking USTs were reported at five sites (refer to **Figure 4-12**). One site, located on 205 Channel Street, contained TPH as gasoline at concentrations greater than the acceptance threshold for a Class III facility.[177] Remedial action was either completed or deemed unnecessary for the remaining four sites. Based on the available data, excavation along this segment may encounter hazardous levels of metals and PNAs.

There are no data on groundwater quality in areas south of Fourth Street (Mission Bay). However, past industrial land uses in this area, including a rail roundhouse, illegal dumping, and paint shops, have the potential to have impacted the underlying groundwater with metals, VOCs, and possibly petroleum hydrocarbons.[178] At Third and King Streets, groundwater samples contained mercury at a concentration greater than the BWWD threshold level.[179] At Fourth and Channel Streets south of Berry Street, elevated concentrations of TPH were identified in the underlying groundwater.[180] Since there is no specific BWWD threshold for TPH, it is unknown whether the fuel in the groundwater could exceed the oil and grease [181] threshold. Groundwater levels along this segment ranged from 1.8 to 3.7 meters (6 to 12 feet) bgs.

Segment 7 - King Street to Chinatown

Past land uses along Segment 7 included a combination of residential, commercial, and industrial uses (refer to **Figure 4-12**). Along Third and Fourth Streets (between Townsend and Folsom Streets), land uses were primarily commercial and industrial; land uses in these areas included oil and gas (specific business unknown), lithographic, bus garage, spray painting booth, machine shop, auto truck freight depot, paint spraying, printing warehouse, metal shop, auto body and greasing, blacksmith, and scrap metal facility. Between Folsom and Sutter Streets, past land uses included gas and oil (of undermined form), printing and

[174] City and County of San Francisco, Department of City Planning, Mission Bay Final Environmental Impact Report, Volume 1 and Mission Bay Draft Environmental Impact Report, Volume 3 (Appendices). 1990.
[175] Ibid.
[176] Dames & Moore. Final Report, Preliminary Hazardous Waste Investigation, Embarcadero Roadway Project, San Francisco, CA. November 7, 1990.
[177] San Francisco Local Oversight Program (LOP). 205 Channel Street Leaking Underground Fuel Storage Tank Case File. January 24, 1997c.
[178] City and County of San Francisco, Department of City Planning. Mission Bay Final Environmental Impact Report, Volume 1 and Mission Bay Draft Environmental Impact Report, Volume 3 (Appendices). 1990.
[179] Dames & Moore. Final Report, Preliminary Hazardous Waste Investigation, Embarcadero Roadway Project, San Francisco, CA. November 7, 1990.
[180] City and County of San Francisco. San Francisco Waterfront Environmental Impact Report. 1996.
[181] Oil and grease may contain fuel hydrocarbons in addition to biogenic materials.

sign painting, an underground garage which currently exists, retail stores, hotels, and offices. North of Sutter Street, land uses were primarily commercial and residential.

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, current land uses consist of offices, retail stores, hotels, and apartments. Fifteen facilities were identified as federal and/or California hazardous waste generators were along this segment[182] (refer to **Table 4-11**). Twelve sites were reported as having had a release of TPH due to a leaking UST.[183] The regulatory database indicated that remedial action was either completed or was deemed unnecessary for five of these sites. At three sites, the regulatory database indicated that soil contamination was at such low levels and did not pose a threat to water quality; subsurface soils were impacted with fuel, TPH as diesel, and TPH as gasoline. Subsurface soils at the remaining four sites contain mineral spirits, TPH as gasoline, TPH as diesel, and/or waste oil.[184]

Groundwater quality data collected at 529 Third Street did not identify benzene concentrations above detectable levels.[185] Groundwater measurement data were available at two sites. Data collected at 151 Third Street in 1993 indicate groundwater levels at 5.5 to 7.9 meters (18 to 26 feet) bgs.[186] At 750 Howard, groundwater was encountered at 0.9 to 5.8 meters (3 to 19 feet) bgs.[187,188]

Western Pacific Maintenance Facility Site

This site is located on artificial fill placed on the site between 1913 and 1965. Previous land use at the site consisted of railroad operations. Former site structures included a general yard area, scale pit/pier demolition area, and a lubrication/fuel area.[189] Railroad operations ceased between the mid 1970s to 1980s. Currently, most of the western and northern portions of the site are unpaved and vacant; the remaining area is paved and used for bus storage.

A subsurface investigation was conducted at this site in 1989.[190] Soil trench and sediment samples collected contained reportable concentrations of metals and PNAs. Several metals were reported at concentrations greater than the acceptance threshold for a Class III facility. Reported lead concentrations were greater than the TTLC. The analytical results indicate that hazardous levels of metals may be encountered during excavation.

Groundwater measurements collected in 1989 throughout the site ranged from 1.2 to 4.6 meters (4 to 15 feet) bgs. Groundwater samples collected at depths shallower than the assumed excavation depth of 1.5 meters (5 feet) bgs contained metals (arsenic and lead) at concentrations below the BWWD requirements. In addition, the pH of the groundwater samples were within the BWWD requirements.

[182] Environmental Data Resources (EDR) Inc. The Environmental Data Resources Corridor Study Report (database version). November 5, 1996.
[183] Ibid.
[184] Ibid.
[185] San Francisco Local Oversight Program (LOP). 529 Third Street Leaking Underground Fuel Storage Tank Case File. January 24, 1997d.
[186] San Francisco Local Oversight Program (LOP). 151 Third Street Leaking Underground Fuel Storage Tank Case File. January 24, 1997e.
[187] San Francisco Local Oversight Program (LOP). 750 Howard Leaking Underground Fuel Storage Tank Case File. January 24, 1997f.
[188] The date when groundwater measurements were collected was not reported.
[189] Dames & Moore. Final Draft Report, Phase II Site Characterization/Risk Assessment, Union Pacific Army Street Site, San Francisco, CA. June 26, 1989.
[190] Ibid.

Cargo Way Maintenance Facility Site

This site is located on artificial fill placed on the site from 1959 to 1975. Currently, the site contains piles of concrete and asphalt, wrecked autos, and miscellaneous debris, likely a result of recent dumping. It is unknown whether dumping of hazardous materials has occurred in this area.[191]

An investigation was conducted at this site in 1994.[192] Soil samples collected contained reportable concentrations of metals (selenium, arsenic, barium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc), pesticides (4,4-DDT and endosulfan II), and polychlorinated biphenyls (PCBs). Several metals (chromium, cobalt, lead, mercury, nickel, and vanadium) were reported at concentrations greater than the acceptance threshold for a Class III facility. In addition, the total concentrations of chromium, lead, and nickel were at levels greater than ten times the level that would render it a California hazardous waste. The analytical results indicate that hazardous levels of metals may be encountered during excavation.

Depth to groundwater throughout this site ranged from 2.7 to 8.5 meters (9 to 28 feet) bgs in 1994. Groundwater samples collected at this site contained metals at concentrations below the BWWD requirements; heptachlor epoxide was not reported above detection limits.[193]

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 for six national criteria pollutants, including; ozone (O_2), 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 ozone and particulate matter with diameters less than or equal to 2.5 microns ($PM_{2.5}$). The existing 1-hour ozone standard of 0.12 will be phased out and will be replaced by an 8-hour standard of 0.08 parts per million (ppm). The new 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.

The 1988 California Clean Air Act, amended in 1992, sets State Ambient Air Quality Standards (SAAQS) for the six national criteria pollutants as well as for hydrogen sulfide, sulfates, and vinyl chloride, for which there are no corresponding NAAQS. 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 4-13**. The source of each criteria pollutant and the corresponding health effects are described below.

O_3, or smog, is formed in the atmosphere by complex chemical reactions between oxides of nitrogen (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 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.

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191 Bechtel Environmental, Inc. Phase II Environmental Site Assessment Report for the proposed San Francisco Energy Company Facility Port Site. October, 1994.
192 Ibid.
193 Ibid.

TABLE 4-13

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 n/a	0.12 ppm 0.08
Carbon Monoxide (CO)	1-hour 8-hour	20 ppm 9.0 ppm	35 ppm 9 ppm
Nitrogen Dioxide (NO_2)	1-hour Annual Average	0.25 ppm n/a	n/a 0.053 ppm
Sulfur Dioxide (SO_2)	1-hour 24-hour Annual	0.25 ppm 0.04 ppm n/a	n/a 0.14 ppm 0.03 ppm
Suspended Particulate Matter with diameter $\leq$10 microns (PM_{10})	24-hour Annual Arithmet. Mean Annual Geomet. Mean	50 μ/m^3 n/a 30 μ/m^3	150 μ/m^3 50 μ/m^3 n/a
Suspended Particulates Matter with diameter $\leq$2.5 microns ($PM_{2.5}$)	Annual Average 24 hours	n/a n/a	15 μ/m^3 65 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.

Source: BAAQMD CEQA Guidelines, Assessing Air Quality Impacts of Projects and Plans, Bay Area Air Quality Management District, April 1996.

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 fine particular 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.

The project site is within the Bay Area Basin which is composed of nine counties. Air quality in the Bay Area Basin is regulated by the Bay Area Air Quality Management District (BAAQMD), which operates ambient air quality monitoring stations within the Bay Area. The California Air Resources Board 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 US EPA.

4.11.2 EXISTING AIR QUALITY AND REGIONAL ATTAINMENT STATUS

The San Francisco Bay Area climate is defined by the surrounding marine environment. The movements of marine air, which determine the temperature, humidity, wind and precipitation throughout the year, depend on the location and the strength of the dominant Pacific high-pressure system and the coastal temperature cross-gradient. 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 51 centimeters (20 inches) per year and is confined primarily to the wet season from late October to early May. 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.

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 City can generally be inferred from ambient air quality measurements conducted by the BAAQMD at its two San Francisco monitoring stations. The Potrero Hill station at 10 Arkansas Street measures all criteria pollutants, 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 4-14** summarizes five years of published data (1992 through 1996) from these monitoring stations. During this five-year period, there were no violations of the one-hour or the eight-hour CO standards at the Ellis Street monitoring station. At the Arkansas Street monitoring station, the state PM_{10} standard was violated on two days in 1996; on six days in 1994; on five out of 61 measurement days in 1993; and on nine days out of 61 measurement days in 1992. In 1995, there were no violations of the PM_{10} standard. Ozone, nitrogen dioxide, particulate sulfate, and lead measurements were within the allowable maximum concentrations during the survey period.

TABLE 4-14

SAN FRANCISCO AIR POLLUTANT SUMMARY, 1992-1996

		MONITORING DATA BY YEAR(1)				
POLLUTANT	**STATE STD.(2)**	**1992**	**1993**	**1994**	**1995**	**1996**
Ozone						
Highest 1-hr. average, ppm(3)	0.09	0.08	0.08	0.06	0.09	0.07
Number of violations		0	0	0	0	0
Carbon Monoxide						
Highest 1-hr average, ppm	20.0	8.0	7.0	6	5	5
Number of violations		0	0	0	0	0
Highest 8-hr. average, ppm	9.1	6.4	5.1	4.5	4.4	3.9
Number of violations		0	0	0	0	0
Nitrogen Dioxide						
Highest 1-hr. average, ppm	0.25	0.09	0.08	0.09	0.09	0.08
Number of violations		0	0	0	0	0
Sulfur Dioxide						
Highest 1-hr. average, ppm	0.25	0.04	0.04	0.02	0.04	0.04
Number of violations		0	0	0	0	0
Particulate Matter (with diameter ≤ 10 microns)						
Highest 24-hr. average, μg/m³	50	81	69	93	50	71
Number of violations[4]	-	9	5	6	0	2
Annual geometric mean, μg/m³	30	27.6	25.1	24.7	22.1	21.4
Lead						
30-day average, μg/m³	1.5	0.02	0.02	0.02	0.02	0.01
Number of violations		0	0	0	0	0

Notes: (1) All data are from the monitoring station located at 10 Arkansas Street in San Francisco.
(2) State standard, not to be exceeded, except for Lead standard, which is not to be equaled or exceeded.
(3) ppm = parts per million; μg/m³ = micrograms per cubic meter.
(4) 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*, 1991-1995; Bay Area Air Quality Management District.

Comparison of these data with those from other BAAQMD monitoring stations indicates that the air quality in San Francisco is among the least degraded of all developed portions of the Bay Area. Three of the prevailing winds in San Francisco, west, northwest, and west-northwest, blow from the Pacific Ocean, reducing the potential of San Francisco to receive air pollutants from elsewhere in the region.

Regionally, the Bay Area air basin is designated as a state non-attainment area for O_3 and PM_{10}. The 1997 Bay Area Clean Air Plan (CAP), prepared by the BAAQMD in cooperation with MTC and ABAG to address attainment for the state air quality standard for ozone, includes specific measures which encourages cities and counties to develop and implement local plans, policies and programs to reduce auto use and improve air quality. With respect to PM_{10} non-attainment for the state air quality standards, the California Legislature recognized that the PM_{10} was relatively intractable and excluded it from the basic planning requirements of the section. The control measures of the CAP will reduce PM_{10} emissions, through measures to reduce vehicular traffic. The California Clean Air Act requires regions to update their state air quality plans every three years.

The Bay Area is designated as a national attainment/maintenance area for **federal CO standards.** A Redesignation Request and Maintenance Plan for the national CO standard was submitted to US EPA in 1993.[194] **The US EPA has reclassified** the Bay Area from national attainment to nonattainment based on recent violations of the national ozone standard at several locations in the air basin.

4.11.3 REGULATORY CONSIDERATIONS

The Clean Air Act and subsequent amendments required that State Implementation Plans (SIP) be developed for nonattainment areas to identify strategies to achieve the NAAQS. The amended 1982 Bay Area Air Quality Plan was prepared to satisfy these requirements and acts as the SIP for the Bay Area.

MTC is responsible for establishing that the Bay Area Regional Transportation Improvement Program (TIP) and Regional Transportation Plan (RTP) conform with the SIP. In November 1990, the Clean Air Act amendments were passed that provided new direction for reviewing air quality effects of transportation projects. In April 1991, the MTC adopted Resolution No. 2270, which consists of conformity assessment procedures and criteria used to review transportation projects. In November 1997, the "Project Level Conformity Guidelines for the San Francisco Bay Area" prepared by MTC superseded Resolution 2270.

Air pollution sources include stationary sources such as combustion of natural gas for heating and mobile sources such as motor vehicle traffic and marine vessels. The BAAQMD publishes emissions inventory estimates for criteria pollutants every 10 years. For the San Francisco area, the year 2000 projected contaminant levels annual average in tons/day is as shown in **Table 4-15**. The BAAQMD also maintains a database of all permitted facilities that emit toxic air contaminants and the daily emissions in tons/day.

TABLE 4-15

EMISSION LEVEL INVENTORY
Year 2000 Contaminant Levels Annual Average (Tons/Day)

	CO	**ROG**	**NO_x**	**SO_2**	**PM_{10}**
Residential	22	8	4	0	2
Commercial	6	10	0	0	1
Industrial	5	5	2	0	0
Infrastructure	1	0	7	0	0
Construction	24	1	6	1	2
Transportation	96	14	16	9	29
Agricultural and Natural	0	1	0	0	2
Total	154	40	34	10	37

CO = Carbon monoxide
ROG = Reactive organic gases
PM_{10} = Particular matter with diameter $\leq$10 microns
No_x = Nitrogen oxides
SO_2 = Sulfur dioxide

Source: BAAQMD CEQA Guidelines, Appendix C, Table C-7, April 1996.

[194] BAAQMD CEQA Guidelines, April, 1996.

4.11.4 SENSITIVE RECEPTORS

Sensitive receptors are considered the very young, the elderly, people weak from disease or illness, or persons doing heavy work or exercise who are more susceptible to respiratory infections and other air-quality related health problems than the general public. 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 4.3.3). 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.

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[195] are progressively and severely attenuated, as are high frequencies above 10,000 Hz. 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, the 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

[195] 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.

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 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 and Vibration

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 4-16.**

TABLE 4-16

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 sould not exceed existing ambient plus 10 dB.
[2] Twenty-four hour Leq, not Ldn.

Source: FTA, 1995

Since this project is entirely within the City and County of San Francisco, all construction will 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 should ensure that construction noise is below the FTA guidelines.

As with noise, the vibration from construction is temporary, and, as long as the vibration does not cause any damage to buildings, there are no permanent impacts. The vibration processes that are likely to be either intrusive or have the potential for damaging buildings include: tunnel boring, blasting, pile driving, demolition with jack hammers and hoe rams, and the use of tracked vehicles close to buildings. Contractors can usually control vibration from blasting by adjusting the size of a blasting charge. Potential for community impact from construction vibration is usually controlled by vibration limits and requirements for monitoring during vibration producing activities. It is assumed that these types of measures will be included in the construction specifications for this project and that there would not be any vibration-induced damage to buildings during construction and that intrusive vibration would not last for more than a few days.

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 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 are 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.
- Impact (sometimes referred to as 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 4-17**. 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 4-17** 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 4-18** 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 4-18** are based on available research and on the experience of rail transit systems and their vibration complaints.

TABLE 4-17

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	
	Impact	Severe Impact	Impact	Severe Impact
<43	Amb.+10	Amb.+15	Amb.+15	Amb.+20
43	52	58	57	63
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, 1995; HMMH, 1997.

TABLE 4-18

GROUND-BORNE VIBRATION AND NOISE IMPACT CRITERIA

Land Use Category	Ground-Borne Vib. Impact(1) (VdB re 1 micro inch/sec)	Ground-Borne Noise Impact(1) (dB re 20 micro Pascals)
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB(2)	--(3)
Category 2: Residences and buildings where people normally sleep.	72 VdB	35 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	40 dBA

Notes: (1) Criteria are applicable *inside* buildings.
(2) 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.
(3) Vibration-sensitive equipment is not sensitive to ground-borne noise.

Source: FTA, 1995.

The FTA limits for ground-borne vibration and ground-borne noise inside residential buildings are 72 VdB and 35 dBA, respectively. These limits represent relatively conservative levels. Most people will be able to feel vibration and hear noise at these levels. However, these levels are not generally considered to be intrusive even during the nighttime hours when people are most sensitive to noise and vibration.

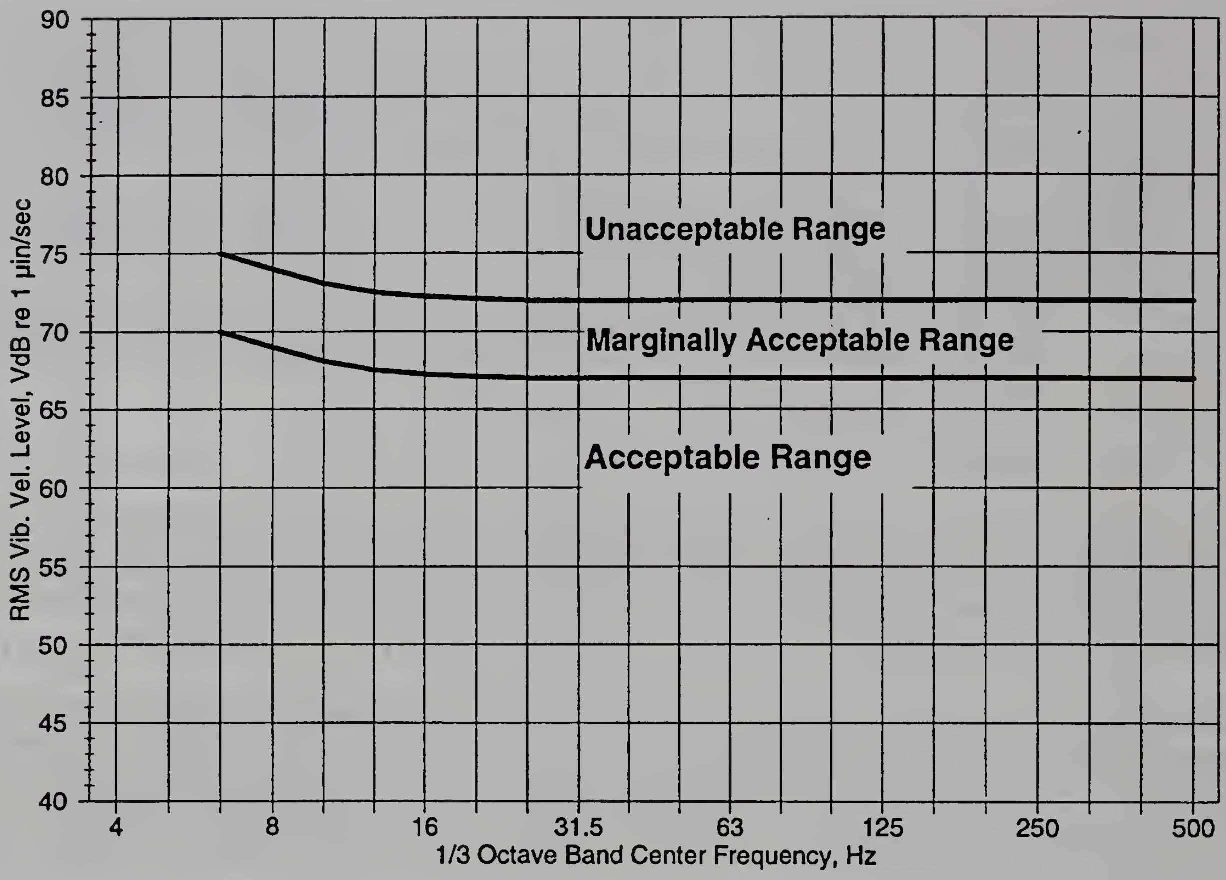
Figure 4-13 is another approach to limiting levels of ground-borne vibration based on the 1/3 octave band spectrum that has been used on a number of previous MUNI projects. The vibration is considered acceptable as long as no part of the 1/3 octave band spectrum encroaches into the shaded area. If any part of the spectrum exceeds the upper level of the shaded range, it is considered clearly unacceptable. The FTA limit on overall vibration velocity level of 72 VdB is approximately equivalent to the middle of the range shown in **Figure 4-13**.

4.12.3 EXISTING NOISE CONDITIONS AT SENSITIVE RECEPTORS

Existing noise exposure at sensitive receptors along the Corridor was documented through a noise monitoring program. Noise monitoring was performed at a total of 15 locations throughout the corridor that are representative of the noise sensitive receptors in the corridor. As discussed below, the monitoring showed existing noise exposure to be relatively high in the Corridor due to existing traffic on Third Street, Stockton Street, and other heavily traveled arterials.

Existing noise is an important element of the noise impact assessment since 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 must be 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.



Source: ICF Kaiser Engineers, Inc.

FIGURE 4-13

GROUND-BORNE VIBRATION CRITERIA USED IN PREVIOUS MUNI PROJECTS

Third Street Light Rail EIS/EIR

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. **Figure 4-14** shows the general locations of the monitoring sites. 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, usually Third Street. 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.

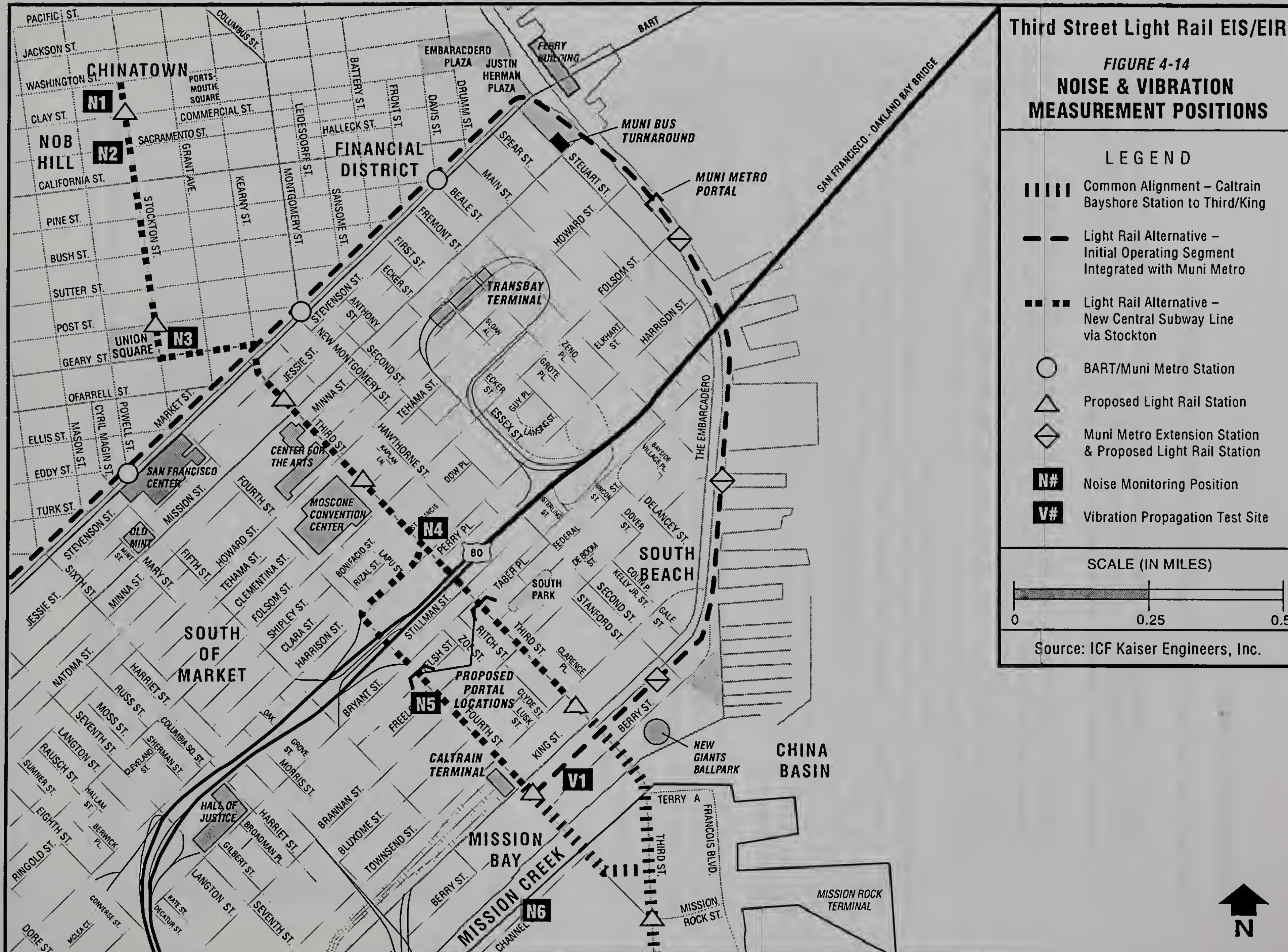
The results of the noise monitoring are summarized in **Table 4-19** in terms of Ldn and Leq during daytime and nighttime hours. Ldn at the short-term noise monitoring sites was estimated to be the measured Leq plus 2 dBA. This approach tends to underestimate Ldn since the average difference between Ldn and daytime Leq at the five 24-hour sites was just over 3 dBA and reduces the potential of underestimating the noise impacts.

TABLE 4-19

SUMMARY OF NOISE MONITORING RESULTS

Site	Description	Start		Type	Noise Monitoring Results, dBA		
		Date	Time		Lday(1)	Lnight(2)	Ldn(3)
N1	Chinatown, Stockton & California	7/28/97	05:00 p.m.	24-hr	66	63	70
N2	Stockton & Sacramento	7/29/97	11:02 a.m.	30-min	72	–	74
N3	Stockton Street & Post	7/29/97	11:43 a.m.	30-min	69	–	71
N4	Third Street, between Harrison & Folsom	7/29/97	12:23 p.m.	30-min	70	–	72
N5	Third Street, south of Moscone Center	7/23/97	06:28 p.m.	30-min	69	–	71
N6	Channel Street	7/28/97	09:28 a.m.	30-min	60	–	62
N7	Third Street between 22nd and 23rd Street	7/28/97	10:21 a.m.	30-min	71	–	73
N8a	St. Johns Church near Third and Jerrold	7/23/97	03:00 p.m.	24-hr	74	69	77
N8b	1651 LaSalle	7/28/97	11:35 a.m.	30-min	66	–	68
N9	Hardware Store, 5166 Third Street	7/24/97	10:00 a.m.	24-hr	70	66	74
N10	McCoy's Patrol Service, 6271 Third Street	7/24/97	05:20 p.m.	24-hr	74	70	77
N11	Key Avenue	7/29/97	08:57 a.m.	30-min	65	–	67
N12a	Bayshore Heights Condos, 288 Hester Ave.	7/24/97	11:00 a.m.	24-hr	75	70	78
N12b	2108 Bayshore	7/28/97	01:33 p.m.	30-min	74	–	76
N13	165 Desmond Street	7/28/97	02:23 p.m.	30-min	56	–	58

Notes:
(1) 24-hour measurements: Leq during daytime hours (7 a.m. to 10 p.m.) 30-minute measurements: Measured 30-minute Leq
(2) Leq during nighttime hours (10 p.m. to 7 a.m.).
(3) 24-hour measurements: Measured Ldn. 30-minute measurements: Based on average difference between Lday and Ldn for 24-hour measurements, Ldn at short-term measurements estimated as: Ldn = Lday + 2

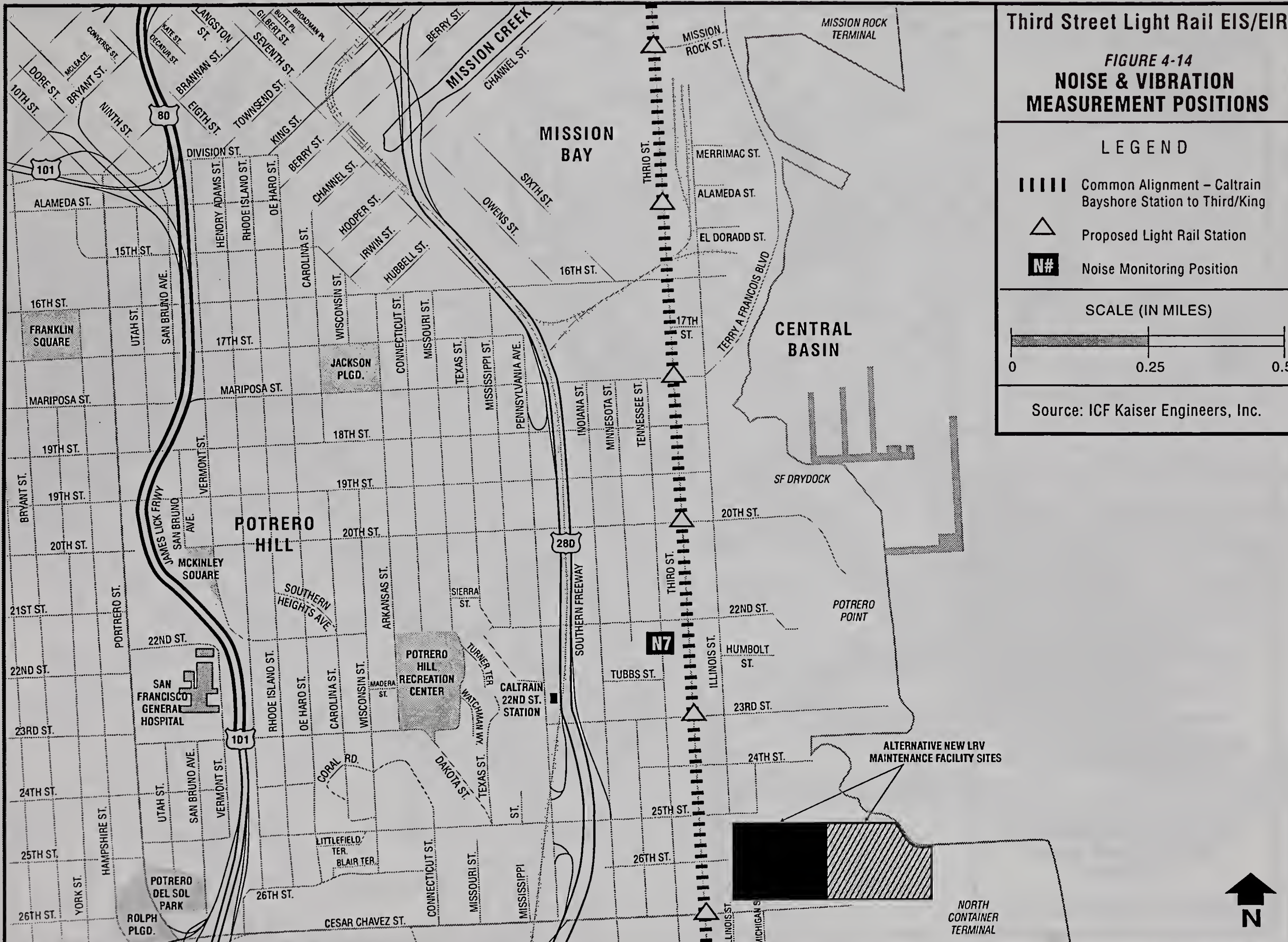


J96-082.91 3rd St. (11/5/97)

Third Street Light Rail EIS/EIR

FIGURE 4-14

NOISE & VIBRATION MEASUREMENT POSITIONS



J96-082.94 3rd St. (11/6/97)

Third Street Light Rail EIS/EIR

FIGURE 4-14

NOISE & VIBRATION MEASUREMENT POSITIONS

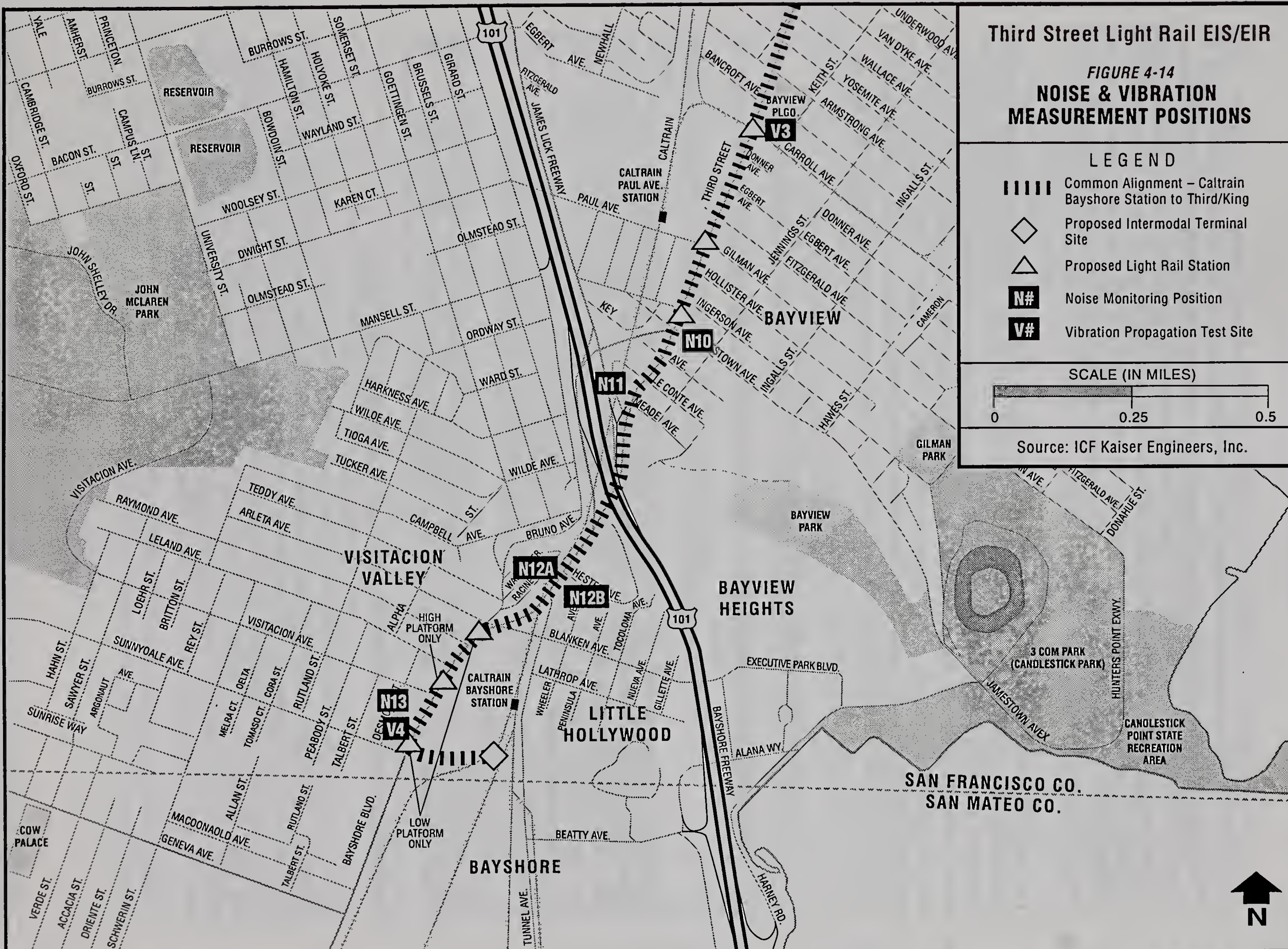
LEGEND

- IIIII Common Alignment – Caltrain Bayshore Station to Third/King
- △ Proposed Light Rail Station
- N# Noise Monitoring Position
- V# Vibration Propagation Test Site

SCALE (IN MILES): 0 — 0.25 — 0.5

Source: ICF Kaiser Engineers, Inc.

J96-082.93 3rd St. (11/19/97)



Third Street Light Rail EIS/EIR

FIGURE 4-14

NOISE & VIBRATION MEASUREMENT POSITIONS

J96-082.92 3rd St. (11/19/97)

Table 4-20 summarizes the results of the traffic counts performed during the short-term noise measurements. Noise projections developed using a simplified version of the approved FHWA model for traffic noise and traffic counts are also presented in **Table 4-20**. Measurement Site N6, the measurement site near the houseboat community in the China Basin channel west of Fourth Street, is not shown in **Table 4-20** 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. Site N13 is also not shown in **Table 4-20** since it was located one block back from Bayshore Boulevard with no view of Bayshore Boulevard.

The projected levels of traffic noise in **Table 4-20** are within 1 dBA of the measured level at five of the sites and within 3 dBA of the measured level at the other three sites. 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 determine whether the change in the traffic patterns resulting from this project would cause any noise impacts.

TABLE 4-20

TRAFFIC COUNTS DURING SHORT-TERM MEASUREMENTS

Site	Description/Street	Main Noise Source	Start		Traffic Counts, vehicles/hour			Leq, dBA	
			Date	Time	Autos	Trucks		Meas.	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
N7	Third Street between 22nd and 23rd Streets	Third	7/28/97	10:21 a.m.	956	138	64	71	74
N8b	1651 LaSalle	Third	7/28/97	11:35 a.m.	1,186	54	46	66	65
N11	Key Avenue	Third	7/29/97	08:57 a.m.	872	94	70	65	66
N12b	2108 Bayshore	Bayshore	7/28/97	01:33 p.m.	1,452	126	62	74	75

Existing Noise Conditions: Light Rail Alternative - Initial Operating Segment

The IOS runs from the Caltrain Bayshore Station north to King Street where it joins the MUNI Metro Extension. The alignment would share the right-of-way with Bayshore Boulevard from the Caltrain Bayshore Station to Highway 101. The alignment would then share the right of way with Third Street and possibly Fourth Street from Highway 101 to King Street. These are all relatively busy arterials and land uses along these streets are largely commercial and industrial with intermixed areas of noise sensitive receptors. The noise sensitive receptors include single- and multi-family residences, schools, churches and parks. Generalized existing noise levels for each segment are summarized in **Table 4-21.**

TABLE 4-21

GENERALIZED EXISTING NOISE CONDITIONS, INITIAL OPERATING SEGMENT

Segment	Measurement Sites in Area	Generalized Existing Ldn, dBA	
		First Row(1)	Second Row(2)
1. Caltrain Bayshore Station to 101 Overpass	N12a, N12b, N13	77	58
2. 101 Overcrossing to Thomas Avenue			
101 Overcrossing to Jamestown	N11	70	70
Jamestown to Armstrong	N10	77	67
Armstrong to Thomas Avenue	N9	73	63
3. Thomas Avenue to Jerrold Avenue			
Thomas Avenue to Palou Avenue	N9	73	63
Palou Avenue to Jerrold Avenue	N8a, N8b	76	66
4. Jerrold Avenue to 16th Street			
Jerrold Avenue to Evans	N8a	76	66
23rd Street to 22 Street	N7	73	--
5. 16th Street to King Street			
China Basin Channel Houseboats	N6	62	--
6. Third/Fourth to Market Street Subway	no sensitive receptors		

Notes: (1) First rows of buildings along roadway that are directly exposed to the traffic noise.
(2) Buildings that are at least one row back from the street and are acoustically shielded from the major source of traffic noise by intervening buildings.

The noise sensitive receptors and existing noise levels within each segment are summarized below.

Segment 1 - Caltrain Bayshore Station to the Highway 101 Overcrossing

After leaving the Caltrain Station, the light rail tracks would curve north into the median of Bayshore Boulevard. The land uses along Bayshore Boulevard are commercial and industrial from the point where light rail would join Bayshore Boulevard north to Arleta Avenue. The closest noise sensitive receptors are single family residences located one block back from Bayshore. Closer to Highway 101, there is a condominium development on the east side of Bayshore near Hester Avenue and single family residences along both sides of Bayshore Boulevard between Hester Avenue and Blanken Avenue. Existing noise exposure is relatively high for land uses along Bayshore Boulevard.

The Ldn for the 24-hour measurement at Site N12, at a residence fronting on Bayshore Boulevard, was 78 dBA. Traffic on Bayshore Boulevard was the dominant noise source, although, during breaks in the traffic on Bayshore, noise from traffic on the 101 freeway was clearly audible. The nighttime noise levels averaged only five decibels lower than the daytime levels, which indicates that there was a substantial volume of traffic on Bayshore Boulevard throughout the nighttime hours.

The measurement at Site N13 is representative of the noise environment for residences one block back from Bayshore. The 30-minute Leq at Site N13 was 56 dBA, which, based on the results of the 24-hour measurement, indicates that the Ldn at this site is about 58 dBA. The 20 dB difference between sites N12 and N13 is partially due to N13 being farther from the noise source and partially due to the acoustic shielding at Site N13 provided by the buildings along Bayshore Boulevard.

For the noise impact assessment, the existing noise along Segment 1 has been assumed to be Ldn 77 dBA for residences on Bayshore Boulevard and 58 dBA for the residences one block back from Bayshore Boulevard.

Segment 2 - Highway 101 Overcrossing to Thomas Avenue

The LRT tracks in this segment would run in the median of Third Street. Third Street is a busy arterial street in this area, although southbound traffic is diverted off of Third Street at Jamestown Street. Land uses between the Highway 101 overcrossing and Key Avenue are primarily single and multi-family residences. There is also a small hotel at the corner of Key Avenue and Third Street, and a church/school on the east side of Third Street near Key Avenue.

North of Key Avenue, the land use on Third Street is mostly commercial with residential land uses beyond the first row of buildings. Noise sensitive land uses include single-family residences and apartments over commercial establishments south of Gilman, Bayview Park at Armstrong and Third, a school on Egbert Avenue, and two churches located near Paul Avenue.

Noise monitoring was performed just north of this segment at 5166 Third Street (Site N9, 24-hour measurement), between Jamestown and Ingerson (Site N10, 24-hour measurement), and at Key Avenue (Site N11, 30-minute measurement). The measurements at these sites were used to characterize existing noise for sensitive receptors along Third Street. Existing noise levels from the 101 crossing to Jamestown are somewhat lower because southbound traffic is diverted off of Third Street at Jamestown. Based on the measurements, the existing Ldn from the 101 overcrossing to Jamestown was estimated at 70 dBA. The existing Ldn between Jamestown and Armstrong was estimated at 77 dBA, and the estimated Ldn from Armstrong to Thomas Avenue was 73 dBA.

Segment 3 - Thomas Avenue to Jerrold Avenue

Light rail tracks would run in the median of Third Street for this entire segment. Land uses between Thomas Avenue and Jerrold Avenue are primarily commercial with multi-family residential on the second floor along Third Street and single-family residential down intersecting side streets. There are also three churches, one library and one school along Third Street in this segment. Noise monitoring was performed at 5166 Third Street (Site N9, 24-hour measurement), at St. John's Church near Third and Jerrold (Site N8a, 24-hour measurement), and at 1651 LaSalle (Site N8b, 30-minute measurement). Based on these measurements, the existing Ldn for buildings on Third Street has been assumed to be 73 dBA from Thomas Avenue to Palou Avenue and 76 dBA from Palou Avenue to Jerrold. Existing noise at buildings one row back from Third Street has been assumed to be 10 decibels lower than along Third Street.

Segment 4 - Jerrold Avenue to 16th Street

Light rail tracks would run in the median of Third Street for this entire segment. Land use along Third Street is primarily industrial and commercial with some residences one block back. The only areas with noise sensitive land uses directly on Third Street are between Jerrold and Evans Avenue and between 22nd Street and 23rd Street. There are schools on Evans Avenue and Newcomb Avenue facing Third Street, and a church at the corner of Jerrold Avenue and Third Street. Land uses between Jerrold Avenue and 16th Street are primarily commercial and industrial. Between 22nd Street and 23rd Street, there are some multi-family residential units on the second floor and single-family residential down intersecting side streets.

Noise monitoring was performed at Jerrold Avenue and Third Street (Site N8a, 24-hour measurement) and along Third Street between 22nd and 23rd Streets (Site N7, 30-minute measurement). Based on the measurements, the existing Ldn from Jerrold north to Evans has been assumed to be 76 dBA and the existing Ldn between 22nd Street and 23rd Street has been estimated to be 73 dBA.

Segment 5 - 16th Street to King Street

Light rail tracks would run in the median of Third Street and then turn northwest to cross the Mission Creek channel on the Third Street bridge and/or the Fourth Street bridge. The only existing noise sensitive land uses identified in this area are a small community of houseboats in the Mission Creek channel west of Fourth Street. Noise monitoring was performed along Channel Street where a dock allows access to the Mission Creek houseboats (Site N6, 30-minute measurement). The existing Ldn at the houseboats is estimated to be 62 dBA. Potential future sensitive noise receptors in this area include planned residential, institutional (UCSF), laboratory and childcare uses, all of which would be along the IOS alignment as part of the proposed redevelopment for Mission Bay South.

Segment 6 - Third/Fourth to the Market Street Subway

The IOS would join with the Market Street Subway at this point. Land use is primarily commercial and industrial with no noise sensitive receptors that would be affected by light rail noise. A new hotel has been proposed in this corridor at the site of the new Giants ballpark. Noise and vibration impacts for the proposed hotel have not been assessed because: 1) it would not be possible to accurately assess impacts until specific information about the hotel design is available, and 2) mitigation for noise sensitive land uses developed subsequent to construction of a light rail system is usually the responsibility of the developer. Should plans for the development of any land along the Corridor be completed prior to the Final EIS/EIR, assessment of noise and vibration impacts will be included in the EIS/EIR.

Light Rail Alternative - New Central Subway

The New Central Subway segment would run from the northern end of the IOS at King Street, north along Third/Fourth, Geary, and Stockton to the terminus at Jackson and Stockton Streets. There is relatively little potential for noise impact along this segment once the system is operational since most of this segment would be subway. However, there is potential for noise impact during construction. **Table 4-22** summarizes the existing noise conditions along the New Central Subway alignment, all of which is included in Segment 7 - King to Stockton/Jackson.

TABLE 4-22

GENERALIZED EXISTING NOISE CONDITIONS, NEW CENTRAL SUBWAY SEGMENT

Segment	Measurement Sites in Area	Generalized Existing Ldn, dBA
7. King to Stockton/Jackson		
South of Market	N4, N5	70
North of Market	N1, N2, N3	70

The land use along Segment 7 is commercial with several pockets of residential. South of Market Street noise levels for the noise sensitive areas were characterized by 30-minute noise measurements at Sites 4 and 5. Both of these measurements were at apartment buildings along Third Street, and the dominant noise source was traffic on Third Street. The measured 30-minute Leq was 70 dBA at both sites. Based on the 24-hour measurements, Ldn at these sites is estimated to be about 72 dBA. To ensure that the assessment does not underestimate the noise impact, Ldn has been assumed to be 70 dBA for all noise sensitive receptors along Segment 7 south of Market Street.

Noise measurements were made at three locations north of Market Street: 1) along Stockton between Washington and Jackson (Site N1, 24-hour measurement); 2) on Stockton just north of Sacramento (Site N2, 30-minute measurement); and 3) at Union Square (Site N3, 30-minute measurement). The measured Ldn at Site N1 was 70 dBA, 5 to 8 dBA lower than most of the noise measurements along Third Street. The noise levels along Stockton Street are lower than along Third Street. This is probably due to the lower traffic speeds along Stockton Street compared to Third Street. The short-term measurements were 72 dBA at Site N2 and 69 dBA at Site N3. This suggests that Ldn is 72 to 74 dBA at many of the buildings along Stockton. For the noise impact assessment, the existing Ldn has been assumed to be 70 dBA for all buildings with noise sensitive uses that front on Stockton Street.

4.12.4 EXISTING VIBRATION CHARACTERISTICS

The testing to characterize ambient vibration and vibration propagation are discussed below.

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 101 and I-280 freeways; Caltrain operations; and the MUNI Metro Extension to the Caltrain Terminal at Fourth and King. 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 at noise monitoring sites N2, N8, and N12. The ambient vibration measurements were all made with high-sensitivity accelerometers mounted in the vertical direction on flat, paved surfaces and set back from the street at the same distance as the facade of the nearest sensitive receptor. The acceleration signal was recorded using a digital audio tape (DAT) recorder. The tape recordings were subsequently analyzed in the laboratory to determine average and maximum vibration levels.

The results of the ambient vibration measurements are summarized in **Table 4-23**. 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 were all around 50 VdB, were 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 4-23

AMBIENT VIBRATION MONITORING RESULTS

Site	RMS Vib. Velocity Level, VdB	
	Average[1]	Max[2]
N2. Near corner of Stockton Street & Sacramento Street.	52	63
N8. Corner of LaSalle Avenue & Third Street	51	63
N12. Bayshore Boulevard, near Hester Avenue	47	60

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 8.2 to 61 meters (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.

Vibration propagation tests were performed at the following four locations:

- parking lot along Third Street between King Street and Berry Street;
- parking lot east of Newhall between Galvez and Fairfax;
- school ballfield east of Third Street between Armstrong and Carroll; and
- S. E. Rykoff parking lot west of Bayshore Boulevard south of Sunnydale.

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. It is assumed that more detailed testing would be performed during the final design phase of the Third Street Light Rail Project to improve the estimates of vibration propagation.

5.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

This section of the EIS/EIR identifies and evaluates the potential environmental consequences of each of the alternatives described in Section 2.0: the No Project Alternative, the No Build/TSM Alternative, and the Light Rail Alternative (Initial Operating Segment, New Central Subway and two alternative maintenance facility sites). Available mitigation measures that would reduce or avoid impacts are then described for each potential adverse impact identified.

Mitigation measures are for significant and non-significant impacts pursuant to CEQA and NEPA and have been agreed to by MUNI.[1] As a general rule, the City and County of San Francisco considers mitigation measures when necessary and feasible in order to reduce or eliminate potentially significant environmental effects. Consistent with NEPA and FTA procedures, the mitigations presented below address project-related impacts for each alternative even if those impacts would not necessarily constitute a significant impact.

5.1 LAND USE

5.1.1 INTRODUCTION

This section first evaluates the consistency of the proposed project and alternatives with adopted land use plans and policies. It then evaluates the compatibility of the proposed light rail project with existing land use in the Corridor.

5.1.2 CONSISTENCY WITH ADOPTED PLAN AND POLICIES

No Project Alternative

The No Project Alternative would not be consistent with many of the adopted plans and policies reviewed in Section 4.1.1. For example, the No Project Alternative would not 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 not be consistent with goals and objectives contained in the Regional Transportation Plan, including the following: *Improve mobility of persons and freight* and *Support transportation investments that promote community social and economic objectives* through transportation system improvements.

Under the No Project Alternative, transit services would not keep pace with future demand. As the quality and efficiency of public transit service deteriorates, users could be attracted to alternative modes of transportation, including use of private vehicles. For this reason, the No Project Alternative would be inconsistent with transportation policies contained in many area plans--including the Downtown Plan, Central Waterfront Area Plan, Mission Bay Plan, Rincon Hill Plan, South of Market Plan, South Bayshore Plan and the Waterfront Land Use Plan--that encourage accommodating future employment and population growth in San Francisco through transit, rather than private automobiles. The No Project Alternative would also be inconsistent with the South Bayshore Plan's policy of maintaining the area's economic vitality by developing a system for the easy movement of people and goods, taking into account the anticipated needs of both local and through traffic.

[1] In this analysis, "significant" impacts are adverse by definition; potentially beneficial impacts are identified as such.

No Build/TSM Alternative

The No Build/TSM Alternative would be generally consistent with General Plan and Area Plan policies aimed at developing transit as the primary mode of travel between residential neighborhoods and job centers in San Francisco. This alternative would be consistent with the Transportation Element objective of upgrading existing transit service along corridors with a high level of ridership, because it would increase bus service to continue to meet service demand.

While the No Build/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. Planning policies that are relevant to the new bus maintenance facility would be the same as those described for the light rail maintenance facility (see Maintenance Facility discussion below).

Light Rail Alternative - Initial Operating Segment

Because the IOS would involve lands within BCDC's jurisdiction as defined by the federal Coastal Zone Management Act, a determination of consistency would have to be made prior to project approval. This determination would be made by BCDC staff, based on information provided by MUNI. Overall consistency with adopted local plans and policies is discussed below.

The IOS would be consistent with the City and County of San Francisco's "Transit First" policy, as well as regional government policies aimed at improving transportation access to job centers and recreational opportunities. The IOS also would be consistent with MTC's Regional Transportation Plan, which "supports transportation investments that promote community social and economic objectives."

The IOS 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. Such policies are contained in a number of General Plan Elements and Area Plans, including the Transportation Element, the Central Waterfront Plan and the South Bayshore Plan.

All IOS design options for the Third Street commercial core *except* the one lane design option would preclude the future development of a formalized (striped) bike lane along this section of Third Street; however, under all conceptual plans Third Street would retain the designation as Bike Route 5. The proposed restriping of Terry Francois Boulevard and the proposed Mission Bay Plan would provide alternative bike lanes, separated along the west side of Terry Francois Boulevard. Construction of the IOS would be consistent with the light rail project funding priorities identified in the San Francisco County Transportation Authority's Strategic Plan and Four Corridor Plan, as well as in MTC's Regional Transportation Plan.

Light Rail Alternative - New Central Subway

Like the IOS, the New Central Subway 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 New Central Subway 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 Regional Transportation Plan.

Western Pacific Maintenance Facility Site

Because construction of a light rail maintenance facility on either the eastern or western portion of the Western Pacific site would involve lands within BCDC's jurisdiction as defined by the federal Coastal Zone Management Act, a determination of consistency would have to be made prior to project approval and issuance of a Coastal Development Permit. The determination of consistency would be made by BCDC staff, based on information provided by MUNI.

Because the proposed maintenance facility (and other ancillary facilities such as substations) would be necessary to the operation of the IOS and the New Central Subway, its consistency with adopted local plans and policies is assumed as part of that described for the light rail line in the sections above. The proposed maintenance facility at the Western Pacific site would not conflict with waterfront plans and policies, because the proposed site is within an area designated for non-maritime uses. If the maintenance facility were constructed on the eastern portion of the Western Pacific site, adopted BCDC policies aimed at enhancing public access to the waterfront would be supported through the construction of a 0.8-hectare (two-acre) open space that is included in the project design for that location. Construction of the maintenance facility on the western portion of the site would not include a waterfront open space and public access improvements, since it would not abut the waterfront.

Cargo Way Maintenance Facility Site

Because construction of a light rail maintenance facility would involve lands within BCDC's jurisdiction as defined by the federal Coastal Zone Management Act, a determination of consistency would have to be made prior to project approval. This determination would be made by BCDC staff, based on information provided by MUNI. Overall consistency with adopted local plans and policies would be the same for the Cargo Way site as described above for the Western Pacific site.

5.1.3 COMPATIBILITY WITH EXISTING LAND USES

The Project could affect surrounding land use in a variety of ways, both during the construction and operational phases. These impacts include the physical impacts of construction of the right-of-way and ancillary facilities such as substations, parking lots and station platforms. Compatibility of the required maintenance facility with surrounding land uses is also a potential impact issue.

In this section, potential land use impacts are assessed in terms of corridor, neighborhood, and site-specific impacts. The characteristics of the Project are compared to the existing and planned developments in 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 91-meter (300-foot) area along either side of the proposed alignments and a 457-meter (1,500-foot) area around the boundaries of the proposed light rail stations. For the purposes of this analysis, a land use impact is considered potentially significant if an element of the Project would conflict with existing land uses, adopted land use compatibility standards, or planned future land uses.

No Project Alternative

Since the No Project Alternative represents virtually no change in the physical environment from existing conditions, it would not have an impact on existing or planned land use.

No Build/TSM Alternative

This alternative would include a variety of roadway and MUNI service improvements. For the most part, these improvements would consist of redesigning facilities within the existing right-of-way, or seismically retrofitting existing ramps and bridges. No new rail improvements would be constructed within the Corridor, although bus service would be increased to meet the increased demand resulting from future growth and development in order to keep the level of service comparable to what it is at present. This improved bus service is unlikely to substantially affect land use along the Corridor.

Because additional bus service would be required to meet demand associated with planned changes in land use, such as those planned for the Mission Bay area, a new bus maintenance facility would be required under the No Build/TSM Alternative. This new facility would maintain the estimated 40 additional diesel and trolley buses that would be required to meet service demand by 2015. Since the bus facility would be located at either the Western Pacific or Cargo Way site, land use impacts would be the same as those described below for the rail maintenance facility (see Maintenance Facility discussion below).

Light Rail Alternative - Initial Operating Segment

<u>Construction Impacts</u>

The construction of the Caltrain Bayshore intermodal station, including a bus terminal and parking structure, would require the acquisition and demolition of a vacant warehouse type industrial building approximately 929 to 1,394 square meters (10,000 to 15,000 square feet) in size. Construction of other ancillary facilities, such as the track and traction power substation at the intersection of Bayshore Boulevard and Sunnydale Avenue and a trolley bus layover facility at Third/Palou, would require the acquisition of a few existing facilities and conversion to transit-related uses, as described in Section 5.2. With the exception of the Sunnydale Avenue facility, the traction power substations, each approximately 610 square meters (2,000 square feet), would be located along Third Street adjacent to the right-of-way. Sites would be selected that do not require demolition or relocation of existing buildings. These would be limited impacts that would not affect overall land use in the Corridor, reflecting only minor changes in land use to accommodate transit improvements.

Construction of the light rail right-of-way in the median of Third Street would temporarily affect traffic flow and parking availability in the area under construction, as described in detail in Chapter 3. These construction-related land use impacts are not considered significant.

<u>Operation Impacts</u>

On-street parking would be eliminated permanently in the vicinity of some planned stations in order to allow sufficient space for platforms, the rail right-of-way and lanes for traffic flow. Some design options would displace more parking and traffic lanes than other options. (Refer to Chapters 2 and 3 for detailed discussion of these impacts by design option and by segment.) With the few exceptions described in Section 5.2, all direct land use impacts would occur within the existing public right-of-way.

Over the long term, IOS operation could cause indirect land use impacts, as commercial uses in the Corridor that depend on automobile access are likely to be replaced by businesses more oriented to pedestrian traffic, particularly around station locations. While IOS operation would not result in any major or permanent changes in land use along the Third Street Corridor, it is possible that vacant or underutilized industrial sites in the area could come under pressure to be rezoned and converted to new residential or commercial uses as a result of proximity to the IOS.

The Project would have beneficial indirect impacts on land use in the Corridor by providing improved transit access and providing highly visible public investment in the neighborhood. Investment in and provision of light rail service may encourage commercial and residential development around station locations, contributing to desired economic revitalization, particularly along the Third Street commercial core. This would be a positive intensification of land use in the Corridor that is consistent with existing plans. Therefore, no mitigation is required. Improved transit service in the Corridor would also facilitate the planned development of Mission Bay, including the relocation of UCSF research facilities.

Cumulative Impacts

The construction and operation of light rail in the Corridor is one of several projects designed to improve public access, generate employment opportunities, and stimulate further public and private investment in the southeastern quadrant of San Francisco. Other projects being planned include redevelopment of Mission Bay and Hunters Point Shipyard, development of a new football stadium and mall at Candlestick Point, and improvements to Caltrain operations. Depending on the sequencing of these projects, construction related "nuisance" impacts could be more intense, or could last longer than such impacts for the IOS alone. Furthermore, the cumulative effect of these projects would be to change land use in the southeastern quadrant of the City (including Mission Bay) somewhat faster than otherwise anticipated. Projected charges would be consistent with proposed or adopted plans. This is not considered a significant impact.

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. Temporary and permanent replacement parking on adjacent streets can offset the majority of parking spaces that would be lost as a result of the Project (see also, Chapter 3.0). *Wherever possible and deemed essential for nearby businesses, replacement parking would be provided as close as possible to the spaces lost.* As described in Section 5.2, where buildings or land would be acquired for right-of-way, MUNI would compensate property owners at fair market value for loss of use.

Light Rail Alternative - New Central Subway

Construction Impacts

While generating some noise, dust, and disruption of traffic on Third, Geary, and Stockton Streets, the construction of the New Central Subway would not cause any substantial changes in land use. Due to tunnel portal construction, curb parking would be eliminated on both sides of Third Street and on the west side of Fourth Street between Brannan and Bryant Streets. Other parking spaces would be temporarily lost during the construction period. Uses oriented to vehicular access in the vicinity of the tunnel portal may find it difficult to operate during the construction period, but this impact would be temporary.

Operation Impacts

Since it would be almost exclusively underground, the New Central Subway would have minimal direct impact on surface land uses. Station stops 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.

For the New Central Subway, some curb parking would be eliminated permanently on Third and Fourth Streets between Brannan and Bryant Streets. Elevators, stairs, and escalators for below-grade stations for the New Central Subway would displace portions of existing public sidewalks in the Moscone Center, Union Square, and Chinatown areas, and would result in a potential loss of about two to three spaces in the Union Square garage. With the exception of access points, all other station and track facilities would be underground.

Cumulative Impacts and Mitigation Measures

Construction and operation of the New Central Subway is not expected to have any long-term cumulative impacts on land use, since it would primarily serve fully developed, urban areas. "Nuisance" impacts associated with construction of stations and in the portal area could be exacerbated if there are other major construction projects taking place in these areas at the same time. Mitigation measures would be the same as those proposed for the IOS.

Western Pacific Maintenance Facility Site

Construction and Operation Impacts

A maintenance facility at the Western Pacific site would result in a change in land use in the vicinity of 26^{th} and Maryland Streets from vacant, industrially designated land to a light rail maintenance yard. In addition, if the eastern portion of the site is used for this purpose, the area immediately east of the maintenance facility would be developed as a 0.8-hectare (two-acre) waterfront open space with 13 public parking spaces, providing public access to the waterfront. (No open space and access improvements would be made if the facility were built on the western portion of this site). Land uses surrounding the site are primarily industrial in character, and no conflicts with existing land uses were identified; therefore, no mitigation is required.

Cargo Way Maintenance Facility Site

Construction and Operation Impacts

A maintenance facility at the Cargo Way site would change land use in the vicinity of Cargo Way and Amador Streets from vacant industrially designated land to a light rail maintenance yard. No waterfront improvements would be made at this location. A portion of the area immediately west of the maintenance facility, currently a recycling center, would be acquired to facilitate rail access into the proposed rail maintenance yard. The recycling center would be relocated to another industrially zoned site. No other surrounding land use would be affected, and the maintenance facility would be compatible with adjacent industrial land uses.

5.2 ACQUISITION AND DISPLACEMENT OF EXISTING USES

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 MUNI 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 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.

For the purpose of this analysis, properties that would need to be acquired for the construction and operation of an alternative were 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 5-1 lists the acquisitions that would be necessary to implement the alternatives. The information contained in this table is discussed in the section below.

No Project Alternative

The No Project Alternative would not involve acquisition of property, and, therefore, would not have any displacement impacts.

No Build/TSM Alternative

The No Build/TSM Alternative would not require the acquisition of any property for stations or ancillary facilities, but it would require the purchase of a site for construction of a new bus maintenance facility. The maintenance facility sites (at Western Pacific and Cargo Way) under consideration are currently vacant properties zoned for industrial use. One of these sites would be purchased from the Port of San Francisco for the new bus maintenance facility that would be required under the No Build/TSM Alternative. There would be no displacement impacts associated with this purchase, however, so there would be no relocation impacts. For the Cargo Way site, the relocation of an adjacent recycling business may be required (refer to **Table 5-1**).

TABLE 5-1

ACQUISITION AND RELOCATION REQUIREMENTS

LOCATION	REASON FOR ACQUISITION/SEGMENT	ACQUISITION	RELOCATION
North of County line between Bayshore Blvd. and Tunnel Avenue	Bayshore Station/IOS	several parcels containing a vacant industrial structure and abandoned maintenance-of-way sheds	**Two businesses with one to two employees**
North and south of County line between Bayshore Blvd. and Tunnel Avenue	Bayshore Station/IOS	UPRR freight spur (possibly)	No
Southeast corner Sunnydale Avenue at Bayshore Boulevard	Line and traction power substation/IOS	car wash station	Yes, one business 3 - 5 employees
East side of Bayshore at Highway 101	Line/IOS	vacant land next to motel	No
West side of Bayshore at Highway 101	**Line/IOS**	**Vacant public right-of-way**	**No**
Southeast corner Third Street and Oakdale Avenue	Station/IOS	small vacant commercial building	**Yes, one business**
East of Third Street between 25th and 26th	Western Pacific maintenance site and two traction power substations	approximately eleven acres of vacant site (on east or west side)	No
Cargo Way & Amador Street	Cargo Way maintenance site	vacant Port site and part of recycling center	Yes, one business, 3-5 employees
Quint St. at Arthur Ave.	Spur track relocation (Cargo Way maintenance facility option)	36,000 sq. ft. industrial building	Yes, 6 businesses, with 20-40 employees
Keith St. near Key Avenue	Traction power substation (IOS)	vacant public right-of-way	No
Newhall St. at Hudson Avenue **(possibly)**	Traction power substation (IOS)	vacant private parcel	No
16th Street near Terry Francois Boulevard	Traction power substation (IOS)	vacant private parcel	No
Union Square Garage - Stockton between Post and Geary	Union Square Station/Central Subway	two to three parking spaces plus 50 additional spaces if an optional subway bypass were constructed at the Union Square station	No

Light Rail Alternative - Initial Operating Segment

Construction of the Light Rail Alternative would involve the acquisition of eight partial properties for the IOS. This would not involve displacement of any residents, but would require the displacement of one business that currently employs an estimated three to five employees. MUNI would also require a strip of property currently used for truck parking at the intersection of Third and Jamestown Streets. This is not likely to result in displacement of any business, however, because MUNI should be able to purchase other property in the vicinity and lease it for parking. Depending on the design adopted for the Caltrain Bayshore intermodal station, it may be necessary to relocate a UPRR spur track which is currently used to serve six businesses in Daly City and Brisbane as well as some events at the Cow Palace. If it could not be relocated, the spur could be acquired from the railroad which would be compensated. Either the railroad or MUNI would need to get State PUC approval of abandonment. Industrial property owners and businesses along the existing spur could challenge abandonment and make a claim for loss of value. Alternatively, the intermodal station could be redesigned and the spur track retained (refer to Section 3.2.3 for more information related to the UPRR spur track and for design options to mitigate potential impacts).

Implementation of the IOS would also require acquisition of narrow strips of land along Third and Fourth Streets in Mission Bay. Catellus, the owner of these parcels that total approximately 975 square meters (10,500 square feet), intends to donate them to facilitate MUNI service through the proposed Mission Bay development as part of a larger City land exchange agreement. In addition, as part of the Mission Bay Plan, Catellus would displace a skating rink located on the new Owens Street alignment prior to construction of the IOS alignment through Mission Bay. A strip of land totaling 510 square meters (5,500 square feet) would also be required from the Port of San Francisco.

Since MUNI would follow the provisions of the Uniform Relocation Act, these acquisition and potential relocation impacts are considered less than significant. 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 owners. Therefore, no further mitigation would be required.

Light Rail Alternative - New Central Subway

Construction of the New Central Subway would require an easement along an arcade on the east side of Third Street between Howard and Folsom Streets and two to three parking spaces at the Union Square garage. Fifty additional spaces would be displaced if an optional subway bypass were constructed at the Union Square station. These displacements would not require relocation of any residents or businesses. Existing public sidewalk right-of-way would be required for station access points.

Western Pacific Maintenance Facility Site

Acquisition of land in the vicinity of 26th and Maryland Streets for the Western Pacific maintenance facility would not cause any displacement of businesses or residents since this land is currently vacant. Therefore, there would be no relocation impacts.

Cargo Way Maintenance Facility Site

Acquisition of the Cargo Way site itself would not cause any displacements, since this land is currently vacant. However, it may be necessary to acquire a portion of a parcel at the intersection of Cargo Way and Amador Street which currently contains a recycling center that is estimated to employ three to five persons. Depending upon the size and configuration of the remaining land, the recycling center might have to be relocated to other vacant industrial land in the vicinity. In addition, the relocation of a spur track to accommodate the facility would require the acquisition of the 3,300 square meter (36,000-square foot) industrial building at the corner of Quint Street and Arthur Avenue. This would displace six industrial and commercial businesses with an estimated 20 to 40 employees. Based on the criteria defined at the beginning of this section, these business displacement impacts would not be significant.

5.3 SOCIOECONOMIC CHARACTERISTICS

The potential impacts and potential benefits of each project alternative on population 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, if it would displace a large number of people, or if it would substantially alter the location, distribution, density, or growth rate of population of an area in a manner inconsistent with public policy. Other considerations include whether the Project would disrupt access to neighborhoods, or isolate some areas within a neighborhood from others.

The construction and/or operation of new transportation improvements could have adverse impacts on neighborhoods in terms of dividing or disrupting communities and changing patterns of neighborhood interaction. It could adversely affect businesses by disrupting access or by separating a business from its customers. The potential impacts and benefits of the construction and operation on neighborhoods and on business communities are described below.

5.3.1 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. Potential impacts associated with the Third Street Light Rail Project are described below.

No Project Alternative

The No Project Alternative would not affect the socioeconomic characteristics of the study area, nor would it affect neighborhoods or businesses along the Corridor. However, the lack of transit improvements would result in the adjacent community being underserved by transit, particularly relative to other San Francisco neighborhoods that have the benefit of MUNI light rail or BART service.

No Build/TSM Alternative

This alternative would have minimal impacts on the socioeconomic characteristics of the study area. While there would be improvements to transit service relative to the No Project Alternative, the neighborhood would still remain underserved by transit improvements relative to other San Francisco neighborhoods. Increasing traffic congestion might adversely affect neighborhoods and businesses, but this impact would be difficult to quantify.

An estimated 145 new jobs would be generated under this alternative to operate and maintain the additional buses that would be required to meet 2015 transit demand. Because of the large size of the local and regional labor force, this employment impact is considered to be less than significant.

Light Rail Alternative - Initial Operating Segment

Construction

Table 5-2 presents the estimated employment impacts that would occur during the construction period. The IOS would create local employment during the short term during the construction period. A total of 1,845 person-years of labor would be required to design and construct the IOS, at a total cost of more than $380 million for labor and materials. Since the Bay Area has a large labor force and vibrant economy, this number of temporary construction jobs would not adversely affect the availability of labor supply, the price and availability of housing, or school enrollment.

In the context of City and area-wide employment, the acquisition of several partial or entire properties, and the potential relocation of one small business employing an estimated three to five people (or potentially seven businesses and up to 45 employees if the Cargo Way site were selected) would not have a significant adverse impact on the local economy. Construction of the rail right-of-way would have temporary adverse impacts on neighborhoods, including noise, dust and disruption of existing traffic patterns, as described in other sections of this document.

TABLE 5-2

CONSTRUCTION EMPLOYMENT IMPACTS IN PERSON-YEARS

SEGMENT	COST OF FACILITIES	COST OF LRVS	COST OF PROF. SERVICES	TOTAL COST	PERSON-YEARS
Initial Operating Segment	$224.57	$69.66	$64.76	$387.09	1,845
Central Subway	$376.31	$20.28	$102.56	$499.15	3,033
Project Total	$600.88	$89.94	$167.33	$886.24	4,878

The following assumptions were used in calculating local person-year equivalencies:
1) all costs are in millions of dollars, with 33% contingency and project reserve assumed.
2) $75,000 average annual construction cost/person year for Bay Area
3) 40% of all facility costs represents labor
4) 0% of LRV costs represents local labor
5) $100,000 average annual professional service cost/person year (direct + overhead)
6) 100% of professional services cost represents local labor
Source: *Gabriel Roche, Inc. from Table 2-11 Alternative Capital Cost Summary*

These impacts would be potentially most pronounced in the Third Street commercial core where traffic lanes and sidewalks would be reconfigured to accommodate light rail. Construction would also have a temporary adverse impact on local businesses, due to construction noise, dust, vibration and disruption of local traffic and parking patterns. These impacts would be mitigated through standard construction practices such as public information programs, construction phasing, and provisions of nearby temporary parking where possible.

The loss of tax revenues resulting from property acquisition (as described in Section 5.2) and conversion to public use would not be significant because of the size and character of affected properties. Any reduction in tax revenue would likely be temporary since property values along the alignment, particularly near station stops, could eventually rise higher than they would have been without the rail line.

Operation

The operation of additional LRVs would also generate jobs. An estimated 145 permanent jobs are expected to be generated in the operation of the IOS.[2] The small number of additional jobs represents a positive impact.

Because light rail stations are a greater distance from each other than bus stops, they would concentrate pedestrian activity around station stops. Because the stations serve as a symbol of public investment, the development of light rail could have indirect effects on the location and intensity of residential or commercial development where there are nearby vacant residential parcels or areas designated for redevelopment or zoned to allow greater intensity of development than exists on the site at present. The provision of light rail would serve as one of the infrastructure investments that would help facilitate the redevelopment of Mission Bay, including a new UCSF campus, biotechnology center, residential and commercial development.

Light rail would improve the mobility of some adjacent neighborhood residents, but it could adversely affect mobility for others, as some existing bus lines would be rerouted and others would be discontinued. There would be no net increase in transit service compared with the No Build/TSM Alternative. The IOS would provide more efficient connections to important job centers Downtown and South of Market. The

[2] Conversation with John Mason, Manuel Padron and Associates, September 1997.

replacement of Third Street parking in the commercial area of Bayview Hunters Point with additional "spillover" parking on side streets could adversely affect the ambiance of local streets that are now residential in character. Modifications to Third Street to accommodate light rail, including the reduction of vehicular travel lanes, are likely to discourage through traffic, which could reduce the customer base for some local businesses. Some design options would remove more on-street parking along Third Street than others. Reduction of parking for the commercial area or replacement of Third Street parking with additional parking on adjoining residential streets could affect direct automobile and truck access to specific businesses. On the other hand, local businesses located near stations would likely benefit from the increase in pedestrian volumes in these vicinities.

The Project also could indirectly provide additional employment benefits to residents of the Corridor by improving access to jobs available in other parts of the City (e.g., by enabling Bayview Hunters Point and Visitacion Valley residents to ride a convenient transit service directly to jobs available in the South of Market and Downtown areas, as well as new jobs to be created in Mission Bay). Project-related community outreach and economic revitalization activities (working group meetings, one-on-one interviews, and surveys) could improve the likelihood of these economic benefits accruing to local community residents. According to the *Third Street Light Rail Economic Revitalization Strategies Report,* Bayview Hunters Point residents surveyed believe that light rail was an important milestone for change to improve the image of Third Street and to provide "a more efficient and attractive mode of travel in comparison to the bus that would improve accessibility and integrate [Bayview Hunters Point] with the rest of the City."[3]

Light Rail Alternative - New Central Subway

Construction

As presented in **Table 5-2**, design and construction of the New Central Subway would require an additional 3,033 person-years of labor and the expenditure of approximately $500 million for materials and labor. As described above for the IOS, this would be a beneficial impact.

Operation

The operation of the New Central Subway would generate approximately 80 additional jobs beyond that of the IOS, including at the maintenance facility. This would be a beneficial impact.

Western Pacific and Cargo Way Maintenance Facility Sites

The potential demographic and economic impacts associated with construction of a maintenance facility, at either the Western Pacific or Cargo Way site, were included in the impact analysis for the IOS. Similarly, the operating jobs at the maintenance facility were included in the estimates for the IOS and New Central Subway. These impacts would be less than significant.

Because the proposed maintenance facility sites are located away from residential neighborhoods and commercial centers, they would not adversely affect neighborhood character or business activities. Both the Western Pacific and Cargo Way locations are in industrial areas subject to heavy volumes of truck traffic and noise. The Cargo Way site also adjoins a rail spur to Pier 94-96, so additional rail traffic would

[3] Pittman and Hames. *Economic Revitalization Strategies Report: Working Paper #6.* September 1997.

not change the industrial character of this area. Use of the Western Pacific site or the Cargo Way site would preclude the use of the selected site for other industrial (maritime or non-maritime) uses.

Mitigation Measures

No significant adverse impacts on demographic or economic conditions are anticipated from the construction or operation of any of the project alternatives. While beneficial to the City and region in terms of employment opportunities and income, both short-term and long-term direct employment impacts are not considered to be a significant impact. Therefore, no mitigation is recommended for these impacts.

5.3.2 ENVIRONMENTAL JUSTICE CONSIDERATIONS

This section addresses requirements contained in Executive Order No. 12898 ("Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"), as well as the subsequent Department of Transportation Order to Address Environmental Justice in Minority Populations and Low-Income Populations (published in Federal Register Volume 62, No. 72, April 15, 1997) and Interim FTA Region 9 Guidance on Addressing Environmental Justice in the Environmental Impact Statement (dated May 9, 1997). Executive Order 12898. *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, signed by President Clinton on February 11, 1994, requires federal agencies to take the appropriate and necessary steps to identify and address disproportionately high and adverse effects of federal projects on the health or environment of minority and low income populations to the greatest extent practicable by law. The Executive Order requires that:

> To the greatest extent practicable and permitted by law... each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its program, policies and activities on minority populations and low-income populations (Subsection 1-101).
>
> Each Federal agency shall conduct its programs, policies and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying person (including populations) the benefits of, or subjecting persons (including populations) to discrimination under such programs, policies, and activities, because of their race, color, or national origin (Subsection 2-2).
>
> Each Federal agency shall work to ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public [Subsection 5-5(c)].

The US Department of Transportation has issued guidance on complying with Executive Order 12898 during the environmental review process. In addition to complying with the Executive Order, the Department of Transportation is committed to Title VI of the Civil Rights Act, which provides that no person in the United States shall, on the grounds of race, color or national origin, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving federal financial assistance.[4]

[4] Federal Highway Administration, Federal Transit Administration, Interim Region 9 Guidance: *Addressing Environmental Justice in the Environmental Impact Statement.* May 9, 1997.

A Presidential Memorandum that accompanied the Executive Order emphasized that the order was "intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority communities and low-income communities access to public information on, and an opportunity for public participation in, matters relating to human health or the environment"[5]. It also underscored the application of certain provisions of existing law, such as NEPA. Specifically, the memorandum notes that a NEPA analysis must include "effects on minority communities and low-income communities". In addition, "each Federal agency shall provide opportunities for community input in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving the accessibility of meetings, crucial documents and notices" (Subsection 5-5c).

Thus, the memorandum-as well as the USDOT and FTA guidance-encourages wherever possible the use of existing requirements and procedures to accomplish the goals of the Executive Order. Accordingly, this section uses the NEPA/CEQA framework to assess whether the Project meets the goals and requirements of the order and memorandum, first by determining if it meets community participation goals and then by analyzing potential impacts on minority and low-income communities.

Another Executive Order--E.O. 13045, signed on April 21, 1997--require federal agencies to evaluate, and address if necessary, any project-related environmental health and safety risks that would disproportionately affect children. In this document, the sections on Hazardous Materials and Transportation address environmental health and safety risks associated with the Third Street Light Rail alternatives. There is no basis to conclude that such impacts would disproportionately affect children. Hazardous materials in the project right-of-way are more likely to affect construction workers than children, and the project alternatives would be constructed within existing transportation rights-of-way or underground.

Community Participation

The Third Street Light Rail Project has been conducted with extensive public participation throughout the project development and environmental review processes. Serious efforts were made to conduct meetings within the affected neighborhoods, in order to make these meetings more accessible to the residents who would be most affected by the Project. Special outreach efforts have been taken to encourage participation by minority and low income residents of the Corridor. More than 100 interested persons attended the two Scoping meetings, which were held in the northern and southern portions of the Corridor, and translation services were made available at these public meetings. In addition, more than 300 persons attended a series of informal neighborhood workshops which were held in Visitacion Valley/Little Hollywood, Bayview Hunters Point, Potrero Hill, South of Market, Downtown, and Chinatown. MUNI staff have made more than 40 presentations about the Project to interested community groups.

Project fact sheets and meeting announcements were published in English, Spanish and Cantonese. More than five thousand copies of Project newsletters were distributed by mail, as well as door-to-door and on bus lines currently serving the Corridor. Special newsletter inserts on revitalization opportunities and concepts were distributed. Project updates and meeting announcements were also published in existing community newspapers or neighborhood newsletters. A bus patronage survey that was conducted for the Project was also done in three languages.

[5] *Weekly Compilation of Presidential Documents* at 279, February 11, 1994.

In addition, a Citizens Advisory Group (CAG) was appointed to assist MUNI with project planning. The CAG has an equal number of representatives from each of the affected neighborhoods located along the Corridor, as well as several "at large" representatives from urban planning and transportation organizations. Fourteen of the CAG's 28 members are Asian, Black or Hispanic. CAG meetings, which are open to the public, have been held at alternating locations in the northern and southern portions of the Corridor. This outreach program satisfies the intent of Executive Order 12898 to involve affected minority and low income communities in project planning.

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Potential Impacts on Minority or Low Income Communities

The Executive Order and DOT/FTA guidance documents require consideration of the impacts on minority and low-income communities. This section determines whether the affected neighborhoods are "high-minority" or "low-income" according to demographic data from the US Census Bureau and San Francisco Planning Department. The neighborhoods identified for this analysis are established neighborhoods delineated by the San Francisco Planning Department in its document entitled *San Francisco Neighborhood Profiles,* 1997. This section includes a discussion of project impacts on these neighborhoods to determine whether or not these are "disproportionate" in comparison with impacts on other neighborhoods within the Corridor.

According to US Census Bureau data, the overall population of San Francisco in 1990 was 54 percent "White", however, when adjusted to include 'Hispanic' as a distinct racial category, approximately 53 percent of the City's 1990 population was minority. Allowing a 10 percent variation for normal fluctuations in population distribution, a San Francisco neighborhood would be considered "high-minority" if over 58 percent of its residents were minorities. Using this definition, five of the seven relevant neighborhoods can be considered "high-minority"--Excelsior, South Bayshore, South of Market, Union Square, and North Beach/Chinatown--as shown on **Table 5-3**. The remaining two neighborhoods--Potrero and Financial District--are considered to be "mixed-populace" neighborhoods, based on adjusted census data.

TABLE 5-3

MINORITY COMPOSITION AND MEDIAN INCOMES OF NEIGHBORHOODS

	PERCENT MINORITY	HIGH MINORITY	MIXED POPULACE	MEDIAN INCOME	LOW-INCOME
San Francisco	53		x	$33,719	
Excelsior	75	x		38,068	
South Bayshore	91	x		25,539	x
Potrero	39		x	36,170	
SOMA	66	x		17,495	x
Financial District	46	x		29,959	
Union Square/Downtown Retail	68	x		22,576	x
North Beach/Chinatown	63	x		31,635	

Source: San Francisco Neighborhood Profiles, 1997; US Census; and Gabriel-Roche, Inc.

The Department of Housing and Urban Development defines a low-income household as one where income is 80 percent, or less, of the County median income. The median household income for San Francisco in 1990 was $33,719, and 80 percent of this figure is $26,975. Three of the neighborhoods can be considered low-income under this definition: South Bayshore, South of Market, and Union Square/Downtown. The remaining four--Excelsior, Potrero, Financial District, and North Beach/Chinatown--are not considered low-income neighborhoods by this definition. The paragraphs below consider whether the alternatives would have disproportionate impacts on the high minority or low income neighborhoods identified.

No Project Alternative

The No Project Alternative would not impose adverse impacts disproportionately on any of the high minority or low income neighborhoods identified. This alternative would cause increased traffic congestion and slower travel times throughout the Corridor (in Segments 1 through 5 and Segment 7). All of the 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.

No Build/TSM Alternative

The No Build/TSM Alternative would not impose adverse impacts disproportionately on any of the high minority or low income neighborhoods identified. This alternative would increase bus service in the Corridor to keep pace with future demand, but the adjacent neighborhoods (again with the possible exception of the Financial District) would remain underserved by rail transit in comparison to other parts of the City.

Light Rail Alternative

Several of the defined goals for the Third Street Light Rail Project--including achieving equity in transit investments, obtaining community acceptance and political support, and supporting economic revitalization efforts for the Third Street commercial core--relate to environmental justice principles. Residents of the City's southeastern quadrant have complained that the Corridor has a disproportionate share of facilities such as sewage treatment plants, hazardous waste recycling centers and other industrial facilities, but that they have not benefited from a fair share of public investments for civic improvements such as light rail lines. The Project is perceived by many area residents as an overdue public investment that will improve several neighborhoods that have been overlooked in the past, and that 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.

Impacts to traffic, parking, land use, socioeconomic condition, community facilities, geology, soils, hydrology, water quality, hazardous materials, noise and vibration along each project segment are addressed in detail in other sections of Chapters 3 and 5 of this document. In general, the adverse impacts identified for each resource and each alternative are distributed throughout the Corridor, without a disproportionate share of those impacts occurring in minority or low income neighborhoods. Mitigation measures proposed are the same for each segment, whether the adverse impact identified would occur in a high minority/low income neighborhood or not.

Project impacts (adverse, but less than significant) and benefits would be experienced in each neighborhood along the alignment. For example, construction staging areas and traction power substations would be located at regular intervals along the light rail alignment without regard to incomes or the racial composition of adjacent residents. Light rail construction impacts--including traffic disruption and permanent losses of on-street parking--would occur along the entire alignment, not just in some segments. Similarly, long-term operation impacts such as noise and vibration would occur in each neighborhood along the light rail alignment. The same neighborhoods that would experience these adverse impacts associated with the Project would also be the ones to reap the benefits of the Project, including improved transit service reliability, greater connectivity with other regional transportation services and better access to job centers.

Light rail stations would be built every three to five blocks along the alignment, except along the Third Street commercial core in the Bayview Hunters Point neighborhood, where they would be built at closer intervals. As a result, this minority neighborhood would experience more nuisance impacts associated with the construction of more station platforms, but it would also benefit from a higher level of service during light rail operation. Furthermore, in order to leverage the investment of public funds in rail service through this neighborhood, MUNI is cooperating with the San Francisco Redevelopment Agency in a program aimed at revitalizing the Third Street commercial core. In addition, MUNI has encouraged extensive participation by Bayview Hunters Point residents in the consideration of alternative design options for the light rail system along the Corridor.

Some site-specific impacts, such as business acquisition and displacement, would not be evenly distributed among all neighborhoods in the Corridor. Of the eight potentially displaced businesses, one is located in Visitacion Valley and the other seven (all associated with the Cargo Way maintenance facility site) are located in the Bayview Hunters Point neighborhood. The ethnicity of the persons who own or work at these affected businesses is not known. Since all of the businesses are located in high-minority segments, selection of a maintenance facility site other than Cargo Way may be preferable from an environmental justice perspective. This would avoid the majority of impacts affecting businesses within high-minority neighborhoods, even though the impacts are mitigable through existing relocation assistance programs.

Project benefits--such as improved transit service and better access to Downtown jobs--would also be distributed throughout the Corridor, benefiting minority and non-minority neighborhoods equally. Special efforts are being made to "leverage" the benefits of the light rail system to enhance economic revitalization efforts in the Third Street commercial core, where additional care has been taken to plan sidewalk and landscaping improvements desired by the community. In conclusion, the Project would result in some adverse effects on minority or low income populations, but the impact would not be disproportionately high after considering the previously identified project benefits and mitigation measures to all the affected populations.

Cumulative Impacts

None of the alternatives would contribute substantially to cumulative changes in population or employment in San Francisco. The Project would serve 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 to substantially to cumulative employment growth. (See Section 6.2.2 for additional discussion of cumulative population and employment impacts). The Project in combination with other cumulative development in the Corridor would not impose adverse impacts disproportionately on any of the high minority or low income neighborhoods identified.

5.4 COMMUNITY FACILITIES AND SERVICES

5.4.1 INTRODUCTION

Significant impacts on community services and facilities would result if the No Project, No Build/TSM or Light Rail Alternatives 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. Similarly, parks and recreational facilities would be significantly affected if they were altered or displaced or their use or function were diminished. In addition, parklands as well as cultural and recreational facilities are subject to guidelines established by Section 4(f) of the US Department of Transportation Act (USC 1653 (f)). Taking of parkland or cultural or recreational properties for the implementation of the Third Street Light Rail Project would be a significant impact, requiring consultation with the US Department of Transportation, US Department of the Interior, State Department of Parks and Recreation, and San Francisco Recreation and Park Department. For police and fire services, an impact would be considered significant if the alternative required additional equipment or personnel to maintain acceptable service levels or if access to police or fire stations or emergency vehicle routes were impeded.

Other sections of this document that discuss community and safety-related issues include Hazardous Materials and Transportation.

5.4.2 PUBLIC AND COMMUNITY FACILITIES

No Project Alternative

For the No Project 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 will increase. In addition, by 2015, transit operating along Third Street and Bayshore Boulevard is expected to be over capacity, potentially impairing the accessibility of transit dependent residents who are not within walking distance of these facilities.

No Build/TSM Alternative

Construction Impacts

Construction of a new bus maintenance facility at the Western Pacific or Cargo Way site would not affect existing public or community facilities since none are located near these sites.

Operation Impacts

By increasing bus service in the Corridor to accommodate 2015 demand, accessibility to public or community facilities would improve. Yet travel times would remain relatively high, as in the No Project Alternative, since transit would operate in traffic the length of the Corridor. Impacts would be less than significant.

Mitigation Measures

No significant impacts to community or public services are identified; therefore, no mitigation is proposed.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

By temporarily displacing curb parking, construction of the IOS may disrupt vehicular access and on-street parking at community centers, educational institutions, cultural facilities, health and social service centers that border the light rail alignment along Bayshore Boulevard and Third Street (refer to **Figure 4-3** in Section 4.3.3, for location of facilities fronting Third Street and Bayshore Boulevard). Pedestrian access to these facilities would be temporarily affected in the Third Street commercial core if sidewalks were widened (as in three Third Street commercial core design options). Construction noise and vibration may increase ambient noise levels (refer to Section 5.13). These construction-related impacts would be a short-term nuisance that would be less than significant.

Operation Impacts

No community or public facility would be altered or displaced by operating the IOS. Operation of light rail along the surface would not substantially increase noise or vibration in adjacent public and community facilities (refer to Section 5.13). Pedestrian access to the existing facilities would be maintained except access across Third Street at Key and La Conte, where the retained cut would continue through the intersection. It would be enhanced by widened sidewalks in three of the design options for the Third Street commercial core. Existing street crossings would be retained as identifiable crosswalks. Except for the one-lane design option, which would restrict traffic flow in the Third Street commercial core, vehicular access would not be affected since the light rail alignment would occur in the street median and traffic circulation would continue unabated in the four remaining lanes. However, for those community facilities that rely on street parking in the commercial core, such as the Bayview Opera House and the branch Public Library, parking would be displaced at all station locations under the two-lane street configuration option and at certain station locations for the one-lane design option with the widest sidewalk configuration.

Cumulative Impacts

The Third Street Light Rail Project would not impact park land nor would it contribute to any impacts of other projects in the area. No existing community or public facilities would be affected by the building activities expected in Mission Bay North or South, Pacific Bell Ballpark, Candlestick Mills Mall, potentially occurring simultaneously with the construction of the IOS.

Mitigation Measures

In areas of construction for the IOS, *temporary detours for vehicular and pedestrian circulation patterns that permit continued access to community and public facilities would be developed and clearly identified during final design*. If a street design option were chosen for the Third Street commercial core that displaced curb parking adjacent the Bayview Opera House, Public Library, or other community facility, *replacement parking would be located on the adjacent side streets by restriping for angled or perpendicular parking along curbs.* Noise limits would be included in the construction specifications to ensure that the construction is in compliance with City regulations. With mitigation, the impacts would be less than significant.

Light Rail Alternative - New Central Subway

Construction Impacts

Construction of the New Central Subway would temporarily affect vehicular access and on-street parking for the public facilities along Third Street in the Yerba Buena Gardens. Construction activities also would temporarily increase noise and vibration in this area. Because the subway would be mined under Stockton Street in Chinatown, the community facilities located along Stockton would not be adversely affected.

Operation Impacts

Operation of the New Central Subway would not adversely affect the community and public facilities that are situated along the alignment or near subway stations; however, access to these facilities by transit would improve.

Cumulative Impacts

Because no major plan developments have been proposed for the New Central Subway area, no cumulative impacts have been identified.

Mitigation Measures

In the Yerba Buena Gardens area, *alternative vehicular and pedestrian circulation patterns that permit continued access to community and public facilities, particularly truck access to Moscone Center, would be developed and clearly identified during final design*, in consultation with Department of Parking and

Traffic staff. Noise limits will be included in the construction specifications to ensure that the construction is in compliance with City regulations. With mitigation, the impacts would be less than significant.

Western Pacific and Cargo Way Maintenance Facility Sites

Construction and operation of the new LRV maintenance facility at the Western Pacific or Cargo Way site would not affect existing community or public facilities since none are located close to these sites.

5.4.3 POLICE, FIRE AND EMERGENCY SERVICES

No Project Alternative

The No Project Alternative could adversely affect response times for police, fire, and emergency services since traffic congestion on Corridor roadways is expected to increase substantially by 2015 (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.

No Build/TSM Alternative

Construction Impacts

Construction of a new bus facility at the Western Pacific or Cargo Way site would not substantially affect police, fire, or emergency service resources[6], thus no significant construction impacts are identified. Security at the construction site would be the responsibility of the construction contractor.

Operation Impacts

To accommodate 2015 demand in the Corridor, MUNI would increase service levels on the 15-Third. Existing police, fire, or emergency resources are expected to be adequate to respond to an incremental increase in the number of incidents resulting from the added service in the Corridor[7]. A new bus maintenance facility at the Western Pacific site would require expanded security services from MUNI security personnel. MUNI will provide the resources to patrol and secure the new bus maintenance facility.

Cumulative Impacts

An increased demand for police, fire, and emergency services may result from cumulative development in the study area with the new ballpark, stadium-mall, and Mission Bay. However, MUNI's contribution to any increase is not anticipated to be significant because MUNI provides its own security officers.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

Construction of the IOS would not substantially affect police, fire, or emergency service resources[8].

[6] Captain Steve Tacchini: MUNI Detail, San Francisco Police Department and Paul Tabacco, Assistant Chief of Training, phone conversations, September 17, 1997.
[7] Ibid.
[8] Ibid.

Operation Impacts

The IOS would include a terminal station and parking structure at the Caltrain Bayshore Station and a new MUNI light rail maintenance and storage facility, each of which would require security patrols. As a result, one additional full-time equivalent MUNI-contracted security officer may be required[9]. City Police and Fire departments would be available to respond to emergency situations, which may increase as a result of new rail operation. However, the incremental increase is not expected to place substantial added demand that would affect police, fire, and emergency medical resources to meet these needs[10]. MUNI will provide the resources to patrol and secure the new LRV maintenance facility and the new Bayshore intermodal station.

Cumulative Impacts

Cumulative impacts associated with the IOS would be the same as those described for the No Build/TSM Alternative.

Light Rail Alternative - New Central Subway

Construction Impacts

Construction staging areas for the New Central Subway would be secured by the construction contractor.

Operation Impacts

Operation of the New Central Subway 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 New Central Subway is not expected to require additional police, fire, or emergency services personnel[11,12]. However, if the surveillance system were expanded to include the New Central Subway, additional MUNI resources would be required[13]. MUNI will provide the resources necessary to secure the stations and other fixed facilities associated with the Central Subway.

Cumulative Impacts

None were identified because of the future time frame of this alternative, and the uncertainty of other projects and plans into the future.

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[9] Walter Gibbons, MUNI Security, phone conversation, September 17, 1997.
[10] Captain Steve Tacchini: MUNI Detail, San Francisco Police Department and Paul Tabacco, Assistant Chief of Training, phone conversations, September 17, 1997.
[11] Ibid.
[12] Brian Cunningham, MUNI Systems Safety Administrator, phone conversation, September 17, 1997.
[13] Phil Chen, MUNI Security, phone conversation, January 12, 1998.

Western Pacific and Cargo Way Maintenance Facility Sites

Construction and Operation Impacts

No additional security personnel would be required beyond what is provided for the IOS. There could be potential conflicts with fire trucks exiting the fire station at Third Street and Cargo Way.

Mitigation Measures

If the Cargo Way maintenance facility site were selected, MUNI would conduct final design after review and approval of the Fire Department to *develop signal pre-emption or other controls to avoid conflicts between light rail and emergency vehicles at Third Street and Cargo Way.*

5.4.4 PARKS AND RECREATIONAL FACILITIES

No Project Alternative

No impacts to parks and recreational facilities would result from the No Project Alternative. However, access and parking for these facilities may be impaired because of the increase in Corridor roadway congestion causing travel delays and increasing parking demand along the streets adjacent to parks.

No Build/TSM Alternative

Construction and Operation Impacts

No construction or operation impacts to existing parks or recreational facilities would result from the additional bus service or the new bus maintenance facility implemented as part of the No Build/TSM Alternative. If the new bus facility were located on the eastern portion of the Western Pacific, new Bayfront open space would be provided in tandem with the construction of the bus facility. This would be a beneficial impact.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

The construction of the IOS would not affect the parklands or recreational centers that border the light rail alignment because construction would be confined to the street right-of-way and noise and dust would not be expected to increase substantially (refer to Sections 5.12 and 5.13).

Operation Impacts

Operation of the light rail line would enhance access to parks, playgrounds, and recreational facilities that lie along the IOS alignment by the placement of stations adjacent to parklands and recreational facilities, such as Bayview Playground and the Bayview Opera House. Noise and vibration from passing light rail trains would not be expected to deter use of these facilities (refer to Section 5.13).

Light Rail Alternative - New Central Subway

Construction Impacts

Cut-and-cover construction along Third Street would temporarily affect traffic and pedestrian circulation at Yerba Buena Gardens. Because the parkland is set back from the street and because much of the excavation work would occur at night or under a road deck, construction noise, vibration, and dust would not be expected to affect the use of this area. Union Square is located adjacent to the proposed excavation for Union Square station. The sidewalk on the eastern edge of the Square would be closed for several months. Noise, dust, and vibration may temporarily affect the use of the eastern portion of the Square until the excavation is decked over and construction activities, including hauling of debris through the subway tunnel, occur below the surface, which would be expected to occur within two months. Impacts would be less than significant with mitigation measures described below.

Operation Impacts

Parks and recreational facilities, such as Yerba Buena Gardens and Union Square, would not be displaced nor would land be acquired for the construction of the New Central Subway. Indirect operational impacts due to noise and vibration from passing trains would not affect the adjacent parklands or recreational facilities (refer to Section 5.13). Similar to the IOS, public access to the parks and recreational facilities near station locations for the New Central Subway would be enhanced.

Cumulative Impacts

None were identified.

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 avoided* as a way of minimizing temporary increases in pollutant emissions. 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.* With mitigation, impacts would be less than significant.

Western Pacific Maintenance Facility Site

Establishing the new LRV maintenance facility on the eastern portion of the Western Pacific site would provide a new open space area along the Bay waterfront including a shoreline walkway connecting the new Bayfront open space with the existing Warm Water Cove park, located just north of the new LRV maintenance facility site **(Figure 5-1)**. Although the open space plan on two acres of Bayfront property has yet to be determined, landscape treatments and a shoreline pathway would connect this site with the park at Warm Water Cove. Access and parking would be provided via an extension of 25th Street. This represents a beneficial impact for the community and would meet BCDC goals for improved public access to the waterfront.

No construction or operation impacts to existing parklands or recreational facilities would result from the implementation of the new LRV maintenance facility at the west end of the Western Pacific site since none are near this site. The benefit of creating a new Bayfront open space as part of the new LRV maintenance facility construction would not occur at this location.

Cargo Way Maintenance Facility Site

No construction or operation impacts to existing parklands or recreational facilities would result from the implementation of new LRV maintenance facility at Cargo Way since none are near this site.

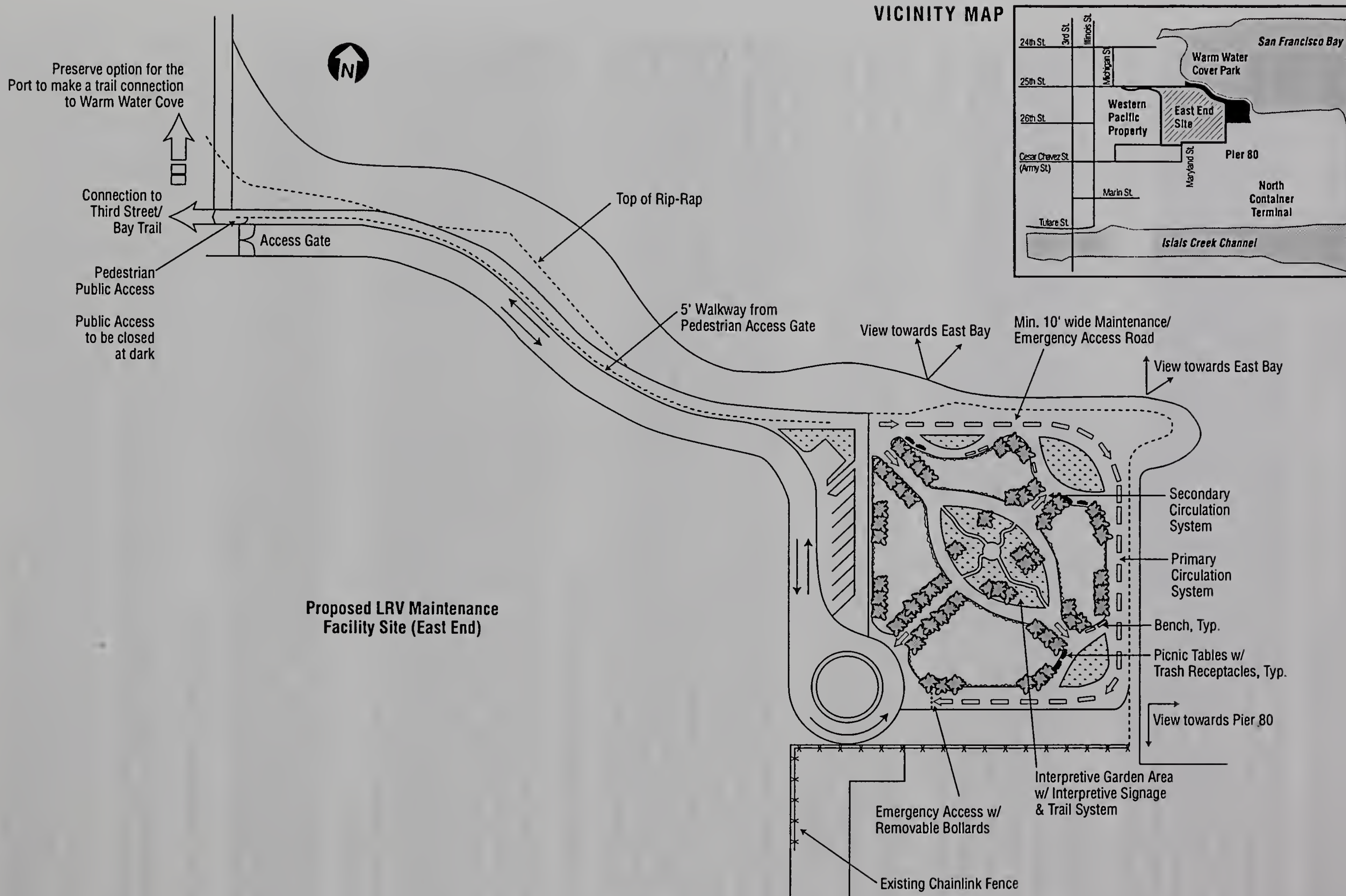

FIGURE 5-1

PROPOSED NEW OPEN SPACE AREA AT WESTERN PACIFIC SITE – EAST END

Third Street Light Rail EIS/EIR

Source: ICF Kaiser Engineers, Inc.

J96-082.110 3rd St. (2/25/98)

5.5 CULTURAL RESOURCES

5.5.1 INTRODUCTION

Technical reports evaluating the significance of historic architectural and archaeological properties located within the Area of Potential Effect were prepared in order to comply with various federal and state laws related to historic properties [(NEPA, CEQA, Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended, and Section 4(f) of the National Transportation Act of 1966)]. These technical reports are on file at the San Francisco Planning Department.[14]

In the context of a federally reviewed and permitted project, the significance of historic properties and archaeological resources is measured by the National Register of Historic Places (NRHP) criteria. These criteria include 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

- 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).

These criteria, by which the NRHP eligibility of historic properties is evaluated, are essential because they "indicate what properties should be considered for protection from destruction or impairment" (36 CFR 60.2). Any action as part of an undertaking, that could affect significant cultural resources is subject to review and comment under Section 106 of the National Historic Preservation Act of 1966. Under CEQA requirements, potential damage to or disturbance of important archaeological or historical resources resulting from a proposed project would be considered a significant impact.

5.5.2 HISTORIC PROPERTY IMPACT: ACQUIRING, RELOCATION, DEMOLISHING, OR ALTERING THE INTEGRITY OF HISTORIC PROPERTIES WITHIN THE AREA OF POTENTIAL EFFECT

No Project Alternative

Construction Impacts

The No Project Alternative would utilize the existing bus system and would result in no substantial construction activities. No construction impacts to historic properties would be expected.

Operation and Cumulative Impacts

The No Project Alternative utilizes the existing bus system. There would be no changes to existing operation. No operational impacts or cumulative impacts to historic properties would be expected and no mitigation is required for historic properties.

[14] The Historic Properties Survey Report (which summarizes information in technical reports), Archaeological Resources Investigations for the Third Street Light Rail Project, San Francisco, California, by Jan Hupman and David Chavez, October 1997, and Historic Architectural Survey Report by Dames & Moore, December 1997

No Build/TSM Alternative

Construction Impacts

The only construction for the No Build/TSM Alternative would be a bus storage and maintenance facility for 33 diesel buses and 7 trolley buses on the Western Pacific or Cargo Way properties. The properties are vacant and no historic properties surround either property; therefore no construction impacts to historic properties would be expected.

Operation Impacts and Cumulative Impacts

The No Build/TSM Alternative would increase the bus transit service and utilize the roadways that currently exist. No operational impacts or cumulative impacts to historic properties would be expected and no mitigation is required.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

Light rail would cross three bridges requiring the addition of tracks and overhead wires on each bridge. The two bridges located over Mission Creek, at Third Street and at Fourth Street (both Segment 5) have been previously evaluated as eligible for the NRHP. The Third and Fourth Street lift bridges are in need of seismic upgrade and rehabilitation. The San Francisco Department of Public Works is currently designing the improvements that**, when completed, will allow the placement of light rail track, overhead wire, and support poles on the Fourth Street bridge and** will have carrying capacity for two-car light rail trains. These two bridges were historically designed for electrical trolley car use. The addition of tracks and overhead wires to these two bridges would be in keeping with their original historic design. No significant additional modifications would be done to the bridges as part of this alternative, and therefore, no adverse effect on the bridges would result.

The Islais Creek bridge appears to be eligible for the NRHP. This bridge replaced the earlier Long Street bridge that accommodated trolley cars; however, the newer bridge never had overhead wires or tracks. Light rail would add visual elements, tracks and overhead wires, to the bridge structure that would not affect the eligibility of the Islais Creek bridge. The finding of no adverse effect will be confirmed in consultation with SHPO.

Operation Impacts and Cumulative Impacts

The IOS would operate within the existing roadway right-of-way and substations would be located on vacant commercial/industrial parcels. The only historic properties located within the APE for this segment are three bridges. Tracks and overhead wires would be added to the bridges to convert them to light rail usage. Two of the bridges (the Third and Fourth Street lift bridges) were historically designed for electrical trolley car uses, and plans for seismic upgrade and rehabilitation that would ensure the carrying capacity for two-car light rail trains has already been cleared by SHPO as part of a separate project. (See Appendix F). No additional operation and cumulative impacts would be expected as part of this alternative.

Tracks and overhead wires would be added to the Islais Creek bridge to convert it to light rail usage. Impacts of wires and tracks are discussed above under construction. This transit usage would not be expected to result in operation or cumulative impacts that would affect the NRHP eligibility of the Islais Creek bridge since the drawbridge would continue to operate as it does now.

Mitigation Measures

While no significant effects are identified, *MUNI will consult with SHPO regarding the final design considerations for overhead wires and tracks to preserve the historic architectural character of the bridge and meet the Secretary of the Interior's Standards and Guidelines for historic preservation.* Mitigation for altering the historic integrity may include (at a minimum) Historic American Building Survey (HABS)/Historic American Engineering Record (HAER) documentation. Measures will also include specifications to be incorporated into construction plans. With mitigation, the impact would be less than significant.

Light Rail Alternative - New Central Subway

Construction Impacts

Lowering of the water table, and possible subsidence as a result of mined and cut-and-cover tunnel could potentially affect historic properties. Properties that could be affected are in the area north of Brannan Street where cut-and-cover and mined tunnel construction are proposed. These include 57 historic properties previously evaluated as eligible to the NRHP and 38 properties, which appear to be eligible based on preliminary evaluations (property evaluation information in the Historic Property Survey Report is available for public review at the San Francisco Planning Department).

Operation Impacts and Cumulative Impacts

The New Central Subway would operate adjacent to or underneath historic properties. The operation would not impact the historic properties, and no cumulative impacts would be expected.

Mitigation Measures

Mitigation would include specifications for shoring cuts and stabilizing slopes to prevent subsidence. Mitigation for construction impacts involving the taking, relocating, demolishing, or altering the integrity of historic properties may, at a minimum, include Historic American Building Survey (HABS)/Historic American Engineering Record (HAER) documentation. Additional mitigation measures would be identified in consultation with SHPO.

Western Pacific Maintenance Facility Site

Construction Impacts

There are no historic properties located within the Western Pacific site. Therefore, no construction impacts would be expected. No mitigation is required.

Operation Impacts and Cumulative Impacts

There are no historic properties located within the Western Pacific site. Therefore, no operation or cumulative impacts would be expected. No mitigation is required.

Cargo Way Maintenance Facility Site

Construction Impacts

There are no historic properties located within the Cargo Way site. Therefore, no construction impacts would be expected and no mitigation is required.

Operation Impacts and Cumulative Impacts

There are no historic properties located within the Cargo Way site. Therefore, no operation or cumulative impacts would be expected and no mitigation is required.

5.5.3 PREHISTORIC AND HISTORIC ARCHAEOLOGICAL RESOURCE IMPACTS

No Project Alternative

No subsurface disturbance would take place for the No Project Alternative. No impacts to prehistoric or historic archaeological resources would occur for this alternative.

No Build/TSM Alternative

Construction Impacts

Subsurface disturbance for the No Build/TSM Alternative would be limited to construction for the approximate 1.6-hectare (4.0-acre) bus storage and maintenance facility on a portion of the Western Pacific on Cargo Way site. Because this area was reclaimed from Islais Creek Cove, it is highly unlikely that prehistoric resources would be found at this site because excavation would not extend below fill.

Since the structures, machinery, tracks, and other equipment related to the Western Pacific Railroad Company were apparently removed after the company's departure, it is unlikely that historic archaeological resources would be found at this site. Maritime resources, such as the remains of scow schooners, barges, and/or small vessels, could be deeply-buried below the northern and western section of the site. Maritime resources that existed below Pier 80 would probably have been destroyed during pier construction.

Operation and Cumulative Impacts, and Mitigation Measures

No impacts from operation of the No Build/TSM Alternative to prehistoric or historic archaeological resources would occur and no mitigation would be required.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

No subsurface disturbance except limited excavation (up to one meter or three feet) for trackwork in the median of existing streets and stations would be required for the IOS. No impacts to prehistoric or historic archaeological resources are anticipated because excavation would not be deeper than what has previously been disturbed during street and utility construction. No mitigation would be required.

Operation and Cumulative Impacts and Mitigation

Because operation of the proposed light rail system on the IOS would not involve subsurface disturbance, no impacts to archaeological resources are identified. No mitigation would be necessary.

Light Rail Alternative - New Central Subway

Construction Impacts

Buried archaeological sites can render important scientific information regarding prehistoric lifestyles, population antiquity, origins and migration, settlement patterns, cultural exchange and trade, resource procurement strategies, technologies, and social organization. The following prehistoric archaeological site locations are described as potential impact sites.

- Cultural deposits associated with site CA-SFr-114 (code referring to site records and maps in data base) could be affected as a result of construction trenching on Third Street between Mission and Howard Streets. As a result of subsurface exploration on the site, focused on the north side of Howard between Third and Fourth Streets, Pastron (1990:2) suggests that CA-SFr-114 is potentially eligible for nomination to the NRHP.

- Cultural deposits associated with site CA-SFr-2 could be impacted as a result of construction trenching in three of the project sections: on Third Street, between Folsom and Harrison Streets; on Third Street, between Harrison and Bryant Streets; and, if the Fourth Street alignment is implemented, within the crossover, between Third and Fourth Streets, immediately south of Harrison Street. Based on the range and quantity of cultural materials that are documented from CA-SFr-2, Praetzellis et al. (1993:410) conclude that the site appears potentially eligible for nomination to the NRHP. There is, however, no certainty that such site materials extend into the project APE, and that a potential for impacts to a possible NRHP eligible resource is certain.

- Seven project sections have moderate sensitivity for the presence of undiscovered archaeological sites. There is no specific evidence that suggests subsurface prehistoric cultural deposits are present; moderate sensitivity is based on a professional reading of likely prehistoric environmental conditions that would favor prehistoric cultural activity and habitation, on a section-by-section basis.

Buried historical archaeological deposits, features, and artifacts can yield information that may complement, substantiate, and possibly correct the written historical record of early San Francisco. Historical archaeological finds in recent decades have ranged from being of scientific importance to being nothing less than spectacular in generating high levels of public interest in San Francisco's early cultural, social, economic, and industrial history.

Four locations, however, have been identified that have moderate sensitivity regarding the possible presence of historical deposits, features, and artifacts. The locations are:

- Two sections on Stockton Street, between Washington and Clay Streets and between Clay and Sacramento Streets, where unidentified, circa 1850, wood-framed structures once stood;
- Third Street, between Market and Mission Streets, where Happy Valley 49er camp remains could be present; and
- The crossover, between Third and Fourth Streets, immediately south of Harrison Street, where features, deposits, and artifacts associated with post-1850s commercial and residential use of the area may exist.

Mitigation Measures

Guidelines for specific strategies for the treatment of 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 potentials for NRHP eligibility.

Essentially two mitigation strategies for the New Central Subway would be available -- avoidance of the resource or data retrieval through excavation. Avoidance of resources would be difficult, if not impossible, and it is prudent to assume that data retrieval through excavation would probably be the measure implemented for mitigating impacts to NRHP eligible resources. *Specific field methodologies would be developed for specific resources within the context of a research design/treatment plan. All archaeological work on NRHP eligible and potentially eligible properties would 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 should be performed under the supervision of experienced professionals whose education and experience meet or exceed the Secretary of the Interior's "Professional Qualifications Standards" (48 FR 44738-44739).

For Prehistoric Archaeological Resources the project sponsor and consulting archaeologist would ensure that all State and Federal laws and regulations regarding Native American concerns are strictly adhered to. *A Native American consultant (Most Likely Descendant) would monitor prehistoric archaeological testing and excavation programs.* If human remains are encountered during construction, State Health and Safety Code Section 7050.5 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 site-related cultural resources within the project APE, there is no certainty that a potential for impacts to and evaluation of NRHP eligibility exists. A pre-construction, subsurface archaeological testing program would be necessary to determine the presence or absence of prehistoric cultural deposits, site boundaries (within the APE) and potential for project impacts; if such a presence is substantiated then the program can be expanded to determine depositional integrity, cultural complexity, and eligibility for NRHP nomination. During construction trenching, archaeological monitoring is warranted within these sections: Stockton Street, between Sutter and Geary Streets; Geary Street between Stockton and Grant Streets as well as Grant to Kearny, Market and Third Streets; and Third Street, between Market and Mission Streets, Howard to Folsom Streets, and Bryant to Brannan Streets.

Upon completion of field investigations, *comprehensive technical reports would be prepared that describe the archaeological project's goals and methods, and present its findings and interpretations.* The report would integrate the important archaeological data recovered through excavation with the information gathered through archival research, and address relevant research considerations. The final report(s) would include the following elements: Executive summary; statement of scope; project location and setting; previous research summary; research goals and the strategies that guided research, testing, and data recovery; field and lab methods; archival research; archaeological context; artifact descriptions; consideration of research problems and questions; conclusions and additional recommendations; references cited; and appendices (reports of technical analyses).

Copies of preliminary and final report(s) would be provided to the State Historic Preservation Office, Advisory Council on Historic Preservation, the San Francisco Planning Department, and the Historical Resources Information System, Northwest Information Center at Sonoma State University.

Four project segments with moderate potentials for containing historical archaeological resources have been recommended for archaeological monitoring during construction trenching. In the event that historical deposits, features, or artifacts are discovered, evaluation procedures similar to those recommended for prehistoric resources would be required. Locations where historical resources potentially eligible for NRHP nomination are present will require mitigation action under the NHPA Section 106 process.

Discussions regarding mitigation options, guidelines, strategies, and reporting would essentially be the same as those presented for prehistoric archaeological resources.

Areas of prehistoric and historic archaeological sensitivity have been identified for subsurface testing and monitoring throughout the project APE. It is noted that on any project involving land alteration activities, unanticipated cultural deposits can be discovered in areas not scheduled for preconstruction archaeological exploration or construction monitoring.

In the event that archaeological remains are discovered in such areas during subsurface construction, land alteration work in the general vicinity of the find should be halted and a qualified archaeologist would be consulted. Prompt evaluations could then be made regarding the finds and a course of action can be taken that is in keeping with federal, state, and city cultural resources management requirements.

In the event that prehistoric archaeological deposits are discovered, the California Native American Heritage Commission in Sacramento and local Native American organizations should be consulted and involved in making resource management decisions. *All applicable federal and state legal requirements concerning the treatment of cultural materials and Native American burials will be enforced.*

A draft Programmatic Agreement that identifies the steps to be taken in constructing the New Central Subway to mitigate the potential effects on archaeological resources is presented in Appendix F. The Programmatic Agreement between MUNI, FTA, SHPO, and the Advisory Council on Historic Preservation is currently being finalized.

Operation and Cumulative Impacts and Mitigation

Because operation of the proposed light rail system in the New Central Subway would not involve subsurface disturbance, no impacts to historical archaeological resources are identified and no mitigation would be necessary.

Western Pacific Maintenance Facility Site

Construction Impacts

Because this area was reclaimed from Islais Creek Cove it is highly unlikely that prehistoric resources would be found beneath the ground surface. Since the structures, machinery, tracks, and other equipment relating to the Western Pacific Railroad Company were apparently removed after its departure, it is unlikely that potentially significant historic archaeological resources would be found at this site.

Maritime resources such as the remains of scow schooners, barges, and/or small vessels could be deeply-buried below the northern and western section of the site; however, any maritime resources that existed below Pier 80 would probably have been destroyed during pier construction.

No impacts to prehistoric or historic archaeological resources are identified and no mitigation is necessary.

Operation Impacts

No potential for impacts from operation of the maintenance facility would affect subsurface resources.

Cargo Way Maintenance Facility Site

Construction Impacts

Due to the recent date (1960s) of the fill of the Cargo Way site, the deposits do not meet the 100-year CEQA or 50-year NHPA age requirement for important archaeological resources; therefore, no significant impacts to prehistoric or historic resources are identified.

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Operation Impacts

No potential for impacts from operation of the maintenance facility would affect subsurface resources, no mitigation is necessary.

5.6 VISUAL AND AESTHETIC RESOURCES

5.6.1 INTRODUCTION

Visual impacts were determined by comparing plan and profile drawings for the proposed facilities with photographs and descriptions of the existing setting. Field visits were conducted at sites where proposed structures might block views, illuminate facilities, cast shadows, alter the scale or visual context of the surrounding community, or displace visual resources. Examples of such visual changes were created using computer simulation techniques at three locations that would have substantial visual alterations. 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. Other visual changes are described in the text.

5.6.2 VISUAL IMPACTS

No Project Alternative

The No Project Alternative would not alter or change the landscape. Therefore, no visual impacts would occur.

No Build/TSM Alternative

The No Build/TSM Alternative would have an increased number of articulated (double) buses providing increased service on the 15-line. This would not be perceived as a visual change. A new bus maintenance facility would be constructed on the eastern or western portions of the old Western Pacific site adjacent to Pier 80 or at Cargo Way. The bus facility would be a low-level structure designed to conform with the existing industrial land uses that surround the property. The new facility would neither block views nor be out of scale with the surrounding area. As a result, the No Build/TSM Alternative would not have visual impacts.

Light Rail Alternative - Initial Operating Segment

Construction and Operation Impacts

The IOS would alter the landscape along Bayshore Boulevard and Third Street by having two tracks, slightly raised and set in a textured brick or stone, and overhead wire installed along the median the length of the roadways. Light standards or trolley poles would serve to support the overhead wire. The linear pattern of the surface alignment would be broken by station platforms, each containing shelters and benches, ticket vending machines and, for low platform stations, mini-high boarding areas 85 centimeters (34 inches) high. New above-ground facilities would be constructed at the southern terminal and at the new LRV maintenance facility site. In addition, six new traction power substations would be constructed; two at the new LRV maintenance facility, one at the southern terminal station, one near Third/Keith at the Highway 101 overcrossing, one at Third/Hudson, and one near 16th/Third in Mission Bay. The substations would be approximately four meters (14 feet) high (including a transformer and other electrical equipment and accessory fencing) and would be designed to be visually unobtrusive, blending with surrounding commercial/industrial structures. These facilities would not constitute a significant visual change. In addition, temporary visual changes would result from construction activities and the use of heavy equipment along the IOS alignment. A description of the other visual changes is presented below.

In Visitacion Valley (Segment 1), a station area and access road would be created in the bowl that currently serves as the Caltrain Bayshore Station. The open area would be transformed into new station platforms, shelters, ticket vending machines, and bus loading bays in addition to a one- or two-level parking structure. The rectangular, concrete parking structure, which would conform with the scale, color and design of the nearby industrial structures, would be 3.7 meters (12 feet) high and visible from residences on the surrounding hillsides. At night, lighting in the station area would illuminate the area and would be visible to these residences. Lights would be down-shaded to prevent glare. At the Caltrain Bayshore intermodal station, landscaping would be installed along the perimeter of the station area to minimize the visual dominance of the parking structure. The type of plants would be based on safety and security concerns, as well as visual screening requirements. Visual change at this station would not be significant.

On Bayshore Boulevard at Hester Avenue, light rail would be placed on a 3-meter (10-foot) high, retained-fill wall to compensate for the steep grade leading to the Highway 101 overcrossing. In addition, a retaining wall would be constructed along the west side of Bayview Hill if the existing Highway 101 off-ramp were reconstructed. The walls would be dominant features at street-side, but less intrusive from the angled view from adjacent hillsides, where nearby residences and businesses are located. On the Third Street side of the Highway 101 overcrossing (Segment 2), light rail would be set into a 244-meter (800-foot) retained cut due to the steep grade between Meade and Jamestown Avenues (**Figure 5-2,** refer to **Figure 4-5** for existing conditions). Since residences are at street level on this narrow section of Third Street, the concrete retaining walls and lowered overhead wire would form a new visual element on the existing streetscape. Because the alignment would be below grade at this point, the low elevation of the retaining walls would not block views or sunlight to the nearby residences. Therefore, the retaining wall would not constitute a significant visual impact.

Design of the light rail alignment would transform the streetscape of the Third Street commercial core between Thomas and Kirkwood Avenues (Segment 3), adding new tree plantings, redesigned lane configurations, and adjacent plazas with landscaping for all design options. The dominant viewing point for this segment would be from businesses and residences along Third Street and for motorists traveling on Third. **Figure 5-3** (refer to **Figure 4-6** for existing conditions) presents a simulation of the streetscape for the two-lane option. At the Third/Palou station, the simulation indicates a high boarding platform, which matches the floor level of the existing LRV fleet. If a low platform with a mini-high boarding area for wheelchair users were substituted, the low platform would be 60 centimeters (24 inches) closer to street level than the high platform. For the one-lane options, sidewalk widening and additional landscaping would be provided. If light rail shared a lane with vehicular traffic in this segment, a landscaped median and widened sidewalks could be included (**Figure 5-4**). These improvements, which were developed with input from the community, represent beneficial visual/aesthetic impacts to the community.

Along the Central Waterfront (Segment 4), the dominant viewing position is from the street. Light standards would be removed from the median of Third Street and placed along the sidewalks. This relocation would improve lighting for pedestrians. Light rail would cross the historic Fourth Street bridge and, if a one-way couplet alignment were chosen in Mission Bay, the Third Street bridge as well (Segment 5). The bridges were originally constructed with track and overhead wire for streetcar operation and would resemble their historic appearance with vehicles and streetcars sharing the bridge right-of-way. This would not be a significant impact.

Cumulative Impacts

No cumulative visual impacts have been identified that would be substantial when considered in light of other anticipated visual changes expected to occur in the Corridor. In the context of the scale and extent of change from the projects in the Corridor (e.g. Mission Bay, new Giants ballpark), the proposed light rail features would represent minor changes to the landscape. There would be short-term visual changes related to construction activities; **however, short-term construction-related visual impacts would not be considered significant even** when combined with other projects, **because of their temporary nature.**

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Light Rail Alternative - New Central Subway

Construction Impacts

Heavy equipment would be brought in at night from staging areas south of Downtown to install the shoring system and perform cut-and-cover excavation. In those sections having cut-and-cover construction, 25-meter (80-foot) high augers and cranes will temporarily change the streetscape Downtown. Because of the short-term duration, this would not represent a significant visual impact.

Operation Impacts

The Central Subway would begin at portal locations between Brannan and Bryant Streets on Third and Fourth (Segment 7). The wide streets are surrounded by commercial, proposed and existing live/work, and industrial structures, parking lots and obtrusive signage. The portals would introduce a new visual element in the streetscape as presented by the computer simulation of Third Street at this location (**Figure 5-5,** refer to **Figure 4-8** for existing conditions). The portals 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 one meter (three feet) from the street.

Central Subway stations would be demarcated by station entryways, which would be low-level and made of textured materials, and elevators along the sidewalks. In addition, if the siphon and pumping station were selected as the mitigation for the North Point trunk sewer line (refer to Section 5.7), vent shafts approximately 2.4 meters (eight feet) high would be constructed in the sidewalk on the east and west sides of the Mission/Third intersection. The shafts would be enclosed in kiosk-style structures that would conform with existing kiosks in the Yerba Buena Gardens area visible by pedestrians. These new features would be unobtrusive compared with the surrounding densely-packed mid- and high-rise buildings. The remainder of the subway facilities would be underground.

Western Pacific Maintenance Facility Site - East End

Construction and Operation Impacts

A 0.8-hectare (two-acre) light rail maintenance facility is proposed to be constructed on vacant land near Pier 80. The facility would be 12 meters (40 feet) high and designed to conform with the surrounding industrial structures. Storage track, which would surround the structure, would be well-lighted at night. Lights would be down-shaded to prevent glare. Although noticeable, the new facility would not block views from public areas and would not be out of scale with the surrounding (non-residential) land uses. In addition, construction equipment would temporarily alter the visual setting of the site. Views of this site are blocked by a row of buildings along Third Street, although some views of the site are possible from boats on the Bay.

Should the eastern portion of the Western Pacific site be developed as the new LRV maintenance facility, a two-acre tract immediately to the east of the facility would be converted to open space and connected to Warm Water Cove Park. The new open space would provide public access to the improved waterfront landscape and would enhance viewing opportunities of the Bay. This would be a beneficial impact.

Western Pacific Maintenance Facility Site - West End and Cargo Way Site

Construction and Operation Impacts

These maintenance facility sites would have the same characteristics as described for the Western Pacific site, east end, except that no new open space would be created. Open views of these sites are blocked by surrounding structures along Third Street.

FIGURE 5-2

LIGHT RAIL ALTERNATIVE AT THIRD/KEY

Source: ICF Kaiser Engineers, Inc.

J97-080-1 3rd St./Server

FIGURE 5-3

LIGHT RAIL ALTERNATIVE AT THIRD/PALOU (TWO-LANE OPTION)

Source: ICF Kaiser Engineers, Inc.

J97-080-2 3rd St./Server

FIGURE 5-4

LIGHT RAIL ALTERNATIVE AT THIRD/PALOU (MIXED-FLOW OPTION)

Source: ICF Kaiser Engineers, Inc.

J97-080-1 3rd St./Server

FIGURE 5-5

LIGHT RAIL ALTERNATIVE AT THIRD/BRANNAN

Source: ICF Kaiser Engineers, Inc.

J97-080-1 3rd St./Server

5.7 UTILITIES AND ENERGY

5.7.1 INTRODUCTION

The conceptual plan drawings showing the location of the proposed facilities for the Light Rail Alternative were used to determine impacts on existing utilities by assessing the potential effects to utilities in specific locations and by reviewing the utility information developed for the Project capital cost estimates.[15] Potentially significant impacts, constituting extended service disruption, were considered for those utilities described in Chapter 4. The following section describes the impacts and mitigation measures for major subsurface and above-ground utilities. In addition, energy considerations for both alternatives are summarized below.

5.7.2 IMPACTS TO MAJOR UTILITY LINES

No Project Alternative

The No Project Alternative would not require modifications to utility lines in the Corridor. Therefore, no utility impacts are anticipated.

No Build/TSM Alternative

The No Build/TSM Alternative would not require modifications to utility lines in the Corridor. Therefore, no utility impacts are anticipated.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

Construction of the IOS would affect approximately 380 utilities. Utilities affected would be those underground utilities relocated from the center of the street right-of-way on Bayshore Boulevard and Third Street where the light rail alignment would be placed to the side of the street so that direct access to these utilities could be maintained. As indicated in Section 2.4.3, utility relocation for the IOS would occur over an 18-month period and affect each block for a minimum of two weeks.

Affected underground utilities include four major subsurface PG&E gas pipelines located: 1) between Sunnydale and Hestor Avenues along Bayshore Boulevard in Visitacion Valley; 2) between Gilman and Shafter Avenues on Third Street in Bayview; 3) between Palou and Innes Avenues along the Third Street commercial core; and 4) between 18th and 22nd Streets along Third Street in the Central Waterfront area. Also included are San Francisco Clean Water Department subsurface sewer lines extending: 1) between Jerrold and Revere Avenues in the Third Street commercial core; 2) on Third Street between Cesar Chavez and Tulare Streets, between 18th and 23rd Streets, and between 19th and 22nd Streets in the Central Waterfront area. The San Francisco Water Department has a water line that would be affected by constructing the IOS alignment between 18th and 23rd Streets along Third Street in the Central Waterfront. Similarly, light standards currently situated in the median of Third Street would be relocated to the curb. In addition, above-ground electric lines located near the Highway 101 Overcrossing would be retained and supported in place. Since the affected utilities' function and capacity would remain the same and since disruption to the utilities would be minimal (two to three hours), no significant impacts would occur.

[15] San Francisco Municipal Railway. *Conceptual Capital Cost Estimates, Working Paper #5A*, November 1997. Available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

Operation Impacts

None were identified.

Cumulative Impacts

As construction of the IOS commences in 2000, Mission Bay development will be on-going and the Pacific Bell Ballpark will be in the final stages of construction. Utilities in the Mission Bay area may be simultaneously affected by these projects. Coordination with the City departments and utility companies in relocating, replacing, or maintaining utility lines during construction would minimize disruption to service.

Mitigation Measures

None required. All project-related utility relocation and reinforcement/ protection of existing utilities that do not have to be relocated would be a project cost as identified in the Conceptual Capital Cost Estimate.[16]

Light Rail Alternative - New Central Subway

Construction Impacts

Construction of the New Central Subway would affect over 250 subsurface utilities, most of which are sewer lines. As indicated in Section 2.4.3, utility relocation would occur over an 18-month period per phase for the New Central Subway. Of these impacts, the displacement of the 2.4-meter (eight-foot) North Point trunk sewer line, which would cross the New Central Subway alignment at Mission Street, would be most critical because of the size and the importance of this line.

Operation Impacts

None have been identified.

Mitigation Measures

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.* If this mitigation 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 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.* During final design of the New Central Subway, other mitigation options, identified in consultation with the San Francisco Public Utilities

[16] San Francisco Municipal Railway. *Conceptual Capital Cost Estimates, Working Paper #5A,* November 1997. Available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

Commission, such as abandoning the North Point sewer line, may be considered and may require additional environmental analysis. Work for this trunk sewer line would require 18 months to complete.

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All utility relocation or replacement due to the construction of the Light Rail Alternative would be a project cost as identified in the Conceptual Capital Cost Estimate. [17]

Western Pacific and Cargo Way Maintenance Facility Sites

Construction and Operation Impact

No existing, major utilities would be affected at the Western Pacific or Cargo Way sites, **except for the combined sewer system on Third Street. Additional capacity will be provided by the construction of a new sewer line on Illinois Street. The diameter of the planned line will be expanded from 60 to 66 inches to provide sufficient capacity to accommodate the proposed light rail maintenance facility at the Western Pacific site. The Municipal Railway is negotiating with the San Francisco Public Utilities Commission to share the cost for a portion of the planned sewer project**.

5.7.3 ENERGY CONSIDERATIONS

No Project Alternative

The No Project Alternative would maintain MUNI's current diesel fuel and electric power consumption. In this scenario, 2015 transit demand in the Corridor would not be accommodated, precipitating increased auto trips and fuel consumption.

No Build/TSM Alternative

The No Build/TSM Alternative would increase MUNI's diesel fuel and electric power consumption to operate the additional buses required to meet 2015 demand. In terms of MUNI's overall energy requirements, the additional power would not be a substantial increase.

Light Rail Alternative - Initial Operating Segment and Central Subway.

Similarly, implementation of the Light Rail Alternative would require electric power to operate the light rail line. MUNI's traction power distribution system would be expanded for this purpose. **Table 5-4** indicates that the Light Rail Alternative would consume more total British Thermal Units (BTUs) of energy than the No Build/TSM Alternative. The formula used to calculate energy is stipulated by FTA. Since the formula does not consider articulated buses or light rail vehicles, the BTUs represented in the table are approximate. The electrical energy for the Light Rail Alternative would be generated at the City's Hetch Hetchy hydroelectric (clean-burning fuel) facility. Additionally, the Light Rail Alternative would reduce the consumption of fossil fuel for autos and diesel buses.

[17] San Francisco Municipal Railway. *Conceptual Capital Cost Estimates, Working Paper #5A*, November 1997. Available for review in Project File #96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

TABLE 5-4

ESTIMATED CHANGE IN 2015 REGIONAL ENERGY CONSUMPTION BETWEEN THE NO BUILD/TSM ALTERNATIVE AND THE LIGHT RAIL ALTERNATIVE

	Change in BTU/Year		
Technology/Fuel Type	**IOS Two-Lane Option**	**IOS Mixed-Flow Option**	**New Central Subway Two-Lane Option**
Passenger Vehicle	(4,784,139,150)	(3,944,242,000)	(14,341,509,700)
Heavy-Duty Vehicle	0	0	0
Diesel Bus	(40,653,322,215)	(40,653,322,215)	(45,040,093,575)
Electric Bus	0	0	(8,185,332,465)
Electric Light Rail	61,258,332,000	61,258,332,000	80,148,909,000
Total	**15,820,870,635**	**16,660,767,385**	**12,581,973,260**

Note:
Based on Vehicle Miles Traveled multiplied by an energy consumption factor for each technology/fuel type, and compared to the No Build/TSM Alternative. In accordance with FTA guidance, the No Build/TSM Alternative serves as the baseline for calculations.
Source: VMT - Korve Engineering, Inc. November 1997; Energy consumption factors - Oak Ridge National Laboratory, *Transportation Energy Book: Edition 16*, 1996.

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No additional Hetch Hetchy generating or transmission capacity would be necessary. Fuel consumption to power construction equipment also could be accommodated with existing energy resources. Therefore, the Light Rail Alternative would not produce significant energy impacts to meet power demands.

Traction Power System

Electric and magnetic fields are produced wherever there are electrical currents. Electric field strengths depend on voltage, while magnetic field strengths depend on the amount of current flowing. Together these fields are referred to as electromagnetic fields or EMFs. There is increasing public concern over possible health effects of exposure to EMFs produced by overhead power lines.

Electric field strength is measured in units of volts per meter (V/m). Field strength increases with higher voltage and decreases rapidly with distance from the source. Electric fields are affected by objects, especially objects that conduct electricity. Trees, fences and walls can partially block or shield out electric fields from power lines. Magnetic field strength is commonly measured in units of milligauss (mG). Magnetic fields also decrease with distance but readily pass through most objects. Magnetic fields are typically the radiation of concern when evaluating EMFs. Consequently, EMF strength is measured in terms of milligauss. Magnetic fields beneath transmission lines range from 50 mG to 700 mG, falling off rapidly with distance. In the case of most high voltage transmission lines, at 91 meters (300 feet) from the line, the magnetic field usually drops below 2 mG.

EMFs are associated with the catenaries used to power MUNI's electric buses and light rail vehicles. The Light Rail Alternative would expand MUNI's existing traction power system, including overheard wires. Although the expanded system will generate EMFs along the surface alignment, the links between EMFs and health effects remain inconclusive. As reported in the Environmental Impact Statement for the Northeast Corridor Rail Electrification, several studies in which EMF exposures are estimated characterize the type of utility wiring outside the homes and the distance of the line from residences, or calculate the EMF levels based on the current flowing in nearby power lines. Results do not support an association between human health effects (cancer) in adults and estimated magnetic field exposures.

Epidemiological research has also looked for associations between occupations presumed to have greater than average exposures to magnetic fields and cancer. Workers on electrified railroads overall have not been shown to be at elevated risk for cancer, leukemia, or health impairment. In summary, to date, the consensus of the scientific community is that there is no conclusive evidence that a link between EMF and cancer exists. For electromagnetic and radio interference, the Federal Communications Commission and the Communications Division of the US Coast Guard were contacted for the Northeast Corridor Rail Electrification Project and reported no interference with radio or television communications resulting from an existing electrification rail line. Therefore, no energy or safety-related impacts are anticipated from the traction power system.

5.8 GEOLOGY AND SEISMICITY EFFECTS

5.8.1 INTRODUCTION

Implementation of the Light Rail or the No Build/TSM Alternative would be considered to have an effect relating to geology, soils, and seismicity if it would: expose people or structures to major geological hazards, or create or exacerbate geologic instability.

5.8.2 DAMAGE TO EXISTING AND FUTURE IMPROVEMENTS FROM SETTLEMENT OR INSTABILITY OF SUBSURFACE MATERIALS

No Project and No Build/TSM Alternatives

Implementation of the No Project or No Build/TSM Alternative would not be expected to result in significant impacts to geology, soils, and seismicity. The No Project Alternative does not include new construction, and therefore would not expose new structures, or the users of new structures, to geologic hazards. The No Build/TSM Alternative includes the construction of a new bus maintenance facility at the Western Pacific site. Impacts would be the same as described below for the Western Pacific and Cargo Way maintenance facility sites.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

Construction would not include any activities (i.e., placement of thick fills or heavy structures, deep excavations, or tunneling) that would be expected to result in settlement of the subsurface materials during the construction period.

Operation Impacts

The light rail alignment for the light rail track and associated utilities is underlain by various types of subsurface materials, including bedrock, dune sand, artificial fill, and surficial deposits. Without careful planning, it is possible that a continuous track and utility trench installed over differing material types could experience damage from aseismically-induced differential settlements. The settlement process occurs at different rates and to varying degrees in the different geologic materials. However, the new light rail tracks and utilities would be installed on or under existing road surfaces. Geologic materials underlying the proposed alignment have been in-place for at least 85 years.[18] During this period of time, the unengineered fill and underlying sediments have undergone aseismic settlement, experienced several earthquakes, and been exposed to continuous traffic vibration, all of which would be expected to further consolidate the shallow subsurface materials. Since the Light Rail Alternative proposes installation of only light rail tracks on existing road and bridge surfaces, and would not include placement of thick fills or heavy structures, renewed consolidation and settlement of underlying materials would not be expected.

Cumulative Impacts

Settlement or subsurface material instability have not been identified as significant impacts for the IOS. Therefore, there would not be cumulative inpacts associated with these issues.

Mitigation Measures

No mitigation is required. No significant impacts related to settlement or unstable geologic conditions would be expected to affect the IOS.

[18] Olmstead, R., Olmstead, N., Fredrickson, D., Bente, V., *San Francisco Bayside, Historical Cultural Survey*, San Francisco Clean Water Program, Map 6 between pages 110 and 111, April 1977.

Light Rail Alternative - New Central Subway

Construction Impacts

This segment includes installation of subway tunnels and stations between Third and Fourth Streets and from Market Street along Geary and Stockton Streets to Clay Street. Unless considered during the design, excavation of a tunnel (either through drilling or cut-and-cover) through the urbanized Downtown area could result in settlement of geologic materials surrounding the tunnel excavation during construction. Dewatering of the tunneling area could cause settlement of aquifer materials. Construction-period settlements could cause damage to existing building foundations, subsurface utilities, and surface improvements (e.g., sidewalks and roadways).

Based on preliminary geotechnical analysis of subsurface materials along the alignment, tunneling would encounter a variety of geologic materials, including artificial fill, dune sand, Bay Mud, undifferentiated sediments, dense sand (Colma Sand) and bedrock. Preliminary geotechnical reports prepared for the mined and cut-and-cover tunneling portions of the project[19,20] include recommendations for management of potential construction-period settlements. Mitigation of potential construction-period settlements would be addressed in detail in the design-level geotechnical analyses that would be prepared for the project. These reports would include detailed evaluations of the geotechnical properties of the subsurface materials; building-by-building evaluations of foundations that may be affected by excavation; excavation shoring design; and other measures designed to minimize the potential adverse effects of dewatering. The geotechnical design of the excavations (cut-and-cover and mined tunnels) would consider site preparation and excavation techniques designed to minimize potential construction period settlements resulting from unstable soft sediments. The geotechnical analysis and design of the New Central Subway tunnel would be reviewed for adequacy by the MUNI Capital Projects technical staff and would adequately reduce this impact to a less-than-significant level.

Operation Impacts

Portions of this alignment (Third/Fourth Streets between King and Brannan Streets) would consist of light rail track placed on existing road surfaces (similar to conditions discussed for the IOS, above), 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 undifferentiated fill. Operational effects on stability of geologic materials around the tunnels would not be expected since the reinforced tunnel would replace the excavated material, limiting the expansion or contraction potential of the sediments.

Cumulative Impacts

Settlement or geologic instability of subsurface materials are site-specific conditions that do not result in cumulative impacts.

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[19] 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.

[20] Dames and Moore. *Geotechnical Engineering Recommendations, Central Subway Cut-and-Cover Construction for the Third Street Light Rail Project.* 12 March, 1997.

Mitigation Measures

No mitigation required. Provisions to ensure that structures adjacent to tunnel alignments are not affected would be incorporated into the project design.

Western Pacific Maintenance Facility Site

Construction Impacts

There are no existing structures or improvements at the new maintenance facility site that would be retained during construction. Therefore, construction period settlement is not applicable.

Operation Impacts

The Western Pacific site is underlain by heterogeneous artificial fill to depths ranging from 1.8 meters (6 feet) to 13 meters (43 feet) below the ground surface.[21] The fill is composed of mixtures of clay, silt, sand, and gravel with varying amounts of debris, such as bricks, concrete, glass, scrap metal, and wood. A wood pile, presumably a remnant from an old wharf, was encountered in one of the boreholes. Significant accumulations of wood in the fill could cause settlement problems as the wood decomposes.

The fill at the site is underlain by young Bay Mud. Geotechnical testing indicates that the Bay Mud is overconsolidated, and therefore additional fills of up to 1.2 meters (4 feet) could be placed on the surface of the site without causing settlement. Placement of fills greater than 1.2 meters (4 feet) could result in additional consolidation of the Bay Mud, which could result in differential settlement of the surface fill, potentially damaging project improvements.

Potential settlement problems would be analyzed and appropriate foundation design and soil stabilization methods presented in the design-level geotechnical analysis of the site. The design-level geotechnical investigation would address the following issues (as recommended in the preliminary geotechnical investigation for the site):

- Densification of fills (by deep dynamic compaction or other suitable technique).
- Potential decomposition of woody material causing settlement of fill. (If it is discovered during additional geotechnical investigation that the fill contains significant accumulation of woody material, the design-level analysis would provide design options to ensure stable foundation material.
- Level of consolidation of Bay Mud (if the development plan requires more than three feet of new fill at the site, additional mitigation may be required to minimize effects of consolidation of the Bay Mud).

The design-level geotechnical investigations and foundation and soil stabilization recommendations would be reviewed by the Port of San Francisco, Building Inspection and Construction Management Department for compliance with existing building codes and ordinances.[22] Implementation of the recommended site preparation activities would be inspected by the Port field inspectors. Preparation of a design-level geotechnical investigation and compliance with existing Port review and inspection procedures would adequately reduce this potential impact to a less-than-significant level.

[21] Dames and Moore, 1997a, *Preliminary Geotechnical Evaluation, Site Development at Western Pacific Railroad Site, Metro East Maintenance Facility, MUNI Third Street Light Rail Project*, 6 May.

[22] Bubnis, Ed, 1997, Chief Building Inspector, Building Inspection and Construction Management, Port of San Francisco, personal communication with BASELINE, 16 July.

Cumulative Impacts

Settlement or geologic instability of subsurface materials are site-specific conditions that do not result in cumulative impacts.

Mitigation Measures

No mitigation is required. Provisions for avoidance of settlement or unstable soil conditions would be included in the design and contractor specifications of the facility.

Cargo Way Maintenance Facility Site

Construction Impacts

There are no structures or improvement at this maintenance facility site that would be retained during construction. Therefore, construction period settlement is not applicable.

Operation Impacts

The Cargo Way site is underlain by heterogeneous artificial fill to depths ranging from three meters (ten feet) to 13 meters (43 feet) below the ground surface.[23] The fill is composed of loose to medium dense silty sand with gravel and interbedded layers of clean sand. The fill contains an abundance of debris, such as bricks, concrete, glass, scrap metal, and wood. Decomposing wood was encountered in eight of the 22 boreholes installed. The decomposing wood appears to occur in varying locations and amounts across the site, and would be expected to cause differential settlements at the surface as the decomposition process progress.

The fill at the site is underlain by young Bay Mud. Portions of the site are still settling due to continuing consolidation of Bay Mud caused by placement of fill at the site as recently as 1975.[24] Geotechnical testing indicates that the Bay Mud is not completely consolidated, and therefore any structures or other improvements constructed at the unimproved site would be subject to differential settlement and severe damage over time.

Potential settlement problems would be analyzed and appropriate foundation design presented in the design-level geotechnical analysis of the site. The design-level geotechnical investigation would address the following issues (as recommended in the preliminary geotechnical investigation for the site):

- Densification of fills (by deep dynamic compaction or other suitable technique).
- Potential decomposition of woody material causing settlement of fills (if it is discovered during additional geotechnical investigation that the fill contains significant accumulation of woody material, the design-level analysis would provide mitigation for this potential adverse effect).
- Level of consolidation of Bay Mud (if the development plan requires more than three feet of new fill at the site, additional mitigation may be required to minimize effects of consolidation of the Bay Mud).

[23] Dames and Moore. *Preliminary Geotechnical Evaluation, Site Development at Proposed Cargo Way Site, Metro East Maintenance Facility, MUNI Third Street Light Rail Project.* 4 March, 1997b.
[24] Ibid.

The design-level geotechnical investigations and foundation recommendations would be reviewed by the Port of San Francisco, Building Inspection and Construction Management Department for compliance with existing building codes and ordinances.[25] Implementation of the recommended site preparation activities would be inspected by the Port field inspectors. Preparation of a design-level geotechnical investigation and compliance with existing review and inspection procedures of the Port would adequately reduce this potential impact to a less-than-significant level.

Cumulative Impacts

Settlement or geologic instability of subsurface materials are site-specific conditions that do not result in cumulative impacts.

Mitigation Measures

No mitigation is required. Provisions for avoidance of settlement or unstable soil conditions would be included in the design of the facility.

5.8.3 SEISMICITY COULD RESULT IN INJURIES TO CONSTRUCTION WORKERS AND/OR THE PUBLIC, AND DAMAGE TO PROJECT COMPONENTS

No Project and No Build/TSM Alternatives

Implementation of the No Project and No Build/TSM Alternatives would not be expected to result in adverse effects to geology, soils, and seismicity. The No Project Alternative does not include new construction, and therefore would not expose new structures, or the users of new structures, to geologic hazards. The No Build/TSM Alternative includes construction of a new bus maintenance facility. Impacts associated with that facility are similar to those described below, for the Western Pacific and Cargo Way maintenance facility sites.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

During construction of the IOS, an earthquake could occur. The associated groundshaking could affect the areas under construction and construction workers. The effects would be similar to effects on construction sites throughout most of the Bay Area, if a seismic event were to occur on any of the regional, active faults. It would be speculative to assess whether an increased number of construction workers would be moving into the Bay Area because of this project and therefore be subjected to seismic impacts not previously experienced.

Operation Impacts

The alignment is not crossed by any known active faults; therefore, surface rupture resulting from displacement along a fault is not likely to occur at the site. Portions of the alignment would be subjected to "extremely high" levels of groundshaking. Light rail trains transporting people along the alignment during a seismic event could be derailed or otherwise damaged, potentially causing injuries. However, travel by rail car would not be expected to be more hazardous than other forms of transportation (i.e., diesel bus or

[25] Bubnis; op. cit.

automobile) during a seismic event, and therefore would not increase risk of injury during an earthquake relative to the existing condition. It would be speculative to assess whether this alternative would result in an increase in population of the study area, thus exposing additional populations to seismic hazards.

No identifiable damage to the existing light rail tracks was caused by the Loma Prieta earthquake in 1989.[26] Larger earthquakes may result in damage to tracks and/or utilities associated with the IOS. However, since public transportation facilities are not "lifelines" (such as water, electrical, sewage, or natural gas lines), a breakdown of the IOS would not be a significant impact. Damage to tracks and/or associated utilities would result in temporary discontinuance of service and potentially costly repairs.

All or portions of the IOS traverse areas mapped as being susceptible to earthquake-induced liquefaction. Liquefaction of sediments underlying the build alignment could damage or sever the light rail tracks and utility lines, causing them to be nonfunctional. MUNI has a standard operating procedure for inspecting tracks, roadways, overhead lines, and signals after an earthquake.[27] Based on the inspections, damage report forms would be completed and required repairs, if any, would be prioritized for completion. This procedure would prevent an occupied railcar from traveling a damaged track, potentially causing injuries to riders. Timely repair of damaged components would be completed under the supervision of the Track Superintendent of Cable Car and Rail Systems.[28]

Cumulative Impacts

Other projects (e.g., public transportation, commercial, and residential projects) would also be constructed and operated in a seismically active region. It would be speculative to assess whether this would result in an increase in population of the study area, thus exposing additional populations to seismic hazards.

Mitigation Measures

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. Existing MUNI earthquake preparedness and post-earthquake inspection/ repair procedures are adequate for site operations.

Light Rail Alternative - New Central Subway

Construction Impacts

During construction of the IOS, an earthquake could occur. The associated groundshaking could affect the areas under construction and construction workers. The effects would be similar to effects on construction sites throughout most of the Bay Area, if a seismic event were to occur on any of the regional, active faults. It would be speculative to assess whether an increased number of construction workers would be moving into the Bay Area because of this project and therefore be subjected to seismic impacts not previously experienced.

[26] 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..
[27] MUNI. *S.F. MUNI Railway - Ways and Structures, Track Maintenance, Emergency Response Plan*, internal agency document. Undated.
[28] Ramirez; op. cit.

Operation Impacts

The alignment is not crossed by any known active faults, and therefore rupture of tunnels resulting from displacement along a fault is not likely to occur at the site. The tunnels would be subjected to "extremely high" levels of groundshaking. However, the tunnels would be designed to withstand effects from the design earthquake. No identifiable damage to the existing tunnels (MUNI/BART) was caused by the Loma Prieta earthquake in 1989.[29] The New Central Subway would be designed to withstand the design earthquake, which would reduce potential impacts to a less-than-significant level.

Cumulative Impacts

Other projects (e.g., public transportation, commercial, and residential projects) would also be constructed and operated in a seismically active region. It would be speculative to assess whether this would result in an increase in population of the study area, thus exposing additional populations to seismic hazards.

Mitigation Measures

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. Existing MUNI earthquake preparedness and post-earthquake inspection/ repair procedures are adequate for site operations.

Western Pacific and Cargo Way Maintenance Facility Sites

Construction Impacts

During construction of the new maintenance facility, an earthquake could occur. The associated groundshaking could affect the areas under construction and construction workers. The effects would be similar to effects on construction sites throughout most of the Bay Area, if a seismic event were to occur on any of the regional, active faults. It would be speculative to assess whether an increased number of construction workers would be moving into the Bay Area because of this project and therefore be subjected to seismic impacts not previously experienced.

Operation Impacts

A large earthquake on a regional fault could cause extremely high levels of groundshaking at either of the maintenance facility alternative sites. The completed maintenance facility would include a large shop building and a series of outdoor light rail tracks. During moderate to severe groundshaking, the site could be exposed to lateral and vertical forces that could cause damage to structures, unless structures were designed to withstand high levels of groundshaking.

Although the Uniform Building Code (UBC) provides building standards that are designed to prevent building collapse, severe structural damage could still occur. However, compliance with the UBC standards (an existing requirement) would minimize the risk of injury and damage from groundshaking. The building designs would be reviewed by the Port of San Francisco, Building Inspection and Construction Management Department for compliance with existing building codes (including UBC) and ordinances.

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[29] 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.

The maintenance facility sites are underlain by geologic materials potentially susceptible to earthquake-induced liquefaction.[30,31] The fill below the water table, at depths of 2 to 7 meters (6 to 23 feet), could fail during an earthquake, causing a drop in the ground surface or surface rupture and buckling. Liquefaction at either of the maintenance facility sites could cause severe damage to structures and other site improvements.

As part of the project, detailed geotechnical investigations would define the relative liquefaction hazard for various subareas of each site (based on variable stratigraphy resulting from a complex fill history). Those areas underlain by materials determined to be susceptible to liquefaction would be remediated by deep dynamic compaction, or other suitable method, as determined by a geotechnical engineer. The geotechnical analysis and site work would be reviewed and inspected by the Port of San Francisco, Building Inspection and Construction Management Department.

Cumulative Impacts

Other projects (e.g., public transportation, commercial, and residential projects) would also be constructed and operated in a seismically active region. It would be speculative to assess whether this would result in an increase in population of the study area, thus exposing additional populations to seismic hazards.

Mitigation Measures

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 for an emergency coordinator/team, provisions for emergency power and communication, evacuation procedures, and post-earthquake safety inspection. Existing MUNI earthquake preparedness and post-earthquake inspection/ repair procedures are adequate for site operations.

5.9 HYDROLOGY AND WATER QUALITY

5.9.1 INTRODUCTION

Implementation of the Light Rail, the No Project, or No Build/TSM Alternatives would be considered to have an effect on hydrology or water quality if it would: expose people or structures to substantial new or increased flooding; or result in the substantial degradation of surface or groundwater quality; or substantially interfere with groundwater recharge.

5.9.2 INCREASES STORM WATER RUNOFF

No Project and No Build/TSM Alternatives

Implementation of the No Project and No Build/TSM Alternatives would not be expected to result in adverse effects from increases in storm water runoff. The construction of a new bus facility at the Western Pacific site would result in some increases in impermeable surfaces but would not affect the City's ability to convey and treat the runoff (see expanded discussion below, for the Western Pacific and Cargo Way maintenance facility sites).

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[30] Dames and Moore, 1997a; op. cit.
[31] Dames and Moore, 1997b; op. cit

Light Rail Alternative - Initial Operating Segment

Construction Impacts

Implementation of the Light Rail Alternative would include installation of light rail tracks and utility lines. Construction activities in each segment of the alignment would include excavation, grading, stockpiling, and transportation of soil. These activities would result in exposure of soil to erosion by runoff. Unless controlled during the construction phase, it is possible for storm water runoff to mobilize sediments toward the Bay or the City's combined storm drain/sewer system. The accumulation of sediment could result in blockage of flows, potentially resulting in localized ponding or flooding.

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 Light Rail Alternative would cross two surface water features that would be considered sensitive receiving waters: Mission Creek and the Islais Creek. Construction activities (including laying an electrical conduit in the creek and channel bottom) in the vicinity of these water features could result in direct discharges to surface waters, either as a result of spills or through storm water runoff.

Operation Impacts

Operation of the IOS would result in the potential discharge of contaminants to the environment that could be transported by runoff to the City's combined storm drain/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 wear, and spillage of materials containing metals (e.g., lubricants, waste oil).

Drainage conveyance structures already exist along the IOS alignment or would be in-place upon completion of Segment 6 (Mid-Embarcadero). All storm water runoff from the alignment would be directed toward the City's combined storm drain/sewer system. The City's combined storm drain/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.

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 Light Rail Alternative would result in the construction of a light rail line in the same relative position of an existing roadway surface, and therefore no net increase in impervious surfaces would be expected. Therefore construction of the light rail alignment would not be expected to increase storm water runoff volume.

Cumulative Impacts

Increases in pollutant load resulting from construction of the Light Rail Alternative, in conjunction with increases in pollutant load resulting from the cumulative 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 adequately reduced to a level of insignificance by existing programs. However, there is heightened public interest in the issue of cumulative increases in flows to the City's combined storm drain/sewer system, and the resulting potential for increases in the volume and duration of overflow events during wet weather. Both the proposed Mission Bay development and the proposed Candlestick Point development (as well as anticipated changes at Hunters Point Shipyard and at other waterfront properties) could result in increased flows. In the context of these other proposed projects, and in the context of total flows to the system's Bayside facilities, the increase in flows resulting from the new maintenance yard would be negligible. During a five-year storm event, runoff from the maintenance yard sites would constitute about 0.3 percent of the treatment plant's capacity, or incrementally more than under existing conditions.

<u>Mitigation Measures</u>

Implementation of the mitigation measures, recommended below, would reduce impacts to a less-than-significant level.

In accordance with San Francisco Ordinance 19-92 Sections 118 and 123, *a contractor would prepare and implement a Storm Water Pollution Prevention Plan (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 Mission Creek, Islais Creek or the Bay. The SWPPP would include:

- <u>*Construction Storm Water Management Controls*</u>: *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, appropriate container) 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 (this is already standard procedure).

- <u>*Erosion and Sediment Control:*</u> *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 hay bales, 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.[32]

The project alignment traverses both City and Port of San Francisco jurisdictions, and therefore is subject to two different permitting agencies. Both of the alternative maintenance facility sites are located in Port jurisdiction. A SWPPP would be submitted for review to the appropriate agency with grading and building permits. Within Port jurisdiction, a SWPPP would be submitted to the Building Inspection and Construction Management Department with grading and building permits and reviewed at the Port by the Environmental Health and Safety Section.[33] Within City jurisdiction, a SWPPP shall be submitted to the Public Utilities Commission, Water Pollution Control Division for review.[34] No additional mitigation for control of construction period runoff would be necessary, because the implementation of the SWPPP would reduce this impact to a less-than-significant level.

Light Rail Alternative - New Central Subway

Construction Impacts

The Central Subway would include over 1.6 km (1 mile) of tunneling. Access portals to the tunnels would require excavation and transportation of thousands of 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 drain/sewer system. The accumulation of sediment could result in blockage of flows, potentially resulting in localized ponding or flooding.

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.

Operation Impacts

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 (refer to the discussion, above, for the IOS).

Cumulative Impacts

Impacts would be similar to those described above for the IOS.

Mitigation Measures

Mitigation would be similar to the measures described above for the IOS.

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[32] Storm Water Quality Task Force, California. *California Storm Water Best Management Practice Handbooks: Municipal, Construction Activity and Industrial/Commercial.* March, 1993.
[33] Bach, Carol. Project Manager, Environmental Health and Safety Section, Port of San Francisco. Personal communication with BASELINE. 15 July, 1997.
[34] Franza, Tom. Water Pollution Control Division, Public Utilities Commission. Personal communication with BASELINE. 15 July.

Western Pacific and Cargo Way Maintenance Facility Sites

Construction Impacts

The two possible sites for the new maintenance facility are located within 305 meters (1,000 feet) of the Bay. Unless mitigated, construction activities in the vicinity of the Bay could result in direct discharges to surface waters, either as a result of spills or through storm water runoff. This could affect the quality of Bay waters.

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.

Operation Impacts

The primary pollutants associated with activities at the maintenance facility would include heavy metals, petroleum hydrocarbons, and solvents. Metals could be generated at the maintenance facility in several ways, through exhaust and tire wear from maintenance vehicles, dust or grit produced from metal-on-metal wear, and spillage of materials containing metals (e.g., paint, waste oil). Petroleum hydrocarbons (e.g., fuels, lubricants) and solvents would be expected to be used at the maintenance facility and could be leaked, dripped, or spilled on surfaces that may come into contact with runoff.

The Light Rail Alternative would include the construction of a drainage conveyance system designed to collect runoff from the maintenance facility. The runoff could be discharged to the City's combined storm drain/sewer system **after a connection to the planned Illinois Street sewer is provided**.

The City's combined storm drain/sewer system, which collects and treats storm water, is operated in accordance with existing NPDES permits. Potentially contaminated runoff from a large industrial site (i.e., the proposed maintenance facility) could effect the ability of the Southeast Treatment Plant to adequately treat wastewater prior to discharge to the Bay. The maintenance facility would be required to comply with the Industrial Waste Ordinance by obtaining an Industrial Waste Discharge Permit from the Public Utilities Commission, Bureau of Environmental Regulation and Management (BERM). Prior to issuing a permit, BERM would require that the facility either isolate all contaminants from runoff and washdown areas or provide treatment of runoff (using oil/water separators or other treatment systems) prior to discharge to the combined sewer system.[35] Existing regulations would reduce this impact to a less-than-significant level.

The construction of the maintenance facility could increase impervious surfaces at either of the alternative sites. Based on field reconnaissance conducted in June 1997, approximately one-third of the 48,500-square meter Western Pacific site is currently covered by impervious surfaces. Development of this site would result in the addition of approximately 32,400 square meters of impervious surfaces.

The volume of runoff from the selected alternative site would likely increase upon completion of construction of the new maintenance facility. Based on a Rational Method estimation of peak discharge during the five-year storm event (magnitude of storm expected to occur, on average, once every five years), the Cargo Way site would generate about 3,721 cubic meters of runoff per day (983,000 gallons per day) compared to about 697 cubic meters of runoff per day (184,000 gallons per day) for the five-year storm

[35] Lee, Tommy, 1997, Manager of Enforcement Section, San Francisco Public Utilities Commission, Bureau of Environmental Regulation and Management, personal communication with BASELINE, 1 July.

under existing conditions.[36] The runoff increases from the Western Pacific site would be less since a large portion of that site is already paved.

The Southeast Water Pollution Control Plant has a dry weather influent flow of 245,922 cubic meters per day (65 million gallons per day) and a maximum capacity of 945,856 cubic meters per day (250 million gallons per day).[37] The additional influent generated by the Light Rail Alternative would not substantially increase the load on the plant (approximately three-tenths of one percent of the design capacity). In addition, an increase in runoff of this amount would have a negligible effect on the volume and frequency of overflow events allowed under the City's NPDES permit.

Cumulative Impacts

Increases in pollutant load resulting from construction of the Light Rail Alternative, in conjunction with increases in pollutant load resulting from the cumulative 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 adequately reduced to a level of insignificance by existing programs. However, there is heightened public interest in the issue of cumulative increases in flows to the City's combined storm drain/sewer system, and the resulting potential for increases in the volume and duration of overflow events during wet weather. Both the proposed Mission Bay development and the proposed Candlestick Point development (as well as anticipated changes at Hunters Point Shipyard and at other waterfront properties) could result in increased flows. In the context of these other proposed projects, and in the context of total flows to the system's Bayside facilities, the increase in flows resulting from the new maintenance yard would be negligible. During a five-year storm event, runoff from the maintenance yard sites would constitute about 0.3 percent of the treatment plant's capacity, or incrementally more than under existing conditions.

Mitigation Measures

Mitigation measures described for the IOS would also apply to both the Western Pacific and Cargo Way maintenance facility sites.

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[36] Runoff from the Cargo Way Site under existing conditions:

F = Unit-based conversion factor = 1.008

$$\text{Precipitation intensity (i)} = \frac{\text{total 24-hour rainfall (5-year event)}}{\text{24 hours}} = 0.11 \text{ in/hr}$$

Area (A) = 17 acres.

Runoff coefficient (C) = 0.15 (undeveloped site).

Q = (runoff) = FCiA = (0.15) (0.11 in/hr) (17 acres) (1.008)

Q = 0.29 cubic foot per second = 697 cubic meters per day

Runoff from Cargo Way site under developed conditions:

Runoff coefficient = 0.80 (developed industrial site)

Q = (0.80) (0.11 in/hr) (17 acres) (1.008)

Q = 1.52 cubic feet per second = 3,721 cubic meters per day

[37] Ahmad, Meei-Lih. Facility Planning and Design, Southeast Treatment Plant. Personal communication with BASELINE. 1 July, 1997.

5.9.3 FLOODING OF LOW-LYING AREAS

No Project and No Build/TSM Alternatives

Implementation of the No Project and No Build/TSM Alternatives would not be expected to result in adverse flooding effects. These alternatives do not include new construction in flood-prone areas, and, therefore, would not expose people or structures to new flooding hazards.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

Based on an evaluation of existing surface elevations (all elevations equal to or greater than 0 meter SFCD), the IOS would not be expected to be affected by 100-year high tides or tsunami events.

Operation Impacts

The alignment for the IOS is at elevations above 100-year tides or tsunami events. This is not a significant impact.

Cumulative Impacts

No significant impacts have been identified for the IOS. This alternative, therefore, would not contribute to potential cumulative impacts.

Mitigation Measures

None necessary.

Light Rail Alternative - New Central Subway

Based on an evaluation of existing surface elevations (all elevations equal to or greater than 0 meter SFCD), the New Central Subway alignment would not be expected to be affected by 100-year high tides or tsunami events.

Construction Impacts

Based on an evaluation of existing surface elevations (all elevations equal to or greater than 0 meter SFCD), the Western Pacific site would not be expected to be affected by 100-year high tides or tsunami events. Portions of the Cargo Way site may experience flooding during construction, if flood conditions occur and the finished ground elevations are not above -1.1 meters (-3.6 feet) SFCD. The flooding would be less than 1 meter (less than 3 feet) and would not likely result in injury to people and would only result in temporary damage to unfinished structures. This would not be a significant impact.

Operation Impacts

The alignment for the New Central Subway is at elevations above 100-year tides or tsunami events. This is not a significant impact.

Cumulative Impacts

No significant impacts have been identified; therefore, the New Central Subway would not contribute to cumulative impacts.

Mitigation Measures

None necessary.

Western Pacific and Cargo Way Maintenance Facility Sites

Construction Impacts

Based on an evaluation of existing surface elevations (all elevations equal to or greater than 0 meter SFCD), the Western Pacific site would not be expected to be affected by 100-year high tides or tsunami events. Portions of the Cargo Way site may experience flooding during construction, if flood conditions occur and the finished ground elevations are not above -1.1 meters (-3.6 feet) SFCD. The flooding would be less than one meter (less than three feet) and would not likely result in injury to people and would only result in temporary damage to unfinished structures. This would not be a significant impact.

Operation Impacts

The sites would be regraded as part of the construction of either facility. The final elevations would be above 100-year tides or tsunami events. Therefore, there would be no flooding impacts.

Cumulative Impacts

No significant impacts have been identified; therefore, the Western Pacific and Cargo Way site would not contribute to cumulative impacts.

Mitigation Measures

None necessary.

5.10 BIOLOGICAL AND WETLAND RESOURCES

5.10.1 INTRODUCTION

A significant effect would occur if the project 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 resting places for urban wildlife species.

5.10.2 REMOVAL OF LANDSCAPING

No Project and No Build/TSM Alternatives

Implementation of the No Project and No Build/TSM Alternatives would not result in effects to critical habitat, special-status species, or removal of existing landscaping. Therefore, implementation of these alternatives would not result in any significant impacts.

Light Rail Alternative - Initial Operating Segment

Construction Impacts

Utility trenches would be excavated to house utilities for the light rail. The utility trenches would be constructed along one side of the Third Street Corridor and, to cross the waterways trenches would be dug on the bottom of Mission and Islais Creeks, temporarily affecting water turbidity and potentially affecting spawning Pacific herring. **The appropriate Nationwide Permit would be obtained for the underwater cable, consulting with the US Coast Guard, CDFG, USFWS and ACOE.** In many places along the edge of the pavement in the Third Street Corridor, mature or recently planted trees occur. Installation of utilities could disrupt or result in removal of these trees or shrubs, or sever or damage root systems. No wetlands would be affected by construction of the light rail IOS.

Operation Impacts

Operation of the light rail would not result in any effects to vegetation or wildlife.

Cumulative Impacts

No cumulative impacts to biological and wetland resources would result from operation of the IOS, since no significant impacts have been identified for facility operations.

Mitigation Measures

Any *street trees removed or damaged as part of construction would be replaced along the street at a 1:1 ratio.* If possible, installation of underwater cables on the bottom of Mission and Islais Creeks would occur outside of the Pacific herring spawning season from December 1 to March 1. Otherwise, a silt curtain would be placed along the underwater cable locations prior to trenching activities. The curtain would be removed after trenching and underwater cable installation were completed provided no spawn of Pacific herring had taken place. If spawning occurred, the curtain may not be removed for 14 days or until it can be determined, by a professional fisheries biologist, that the hatch was completed and larval herring had left the site.

Light Rail Alternative - New Central Subway

Construction Impacts

North of Market Street, construction of entrances to the New Central Subway could result in the removal of existing street trees along Third, Geary, and Stockton Streets. No wetlands would be affected.

Operation Impacts

Operation of the New Central Subway would not result in any significant impacts, since no vegetation or wildlife would be affected.

Cumulative Impacts

No cumulative impacts to biological and wetland resources have been identified for the New Central Subway; therefore, there would be no cumulative impact from operation of the light rail.

Mitigation Measures

Any street trees removed or damaged as part of construction would be replaced along the street at a 1:1 ratio.

Western Pacific and Cargo Way Maintenance Facility Sites

Construction Impacts

Based on a field reconnaissance of the maintenance facility sites and a CNDDB review, no special-status species or critical habitat have been identified at either site. Therefore, there would be no impacts.

Operation Impacts

Operation of either site would not result in any significant impacts since there are no special status species or critical habitat.

Cumulative Impacts

No significant impacts were identified for the sites. Therefore, there would be no cumulative impacts.

Mitigation Measures

None necessary.

5.11 HAZARDOUS MATERIALS

5.11.1 INTRODUCTION

Implementation of the alternatives would be considered to have an effect on the environment and public health if construction and/or operational effects would result in: increased potential for accidental explosion or release of hazardous materials; increased exposure, or potential exposure, of construction workers, the public, or the environment, to hazardous materials creation of health hazards or potential health hazards from hazardous material sources; 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 at the Planning Department, 1660 Mission Street, San Francisco.

5.11.2 EXPOSURE OF SITE WORKERS AND PUBLIC TO HAZARDOUS MATERIALS

No Project and No Build/TSM Alternatives

The No Project and No Build/TSM Alternatives 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 these alternatives would not result in adverse effects associated with hazardous materials.

Light Rail Alternative - Initial Operating Segment

Potential effects of exposure to hazardous materials for the Light Rail Alternative (including the IOS, New Central Subway, and maintenance facility sites) are similar; therefore, the discussion below pertains to both the IOS and New Central Subway and either of the maintenance facility sites.

Construction Impacts

Construction activities for most of the IOS include soil excavation for the construction of the surface light rail tracks and associated utility trenches. Utility trenches would be excavated to approximately 2.4 meters (8 feet) below ground surface (bgs). For the New Central Subway, the surface light rail tracks would be transitioned into a subway tunnel. A cut and cover method would be used for constructing the subway stations and to connect the surface tracks to the subway. Construction of access portals and subway stations to the tunnels would require excavation, transportation, and off-site disposal of large quantities of soil. The remaining portions of the subway would be constructed using a tunneling method at depths ranging from 18 to 24 meters (59 to 79 feet) bgs. Construction of either of the maintenance facility sites may require soil excavation to depths of up to 1.5 meters (5 feet) bgs.

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 Light Rail Alternative 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, if dust or vapors generated from excavation activities were 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. 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 Light Rail Alternative 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.

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.[38] Areas on the Bay side of the 1851 high tide line are subject to Article 20 requirements (refer to Chapter 4 - Figure 4-12).

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;[39]
- 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.

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 1.8 meters (6 feet) bgs and 8.5 meters (28 feet) bgs. Construction of the Light Rail Alternative would require excavation below the groundwater level along portions of the alignment. As a result, dewatering would be needed to lower the groundwater during construction. Dewatered groundwater may be disposed either to the San Francisco Bay or the City and County of 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 drain/sewer system, a Batch Industrial Wastewater Discharge permit would need to be obtained from the City and County of San Francisco Department of Public Works, Bureau of Environmental Regulation and Management (BERM) prior to discharge. The permit application must identify the total estimated volume and duration of

[38] Compliance with Article 20 is required if development is proposed bayward of the 1851 high tide line and more than 50 cubic yards of soil are excavated.
[39] Section 1002 of Article 20 identifies the analytical requirements for the soil samples.

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 for removal of volatile compounds. 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 reduce the potential effect to the environment to a less-than-significant level and therefore would not warrant mitigation measures.

Dewatering during construction could result in preferential groundwater flow toward the alignment; this would be an indirect effect of the Light Rail Alternative. 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. Mitigation would be required to reduce this effect to a less-than-significant level.

Operation Impacts

Operation of the Light Rail Alternative 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.

Since hazardous materials would be used at the Maintenance Facility, preparation of the following plans and programs would also be required:

- Hazard Communication Program. The Program identifies safe handling practices for hazardous substances, ensures proper labeling of hazardous materials, and requires employee access to Material Safety Data Sheets.

- Hazardous Waste Generator Requirements.[40] Requirements include procurement of an EPA ID number; waste manifesting; use and management of waste containers; storage and accumulation period; preparedness and prevention measures; employee training; and preparation of a Contingency Plan and emergency response procedures.

- Hazardous Materials Certificate of Registration. Registration includes the preparation of an emergency response plan, employee training plan, hazardous materials disclosure forms, and a hazardous materials reduction plan.[41] Compliance with Registration requirements would sufficiently meet Hazardous Materials Business Plan requirements of the Business Plan Act.

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 reduce the potential effect to site workers, the public, and the environment to a less-than-significant level.

Cumulative Impacts

The City's combined storm drain/sewer system could potentially be affected if dewatered groundwater from planned or ongoing projects, in addition to the Light Rail Alternative, 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 by existing requirements established by the City.

[40] Requirement not applicable if facility were to generate less than 100 kilograms per month of hazardous waste or 1 kilogram per month of acutely hazardous waste.

[41] Compliance with the Certificate of Registration would be required if facility uses, handles, or stores hazardous materials in specified quantities (e.g., 55 gallons of liquids stored in 1 gallon containers; or 500 pounds of solids stored in 25 pound containers; or 55 gallons of liquid, 500 pounds of solids.

Mitigation Measures

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 would be encountered during soil excavation during construction of the Light Rail Alternative.

As indicated above, most of the measures needed to mitigate against these effects are required by Article 20 for those portions of the Light Rail Alternative 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. For those areas inside and outside the Article 20 jurisdiction, the following is recommended:

- *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.*

  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.

  Soil quality investigation activities would be performed in accordance with a soil sampling workplan approved by the oversight regulatory agency. *The soil quality investigation would be conducted by the City and pertain to those areas where excavation is expected. The workplan would identify the proposed sampling locations and depths, methodology, and laboratory analyses.* Investigations would be conducted by qualified environmental professionals and in conformance with State and local guidelines and regulations. The workplan would be consistent with the following:

  - To determine the hazardous materials potentially contained in excavated soils, contaminants selected for analysis may be based on existing soil quality data collected in the vicinity, identified land use history, and known subsurface lithology. In addition, Section 1002 of Article 20 specifies explicit analytical requirements for soil samples collected within Article 20 jurisdiction.[42]

  - Sampling of soils to be excavated throughout the light rail alignment shall be conducted in accordance to the methodology contained in *Test Methods for Evaluating Solid Waste, Physical/Chemical Method, SW-846* (SW-846), Third Edition, 1986, U.S. EPA. As required by SW-846, collected soil samples shall be representative of the waste stream being characterized; representative soil samples may be achieved by randomly selecting sample locations. The statistical methodology established in SW-846 shall be used to evaluate the soil

[42] Soil samples collected outside Article 20 would not be subject to these requirements.

quality data to determine whether the waste stream(s) would constitute a hazardous or nonhazardous waste, based on toxicity characteristics.[43]

- *Soil Analysis Report. All field activities, findings, and recommendations would be documented in a soil analysis report.* The contents of the soil analysis report 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 throughout the alignment.

- *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 entire Light Rail Alternative. 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, mitigations 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

[43] As discussed in Section 4.10, Hazardous Materials, a waste is considered hazardous if it is a "listed waste" or if it exhibits at least one of the following characteristics: ignitability, corrosivity, reactivity, or toxicity. Waste soils are not a "listed waste" and generally are not ignitable, corrosive, or reactive; waste soils could be hazardous by exhibiting the toxicity characteristic.

analytical requirements to meet landfill acceptance criteria, if necessary; 4) transportation and disposal options and procedures;[44] 5) federal and/or California hazardous waste generator requirements if the excavated soils were to constitute a federal and/or California hazardous waste;[45] and 6) record keeping.

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
  - 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 investigation may be conducted simultaneously with the soil investigation described above. The purpose of the investigation would be to: 1) identify potential

[44] 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.

[45] 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.

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. Before investigation activities begin, the lead oversight agency for the Light Rail Alternative would be determined.

Groundwater quality investigation activities would be performed in accordance with a groundwater sampling workplan approved by the oversight regulatory agency. The workplan 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.

All field activities, findings, and recommendations would be documented in a groundwater quality investigation report. 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 combined City 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.

Implementation of the mitigation measure identified herein would mitigate the potential adverse effect of exposure associated with encountering unforeseen subsurface structures containing hazardous materials. The potential effect would be reduced to a less-than-significant level.

Contaminated soils excavated from construction of planned or ongoing projects, in addition to the Light Rail Alternative, 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.

5.12 AIR QUALITY

5.12.1 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. In addition, implementation of the alternatives would be considered to have an effect on air quality if the alternatives would not be able to eliminate or reduce the severity and number of existing federal CO violations.

A project impact resulting from construction operations would be considered significant if feasible BAAQMD construction control mitigation measures listed in the BAAQMD CEQA Guidelines[46] were not incorporated into the design of any of the alternatives.

In addition, BAAQMD has developed project operation thresholds of significance for CO, ROG, NO_x, and PM_{10} (Table 5-5). 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.[47]

TABLE 5-5

GENERAL THRESHOLDS SIGNIFICANCE FOR PROJECT OPERATIONS

Pollutant	Threshold of Significance
CO	20 ppm (1 hour) 9 ppm (8 hours)
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

Source: Bay Area Air Quality Management District, CEQA Guidelines Assessing the Air Quality Impacts of Projects and Plans, April 1996.

5.12.2 AIR POLLUTANT EMISSIONS

No Project Alternative

Construction Impacts

No construction activities would be performed under the No Project Alternative. Therefore, the No Project Alternative would not result in construction-related air quality emissions.

Operation Impacts

Intersection CO Levels. Intersection CO levels were estimated at several intersections within the study area for existing conditions (No Project Alternative) for 2005 and 2015 using the CALINE4 simulation model

[46] BAAQMD CEQA Guidelines, April 1996.
[47] Thresholds of significance for construction-related emissions have not been developed by BAAQMD.

(Table 5-6).[48,49] CO emissions were estimated at: 1) intersections with the three highest traffic volumes, and 2) three intersections with a forecasted LOS D or worse, for the No Project, No Build/TSM, and Light Rail Alternatives.[50] The estimated CO concentrations at all intersections for existing conditions (and therefore the No Project Alternative) are below the corresponding one-hour NAAQS (35 ppm) and SAAQS (20 ppm) and eight-hour NAAQS (9 ppm) and SAAQS (9 ppm) thresholds **(Table 5-6).**

Regional Emissions. Projects which 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, specifically ROG, NO_x, and PM_{10}, have been estimated for the No Project Alternative for 2015. These emissions would constitute "existing conditions" in 2015. The emission estimates **(Table 5-7)** serve as the baseline emissions against which to evaluate potential impacts for the other alternatives (as discussed, below). Emissions were estimated for 2015 based on the forecasted VMT, and a composite emission factor obtained from the EMFAC7G and BURDEN models developed by CARB **(Table 5-7).**

Mitigation Measures

No mitigation necessary.

No Build/TSM Alternative

Construction Impacts

Dust Emissions. The No Build/TSM Alternative would include the construction of a bus maintenance facility at either the east or west end Western Pacific site or Cargo Way site. Construction of the maintenance facility would require site preparation and soil movement activities such as excavation, backfilling, and grading. Soils exposed during construction activities would be subject to wind erosion. As a result, short-term dust emissions would cause a temporary increase in localized PM_{10} concentrations.

The amount of PM_{10} emissions which could result from construction activities could potentially be on the order of about 0.5 ton per day, based on an emission factor of 0.77 ton per acre per month[51] and a grading period of twelve months. The highest potential for dust impacts would occur when the soils were dry, during the late spring, summer, and early fall. However, PM_{10} generated from construction-related activities is highly dependent on several factors including activity level, specific operations, equipment type, and weather conditions.

PM_{10} emissions are considered by BAAQMD to be the greatest pollutant of concern associated with construction activities. The BAAQMD has established feasible control measures for PM_{10} emissions from construction-related activities. Control measures are based on the size of the construction project. Project sizes that are large in area (greater than four acres) would be subject to the enhanced control measures. BAAQMD further recommends that optional control measures be implemented at construction areas that are large in area, located near sensitive receptors, or may for any other reason be warranted. BAAQMD would consider a project to be significant if the established control measures were not implemented.

[48] The CO emissions calculated for the 2015 No Project alternative reflects cumulative conditions.
[49] The CALINE4 model was developed by CARB and is identified by MTC as the preferred model for evaluating CO emissions to determine compliance with Transportation Conformity Compliance requirements.
[50] LOS and traffic volume data were developed by the San Francisco Department of Parking and Traffic and Korve Engineering.
[51] Bay Area Air Quality Management District, CEQA Guidelines Assessing the Air Quality Impacts of Projects and Plans, April 1996.

TABLE 5-6

PREDICTED WORST-CASE INTERSECTION CARBON MONOXIDE CONCENTRATIONS (IN PPM)

Intersection	Case 1		Case 2		Case 3		Case 4		Case 5	
	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr
Bayshore Boulevard and Blanken Street	8.4	5.6	6.0	4.0	6.0	4.0	5.3	3.5	5.3	3.5
Third Street and Quesada Avenue[1]	8.3	5.6	5.9	3.9	NA	NA	5.2	3.5	NA	NA
Third Street and Palou Avenue[1]	8.3	5.6	5.9	3.9	NA	NA	5.3	3.5	NA	NA
Third Street and Oakdale Avenue[1]	8.4	5.6	6.0	4.0	NA	NA	5.3	3.5	NA	NA
Third Street and Quesada Avenue - Dedicated Flow[2]	NA	NA	NA	NA	6.0[4]	4.0	NA	NA	5.3[6]	3.5
Third Street & Palou - Dedicated Flow[2]	NA	NA	NA	NA	6.0[4]	4.0	NA	NA	5.3[5]	3.5
Third Street & Oakdale - Dedicated Flow[2]	NA	NA	NA	NA	6.0[5]	4.0	NA	NA	5.3[5]	3.5
Third Street & Quesada Avenue - Mixed Flow[3]	NA	NA	NA	NA	5.9	3.9	NA	NA	5.3	3.5
Third Street and Palou Avenue - Mixed Flow[3]	NA	NA	NA	NA	5.9	3.9	NA	NA	5.3	3.5
Third Street and Oakdale Avenue - Mixed Flow[3]	NA	NA	NA	NA	6.0	4.0	NA	NA	5.3	3.5
Third Street and McKinnon Avenue	8.1	5.4	5.8	3.9	5.8	3.9	5.2	3.5	5.2	3.5
Third and Cesar Chavez St	8.5	5.7	6.0	4.0	6.1	4.1	5.4	3.6	5.4	3.6
Third and Mariposa Streets	8.4	5.6	6.0	4.0	6.0	4.0	5.4	3.6	5.4	3.6
Third and Berry Streets	8.5	5.7	6.0	4.0	6.0	4.0	5.3	3.5	5.3	3.5
Third and King Streets	9.5	6.4	6.5	4.4	6.6	4.4	5.7	3.8	5.7	3.8
Fourth and King Streets	8.6	5.8	6.2	4.1	6.2	4.1	5.7	3.8	5.7	3.8

TABLE 5-6 (Cont.)

PREDICTED WORST-CASE INTERSECTION CARBON MONOXIDE CONCENTRATIONS (in ppm)

Intersection	Case 1		Case 2		Case 3		Case 4		Case 5	
	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr
NAAQS	35	9	35	9	35	9	35	9	35	9
SAAQS	20	9	20	9	20	9	20	9	20	9

Notes: Carbon monoxide (CO) concentrations were estimated using the CALINE4 simulated model.
A persistence factor of 0.7 was used to calculate between the 1-hour and 8-hour CO concentrations.
ppm = parts per million.
NA = Not applicable.
Case 1 = 1996 Existing conditions.
Case 2 = 2005 No Project/ No Build/TSM Alternative.
Case 3 = 2005 Light Rail Alternative - IOS.
Case 4 = 2015 No Project/No Build/TSM Alternative.
Case 5 = 2015 Light Rail Alternative - New Central Subway (full buildout).
NAAQS = National Ambient Air Quality Standard.
SAAQS = State Ambient Air Quality Standard.

(1) CO concentrations for Cases 3 and 5 are shown in the corresponding dedicated or mixed flow intersections below.
(2) CO concentrations correspond to Options 1, 2 and 3 of Segment 3 for the Light Rail alternative (Cases 3 and 5 only). Dedicated flow does not apply to the existing conditions and the No Project/No Build/TSM alternative.
(3) CO concentrations correspond to Option 4 of Segment 3 for the Light Rail alternative (Cases 3 and 5 only). Dedicated flow does not apply to existing conditions and the No Project/No Build/TSM alternative.
(4) The maximum CO concentration for the three options is included in this table. The values for Options 1, 2 and 3 were 5.9, 6.0 and 5.9, respectively.
(5) The CO concentrations for the three options were identical.
(6) The maximum CO concentration for the three options is included in this table. The values for Options 1, 2 and 3 were 5.3, 5.2 and 5.2, respectively.

TABLE 5-7

ESTIMATED 2015 REGIONAL EMISSIONS GENERATED FROM VEHICULAR TRAFFIC (POUNDS PER DAY)

Alternative	Emissions			Emission Reduction (Compared to No Project and No Build/ TSM Alternatives)		
	ROG	NO_x	PM_{10}	ROG	NO_x	PM_{10}
No Project and No Build/TSM Alternatives	16,691	41,127	1,791	0	0	0
Light Rail Alternative - IOS (dedicated flow option)	16,676	41,000	1,789	15	127	2
Light Rail Alternative - IOS (mixed flow option)	16,677	41,001	1,789	14	126	2
Light Rail Alternative - New Central Subway (dedicated flow option)(1)	16,672	40,981	1,789	19	146	2
Light Rail Alternative - New Central Subway (mixed flow option)(1)	16,673	40,981	1,789	19	146	2

Notes: (1) The Light Rail Alternative - New Central Subway consists of the full build-out alignment. Emissions based on VMT data and emission factors were obtained from EMFAC7G and BURDEN models. VMT data provided by Korve Engineering and MUNI.
ROG = Reactive organic gases.
NOx = Nitrogen oxides.
PM_{10} = Particulate matter less than ten microns in diameter.

PM_{10} emissions from construction-related activities would constitute a significant impact since the emissions would impair short-term air quality and could affect nearby residents and other sensitive receptors located downwind from the maintenance facility location. Increased dust fall may create a nuisance for nearby residents and potentially exacerbate chronic respirator problems of those persons exposed to construction activities.

Exhaust Emissions. Construction activities would result in short-term exhaust emissions generated from construction-related equipment. The primary pollutants associated with construction equipment exhaust emissions consist of ozone precursors (ROG and NO_x) and PM_{10}. The estimated daily exhaust emissions from on-site construction activities were calculated based on the volume of disturbed soil (about 84,000 cubic yards for the Western Pacific site and about 180,000 cubic yards for the Cargo Way site), a 12-month construction period of 20 working days per month, and emission factors developed by BAAQMD (1996) for a composite fleet of heavy and light duty construction equipment in the Bay Area. Exhaust emissions would also be generated from transporting excavated soils off-site. Excavated soil transport activities would require about 40 truck trips per day. The estimated daily exhaust emissions due to off-site transport were calculated based on the estimated daily truck trips, an assumed trip travel distance of 100 miles, an average speed of 30 miles per hour, and EMFAC7G running exhaust emission factors for heavy-heavy duty trucks (diesel-powered). The EMFAC7G emission factors were developed assuming a winter and summer temperature of 11 to 16 degrees Celsius (53 and 62 degrees Fahrenheit), respectively (**Table 5-8**).

Although thresholds of significance for pollutants generated from construction-related activities are not established by BAAQMD, the estimated daily exhaust emissions of ROG and NO_x from construction activities and off-site transport would increase compared to existing conditions. Increased emissions would

TABLE 5-8

ESTIMATED AIR POLLUTION EMISSIONS GENERATED FROM CONSTRUCTION-RELATED ACTIVITIES (pounds per day)

Phase/Alternative	CO(1)	ROG(1)	NO_2(1)	SOx(1)	PM_{10} Exhaust(1)	PM_{10} Dust(2)
NO BUILD/TSM ALTERNATIVE						
Western Pacific Maintenance Facility Construction	169.9	18.7	111.5	3.2	7.8	1,001.0
Cargo Way Maintenance Facility Construction	284.9	26.4	146.9	7.1	9.7	1,463.0
LIGHT RAIL ALTERNATIVE - IOS AND MAINTENANCE FACILITY						
Utility Relocation (IOS only)	79.2	12.7	83.7	0.2	6.4	151.2
IOS Rail track installation and Western Pacific Maintenance Facility Construction	224.6	22.4	128.3	5.0	8.7	2,210.6
IOS Rail track installation and Cargo Way Maintenance Facility Construction	251.3	24.2	136.5	5.9	9.1	2,672.6
LIGHT RAIL ALTERNATIVE - NEW CENTRAL SUBWAY						
Utility Relocation and Pump Station/Siphon installation	93.2	9.9	68.9	0.8	3.7	62.2
Construction of Line Section One, portals, and Moscone Station	131.0	12.4	80.5	2.0	4.3	238.2
Construction of Line Section Two, Market Street Station, and Union Square Station	276.5	22.1	125.2	6.9	6.6	187.5

Notes: (1) Values reflect exhaust emissions from construction-related equipment for on-site soil movement activities (i.e. excavation, grading) and off-site soil transport. Emissions factors for on-site construction activities were obtained from BAAQMD's Guidelines and factors related to off-site soil transport were obtained from the EMFAC7G computer model developed for CARB.
(2) Values reflect fugitive emissions generated by site disturbance; an emission factor of 0.77 tons per acre per month was used in the calculation, as provided in BAAQMD's Guidelines (1996).

Construction activities which would occur simultaneously were listed together.

CO = Carbon monoxide
ROG = Reactive organic gases
NO_2 = Nitrogen oxides
SOx = Sulphur oxides
PM_{10} = Particulate matter less than ten microns in diameter

affect short-term air quality and could affect nearby sensitive receptors. However, the emission are not expected to cause or contribute to violations of ambient air quality standards.

Operation Impacts

Intersection CO Levels. The No Build/TSM Alternative would include about 33 additional diesel buses to maintain existing bus schedules and accommodate expected travel demand for 2015. As discussed in Section 5-3, Traffic, implementation of the No Build/TSM Alternative would not result in a measurable increase in bus trips or decrease in vehicular traffic on local roads, compared to the No Project Alternative for 2015; traffic volumes would be nearly identical to existing (No Project) conditions. Therefore, implementation of the No Build/TSM Alternative would not result in a measurable change in localized CO emissions compared to the No Project Alternative (refer to **Table 5-6**).

The No Build/TSM Alternative would generate an insignificant increase in 2015 VMT compared to the No Project Alternative since the 2015 vehicular traffic associated with the two alternatives have been estimated in the traffic analysis to be nearly identical, with the exception of the additional buses under the Build/TSM Alternative.

Regional Emissions. The regional daily VMT estimated for the No Build/TSM Alternative were nearly identical to that calculated for the No Project Alternative.[52] Although development in areas throughout the City would result in an increase of regional emissions, implementation of this alternative would not contribute to this increase. Therefore, the estimated regional ROG, NO_x, and PM_{10}, emissions under the No Build/TSM Alternative for 2015 would, in effect, not result in a measurable change compared to the No Project Alternative and would not cause an adverse impact to air quality or exceed the threshold of significance established by BAAQMD (refer to **Table 5-7**).

Cumulative Impacts

An increase in short-term construction emissions, localized CO emissions, and regional emissions from other projects in the Bay Area may result in cumulative effects to air quality. Construction activities are subject to existing control measures established by BAAQMD to reduce the effect to a less than significant level. During environmental review of regional projects, localized CO emission estimates would typically include cumulative and specific projects to determine whether the emissions would exceed the NAAQS or SAAQS. Projects exceeding the standard would be required to implement measures to reduce emissions. Projects which exceed BAAQMD's regional emissions threshold for project operations would similarly be required to implement measures to reduce the emissions impact. Cumulative projects are included in the estimates for local and regional emissions described above and listed in **Table 5-7**.

Mitigation Measures

Implementation of the mitigation measures, recommended below, would reduce construction-related PM_{10} emission impacts to a less-than-significant level. The measures reflect basic and enhanced dust control measures recommended by BAAQMD:[53]

- *All 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 to all unpaved access roads.* 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).
- *The speed of all vehicles driving on unpaved road 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.*
- *Wheel washers shall be installed and used to clean all trucks and equipment leaving the construction site.* If wheel washers cannot be installed, tires or tracks of all trucks and equipment shall be washed off before leaving the construction site.

[52] Daily VMT values determined by Korve Engineering and MUNI.
[53] Bay Area Air Quality Management District, CEQA Guidelines Assessing the Air Quality Impacts of Projects and Plans, April 1996.

- *Wind breaks or tree wind breaks shall be installed/planted on windward sides of construction areas.*
- *Excavation and grading activities shall be terminated when winds exceed 25 mph.*
- *Limit the area subject to excavation, grading, and other construction activities at any one time.*

Implementation of the following mitigation measures would reduce exhaust emissions from construction-related equipment to a less-than-significant level:

- *The idling time of all construction equipment used at the site shall not exceed five minutes.*
- *Limit the hours of operation of heavy duty equipment and/or the amount of equipment in use.*
- *All equipment shall be properly tuned and maintained in accordance with the manufacturer's specifications.*
- *When feasible, alternative fueled or electrical construction equipment shall be used at the project site.*
- *Use the minimum practical engine size for construction equipment.*
- *Gasoline-powered equipment shall be equipped with catalytic converters, where feasible.*

Light Rail Alternative - Initial Operating Segment (IOS)

Construction Impacts

Dust Emissions. IOS construction activities involving soil excavation would include the installation of light rail tracks and utility installation/relocation. Activities would occur over an estimated period of 3.5 years and rail track installation would be conducted simultaneously with the maintenance facility construction. About 16 acres of surface area would be disturbed to install the surface light rail tracks and approximately two acres for the utility relocation/installation. The total amount of PM_{10} emissions which could result from construction activities could potentially be on the order of one ton per day for rail track installation and maintenance facility construction, and less than 0.08 ton per day for utility relocation/installation (**Table 5-8**).[54] PM_{10} emissions from construction-related activities would constitute a significant impact since the emissions would impair short-term air quality and could affect nearby residents and other sensitive receptors located downwind from construction activities.

Exhaust Emissions. Short-term exhaust emissions would be generated from construction-related equipment and off-site soil transport activities associated with the IOS construction (**Table 5-8**). The estimated daily exhaust emissions for ROG and NO_x due to construction activities and off-site transport would increase compared to existing conditions (the No Project Alternative). Increased emissions would 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.

Operation Impacts

Intersection CO Levels. MTC requires that projects that are subject to the transportation conformity requirements must: 1) be included in a transportation plan and program, such as a Regional Transportation Plan (RTP) and Transportation Improvement Plan (TIP), that has been found to conform with the federally approved SIP and the Clean Air Act amendments; and 2) eliminate or reduce the severity and number of localized violations of the federal ambient air quality standards in the area substantially affected by the project. The IOS segment of the Light Rail Alternative would satisfy the first criteria, provided that the IOS portion of the alternative is included in the current RTP and TIP and that these have been found to conform to the SIP.

[54]Cumulating PM_{10} emissions were calculated for the IOS and Maintenance Facility construction activities since the construction would be performed simultaneously.

In order to evaluate whether the IOS segment of the Light Rail Alternative satisfies the second MTC criteria, localized CO concentrations at critical roadway intersections were estimated in accordance with MTC's recently-published project-level conformity guidelines for the San Francisco Bay Area.[55] CO concentrations were estimated for 2005 and 2015 using the CALINE4 simulation model (refer to **Table 5-6**).[56] The intersections were selected based on the LOS values and traffic volumes projected at the intersections.[57] Options one through four of segment three and options one and two of segment five were independently evaluated to identify the critical intersections of the IOS alignment. The estimated CO concentrations at all intersections evaluated are below the corresponding one-hour NAAQS and SAAQS and eight-hour NAAQS and SAAQS thresholds (refer to **Table 5-6**).

Regional Emissions. Implementation of the IOS would result in a reduction of daily VMT of about 5,000, compared to the No Project and No Build/TSM Alternatives. Although development in areas throughout the City would result in an increase in regional emissions, implementation of this alternative would not contribute to the increase. For 2015, the total daily VMT estimated for the San Francisco region under the IOS Light Rail Alternative was forecasted to range from about 26,795,202 to 26,795,587.[58] The reduction in VMT would consequently reduce ROG, NO_x, and PM_{10}, regional emissions, compared to the No Project Alternative (refer to **Table 5-7**).[59]

Cumulative Impacts

The cumulative impacts for the IOS would be similar to those identified under the No Build/TSM Alternative, identified above.

Mitigation Measures

The IOS construction-related impacts would be reduced to a less-than-significant level if the construction mitigation measures for the No Build/TSM Alternative, described above, were implemented.

Light Rail Alternative - New Central Subway

Construction Impacts

Construction and subsequent operation of the New Central Subway would, in conjunction with the IOS, complete the Light Rail Alternative. For the purposes of this analysis, this New Central Subway construction impacts are those associated with construction from King Street to Stockton and Clay Streets.

Dust Emissions. Construction activities involving surficial soil movement would include construction of the Moscone, Market Street, and Union Square stations; portals; subway segments requiring cut and cover or surface excavation activities; and utility relocation/installation. These activities would occur over an estimated period of almost six years. About 5.6 hectares (1.4 acres) of surface area would be disturbed for the construction of the stations, about 0.16 hectares (0.4 acres) for the portals, about four acres for the subway segments, and about two acres for the utility relocation/installation. The PM_{10} emissions which

[55] Project Level Conformity Guidelines for the San Francisco Bay Area, MTC, proposed final dated September 1997; guidelines effective November 1997.

[56] The IOS would begin operations by about 2003. MTC guidelines require CO quantification for the following forecast years: 1) the first MTC TIP forecast year following the year the project is assumed operational (2005); and 2) the last RTP horizon year (2015).

[57] The intersections containing the three highest traffic volumes and the intersections with the LOS D, E, or F expecting to have the highest CO concentrations, were selected.

[58] Range for the VMT reflects the three dedicated flow and mixed flow options for the IOS segment. Daily VMT determined by Korve Engineering and MUNI.

[59] Although implementation of the IOS would be expected to reduce the overall regional emissions, a slight increase in regional emissions would result from the Metro East Maintenance Facility, discussion of the increased emissions is provided in the Western Pacific and Cargo Way Maintenance Facility sections below.

could result from construction/relocation activities were estimated for each construction component (refer to **Table 5-8**). PM_{10} emissions from construction-related activities would constitute a significant impact since the emissions would impair short-term air quality and could affect nearby residents and other sensitive receptors located downwind from construction activities.

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 both 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. The estimated daily exhaust emissions for ROG and NOx due to construction activities and off-site transport would increase compared to existing conditions or the No Project Alternative (refer to **Table 5-8**). Increased emissions would 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.

Operation Impacts

Intersection CO Levels. The New Central Subway would satisfy the first criteria of the transportation conformity requirements provided that it is included in the current RTP and TIP. Localized CO concentrations at various roadway intersections in the vicinity of the New Central Subway were estimated to evaluate the alternative's conformance with the second criteria of the conformity assessment.[60] CO concentrations were estimated in accordance with MTC's recently-published project-level conformity guidelines for the San Francisco Bay Area. CO concentrations were estimated for 2015 (refer to **Table 5-6**).[61] CO concentrations were estimated using the same methods as those estimated for the IOS portion of the Light Rail alternative. The estimated CO concentrations at all evaluated intersections evaluated are below the corresponding one-hour NAAQS and SAAQS and eight-hour NAAQS and SAAQS thresholds (refer to **Table 5-6**).

Regional Emissions. Implementation of the New Central Subway would result in a net reduction of daily VMT of about 10,000, compared to the No Project and No Build/TSM Alternatives and for the IOS. Although development in areas throughout the City would result in an increase in regional emissions implementation of this alternative would not contribute to the increase. For 2015, the total daily VMT estimated for the San Francisco region under the New Central Subway alternative was forecasted to range from about 26,790,470 to 26,790,982.[62] The reduction in VMT would consequently reduce ROG, NO_x, and PM_{10}, regional emissions, compared to the No Project Alternative (refer to **Table 5-7**).[63]

Cumulative Impacts

The cumulative impacts under the New Central Subway would be similar to those identified for the No Build/TSM Alternative and the IOS, discussed above.

Mitigation Measures

The New Central Subway construction-related impacts would be reduced to a less than significant level if the construction mitigation measures for the No Build/TSM Alternative, described above, were implemented.

[60] The full build-out New Central Subway alignment was evaluated in determining the critical intersections.
[61] The New Central Subway would begin operations before 2015.
[62] Range reflects dedicated flow and mixed flow options for segment three of the IOS. Daily VMT determined by Korve Engineering and MUNI.
[63] Although implementation of the New Central Subway would be expected to reduce the overall regional emissions, a slight increase in regional emissions would result from the Metro East Maintenance Facility, compared to the No Project/No Build/TSM alternatives. A discussion of the increased emissions is provided in the Western Pacific and Cargo Way Maintenance Facility sections below.

Western Pacific and Cargo Way Maintenance Facility Sites

Construction Impacts

Dust Emissions. Construction of either maintenance facility site would require site preparation, soil excavation, grading, and backfilling. The selected maintenance facility site would be constructed within approximately 27 months and conducted simultaneously with the construction of the IOS. About 13 acres of surface area would be used to construct either Western Pacific maintenance facility sites and about 19 acres for the Cargo Way maintenance facility site. As previously indicated, the PM_{10} emissions associated with soil movement activities for the maintenance facility site and IOS track installation were estimated to be about 0.5 ton per day for either Western Pacific maintenance facility sites, and about less than two tons per day for the Cargo Way site (refer to **Table 5-8**).[64] The PM_{10} emissions generated from construction-related activities would constitute a significant impact since the emissions would impair short-term air quality and could affect nearby residents and other sensitive receptors located downwind from construction activities.

Exhaust Emissions. Short-term exhaust emissions generated from construction-related equipment and off-site soil transport were calculated (refer to **Table 5-8**). The estimated daily exhaust emissions for ROG and NO_x due to construction activities and off-site transport of soil would increase compared to existing conditions (No Project Alternative). Increased emissions would affect short-term air quality and could affect nearby sensitive receptors. However, the emissions are not to expected to cause or contribute to violations of ambient air quality standards.

Operation Impacts

Intersection CO Levels. Operation of the maintenance facility would create additional vehicular traffic on local roads, thereby increasing CO concentrations in these areas. As described for the IOS section above, CO emissions were calculated at various roadway intersections in the vicinity of the Light Rail Alternative for 2005 and 2015 (refer to **Table 5-6**). The estimated CO concentrations at all intersections evaluated are below the corresponding one-hour and eight-hour NAAQS and SAAQS thresholds (refer to **Table 5-6**).

The maintenance facility may include environmental/waste treatment facilities and LRV work spots. The LRV work spots would include repair/daily service, car washing and under car blow-down activities, car body shop, paint shop, and support shops (i.e., truck/wheel/axle repair and battery shop). The operations at the maintenance facility would likely involve the use of organic compounds (i.e., solvents and coatings), based on the identified services and shops at the facility. BAAQMD's Regulations 2 and 8 include permit and performance standards for activities involving the use of organic compounds. The purpose of the permit and performance standards is to control the emissions of air pollutants from regulated sources and is applicable to specific types of organic compound materials' usage and operational activities.

In addition, compliance with BAAQMD's Risk Management Policy may be required, depending on the lead emission levels generated at the battery shop. The goal of the Risk Management Policy is to prevent any proposed sources (i.e., battery shop) from generating new air toxic problems. Compliance with BAAQMD regulations and Risk Management Policy, as applicable, would reduce the potential air quality effects associated with the use of organic compounds to a less-than-significant level.

[64] Cumulative PM_{10} emissions were calculated for the IOS and Maintenance Facility construction activity since the construction would be performed simultaneously.

Regional Emissions. Regional emissions would slightly increase due to additional vehicular traffic to and from the maintenance facility site; however, there would be a net reduction of daily VMT for the region with the implementation of the Light Rail Alternative, compared to the No Project and No Build/TSM Alternatives.

Regional emissions of ROG, NO_x, and PM_{10} for the maintenance facility were estimated using URBEMIS-5 for 2015. The expected increase in emissions from the maintenance facility sites would be below BAAQMD's threshold of significance for ROG, NO_x, and PM_{10} of 80 lb/day **(Table 5-9)**.

TABLE 5-9

ESTIMATED 2015 REGIONAL EMISSIONS GENERATED BY THE MAINTENANCE FACILITY (POUNDS PER DAY)

Alternative	**Pollutants**		
	ROG	**NO_x**	**PM_{10}**
Light Rail Alternative - Western Pacific Maintenance Facility [(1)]	3.33	5.96	7.55
Light Rail Alternative - Cargo Way Maintenance Facility [(1)]	4.88	8.72	11.03[(2)]
BAAQMD Threshold of Significance	80	80	80

Notes: (1) Overall, the Light Rail Alternative would result in a net reduction in regional emissions, although a slight increase in regional emissions would result from the Maintenance Facility.
(2) The PM_{10} emissions estimated by the URBEMIS model consist of tailpipe and tire wear; emissions from entrained road dust are not included and were therefore calculated manually and added to the PM_{10} emissions calculated by URBEMIS5.
ROG = Reactive organic gases.
NO_x = Nitrogen oxides.
PM_{10} = Particulate matter less than ten microns in diameter.

Cumulative Impacts

The cumulative impacts associated with the maintenance facility alternative would be similar to those identified under the No Build/TSM and Light Rail Alternatives, identified above.

Mitigation Measures

The construction-related impacts would be reduced to a less than significant level if the construction mitigation measures for the No Build/TSM Alternative, described above, were implemented.

5.13 NOISE AND VIBRATION

5.13.1 INTRODUCTION

General Approach - Construction Noise

Construction noise varies greatly depending on the construction process, type and condition of equipment used, and layout of the construction site. Many of these factors are traditionally left to the contractor's discretion, which makes it difficult to accurately estimate levels of construction noise. The noise impact assessment for a construction site is based on:

- an estimate of the type of equipment that will be used during each phase of the construction and the average daily duty cycle for each category of equipment;
- typical noise emission levels for each category of equipment such as those in **Table 5-10**; and
- estimates of noise attenuation as a function of distance from the construction site.

Although the lack of specific information available at the time of the environmental assessment makes estimates of construction noise approximate, the projections do provide a good picture of where noise impacts are likely to occur and the general types of noise mitigation that would be required to mitigate the impacts.

Table 5-10 summarizes relevant data on noise emissions of construction equipment from the FTA guidance manual. Shown are the average of the Lmax values at a distance of 15.2 meters (50 feet). Although the noise levels in the table represent typical values, there can be wide fluctuations in the noise emissions of similar equipment. In fact, several of the noise levels in **Table 5-10** would exceed the limit in the San Francisco noise ordinance that would be applicable to this project.

TABLE 5-10

CONSTRUCTION EQUIPMENT NOISE EMISSION LEVELS

Equipment Type	Typical Sound Level at 50 ft (dBA)
Backhoe	80
Bulldozer	85
Compactor	82
Compressor	81
Concrete Mixer	85
Concrete Pump	82
Crane, Derrick	88
Crane, Mobile	83
Generator	81
Loader	85
Pavement Breaker	88
Paver	89
Pile Driver, Impact	101
Pump	76
Roller	74
Shovel	82
Truck	88

Construction noise at a given noise-sensitive location depends on the magnitude of noise during each construction phase, the duration of the noise, and the distance from the construction activities. Projecting construction noise requires a construction scenario of the equipment likely to be used and the average utilization factors or duty cycles (i.e. the percentage of time during operating hours that the equipment operates under full power during each phase). Using the typical sound emission characteristics, as given in **Table 5-10**, it is then possible to estimate Leq or Ldn at various distances from the construction site.

Table 5-11 is an example of the noise projections for equipment that is often used during rail transit construction. For the calculations, it is assumed that all the equipment is located at the geometric center of the construction work site or construction staging area. Based on this scenario, a 12 hour Leq of 88 dBA should be expected at a distance of 15.2 meters (50 feet) from the geometric center of the work site. This is equivalent to an Leq of approximately 74 dBA at a distance of 76.2 meters (250 feet) from the construction site, approximately equivalent to the daytime Leq in the study area along Third Street. It is also approximately equal to the nighttime Leq plus 5 dBA, which is the limit for nighttime noise in the San Francisco regulations. Since many of the construction activities would take place within 76.2 meters (250 feet) of residential land uses, this is an indication that for any areas where there will be nighttime construction, noise limits would be included in the construction specifications to ensure that the construction is in compliance with the City regulations.

TABLE 5-11

TYPICAL EQUIPMENT LIST FOR RAIL TRANSIT CONSTRUCTION

Equipment Item	Typical Sound Level at 50 ft (dBA)	Equipment Utilization Factor (%)	Leq (dBA)
Air Compressor	81	50%	78
Backhoe	80	40%	76
Crane, Derrick	88	10%	78
Dozer	85	40%	81
Generator	81	80%	80
Loader	85	40%	81
Pavement Breaker	88	4%	74
Shovel	82	40%	78
Dump Truck	88	16%	80
Total workday Leq at 50 feet (12 hour workday)			88

General Approach - Operation Noise

The general approach used to assess potential noise impacts for residential land uses is to:

- estimate existing noise exposure at all noise sensitive receptors that could be affected by the light rail noise (the existing noise conditions are discussed in Section 4.12.3);
- use the estimates of existing noise with the FTA noise impact criteria discussed in Section 4.12.2 to determine the threshold for noise impact from light rail noise; and
- use a model of light rail noise as a function of train speed, train length, distance from the tracks, type of track, and number of trains per day to estimate the distance from the track to the noise impact threshold. (The noise impact distances have been used with aerial photographs of the study area to determine whether light rail operations would cause noise impact at any residences.)

In addition, specific calculations of the noise exposure have been developed for all noise sensitive institutional land uses such as schools and churches.

Train Noise Prediction Model

The models used to project noise from the proposed alternatives are based on measurement data from operational transit systems across the country, the noise limits included in the purchase specifications for the new LRVs being supplied by Breda[65], and standard models of transit train noise that are given in the FTA Guidance Manual. The specific parameters used in the model are:

Maximum Passby Level:	80 dBA (2-car train, 40 mph, ballast and tie track, 50 feet from track centerline)
Train Length:	1-car, 75 feet long

[65] The LRT vehicles initially delivered to MUNI from Breda had noise problems associated with the control system. Based on the most recent testing, these problems have been resolved and the vehicles now meet the noise specifications. (Reference: Test Report SFST 04/03 – R3, RO7-VO7.A61, Rev. 1, "Dynamic Exterior Noise Tests," June 6, 1997)

Ground Conditions:	Hard ground
Operating Hours:	5 a.m. to 2 a.m.
Total Number of Trains per Day in each direction	
Daytime (7 a.m. to 10 p.m.):	130
Nighttime (10 p.m. to 7 a.m.):	25
Train Speed:	5 to 35 mph on at-grade track sections as indicated in preliminary capacity evaluation

The assumed maximum passby level of 80 dBA for a 2-car train is based on the specification for the new Breda light rail vehicles that limits maximum noise to 77 dBA at 15.2 meters (50 feet) at any time when accelerating from 0 to 40 mph or when decelerating from 40 to 0 mph. Increasing the level to 80 dBA for the impact assessment accounts for some noise increase as the vehicles age and some additional noise for embedded track compared to open ballast and tie track. The noise levels are slightly higher with embedded track compared to open ballast and tie track because ballast is more acoustically absorptive than the surface materials used for embedded track.

Figure 5-6 illustrates the projected Ldn for operation at 35 mph on a section of embedded track. The curve is adjusted for other speeds using the relationship:

$$\text{adjustment in dB} = 20\ log\ (\text{speed}/35)$$

For example, the curve should be moved down by 3 decibels if the train speed is 25 mph. The model also needs to be adjusted near special trackwork such as at crossovers. The wheel impacts at the track gaps for special trackwork causes noise levels to increase by about 5 decibels.

Approach to Vibration Impact Assessment

Detailed projection of ground-borne vibration require detailed information about parameters such as soil stiffness, soil damping, layering of the soil, depth to bedrock, and depth to water table. Because this type of detailed information is difficult to gather and is rarely available, alternative methods have been developed for projecting levels of ground-borne vibration using empirical measures of vibration propagation. The test procedure is discussed in Section 4.12-4.

Two models have been developed for ground-borne vibration projections, one for the at-grade sections and one for the subway sections. The at-grade model is based on the propagation tests along with vehicle vibration tests that were performed for previous projects. In addition, the vibration curves were adjusted to reflect recent ground-borne vibration measurement data with the new Breda vehicles, which has shown that the Breda vehicles generate substantially higher levels of ground-borne vibration in the frequency range of 12 to 40 Hz. This is thought to be due to a 12 percent or more increase in the unsprung mass/weight vs. the Boeing light rail vehicles.

The model for subway tracks is based on measurements of ground-borne vibration generated by MUNI trains operating in the Market Street Subway. The vibration testing was performed between 5 a.m. and 6:30 a.m. when traffic on Market Street was still relatively light. For this assessment, it was assumed that vibration from revenue service trains of Breda vehicles operating in the Market Street Subway are representative of the vibration that would be generated by trains operating in the subway portions of the New Central Subway. As such, the projections of ground-borne vibration from the subway operations represent a screening to identify potential impacts. More detailed projections would be performed during the final design phases to verify this impact assessment.

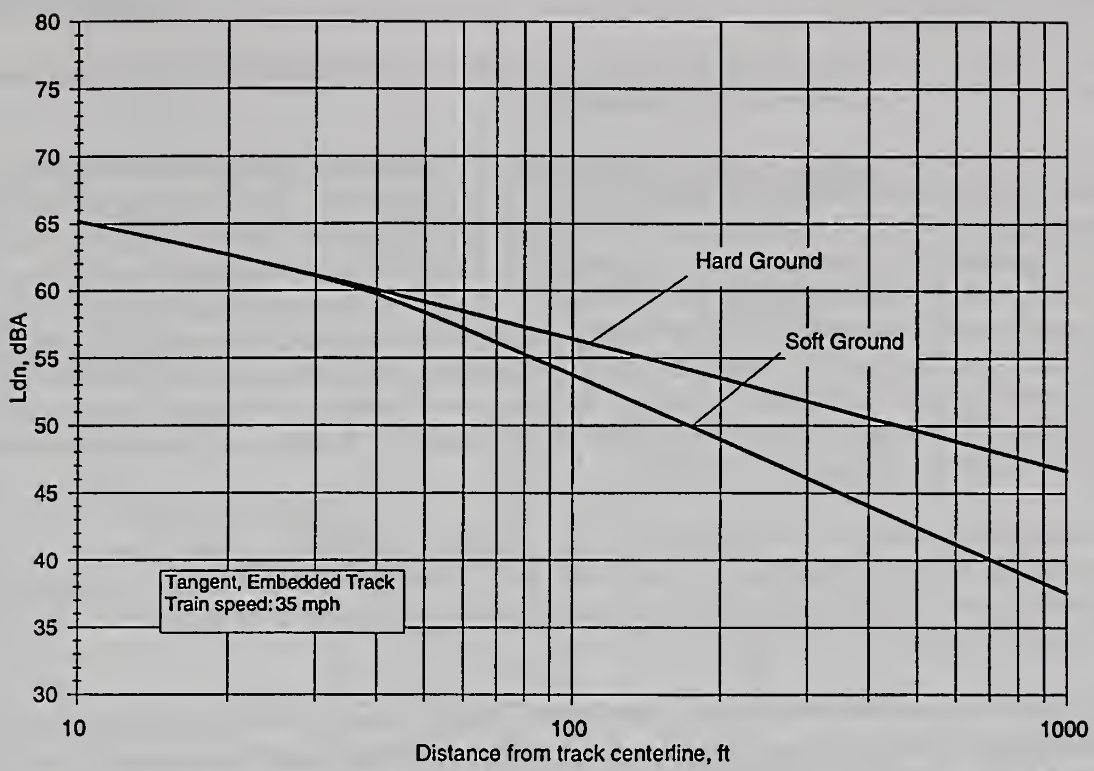

FIGURE 5-6

**PROJECTED LDN,
LRT OPERATIONS ON EMBEDDED TRACK**

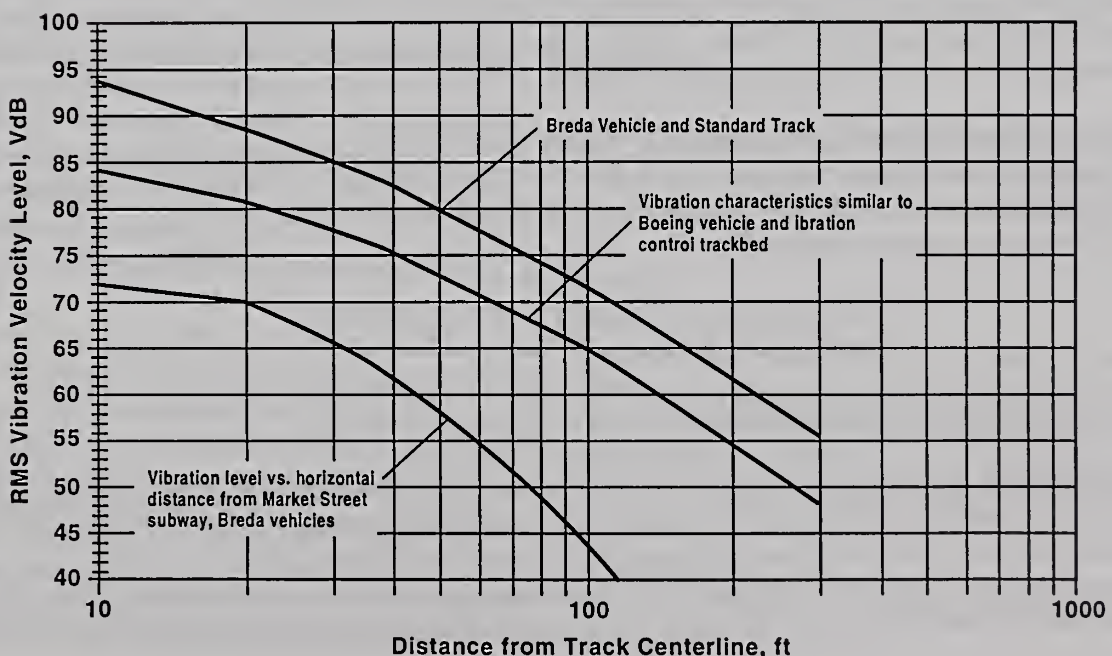

FIGURE 5-7

**SF MUNI GB VIBRATION, EMBEDDED TRACK
WITH AND WITHOUT MITIGATION, 35 MPH**

Source: ICF Kaiser Engineers, Inc.

J96-082.90-2 (2/17/98)

Figure 5-7 shows the basic curves that have been used to assess potential impacts from ground-borne vibration. Shown are the following three curves:

1. Breda vehicle operating on at-grade track. Relatively little data are available on the vibration levels generated by trains operating on different types of at-grade track. The force density used to develop this curve is based on measurements of the Boeing light rail vehicles made on ballast and tie track and older sections of embedded track. The embedded track was basically ballast and tie track with an asphalt road surface constructed over the ballast. This is very similar to the embedded track treatment planned for the Third Street Light Rail Project, except the track would be in a raised median with curbs and with another surface treatment instead of asphalt. Measurements of ground-borne vibration generated by Breda and Boeing vehicles on the same track sections were used to adjust the Boeing data to reflect the Breda vehicles. The adjustments are necessary because no direct measurements of the Breda vehicle force density are available.

2. A mitigated version of the first curve. The assumed mitigation is modifications to the Breda suspension system so that the vibration levels are no worse than the Boeing vehicles, and use of a vibration control track system that provides attenuation equivalent to a ballast mat. The mitigation measures are discussed in Section 5.13.5.

3. The best fit curve of vibration level vs. horizontal distance from the track centerline for Breda vehicles operating in the Market Street Subway. In these tests, overall ground-borne vibration levels from the Breda vehicles was an average of about 3 VdB higher than the vibration from the Boeing vehicles.

These curves are for vibration at the ground surface. For this analysis, it has been assumed that the vibration is transmitted into lightweight wood frame buildings with little or no change. Basically, this is equivalent to assuming that the attenuation due to coupling loss at the ground-foundation interface is offset by the amplification by floor and wall resonances. The appropriate impact thresholds are 72 VdB for residential buildings and 75 VdB for institutional buildings such as schools and churches. The curves indicate that for train speeds of 35 mph, vibration impact is expected out to about 30.5 meters (100 feet) from ballast and tie track. With the assumed mitigation, the distance is reduced to 18.3 meters (60 feet).

In contrast, vibration from train operations in subway is not projected to exceed the impact threshold for residential land uses beyond a distance of about 6.1 meters (20 feet) from the track centerline. The following adjustments should be made to the curves in **Figure 5-6** to account for different train speeds and for wheel impacts at special trackwork:

Speed Adjustment in decibels = 20 log(speed/35)
Special track adjustment = +5

5.13.2 NOISE IMPACT ASSESSMENT

The results of the noise impact assessment are summarized in **Table 5-12** for residential land uses and **Table 5-13** for institutional land uses. As indicated in these tables, no noise impacts are projected. This is largely because the Third Street Corridor is already exposed to relatively high levels of traffic noise and the addition of light rail operations in the median of Third Street and Bayshore Boulevard would increase total noise exposure by an insignificant amount. The projections for each of the rail segments are discussed below.

TABLE 5-12

SUMMARY OF NOISE IMPACT ASSESSMENT FOR RESIDENTIAL LAND USES

Location	Closest Resid., ft	Train Speed, mph	Ldn, dBA			Impact Dist., ft	# Resid[3]
			Exist	Impact Thresh[1]	LRT[2]		
Segment 1							
Caltrain Stn. to 101 Fwy.	50	5-30	77	70	58	<10	0
Segment 2							
101 Fwy to Key	50	30-35	70	64	59	15	0
Key to Armstrong	50	25-35	77	70	59	<10	0
Armstrong to Thomas	40	25-35	73	67	60	<10	0
X-over between Armstrong & Yosemite	45	25	73	67	62	15	0
Segment 3							
Thomas to Palou	55	30-35	73	67	59	<10	0
Palou to Jerrold	50	30-35	76	69	59	<10	0
Segment 4							
Jerrold to Evans	65	30-35	76	69	58	<10	0
Evans to 16th	50	25-35	73	67	59	<10	0
Segment 5							
16th Street to King	500	25-35	62	59	50	60	0
Segment 6	<no noise sensitive receptors>						
Segment 7							
King to Tunnel Portals	30	25	70	64	61	15	0

Notes:
(1) FTA threshold for moderate impact.
(2) Noise level due to light rail operations at minimum distance and maximum speed.
(3) Number of residential buildings within the distance for moderate impact.

Segment 1 - Caltrain Bayshore Station to the 101 Overcrossing

The light rail line would be about 15.2 meters (50 feet) from the closest residences in this segment. The existing noise exposure is estimated to be almost 20 decibels greater than what would be caused by the light rail operations.

Segment 2 - Highway 101 Overcrossing to Thomas Avenue

Noise levels are lower for the first part of this segment since southbound traffic is diverted off of Third at Jamestown Avenue. However, the estimated noise impact distance is still only 4.6 meters (15 feet) from the track centerline. For the remainder of the segment, the existing noise levels are estimated to be substantially higher with the result that the noise impact distance is less than 3.0 meters (10 feet). Noise levels will be highest in this corridor between Armstrong and Yosemite Avenues because of the #10 crossover located in this area. Even with the crossover, the estimated impact distance is only 4.6 meters (15 feet).

There are several churches and schools along Third Street in this segment. However, as seen in **Table 5-13**, the projected noise levels are well below the impact thresholds.

TABLE 5-13

SUMMARY OF NOISE IMPACT ASSESSMENT FOR INSTITUTIONAL LAND USES

Receiver	Location	Distance to Nearest Track, ft	Existing Leq, dBA	LRT Speed, mph	Daytime Leq, dBA		Impact (3)
					Impact Thresh (1)	LRT (2)	
Segment 1	<no noise sensitive institutional land use>						
Segment 2							
Church/School	North of Key St., east of Third St.	50	70	35	69	58	No
Church	South of Paul Ave., west of Third St.	50	74	35	70	58	No
Church	North of Paul Ave., west of Third St.	110	70	35	69	55	No
School	North of Fitzgerald Ave., east of Third St.	60	67	35	67	58	No
Church	North of Armstrong Ave., east of Third St.	140	68	25	68	51	No
Segment 3							
Church	South of Revere Ave., east of Third St.	100	67	35	67	56	No
Church	South of Bay View St., west of Third St.	80	68	35	68	57	No
Library	North of Revere Ave., east of Third St.	40	71	35	70	58	No
School	South of Newcomb Ave., east of Third St.	60	69	35	69	58	No
St. Johns Church	North of Jerrold Ave., east of Third St.	40	74	30	70	58	No
Segment 4							
School	North of Evans Ave., east of Third St.	110	70	35	69	55	No
Segment 5	<no noise sensitive institutional land use>						
Segment 6	<no noise sensitive institutional land use>						
Segment 7	<no noise sensitive institutional land use>						

Notes:
(1) FTA threshold for moderate impact.
(2) Noise level due to light rail operations at minimum distance and maximum speed.
(3) Impact at institutional land uses due to light rail operations.

Segment 3 - Thomas Avenue to Jerrold Avenue

Segment 3 includes a number of residential land uses, both single family and multi-family. However, no impacts are projected because of the high levels of existing noise caused by traffic on Third Street. There are also several churches, a school and a library along Third Street in this segment. The projected noise exposure at all of these institutions is at least 10 decibels lower than the impact threshold.

Segment 4 - Jerrold Avenue to 16th Street

There are two areas of residential land use in this segment: from Jerrold Avenue north about three blocks and on the west side of Third Street between 22nd and 23rd Streets. Both of these areas have high level of existing noise because of traffic on Third Street with the result that the estimated noise impact distances are less than 3.0 meters (10 feet) from the tracks. The one school in this area is on the east side of Third Street just north of Evans. The projected noise exposure at the school building that would be closest to the light rail tracks is 14 dBA below the impact threshold.

Segment 5 - 16th Street to King Street

The only existing noise sensitive land use in this segment is a small community of houseboats west of Fourth Street. Although noise levels are lower at the houseboats than in most of the Corridor, they are much farther from Fourth Street than the impact distance of 18.3 meters (60 feet). Possible noise sensitive receptors (residences, schools, day care facilities) may be planned as part of the Mission Bay South development. However, it is likely that these planned uses would be located outside the 18.3-meter (60-foot) threshold distance. Since the transportation improvements would be adopted before the Mission Bay redevelopment plans would be completed, thereby permitting the Mission Bay plans, to be developed in a manner that recognizes noise and vibration impacts from light rail.

Segment 6 - Third/Fourth to the Market Street Subway

No noise sensitive land uses were identified in this segment.

Segment 7 - King to Stockton/Jackson, New Central Subway

This segment would be above ground along Third and/or Fourth Streets until the tunnel portals. There are several apartment/condominium complexes that would be only about 9.1 meters (30 feet) from the light rail tracks. A hotel complex is planned as part of the proposed Mission Bay North development. However, the existing noise levels are high enough that the estimated noise impact contour would extend only 4.6 meters (15 feet) from the track centerline. No noise impacts were identified in this segment.

Light Rail Facilities

New LRV Maintenance and Storage Facility

The two sites being considered by MUNI for construction of a new LRV maintenance and storage facility are either an abandoned Western Pacific rail yard or a site along Cargo Way immediately south of Islais Creek and Pier 90. Both of these sites are in industrial areas with no existing noise sensitive land uses nearby. No noise impacts are projected during either construction or operation of the light rail or bus maintenance facility that would affect existing sensitive receptors.

Traction Power Substations

Noise sources associated with traction power substations are usually limited to the fans used to ventilate the substation buildings and a low-level humming noise that is caused by magnetostriction of the transformer core. These noises are not normally a source of community annoyance unless a substation is located very close to residences, the background noise levels are very low, or the substation ventilation system is particularly noisy. The purchase specifications for the traction power substations will include noise limits to ensure that any substations located near noise sensitive areas do not cause unusually high noise levels. The maximum substation sound levels are projected to be:

50 dBA	at	7.6 m (25 ft) from any part of the substation building
44 dBA	at	15.2 m (50 ft) from any part of the substation building
38 dBA	at	30.5 m (100 ft) from any part of the substation building

These sound levels are substantially lower than what was measured throughout most of the corridor even during the late night and early morning hours. The acoustical analysis shows that there will be no noise impacts as long as there is at least 12.2 meters (40 feet) of separation between the substation buildings and the closest noise sensitive receptor. In areas along Third Street that are directly exposed to noise from traffic on Third Street, a separation distance of 7.6 meters (25 feet) will be sufficient to avoid any noise impact from substation noise.

5.13.3 VIBRATION IMPACT ASSESSMENT

The results of the vibration impact assessment are summarized in Table 5-14. The preliminary analysis indicated a number of vibration impacts are projected for Segments 1, 2, 3, and 4. This reflects that the light rail tracks would be about 50 feet from the closest residences in these segments, and the impact distance is about 100 feet. Results of this preliminary analysis, which were refined by Harris, Miller, Miller, Hanson, are presented in Table 5-14. The mitigation of ground-borne vibration is discussed in Section 5.13. 5.

The projections for each of the rail segments are discussed below:

Segment 1 - Caltrain Bayshore Station to the 101 Overcrossing

No vibration effects are projected for any of the residences.

Segment 2 - Highway 101 Overcrossing to Thomas Avenue

Although much of Third Street in this segment is commercial land uses, there are also a number of single-family, multi-family and institutional land uses on Third Street. No vibration effects are projected along this segment due, in part, to the inefficient high-frequency propagation characteristics of the ground in this area.

Segment 3 - Thomas Avenue to Jerrold Avenue

No vibration effects are projected at any of the residential or institutional land uses distributed along this segment. Vibration impacts are unlikely due to the inefficient high-frequency vibration propagation characteristics of the soils in this area.

Segment 4 - Jerrold Avenue to 16th Street

Ground-borne vibration effects are projected for a total of two mixed-residential/commercial buildings along this segment. The buildings are located at the northern end of the segment between 20th and 22nd Streets. The vibration impact is due to the special trackwork (crossover) located near these buildings along this segment. Although there are a number of residences along Bayshore between San Bruno and the Highway 101 overcrossing, vibration propagation tests showed the soil in this area to have inefficient propagation characteristics, resulting in low vibration levels at these residences.

Segment 5 - 16th Street to King Street

The only existing vibration sensitive receptors identified in this segment is the small group of houseboats on Mission Creek. They are far enough from the proposed location of the light rail tracks that ground-borne vibration would be well below the impact threshold. Possible future vibration sensitive receptors (e.g., laboratories, research facilities) may be planned for this segment associated with the proposed Mission Bay South development. However, plans for the Third Street light rail line could be adopted before the Mission Bay redesign plans would be completed so that sensitive receptors could be located beyond the 18.3-meter (60-foot) threshold distance from the track centerline to minimize potential vibration impacts.

TABLE 5-14

SUMMARY OF GROUND-BORNE VIBRATION AND NOISE IMPACT ASSESSMENT FOR RESIDENTIAL LAND USES
(Revised September 11, 1998)

Location	Closest Residence, ft	Speed, mph	Max. Impact Dist., ft		Number of Residential Impacts	
			No Mitigation	With Mitigation(1)	No Mitigation	With Mitigation(1)
Segment 1	50	5-30	45	-	0	0
Segment 2	-	25-35	35	-	0	0
	45	-	35	-	0	
Segment 3	50	30-35	35	-	0	0
Segment 4	50	30-35	35	40	0	0
Segment 5	500	25-35	30	--	0	0
Segment 6	<no noise sensitive receptors>					
Segment 7						
At-Grade Track	30	25	25(2)	--	0	0
Subway	30	15-45	20	-	0	0
Total Impacts					2	0

Notes:

(1) Ground-borne vibration mitigation is discussed in Section 5.13.5.

(2) The residential buildings on this section of track are relatively large masonry construction with spread footings or pile foundations. The estimated impact distance is less in Segment 7 than farther south on Third Street because of the attenuation assumed to occur at the soil/foundation interface.

Table 5-15 has been intentionally deleted (refer to FEIS/FEIR Volume II, "Staff Initiated Changes).

Segment 6 - Third/Fourth to the Market Street Subway

No vibration sensitive land uses were identified in this segment.

Segment 7 - King to Stockton/Jackson, New Central Subway

There are several areas of residential land use along both the at-grade and subway sections of this segment. All of the ground-borne vibration projections are below the impact thresholds. This is partly because all of the affected buildings are relatively large with either spread or pile foundations. Some vibration attenuation due to coupling loss at the soil/foundation interface has been assumed, which reduces the impact distance along the at-grade track section to less than 7.6 meters (25 feet).

Western Pacific and Cargo Way Maintenance and Storage Facility Sites

The only operation related to the new LRV maintenance facility that could cause an impact from ground-borne vibration is movements of LRV's in and around the facility. The two sites being considered by MUNI for construction of a new LRV maintenance facility are an abandoned Western Pacific rail yard or a site along Cargo Way immediately south of Islais Creek and Pier 90. Both of these sites are in industrial areas with no existing vibration sensitive land uses nearby. No vibration impacts are projected during either construction or operation of the maintenance facility that would affect existing receptors.

5.13.4 TRAFFIC NOISE

This project would affect traffic patterns throughout the corridor which could cause substantial changes in the traffic volumes. The FHWA approved model for traffic noise uses the following relationship to adjust Leq for different traffic volumes assuming the same mix automobiles, medium trucks and heavy trucks:

$$\text{change in Leq} = 10\ \log(\text{new traffic volume} \div \text{old traffic volume})$$

This means that it requires a doubling of traffic volume to cause a 3 decibel increase in Leq.

The relationship given above has been used with the existing and projected traffic volumes in a screening process to determine whether there are any areas where changes in traffic volume would be sufficient to cause noise impacts. For this screening, no noise impact was considered to occur as long as the projected changes in traffic volume would cause less than a 2 dB change in peak hourly Leq. Peak hourly Leq is the quantity normally used in evaluating noise impacts from highway projects. The results of this analysis are summarized in **Table 5-16**. **Table 5-16** includes some representative road segments from noise sensitive sections of the Corridor. The projections are that no noise impacts would occur from traffic noise since the changes in traffic volume will not cause more than a 1.9 dB change in noise exposure. An analysis of the future No Build scenario was also conducted, and the noise exposure changes were very similar to the future build scenario. The changes in noise exposure on King Street and Mariposa Street (the road segments with the highest change in noise exposure) are identical in both scenarios, indicating that the noise level increase is not due to the project.

TABLE 5-16

NOISE LEVEL CHANGES DUE TO CHANGES IN TRAFFIC VOLUMES

Road Segment	Existing Traffic Volume		Future Traffic Volume (2015)		Noise Level Change, dB	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
3rd St. between Townsend St. and King St.	1803	1878	2020	1848	0.5	-0.1
King St. between 3rd St. and 4th St.	2357	1854	3009	2741	1.1	1.7
3rd. St. between Mariposa St. and 17th St.	2466	2621	2681	2617	0.4	0.0
Mariposa St. between 3rd St. and Tennessee St.	833	890	1107	1379	1.2	1.9
3rd. St. between Oakdale Ave. and Newcomb Ave.	1728	1955	2170	2491	1.0	1.1
Oakdale Ave. between 3rd St. and Newhall St.	361	544	419	582	0.6	0.3
3rd St. between Queseda Ave. and Palou Ave.	1642	1818	2106	2407	1.1	1.2
Queseda Ave. between 3rd St. and Lane St.	86	604	125	300	1.6	-3.0
Bayshore Blvd. between Arleta Ave. and Hester Ave.	2407	2463	2724	3224	0.5	1.2
Arleta Ave. between Bayshore Blvd. and Alpha St.	421	563	443	606	0.2	0.3

5.13.5 MITIGATION MEASURES

Construction Noise and Vibration

Construction of the light rail line would be subject to the San Francisco noise regulations as discussed in Section 4.12.2. There are a number of additional measures that can be taken to minimize intrusion without placing unreasonable constraints on the construction process or measurably increasing costs. These include: noise monitoring to ensure that contractors take all reasonable steps to minimize noise, inspections and noise testing of equipment to ensure that all equipment on the site is in good condition and effectively muffled, and an active community liaison program. This program should keep residents informed about construction plans so they can plan around periods of particularly high noise levels and should provide a conduit for residents to express any concerns or complaints about noise.

The primary measures that reduce noise include specific noise control requirements in the construction specifications. These measures are also required by the City's Noise Ordinance. These would require the contractor to:

- *Perform all construction in a manner to minimize noise.* The contractor should be required to select construction processes and techniques that create the lowest noise levels (e.g., using predrilled piles instead of impact pile driving, mixing concrete offsite instead of onsite, and using hydraulic tools instead of pneumatic impact tools).
- *Use equipment with effective mufflers.* Diesel motors are often the major noise source on construction sites. Contractors should be required to employ equipment fitted with the most effective commercially available mufflers.

- *Perform construction in a manner that maintains noise levels at noise sensitive land uses below specific limits.*
- *Perform noise monitoring to demonstrate compliance with the noise limits.* Independent noise monitoring should be performed to check compliance in particularly sensitive areas.
- *Minimize construction activities during evening, nighttime, weekend and holiday periods.* Permits should be required before construction can be performed in noise sensitive areas during these periods. In any case, the nighttime restrictions in the San Francisco noise ordinance (e.g., a variance is required if construction noise between 8 p.m. and 7 a.m. is in excess of ambient plus 5 dBA) will be applicable to all construction for the light rail line.
- *Select haul routes that minimize intrusion to residential areas.* This is particularly important for the trench alternatives that will require hauling large quantities of excavation material to disposal sites.

It is expected that ground-borne vibration from construction activities will cause only intermittent localized intrusion along the alignment. Although processes such as earth moving with bulldozers can create annoying vibration, there should be only isolated cases where it is necessary to use this type of equipment in close proximity to residential buildings.

Following are some procedures that can be used to minimize the potential for annoyance or damage from construction vibration:

- *Limit or prohibit use of construction techniques that create high vibration levels.* At a minimum, processes such as pile driving should be prohibited at distances less than 250 feet from residences. When piles must be set near residential areas, the contractor would be required to use pre-drilled piles or other measures that minimize impact pile driving.
- *Restrict procedures that contractors can use in vibration sensitive areas.* It is often possible to employ alternative techniques that create lower vibration levels. For example, unrestricted pile driving is one activity that has considerable potential for causing annoying vibration. Using the cast-in-drilled-hole piling method instead will eliminate most potential for vibration impact from the piling.
- *Require vibration monitoring during vibration intensive activities.*
- *Restrict the hours of vibration intensive activities such as pile driving to weekdays during daytime hours.* (Required by City Ordinance.)

Light Rail Operation Noise

Although light rail operations would be a new noise source along the Third Street Corridor, because of the high levels of existing noise caused by vehicular traffic on Third Street and other arterials, the small amount of additional noise from light rail operations is not projected to cause any noise impacts. No noise measures are required to mitigate noise impacts.

Light Rail Operation Ground-Borne Vibration

Because the light rail vehicles that are planned to be used on the Third Street Corridor tend to generate relatively high levels of ground-borne vibration, a number of impacts are projected to occur from ground-borne vibration and ground-borne noise. Since the design is still in the conceptual stage, the type of track support system and vehicle characteristics have not been finalized. In developing projections, it was assumed that light rail transit operations on the Third Street Corridor would generate similar ground-borne vibration forces as have been measured on existing sections of embedded track on the MUNI light rail system. The embedded track was tie and ballast track covered by asphalt, similar to what is planned for the Third Street light rail line except that the surface treatment would be concrete.

The effectiveness of specific mitigation measures will be determined during the final design phase after the vehicle characteristics have been defined and the basic track support system has been designed. The measures that should be considered include:

- *Modifying the transit vehicle suspension to reduce vibration forces.* Recent tests comparing ground-borne vibration from the new Breda vehicles and the older Boeing vehicles shows that the Breda vehicles generate significantly higher vibration levels in the 12 to 40 Hz frequency range. Modifying the Breda vehicle suspension system so that they no longer generate higher levels in this frequency range would result in about 3 to 5 decibel reduction of overall vibration levels. **Vibration measurements of modified Breda vehicles indicate that the reduction of 4 to 6 decibels within this frequency range can be achieved. Based on these results, it has been assumed for the impact assessment that the Breda vehicles will be modified such that vibration levels in the 12 to 40 range will be reduced by 2 to 5 decibels.**
- *Installing a vibration control track system such as ballast mats.* The vibration attenuation provided by ballast mats is strongly dependent on the design of the mat and the frequency spectrum of the ground-borne vibration. Ballast mats can be very effective at frequencies greater than 40 Hz, however, at lower frequencies there is the potential the mat to cause a small amplification. The attenuation of ballast mats can exceed 10 decibels at frequencies above 50 Hz, however, the reduction in overall vibration velocity is usually closer to 5 decibels. Most at-grade ballast mats have been installed on concrete pads or inside concrete "tubs." There is some controversy about whether the concrete pad or tub is necessary for a ballast mat to operate effectively. Some recent ballast mat installations have been directly on compacted subgrade. Should this prove to be effective, it would be a relatively cost-effective means to mitigate the vibration impacts.
- *Installing floating slab trackbed.* Floating slab trackbed basically consists of concrete slab track that is "floated" on rubber pads. There are several examples where floating slab tracks have been successfully used to control vibration from embedded track. They have the advantage of providing very predictable vibration control. The primary disadvantages are the substantial costs required for the initial construction of floating slab track and the potential for maintenance problems and costs after the system has been installed for several years.
- *Relocate crossovers and other special trackwork away from vibration sensitive receptors.* Wheel impacts at **crossovers** can substantially increase the levels of ground-borne vibration. When feasible, the impacts caused by the wheel impacts can be avoided by moving the special trackwork away from residential land uses **to increase the distance between the track and receptors.**

For this assessment, the ground-borne vibration impacts have been reassessed assuming a combination of modified vehicle suspension system and a vibration control track support system. The locations where the projections indicate that vibration mitigation would be needed and the preliminary recommendations for mitigation are given in **Table 5-17** below.

TABLE 5-17

SUMMARY OF VIBRATION MITIGATION MEASURES
(Revised September 10, 1998)

Area	Type of Mitigation	Extent Length, meters	Residual Vibration
Segment 1			
Bayshore, Visitacion to Arleta	None required		
Segment 2	None required		
Segment 3	None required		
Segment 4			
20th to 22nd Streets	Ballast mat	60	0
Segment 5	None required		
Segment 6	None required		
Segment 7	None required		
TOTAL	Ballast mat	60	0

The amount that the above mitigation measures would reduce overall levels of ground-borne vibration is dependent on the dominant frequencies of the vibration spectrum, which is dependent on the local geologic conditions. For example, in areas where there is artificial fill, undifferentiated sediments, or Bay mud, the vibration propagation tests showed considerably more efficient propagation at low frequencies (below 16 Hz) than at other sites. This is important when selecting mitigation measures since most measures that mitigate ground-borne vibration are relatively ineffective at frequencies below 20 to 30 Hz. However, since the projected vibration levels in the proposed alignment are dominated by high-frequency vibration, ballast mats will be an effective means of eliminating impact near any vibration-impacted receptors.

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Following is a summary of each of the areas where mitigation is recommended:

Segment 1 - Caltrain Bayshore Station to the 101 Overcrossing

No mitigation is required along this segment.

Segment 2 - Highway 101 Overcrossing to Thomas Avenue

No mitigation is required along this segment.

Segment 3 - Thomas Avenue to Jerrold Avenue

No mitigation is required along this segment.

Segment 4 - Jerrold Avenue to 16th Street

Vibration mitigation is recommended along this segment between 20th street and 22nd Street. Vibration impacts are projected at two mixed-residential/commercial buildings due to a nearby crossover. Moving the crossover away from these receptors will be sufficient to reduce ground-borne vibration levels below the impact threshold. If it is not feasible to move the crossover, a ballast mat is recommended for this area because the projections indicate that it would effectively reduce the high-frequency components of the vibration spectra.

6.0 CEQA FINDINGS OF SIGNIFICANCE

6.1 UNAVOIDABLE SIGNIFICANT ADVERSE IMPACTS

In accordance with Section 21067 of the California Environmental Quality Act (CEQA), and with Section 15126 of the State CEQA Guidelines, the purpose of this section is to identify impacts that could not be eliminated or reduced to a less than significant level by mitigation measures included as part of the proposed project, or by other mitigation measures that could be required to be implemented. A listing of specific impacts that are not mitigated will be part of the decision-making documents.

The findings of significant impacts are subject to final determination by the City Planning Commission as part of the certification process for the EIR. This chapter in the Final EIR will be revised, if necessary, to reflect the City Planning Commission's findings.

Unavoidable adverse impacts that cannot be mitigated include:

- constrained bicycle travel along Bayshore Boulevard and Third Street and the preclusion of bicycle lanes along Third Street and along a portion of Bayshore Boulevard;
- future traffic congestion along Third Street commercial core with the one-lane design options; and
- under all alternatives the capacity of Third Street and Bayshore Boulevard would be reduced, which could contribute to long-term, significant cumulative impacts at selected intersections by 2015 if project development occurs and automobile trips increase.

6.2 SUMMARY OF CUMULATIVE IMPACTS

CEQA defines cumulative impacts as "two or more individual effects which, when considered together, are considerable," and suggests that cumulative impacts may "result from individually minor but collectively significant projects taking place over a period of time" (State CEQA Guidelines Section 15355). CEQA documents are required to include a discussion of potential cumulative effects when those effects are significant. State CEQA Guidelines suggest two possible methods for assessing potential cumulative effects (State CEQA Guidelines Section 15130). The first method is list-based approach, which considers a list of past, present, and reasonably foreseeable future projects producing related or cumulative impacts. The second method is projections-based, and uses a summary of projections contained in an adopted general plan or related planning document which is designed to evaluate regional or areawide conditions. The projections-based method is generally used by San Francisco in evaluating projects within its jurisdiction. This approach is also suitable for NEPA analysis of cumulative impacts.

FTA guidelines require that regional growth projections from the metropolitan planning organization (MTC in this case) be used as input for the assumed future year conditions. In this document, transportation projections for the study area were estimated using MTC's travel demand forecasting model. Inputs to the MTC model include ABAG projections of future land use and employment intensities and locations throughout the region for 2015 and revisions as described in the next paragraph (refer to Section 3.2.1 for a more detailed explanation of cumulative growth assumptions). Additional inputs were programmed highway, street and transit improvements identified by MTC for 2015, as described in the 1994 Regional Transportation Plan (RTP). The RTP assumes that projects such as the extension of BART to San Francisco International Airport will be completed by 2015.

Within San Francisco, because of the relatively large number of major development proposals and redevelopment projects undergoing environmental review at this time, the San Francisco Redevelopment Agency recently funded a citywide growth study. The purpose of this study was to identify any adjustments that might be necessary to ABAG's 2015 projections of land uses, population and employment -- as well as to traffic model outputs -- to reflect the likely implementation of these projects by 2015. Results of this study are discussed in Section 6.2.2.[1]

6.2.1 REGIONAL CONTEXT

Because this document is based on the most recent adjustments of accepted, regional land use forecasts for 2015, and assumes transportation improvements programmed within the same time frame, effects evaluated with the project include the cumulative effects of development within the region. Thus, additional analysis of potential cumulative effects related to specific development and transportation improvement projects within the region is not necessary. Impact categories such as land use, transportation (including traffic and transit), socioeconomic conditions, air quality and noise, already reflect regional cumulative impact conditions. Furthermore, regionwide cumulative effects were identified in the EIR prepared for MTC's 1994 Regional Transportation Plan, which identified unavoidable significant impacts to air quality, energy, geology and seismicity, water resources, biological resources, visual resources, noise, transportation, social environment and land use. After mitigation, the current project would either not contribute to or would make a negligible contribution to these identified regionwide cumulative significant impacts, which are expected to occur in the future whether or not the current project is adopted and constructed.[2]

6.2.2 LOCAL CONTEXT

Potential cumulative impacts of the Third Street Light Rail Project were analyzed at the citywide level to determine whether less than significant environmental impacts that would be experienced locally could become significant when considered with other reasonably foreseeable future projects in the area, particularly those projects located in the City's southeastern quadrant. Reasonably foreseeable projects are here defined as those projects assumed 2015 No Project Alternative, as described in Sections 2.2 and 4.1.2.

The citywide growth study recently commissioned by the San Francisco Redevelopment Agency evaluated the potential population and employment impacts associated with a large number of major redevelopment and development projects proposed for construction by 2015. These include the Transbay, Bayview Hunters Point, Mission Bay North, Mission Bay South, Mid-Market, and Hunters Point Shipyard redevelopment projects and reuse proposals for the Presidio and Treasure Island, as well as major site-specific proposed development within development projects such as Pacific Bell Ballpark, the new 49ers stadium and the Candlestick Mills Mall retail complex, and the new UCSF research campus. Evaluation of these projects included an overall market projection for real estate development in San Francisco by 2015. In some cases, growth allocated to specific areas of the City in ABAG *Projections 96* was reallocated to other areas of the City in light of the now-known development proposals. For example, some of the growth that ABAG projected for the Richmond District was reallocated to the City's southeastern quadrant due to the many major development and redevelopment projects now proposed for that part of the City.

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[1] Keyser Marston Associates, Draft Memorandum to SFRA, "Cumulative Growth Scenario for Year 2015." August 27, 1997.
[2] Metropolitan Transportation Commission. *1994 Regional Transportation Plan and Final Environmental Impact Report.* June 1994.

This citywide growth study concluded that growth in San Francisco by 2015 would be somewhat greater than that predicted by ABAG in *Projections 96*, but not as great as that predicted in ABAG's *Projections 94*. The revised population and employment projections, which are considered reasonable given current and projected market conditions in San Francisco, were then used to prepare revised traffic projections for 2015 by Traffic Analysis Zones. These traffic projections were incorporated into the transportation analysis and related analyses for this EIS/EIR.

Construction of other planned projects in the general vicinity of the Third Street Corridor could involve temporary cumulative traffic disruptions, including lane closures and detours, construction-related noise and air quality effects. As construction of the IOS begins in 2000, Mission Bay redevelopment and Moscone Center expansion will be underway, **possibly the Sunnydale Sewer Improvement Project,** and the new baseball ballpark and football stadium also will be under construction. These major construction projects could combine to exacerbate local construction nuisances, as well as changes to the visual environment and neighborhood character. Such effects of the Third Street Light Rail Project would be temporary, and would not be considered significant.

6.3 GROWTH-INDUCING IMPACTS

This section considers whether or not the Third Street Light Rail Project would encourage development in excess of amounts expected and provided for in the region and/or San Francisco. Growth inducement would occur if the amount of population or employment growth that would occur under the No Build/TSM or Light Rail Alternatives would exceed planned levels as a result of project implementation.

Transportation projects can be growth-inducing when they provide new service to or beyond the edge of an urbanized area. By reducing travel times and improving access between employment opportunities and underdeveloped lands, such projects can potentially affect population locational decisions. The Third Street Light Rail Project, however, would be replacing existing bus service with improved transit service in a relatively built-out urban environment. It is expected to increase public transportation reliability, but not to substantially reduce travel times to job centers by 2015. The Project could stimulate additional or higher intensity development on specific parcels in the immediate vicinity of stations, but otherwise would help accommodate transit needs associated with planned development and redevelopment projects in San Francisco.

Plans to redevelop parts of the Corridor, such as Mission Bay North and South and the Transbay Area, are expected to proceed whether or not the Third Street light rail line is built. The light rail line itself would not be expected to stimulate unplanned growth, but would help to facilitate planned growth at available sites along the Corridor. (This planned growth would also enhance the ridership potential of the proposed light rail line). In addition, it is anticipated that the IOS would contribute to revitalization of the Third Street commercial core by providing a transit connection to Downtown and planned physical improvements along Third Street, even if it does not reduce travel times. In conclusion, neither the Initial Operating Segment nor the New Central Subway would have a significant growth-inducing impact.

6.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

CEQA calls for a discussion of the uses of non-renewable resources during the initial and continued phases of the Project that could be irreversible because of a commitment of resources that make removal or nonuse of the resource unlikely thereafter. Implementation of the Light Rail Alternative would involve the use of some non-renewable resources. Materials (such as fossil fuels and lubricants) and energy would be consumed during project construction and operation.

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6.5 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

Section 15126 (A)(d)(4) of the CEQA Guidelines (1994) states that "if the environmentally superior alternative is the "no project" alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives. For the Third Street Light Rail Project, the No Project and the No Build/TSM Alternatives would not have the temporary construction impacts, the business displacements, parking displacements, potential historic architectural effects, or vibration impacts described for the Light Rail (Build) Alternative. The No Project and No Build/TSM Alternatives would, however, contribute to increased traffic congestion, reduced transit service reliability, increased travel times and diminished mobility for residents in the southeast quadrant of the City, increased gasoline consumption, and regional air quality impacts. In addition, they would not be compatible with the City's adopted land use and transportation plans and policies calling for rail transit development in the Third Street Corridor. As a result, the No Project and No Built/TSM Alternatives would not meet the stated Purpose and Need for the Project.

Compared with the Light Rail Alternative, the No Project and No Build/TSM Alternatives would not have the potential land use benefits for development at station locations, the employment benefits, enhanced visual character, or potential economic revitalization benefits in the Third Street commercial core. Thus, the proposed Light Rail (Build) Alternative is the environmentally superior and least environmentally damaging, practical alternative.

7.0 FINANCIAL FEASIBILITY

7.1 INTRODUCTION

This chapter describes the analyses conducted to determine the financial condition and capacity of project alternatives for the DEIS/DEIR. The financial analyses are based on annual cash flow results of MUNI during the period Fiscal Year (FY) 1998 to FY 2015.

This analysis of MUNI's financial capability to construct and operate the Light Rail Alternative compared with operating an expanded diesel bus service to accommodate 2015 demand (No Build/TSM Alternative) has been developed in response to the FTA requirements for financial planning.

In 1987, the FTA issued guidelines to be followed by all applicants for federal funds in documenting their "financial capacity" to implement proposed major transit capital improvement projects. The Financial Capacity Analysis Policy, as included in FTA Circular 7008.1 (3/8/87), defines how FTA will assess the financial capacity of its grantees. There are two basic aspects to financial capacity: 1) the general financial condition of the public transportation operating enterprise and its non-federal funding entities; and 2) the financial capability of the agency and its funding entities, which includes the sufficiency of their funding sources to meet future operating deficits and capital costs for an expanded transit system.

7.2 ASSESSMENT OF FINANCIAL CONDITION

MUNI's financial condition can only be assessed within the context of existing and projected revenues and costs. The revenue analysis presented below describes the principal sources of operating and capital (rehabilitation and replacement) revenues received by MUNI for all of its capital and operating costs. These sources include the following:

Local Revenue Sources:

- Passenger fares
- General Fund and Parking Revenues
- Sales Tax Revenues
- Hetch Hetchy Transfers for Electric Power Services
- Other Local Revenue Sources

State Revenue Sources:

- State Transit Assistance (operating support)
- State Transit Capital Improvement Funds (capital)
- Flexible Congestion Relief Funds (capital)

Federal Revenue Sources

- Federal Section 5307 Funds (operating support)
- Federal Section 5307 Funds (capital)
- Federal Section 5309 Funds (bus capital)

- Federal Section 5309 Funds (fixed guideway)
- Federal ISTEA Funds (STP)

These revenue sources are discussed in detail in Section 7.2.1, and show historical amounts received along with anticipated or projected amounts to be received through the 18-year period between FY 1998 to FY 2015.

These revenue sources are used to finance the ongoing operating and maintenance expenses associated with providing existing motor coach, trolley coach, cable car, light rail and paratransit services required by the ADA. Also, the vehicle and fixed facility capital replacement and rehabilitation costs associated with MUNI's vehicle fleet, light rail system, and maintenance facilities must be met from these sources. These operating and recapitalization costs are projected based on assumptions of vehicle replacement cost and operating and maintenance expenses. Each of these costs is discussed in Section 7.2.2. Revenue and cost escalation rate assumptions are presented in Section 7.2.3.

Revenues and costs are shown in the No Build/TSM Alternative cash flow statements (operating and capital) which are included as part of this assessment. The analysis of cash flows discusses particular assumptions underlying each forecasted revenue and expense supporting the No Build/TSM Alternative. Lastly, conclusions are drawn from the analysis as to the financial condition of MUNI and its ability to financially support existing operations and rehabilitation and fleet and facility replacement requirements into the future.

7.2.1 REVENUE ANALYSIS

In the subsections that follow, descriptions of the principal local, state and federal revenue sources that support MUNI's transit operations, maintenance and capital replacement are presented.

Local Revenue Sources

Currently, locally generated revenues constitute approximately 80 percent of MUNI's operating revenues. The most significant sources for supporting operations and capital replacement include the following.

<u>Passenger Fares</u>

Passenger fares constitute the largest source of operating revenue. **Table 7-1** shows annual receipts from passenger and paratransit fares during the period FY 1990-1996, as well as the percentage increase or decrease from the preceding year and the percentage of operating costs met through passenger fares. It also indicates whether a fare increase occurred in that year. As can be seen, fare revenues have grown on average at a 3.5 percent annual rate since FY 1990. However, it appears that the growth has occurred primarily through fare level increases rather than growth in ridership. During years in which no fare increase was implemented, fare revenues grew at a much lower rate.

<u>General Fund/Parking Revenues</u>

Until FY 1994, the City's General Fund was the single largest source of revenue to MUNI. In FY 1994, the General Fund contributed $110.1 million, or 38.8 percent of MUNI's total revenue. In FY 1994, Proposition M passed which, in part, dedicated certain parking-related revenues to MUNI which had

TABLE 7-1

HISTORIC PASSENGER RECEIPTS
($ Thousands)

Fiscal Year	Annual Passenger Fares	Percent Change	Percent of O&M Costs	Fare Increase
FY 1990	$ 78,185	-	29.5 %	No
FY 1991	79,846	2.1 %	28.0	-
FY 1992	82,445	3.3	27.6	-
FY 1993	89,571	8.6	29.2	Yes
FY 1994	96,522	7.8	31.2	Yes
FY 1995	92,785	(3.9)	29.9	-
FY 1996	94,763	2.1	30.5	-
FY 1997*	97,684	3.1	33.7	
Annual Average	N/A	**3.5%**	**29.4%**	N/A

Sources: San Francisco Municipal Railway, Combined Statements of Operations; Comprehensive Annual Financial Reports, City and County of San Francisco; G. Richard Swanson & Associates.
*Projected by the Office of the Controller, City and County of San Francisco as February 28, 1997

previously gone directly to the General Fund. In FY 1995, those parking-related revenue transfers totaled $71.4 million. As a consequence, the General Fund discretionary funds were reduced to $40.1 million or a reduction of $70 million in that same year.

Table 7-2 identifies annual receipts from both General Fund and parking revenues over the seven-year period ending June 30, 1997. As can be seen, MUNI is now receiving fewer total dollars from the City, when General Fund and Parking Revenues are combined, than in FY 1990.

TABLE 7-2

HISTORIC GENERAL FUND AND PARKING REVENUE RECEIPTS
($ Thousands)

Fiscal Year	General Fund	Parking Revenue	Total	Percent Change
FY 1990	$ 112,568	-	$112,568	-
FY 1991	120,340	-	120,340	6.9%
FY 1992	118,794	-	118,794	(1.2)
FY 1993	112,272	-	112,272	(5.5)
FY 1994	110,127	-	110,127	(1.9)
FY 1995	40,089	$ 71,408	111,497	1.2
FY 1996	34,603	78,972	113,575	1.9
FY 1997*	32,564	79,226	111,790	(1.6)

Sources: San Francisco Municipal Railway, Combined Statements of Operations; Comprehensive Annual Financial Reports, City and County of San Francisco; G. Richard Swanson & Associates.
*Projected by Office of the Controller, City and County of San Francisco as February 28, 1997

Sales Tax Revenues

MUNI receives sales tax revenues from three different sources. Those sources are: 1) the State Transportation Development Act; 2) AB 1107 Regional Sales Tax; and 3) the San Francisco County Transportation Authority. Each will be briefly described below.

Transportation Development Act

Established under the state Transportation Development Act of 1972, local transportation funds (LTF) revenue are derived from a one-quarter cent of the State's current 7.25 percent sales tax collected in San Francisco. These funds are MUNI's fourth largest source of revenue (behind fares, parking revenues and General Fund support). **Table 7-3** below provides historical data on sales tax receipts from each of MUNI's sources.

TABLE 7-3

HISTORIC SALES TAX REVENUE RECEIPTS
($ Thousands)

Fiscal Year	LTF	Percent Change	AB1107	Percent Change	Prop. B	Percent Change
FY 1990	$20,259	-	$18,040	-	-	-
FY 1991	23,624	16.6%	19,563	8.4%	-	-
FY 1992	23,362	(1.1)	19,859	1.5	-	-
FY 1993	16,653	(28.7)	17,607	(11.3)	$3,650	-
FY 1994	20,491	23.0	18,666	6.0	3,569	(2.2)%
FY 1995	18,871	(7.9)	18,057	(3.2)	4,362	22.2
FY 1996	24,228	28.4	19,680	9.0	3,802	(12.8)
FY 1997*	25,795	6.5	20,912	6.2	-2	-
Annual Average	**NA**	**3.9**	**NA**	**2.3**	**NA**	**1.4**

Sources: San Francisco Municipal Railway, Combined Statements of Operations; Comprehensive Annual Financial Reports, City and County of San Francisco; G. Richard Swanson & Associates.
*Projected by Office of the Controller as of February 28, 1997
**Projection Unavailable at Time of Printing.

Changes in LTF receipts from year-to-year in part are due to varying economic conditions affecting annual LTF revenue. Fluctuations also occur due to the MTC allocation procedure, where funds for one fiscal year will be based upon taxable sales estimates made during the previous fiscal year. Any difference between actual taxable sales and the estimated taxable sales is then compensated through adjustments to the next year's allocations. Thus, the revenues received by MUNI in any fiscal year may vary either up or down from the actual revenues generated by LTF in that year.

AB 1107 Regional Sales Tax

AB 1107 revenues are generated by the ½-cent sales tax levied in the counties of Alameda, Contra Costa, and San Francisco. State law requires that 75 percent of these revenues be allocated directly to BART, and that the remaining 25 percent be allocated by MTC to BART, MUNI and AC Transit. Historically, this discretionary portion has been divided equally between MUNI and AC Transit.

San Francisco County Transportation Authority

Pursuant to state enabling legislation, San Francisco voters approved a one-half cent sales tax increase in November 1989 to help finance a 20-year Transportation Expenditure Plan (Proposition B). Funds are generated through sales and use transaction within San Francisco. The Expenditure Plan contained a provision that permitted Proposition B funds to fund operating and maintenance costs of certain capital projects constructed with Proposition B funds, such as the F-Line street car service or the MUNI Metro Extension to the Caltrain Terminal. As a result, MUNI receives annual allocations for operating certain completed projects.

Hetch Hetchy Transfers

Historically, electrical power for MUNI's electric trolley coaches, the MUNI Metro light rail system, and other power requirements have been provided to MUNI by the City's Hetch Hetchy electrical power generators. That subsidy dates back to the time when MUNI was part of the Public Utilities Commission (PUC) along with the Water Department and Hetch Hetchy. Since MUNI is now a separate City department, this ongoing support occurs through an augmentation of MUNI's budget from the General Fund, which now receives the Hetch Hetchy Transfers, in an amount equivalent to the transfers which occurred when MUNI was part of the PUC. This transfer has been approximately $7.5 million annually since FY 1994.

Other Local Revenue Sources

MUNI also receives additional revenues from local sources such as advertising (approximately $2.5 million annually), providing paratransit service to clients of the Mayor's Commission on Aging (approximately $675,000 annually), rentals and reimbursement for claims. Collectively, they comprise only about one percent of total MUNI revenue.

State Revenue Sources

Currently, MUNI receives state financial assistance from several sources. However, only the State Transit Assistance (STA) program provides operating support. The Transit Capital Improvement (TCI) program and the Flexible Congestion Relief (FCR) program provide some financial support for MUNI's capital program. It should be noted that the state sources identified below have been combined into a State Regional Improvement Program under the recently enacted SB45. They are proposed to be allocated regionally. Each is briefly discussed below.

State Transit Assistance

Under the STA program, a portion of gasoline sales tax revenues are appropriated by the State Legislature to the State Transportation Planning and Development Account for certain transit and energy-related purposes. Funds are allocated on the basis of population (50 percent) and the amount of local funds used to support transit operations (50 percent). In general, the STA allocations over the last six years have held fairly constant, with the exception of a statewide reduction in FY 93-94 and FY 94-95 (**Table 7-4**). Future allocations to support MUNI's transit operations are projected to increase modestly; however, as the historical receipts have shown, this source can prove volatile from year-to-year.

Transit Capital Improvement

The TCI program is an annual program administered by Caltrans. The California Transportation Commission (CTC) allocates funds for this program (refer to **Table 7-4**). In general, the level of funding for this program reflects the health of the California General Fund. Eligible projects under this program include acquisition of railroad rights-of-way, bus rehabilitation, exclusive public mass transit guideways

TABLE 7-4

HISTORIC STATE REVENUE SOURCES
($ Thousands)

Fiscal Year	STA	Percent Change	TCI	Annual Change
FY 1991	$5,954	-	-	-
FY 1992	6,226	4.6%	$15,559.0	-
FY 1993	6,853	10.1	8,769.5	(43.6)%
FY 1994	5,718	(16.6)	4,670.1	(46.7)
FY 1995	5,685	(0.5)	1,632.0	(65.1)
FY 1996	6,964	22.5	1,063.0	(34.9)

Sources: San Francisco Municipal Railway, Combined Statements of Operations; Comprehensive Annual Financial Reports, City and County of San Francisco; G. Richard Swanson & Associates.

and rolling stock, railroad and rail transit grade separations, intermodal transfer stations serving various transportation modes, ferry vessels and terminals, and short-line railroad rehabilitation. All project applicants for TCI funding must be approved by the local metropolitan planning organization, i.e., MTC. Matching fund requirements for this program are 50 percent for non-intercity rail projects. No formal match ratio is established for intercity rail projects, although the CTC gives higher priority to intercity rail projects with local matching resources.

Flexible Congestion Relief Program

The FCR program provides urban and rural counties the opportunity to compete for state funding for projects designed to relieve traffic congestion by increasing the capacity of the transportation system. Funds are allocated on an annual basis by county. Total funding of the program includes the County Minimum, plus any discretionary funding that the CTC allocates. Applications for these funds are submitted to the CTC, up to the county allocation maximum. However, before the CTC will consider a project, the project must be programmed in the MTC Transportation Improvement Program (TIP).

The intent of the FCR program is to reduce or mitigate traffic congestion. Projects that meet this intent increase vehicle and/or person capacity of either the congested facility or adjacent roadways and rail systems, modify or expand roadways and rail systems, or implement traffic flow improvements which increase the vehicle and/or person-carrying capacity of the facility. Since a broad array of transportation projects are eligible for these funds, regional competition is very strong.

Federal Revenue Sources

Federal funding is authorized under the Intermodal Surface Transportation Efficiency Act (ISTEA) which was approved in 1991 and which expires on December 31, 1997. Currently, Congress is in the process of developing legislation for a reauthorization of ISTEA. The Clinton Administration has submitted its reauthorization proposal called "NEXTEA," which contains several potential changes to ISTEA.

MUNI historically has received federal funds for both operating and capital needs, although the vast majority of the funding is intended for capital programs. Like most other transit properties, MUNI receives both formula and discretionary federal funds. Formula funds are available for both transit operating needs and transit capital projects. Discretionary funds are allocated either through a Congressional earmarking process or through applications to the FTA. Only the annual appropriation levels that are not earmarked can be determined by FTA.

Regardless of the funding amounts that may be earmarked for a particular project, fund recipients must submit grant applications to FTA supporting their request. Federal funds are granted at varying grant matching ratios. Sources of matching revenues must be clearly demonstrated by the grant recipient. In general, operating grants require a 50 percent match ratio.

Section 5307 Assistance

The principal source of transit funding under the ISTEA is found in Section 5307 of the Act. Federal grants are authorized by Section 5307 based on a formula block grant which takes into account population and population density, transit revenues, transit vehicles miles, and rail transit route miles. Section 5307 formula money is the largest transit funding line item within the ISTEA legislation, totaling $16.1 billion over the six-year program. Individual transit properties within an urbanized area can allocate annual Section 5307 to both operating and capital needs. However, an operating limit sets a cap on the amount of Section 5307 funds allowed for operating expenditures. Traditionally, the process of obtaining Section 5307 operating assistance is initiated by MTC, as the designated recipient in the San Francisco Bay Area.

Federal operating assistance has steadily declined. Only $2.4 million was received in FY 1996, down from almost $8 million in the early 1990's. This downward trend appears to be consistent with the goal of the Administration and of many Congresspersons, which is to eliminate federal transit operating subsidies entirely. The Administration's current proposal for reauthorizing ISTEA eliminates the Section 5307 operating grant program for urban areas and folds this program into a broad formula program to urbanized areas. These formula funds could not be used for operating purposes using the current definition of operating assistance. Rather, the proposal reauthorization language liberalizes the definition of "capital" projects to include such activities as preventive maintenance which previously was considered an operating expense. Any formula funds used for operating support would continue to require a 50 percent match.

In a similar manner, the Section 5307 capital program will also be folded into the new formula program. As **Table 7-5** points out, MUNI has received significant amounts of funding from Section 5307 capital and can be expected to continue to do so.

Section 5309 Program

The Section 5309 grant program funds major transit capital investments. The funds are divided into three categories, two of which are used as part of the No Build/TSM Alternative financial analysis:

- Section 5309 Formula Fixed Guideway Modernization Program
- Section 5309 Discretionary Funding for Bus Capital

Fixed Guideway Modernization (FGM) funding (previously referred to as the "Rail Mod" program) is available to modernize and rehabilitate fixed-guideway systems, including rail, trolley coach and exclusive busways. FGM funds have been, in the past, awarded with match ratios ranging from 50 percent to 80 percent, but, in general, are awarded on a formula basis at an 80 percent match ratio. MUNI's FGM support has been relatively large in the past and is programmed to continue for the replacement of the 20-year old Boeing light rail vehicles.

TABLE 7-5

FEDERAL REVENUE RECEIPTS
($ Thousands)

	Section 5307		Section 5309		
	Operating	Capital	Bus Capital	Fixed Guideway	STP
FY 1990	$7,950	-	-	-	-
FY 1991	7,818	-		-	-
FY 1992	7,508	$26,819	-	-	-
FY 1993	7,574	4,945	-	-	$22,100
FY 1994	6,811	15,900	$5,000	$33,734	-
FY 1995	5,769	28,426	1,000	24,500	62,881
FY 1996	2,408	23,511	5,558	22,765	-

Sources: The Metropolitan Transportation Commission, Program of Projects FY 1992-97; Municipal Railway Financial Statements, Office of the Controller, FY 1990-96.

Historically, Section 5309 discretionary funding for Bus Capital has been available for the acquisition of buses, construction of bus operations and maintenance facilities, and other bus-related equipment needs. This funding source is annually appropriated by Congress, but allocated on a discretionary basis. MUNI intends to use this funding source over the next several years for the planned replacement of the diesel and electric trolley bus fleets. The 1996-2005 MUNI Short Range Transit Plan assumes approximately $30 million in Section 5307 Discretionary Bus Capital grants per year through FY 2000.

ISTEA Funding

In addition to authorizing funding for traditional transit programs, ISTEA also established a program which MUNI could use as a capital funding source: the Surface Transportation Program (STP). STP funds can be used for any transportation project that receives planning and endorsements from appropriate state agencies, such as Caltrans or the local metropolitan planning organization, such as MTC. This source of ISTEA funding is the most flexible source of monies for either transit or highway projects. STP funds may be applied to transit projects that are eligible for assistance under the Federal Transit Act. Projects eligible for this funding include bus facilities, bus terminals, highway modifications designed to accommodate new transit modes, transit safety programs, carpool projects, rail transit corridor parking facilities and technology transfer programs.

Funding under the STP program is allocated to MTC, based on a population formula. Local matching funds are required at an 80/20 (federal/local) ratio. During the last several years, MTC has received approximately $8.2 million in STP funding annually. MUNI has averaged approximately $14 million annually since FY 1992, although allocations vary widely from year-to-year as can be seen from **Table 7-5**.

7.2.2 COST ANALYSIS

The following section presents an analysis of both historical and projected costs associated with operating the No Build/TSM Alternative transit service in MUNI's current service area. The analysis of costs examines the two major cost sources: operating and maintenance costs, and those costs associated with rehabilitating and replacing capital equipment, facilities and vehicles. Each will be discussed below.

Operating and Maintenance Costs

Table 7-6 presents historic trends in the total operating and maintenance (O&M) expenses of MUNI for the period FY1990 through FY 1996. Projected O&M expenses for the No Build/TSM Alternative are included in **Table 7-7.** MUNI expects No Build O&M costs to increase at an average annual rate of 2.9 percent. This figure contrasts with the annual average growth rate in operating costs of 2.2 percent during the period FY 1990-96.

TABLE 7-6

HISTORIC OPERATING & MAINTENANCE EXPENSES BY FISCAL YEAR (\$ Millions in Year of Expenditure)

	FY 90	FY 91	FY 92	FY 93	FY 94	FY 95	FY 96
Operating Expenses	$ 247.4	$264.8	$ 274.8	$ 282.5	$ 285.1	$283.2	$ 280.0
Percent Change	-	7.0	3.8	2.8	0.9	(0.7)	(1.1)
Sources: Audited Financial Statements, City and County of San Francisco, Combined Statements of Operations; G.R. Swanson & Associates.							

It should be noted that MUNI's operating and maintenance expenses as shown in **Table 7-6** will not track exactly with numbers shown in MUNI's Short Range Transit Plan because **Table 7-6** is derived from MUNI's final audited operated expenses less amounts for depreciation and amortization. **Table 7-7**, which forecasts MUNI's operating and maintenance expenses through 2015, is derived from MUNI's current adopted budget for FY 1997.

Rehabilitation and Replacement Costs

The No Build/TSM Alternative evaluates MUNI's capacity to fund those replacement and rehabilitation projects required to maintain existing service levels. MUNI's Capital Improvement Program has a total capital cost of almost $3.5 billion. This condition assessment identified only those fleet replacement, infrastructure and facility projects that would be required to sustain existing service. These projects have been estimated to cost $787 million in 1996 dollars. **Table 7-8** identifies the principal rehabilitation and replacement expenditures included in the No Build/TSM Alternative. Major components of this program are summarized below.

Fleet Replacement

As can be seen from the No Build Capital Statement, almost $560 million is intended to be spent on replacing or rehabilitating MUNI's transit vehicle fleet. Maintaining the existing system is a very high priority for MUNI in retaining its strong ridership base. The maintenance of these vehicles is the second highest cost of providing service. Thus, replacing these vehicles when they reach the end of their useful life is very important. The primary source of funding for these acquisitions is federal Section 5307 and Section 5309 sources.

TABLE 7-7

Third Street Light Rail Project - Operating Statement
No Build/Transportation Systems Management (TSM)
($millions in Year-of-Expenditure)

San Francisco Municipal Railway No Build/TSM Alternative FY96 - FY15	Annual Growth Rate	FY96	Actual FY97	Adopted FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	TOTAL
Average Annual Growth: Revenues and Expenses				4.28%	3.18%	2.60%	2.63%	2.62%	2.70%	2.78%	2.62%	2.71%	2.75%	2.75%	4.50%	2.66%	0.94%	2.80%	2.84%	2.85%	3.50%	
REVENUES																						
Local																						
Passenger Fares [1]	3.7%	$ 94.8	$ 97.7	$ 100.1	$ 102.8	$ 104.5	$ 106.3	$ 108.1	$ 110.0	$ 111.9	$ 113.8	$ 115.8	$ 117.7	$ 119.7	$ 124.3	$ 126.4	$ 128.5	$ 130.7	$ 133.0	$ 135.2	$ 138.5	$ 2,320.1
General Fund [2]	0.0%	34.6	32.6	46.7	47.0	47.2	47.5	47.7	48.0	47.5	48.5	48.8	49.1	49.4	50.2	50.4	50.4	50.7	51.1	51.4	51.8	951.2
Parking Revenue	4.0%	79.0	79.2	79.1	83.0	86.3	89.8	93.4	97.1	101.0	105.0	109.2	113.6	118.1	125.8	136.0	136.0	141.5	147.1	153.0	161.0	2,229.0
Hetch Hetchy/Water Subvention [3]	3.0%	7.5	7.5																			15.0
SFCTA Prop. B Sales Tax [4]	3.7%	3.8	4.7	5.0	5.2	5.0	5.6	5.8	6.0	6.2	6.4	6.7	6.9	7.2	7.5	7.7	-	-	-	-	-	90.1
Advertising, Misc.	3.7%	3.5	3.3	3.5	3.8	3.8	3.9	4.0	4.2	4.4	4.5	4.7	4.9	5.0	5.2	5.4	5.6	6.6	8.6	6.3	6.5	94.1
Other Local	3.7%	8.3	6.6	6.6	6.6	6.6	7.1	7.4	4.2	8.0	8.3	8.6	4.9	9.2	10.5	10.9	11.3	11.8	12.2	12.6	13.1	184.2
Subtotal - Local		231.5	233.4	240.8	248.3	254.1	260.2	266.4	272.9	280.0	286.6	293.7	301.1	308.7	323.5	331.9	331.9	340.5	349.4	358.5	370.9	5,883.7
State and Regional	3.7%	50.4	58.3	58.3	60.5	62.7	65.0	67.4	62.7	72.5	75.2	78.0	80.8	83.8	86.9	90.2	93.5	97.0	100.5	104.3	108.1	1,558.2
Federal	0.0%	2.9	3.0	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	58.1
TOTAL - Revenues		$ 284.8	$ 289.6	$ 302.0	$ 311.6	$ 319.7	$ 328.1	$ 336.7	$ 345.8	$ 355.4	$ 364.7	$ 374.6	$ 384.9	$ 395.5	$ 413.3	$ 428.3	$ 428.3	$ 440.3	$ 452.8	$ 465.7	$ 482.0	$ 7,500.1
EXPENSES																						-
Personnel		218.7	226.5	236.2	243.7	256.6	256.6	263.3	226.5	278.0	285.2	263.3	301.0	309.3	323.2	331.9	335.0	344.4	354.1	364.2	377.0	5,861.9
Non-Personnel		62.8	62.7	65.8	67.9	62.7	71.5	73.4	75.3	77.4	79.5	81.6	80.8	86.2	86.9	92.4	93.5	65.8	86.9	101.5	105.0	1,634.9
Debt Service																						
Other		3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2
TOTAL - Expenses [5]		$ 284.7	$ 289.6	$ 302.0	$ 111.9	$ 319.7	$ 328.1	$ 336.7	$ 345.8	$ 355.4	$ 364.7	$ 374.6	$ 384.9	$ 395.5	$ 413.3	$ 428.3	$ 428.3	$ 440.3	$ 452.8	$ 465.7	$ 482.0	$ 7,500.0
																						-
Annual Surplus (Deficit) Operations		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cumulative Surplus (Deficit)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	

Source: Combined Statements of Operations, San Francisco Municipal Railway, FY 96; G. R. Swanson & Associates; Pittman & Hames Associates

[1] On average, passenger fares assumed to grow at an annualized basis of 1.7 percent.

[2] Beginning in FY98, the General Fund includes the Hetch Hetchy Subvention. Contributions from the old General Fund remain flat while the additional Hetch Hetchy Subvention grows annually at three percent.

[3] Hetch Hetchy Subvention transferred to General Fund beginning in FY 98, but continues to grow three percent annually.

[4] San Francisco County Transportation Authority Prop. B revenue source assumed to sunset after 2010 because it must be re-authorized by San Francisco voters.

[5] The No Build/TSM Alternative assumes the implementation of MUNI Metro Extension service with 5 additional LRVs in 1998, with an operating cost increase of $5.0 million, one additional bus to maintain service frequencies by 2003 with an operating cost increase of $0.4 million, the Mission Bay 15-Third short line service with 40 additional buses around 2008 with an operating cost increase of $6.9 million, with the remaining bus service increases needed by 2015 with an operating cost increase of $2.9 million.

TABLE 7-8

Third Street Light Rail Project - Capital Statement
No Build/Transportation Systems Management (TSM)
($millions in Year-of-Expenditure)

San Francisco Municipal Railway No Build/TSM Alternative FY96 - FY15	Actual FY96	Adopted FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	TOTAL
Annual CPI																					
Conversion Factor from 1996$																					
Beginning Cash Balance	$ -	$ -	$ 0.9	$ 0.5	$ 0.6	$ 0.7	$ -	$ -	$ 0.2	$ 0.2	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.2
REVENUES																					
Federal																					
FTA Section 9	62.3	34.6	35.7	36.8	41.1	31.2	29.7	29.8	29.9	-	-	-	-	-	-	-	-	-	-	-	331.1
FTA Section 3 (FG)	18.2	21.0	21.0	21.0	21.0	21.0	22.6	-	-	-	-	-	-	-	-	-	-	-	-	-	145.8
FTA Section 3 (Bus)	4.3	9.5	3.7	9.1	3.7	-	-	-	-	-	11.1	11.5	15.8	-	-	-	-	-	-	-	68.6
FHWA - STP	16.2	2.0	19.9	3.0	3.0	0.4	0.8	1.4	2.0	-	-	-	-	-	-	-	-	-	-	-	48.7
Other Federal	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0
Federal (Sub-total)	101.0	69.1	80.3	69.9	68.8	52.6	53.1	31.2	31.9	-	11.1	11.5	15.8	-	-	-	-	-	-	-	596.2
State																					
TCI	0.8	2.7	2.6	3.8	3.4	3.5	3.2	1.1	1.1	-	-	-	-	-	-	-	-	-	-	-	22.2
TSM (FCR)	0.1	1.6	1.4	1.1	1.1	1.2	1.3	1.5	1.6	-	-	-	-	-	-	-	-	-	-	-	10.9
State/Local Partnership	0.8	1.4	0.7	1.0	1.0	0.5	0.2	0.2	0.2	-	-	-	-	-	-	-	-	-	-	-	6.0
TFCA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
State/Reg'l Improve' Prgm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
State (Sub-total)	1.7	5.7	4.7	5.9	5.5	5.2	4.7	2.8	2.9	-	-	-	-	-	-	-	-	-	-	-	39.1
Local																					
SFCTA Prop. B Sales Tax	24.8	14.8	16.2	17.1	16.3	12.7	11.2	10.4	9.2	12.0	12.0	-	-	-	-	-	-	-	-	-	156.7
TIDF	-	20.0	-	(10.9)	(9.1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bridge Tolls	0.5	3.2	3.7	4.1	3.3	3.3	3.3	3.3	3.3	-	-	-	-	-	-	-	-	-	-	-	28.0
SFMRIC	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3
SFCTA - TSM/Mission Bay	-	-	-	-	-	-	-	-	-	-	11.1	11.5	15.8	-	-	-	-	-	-	-	38.3
Tax Increment Financing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SFCTA - Debt Service	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Local (Sub-total)	25.6	38.0	19.9	10.3	10.5	16.0	14.5	13.7	12.5	12.0	23.1	11.5	15.8	-	-	-	-	-	-	-	223.3
TOTAL - Revenues	$ 128.3	$ 112.8	$ 104.9	$ 86.1	$ 84.8	$ 73.8	$ 72.3	$ 47.7	$ 47.3	$ 12.0	$ 34.1	$ 22.9	$ 31.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 858.5
EXPENDITURES																					
Committed Projects																					
Fleet Rehab/Replacement	111.5	89.6	82.2	62.7	57.7	48.6	46.7	21.0	19.6	9.5	9.5	-	-	-	-	-	-	-	-	-	558.6
Infrastructure	22.6	19.7	20.5	20.7	24.4	23.3	23.0	23.9	25.1	-	-	-	-	-	-	-	-	-	-	-	203.2
Facility Improvement	-	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	-	-	-	-	-	-	-	-	-	28.0
Other Committed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Committed Projects (Sub-total)	134.1	111.9	105.3	86.0	84.7	74.5	72.3	47.5	47.3	12.1	12.1	-	-	-	-	-	-	-	-	-	787.8
New Projects																					
TSM/Mission Bay Bus Service	-	-	-	-	-	-	-	-	-	-	22.1	22.9	31.5	-	-	-	-	-	-	-	76.5
Other New	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
New Projects (Sub-total)	-	-	-	-	-	-	-	-	-	-	22.1	22.9	31.5	-	-	-	-	-	-	-	76.5
TOTAL - Expenditures	$ 134.1	$ 111.9	$ 105.3	$ 86.0	$ 84.7	$ 74.5	$ 72.3	$ 47.5	$ 47.3	$ 12.1	$ 34.2	22.9	31.5	-	-	-	-	-	-	-	864.3
Annual Surplus (Deficit) Capital		$ 0.9	$ (0.4)	$ 0.1	$ 0.1	$ (0.7)	$ -	$ 0.2	$ -	$ (0.1)	$ (0.1)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cumulative Surplus (Deficit)		$ 0.9	$ 0.5	$ 0.6	$ 0.7	$ -	$ -	$ 0.2	$ 0.2	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	

Source San Francisco Municipal Railway - Short Range Transit Plan 1996-2005; G R Swanson & Associates; Pittman & Hames Associates

Infrastructure Improvements

As with vehicle replacements, maintaining the existing transit infrastructure and equipment is critical to the ability of MUNI to effectively maintain current service levels. These improvements include the replacement of existing infrastructure (trackway, overhead lines, system and facility components, and communication systems) and equipment when they reach the end of their economic lives. An estimated $203 million will be spent on maintaining MUNI's infrastructure through FY 2006.

Facility Improvements

A Facilities Master Plan for MUNI has just been completed. The Department of Public Works has also recently completed an evaluation of MUNI's facility improvement needs and identified costs required to maintain usage of many of MUNI's most important transit facilities. Those costs have been estimated at $25.9 million. However, it should be noted that this program is only a fraction of MUNI's total facilities requirements. Rather, the amounts included in this No Build Capital Program represent those projects for which funding is assumed through the provisions of Proposition B over the next decade.

7.2.3 CASH FLOW ANALYSIS

The cash flow analyses for both operations **(Table 7-7)** and capital **(Table 7-8)** indicate MUNI's net operating and capital positions on an annual basis through the FY 2015 time period for operations and FY 2006 for capital. As can be seen from each table, consistently positive or non-negative annual cash balances indicates that MUNI has the financial capacity to operate and maintain its existing transit service through the respective analysis periods.

Revenues for Operations

Passenger Fares

Passenger fares are based on assumptions regarding ridership on the system and fare levels. Because fare levels are policy determinations by the Board of Supervisors, this Financial Condition report assumes fare levels will remain at current rates. Overall growth in passenger fare revenues is consistent with the growth in ridership projected by MUNI at one percent annually between FY 98-99 through FY 09-10.

General Fund

Historically, electrical power for MUNI's electric trolley coaches, the MUNI Metro light rail system, and other power requirements have been provided to MUNI by the City's Hetch Hetchy electrical power generators. That subsidy dates back to the time when MUNI was part of the PUC along with the Water Department and Hetch Hetchy. Since MUNI is now a separate City department, this ongoing support occurs through an augmentation of MUNI's budget from the General Fund which now receives the Hetch Hetchy transfers, in an amount equivalent to the transfers which occurred when MUNI was part of the PUC. This transfer has been approximately $7.5 million annually since FY 1994.

Parking Revenues

Certain revenues realized from parking meters, City-owned off-street parking lots (not under the jurisdiction of the Recreation and Park Department), traffic fines and parking taxes are dedicated to MUNI.

The No Build Operating Statement assumes that they will continue to grow at a 4.0 percent per year rate which is consistent with MUNI's current Short Range Transit Plan. During the years since Proposition M dedicated these revenues to MUNI, they have grown, on average, 5.5 percent per year.

State and Regional Revenues

State and regional support for operations comes from a number of sources, including AB1107 regional sales tax funds, Transportation Development Act sales tax proceeds and State Transit Assistance support. These revenue sources are dedicated to MUNI and are forecasted to grow at an average annual rate of 3.7 percent, which is, as with other sources, consistent with MUNI's Short Range Transit Plan.

Federal

Federal support for operations is difficult to forecast. As noted previously, the current NEXTEA proposal from the Administration eliminates all direct federal support for operations, but liberalizes the definition of capital expenditures to include what were formerly classified as maintenance costs. Consequently, certain of MUNI's previous maintenance costs could conceivably be funded through a capital grant. Because of the undecided nature of the federal program, the current federal subvention to operations has been left in place but not escalated.

Other Local

Certain other sources of revenues, which include Hetch Hetchy transfers (now through the General Fund) Proposition B sales tax support for certain capital programs funded by Proposition B, and advertising have all been assumed to grow at an average annual rate of 3.7 percent. This is consistent with assumptions used in MUNI's Short Range Transit Plan.

Operating Expenses

Operating expenses, as shown previously in **Table 7-7,** consist of personnel and non-personnel costs. Personnel costs are composed of wages, salaries and benefits paid to MUNI employees. Also included are payments to the Trust Fund, a fund financed by the City to compensate drivers for fringe benefits to which they are entitled above and beyond those provided by the City's benefit package. Workers Compensation expenses are also included as a personnel expense. Non-personnel costs include such items as contracted services (e.g., paratransit), materials and supplies, fuel, services from other City departments, and any judgments or claims against MUNI.

Because a significant amount of MUNI's operating support is discretionary funding from the City, MUNI's operating expenses are typically constrained through the use of hiring freezes, salary savings (whereby budgeted positions remain unfilled) and other personnel cuts. As a consequence, MUNI's operating costs are often determined, year-to-year, by available revenues from the City. Costs incurred to operate and maintain the system are in reality constrained by the total amount of available revenues.

In developing an operating cost scenario for the No Build Alternative, conservative estimates for available revenues have been used. In particular, no increases have been assumed for fare levels (either due to fare increases or ridership growth) or General Fund support. Other revenues have been allowed to grow consistent with historical growth levels through FY 2015. Operating costs have been configured to match these assumed revenue amounts. While this approach is likely different that would be used with a transit operator with fully dedicated revenue sources, it does, none the less, conform with the way in which operating costs are actually determined.

Capital Funding

The No Build/TSM Alternative capital replacement program includes projects to maintain the existing level of service (i.e., revenue vehicle replacement), to meet future demand in the Third Street Corridor, and those required by legislation (ADA services, the federal Clean Air Act Amendment of 1990, etc.) Federal revenues for replacement and rehabilitation costs are anticipated to include Section 5307, Section 5309 revenue vehicle and Section 5309 bus capital funds as applicable to specific projects. Each of these sources of capital funds is described in the previous section. The local share of these projects is included in the financial plan.

Vehicle replacement costs are MUNI's first priority use for Section 5307 capital funds. Other rehabilitation and replacement costs (i.e., non-revenue vehicles, facilities infrastructure) are programmed for combinations of federal, state and local funds.

For the No Build/TSM Alternative, the overall size of the Capital Program was determined by those projects identified in MUNI's Capital Improvement Program, dated November 12, 1996, that were determined as necessary to sustain existing service. Funding sources included in the Capital Improvement Program as available to fund these projects were identified and described previously in this report. Since facilities improvements were included in the Capital Improvement Program, but were "unfunded", Proposition B revenues were identified as providing sufficient funding to meet these needs.

7.2.4 ANALYSIS OF FINANCIAL CONDITION

As **Tables 7-7** and **7-8** indicate, MUNI has the financial capacity to continue current bus and rail service levels as well as fulfill ADA paratransit requirements. Because of the nature of MUNI's funding, the cash flow analyses assume that no "ending balances" occur. Historically, MUNI's operating expenses have typically been met through the allocation of year-end "supplemental" appropriations by the Board of Supervisors in order to meet committed operating expenses or legally required expenditures such as for judgments and claims and Workers Compensation expenses.

Although no fund deficits are anticipated to occur in implementing the Capital Improvement Program under the No Build/TSM Alternative, MUNI, in conjunction with the Transportation Authority, does possess the ability to leverage future Proposition B revenues for the purpose of using debt financing to finance its acquisition of new buses and construction of new service facilities.

7.3 ANALYSIS OF FINANCIAL CAPACITY

The Financial Capacity Analysis evaluates MUNI's ability to construct, acquire, operate and recapitalize all of the services and equipment proposed for both the IOS and the New Central Subway. The discussion below presents the capital requirements, the operating and maintenance costs and the revenues available to finance these costs through FY 2015 for the IOS and the New Central Subway.

7.3.1 REVENUE ANALYSIS

In addition to the local, state and federal funding sources used in the No Build Alternative analysis, this section also sets forth conclusions on the ability of MUNI to obtain funding from other transit funding sources.

Local Funding Sources

The primary source of funding for the IOS is currently assumed to be the Proposition B one-half cent sales tax program presently in place in San Francisco. Passed by San Francisco voters in November 1989, sales tax revenues began being collected in April 1990. The tax will sunset in March 2010.

Several components of the Proposition B Expenditure Plan that was adopted in 1989 can potentially contribute to the Third Street Light Rail Project. These Expenditure Plan components are identified in **Table 7-9**. In addition, **Table 7-9** indicates what the Expenditure Plan identified as funding for the Project components in FY 90 dollars (i.e., those amounts actually identified in the Plan), and the escalated amount of those components in FY 96 dollars. The FY 96 dollar amounts were derived by escalating the Plan components at the same annual growth rates as the Proposition B revenues grew between FY 90 and FY 96, which was 4.8 percent. The FY 96 figure of $293.0 million is then escalated at a conservative 3.5 percent annual growth rate for years subsequent to FY 96 until it is utilized to meet the capital costs of the IOS. In terms of FY 97 dollars, this amount grows to $303.2 million.

TABLE 7-9

POTENTIAL PROPOSITION B FUNDING COMPONENTS
($ in millions)

Transportation Plan Component	$ FY90	$ FY96	$ FY97
Transit Corridor Construction Fund	$190.0	$244.2	$252.7
Third Street Median Islands	7.0	9.0	9.3
New LRV Maintenance Facility	18.0	23.1	23.9
Mission Bay Metro Extension	13.0	16.7	17.3
TOTAL	**$228.0**	**$293.0**	**$303.2**

Source: G. Richard Swanson & Associates

In addition to the above four Expenditure Plan components being dedicated to the Project, excess or surplus funds in two additional projects have also been dedicated to the Light Rail Alternative. These are, in 1997 dollars, $30 million from the MUNI Metro Extension project and $44.4 million from the MUNI vehicle replacement project. Combined, these two sources contribute an additional $74.4 million to the Light Rail Alternative bringing the total Proposition B commitment to an estimated $377.7 million in FY 97 dollars.

In addition to local Proposition B funds identified for the Third Street Light Rail Project, the City has also identified certain tax increment funds to be available to the Project from existing and potential redevelopment project areas located adjacent to the Third Street rail line. These include Bayview Hunter's Point (survey area), India Basin, and Mission Bay (survey area). The tax increment that is programmed to support the Third Street Light Rail Project is estimated at $8.5 million in constant 1997 dollars. It is similarly assumed that the operating and maintenance costs associated with the incremental service provided by the Project will be met through existing sources used to fund MUNI's current operations and maintenance (refer to **Table 7-7**).

State Funding Sources

Augmenting local funding from Proposition B sales taxes and tax increment funding, an estimated $20.6 million in State Regional Improvement Program funds have been earmarked for the Project. These funds are allocated regionally and are the result of the recently enacted SB45 which consolidates previous categorical state funding programs, such as Transit Capital Improvement funds, into a single category of funds administered and programmed regionally.

Federal Funding Sources

Because of the significant lead time required to secure federal discretionary funding (Section 5309 New Starts) and formula funding (Section 5309 Fixed Guideway Modernization), no funding from these sources is anticipated to be available for the IOS. However, these sources are anticipated to be significant contributors to the New Central Subway.

In lieu of federal discretionary funding for the Project, the City is allocating an estimated $12 million in STP and Congestion Management Air Quality funding to supplement local and state funding. It is likely that a Letter of No Prejudice will be sought from FTA that will qualify the local Proposition B revenues that will be primarily used to fund the IOS as local match for subsequent federal funding for the New Central Subway.

7.3.2 COST ANALYSIS

Capital Costs - Current Dollars

The tables on the following pages identify the capital cost estimates for both the IOS and the New Central Subway. The IOS includes a new LRV maintenance facility and 25 additional light rail vehicles (Breda LRV3 Type, or equivalent). All capital cost estimates are provided in January 1997 dollars (i.e., FY 97 dollars). The capital cost estimate for the IOS is **$408.9** million; the capital cost estimate for the New Central Subway is $505.9 million. The combined project is estimated to cost **$914.8** million in January 1997 dollars. The individual cost elements for both projects are shown in **Tables 7-10 and 7-11**.

TABLE 7-10

CAPITAL COST ESTIMATES – THIRD STREET LRT IOS (FY 97, $ in millions)

Cost Element	Estimated Cost
Third Street Light Rail Project	
1. Surface Line and Stations (Design and Construction)	$194.9
2. New LRV Maintenance Facility Operations and Maintenance Facility (Design and Construction)	81.2
3. Right-of-Way a. Line and Stations (Private Property) b. New LRV Maintenance Facility (Port Property)	 4.7 24.9(1)
4. LRV Procurement-15 Vehicles (including ATCS, sales tax)	61.0
Subtotal-Third Street	366.7
Mission Bay Service	
5. Mission Bay LRV Procurement - 10 Vehicles	38.0
6. Mission Bay Turnback Facility	4.2
Subtotal-Mission Bay	42.2
TOTAL COST	$408.9(2)

Note: (1) Includes right-of-way, contingency, engineering and management, and project reserve costs
(2) **Please note that while this document shows a potential IOS project cost increase, MUNI is working to reduce the 1997 project cost in order to minimize the need for additional local funding.**
Source: ICF Kaiser Engineers

TABLE 7-11

CAPITAL COST ESTIMATES – THIRD STREET NEW CENTRAL SUBWAY (FY 97, $ in millions)

Cost Element	Estimated Cost (In millions)
Subway and Surface Line and 3 Vehicles (Design and Construction)	$295.7
Engineering and Management	77.4
Contingency (25% of Items 1 and 2)	95.7
Project Reserve (8% of Items 1, 2 & 3)	37.1
TOTAL	$505.9

Source: Ibid., p. III-4.

Capital Costs - Escalated Dollars

Since the capital costs for both the IOS and the New Central Subway are expressed in FY 97 (January 1997) dollars, they must be escalated to account for inflation up to the point in which the costs are met in the course of constructing the Project, at 3.5 percent per year to the mid-point of construction. The estimated escalated cost of the IOS ($445.72 million) will be expended as indicated in Table 7-12.

TABLE 7-12

THIRD STREET LRT IOS
ESTIMATED ANNUAL CONSTRUCTION DRAW-DOWN
($ millions-escalated)

	FY99	FY00	FY01	FY02	FY03	Total Cost
Cost	41.58	107.58	133.61	115.24	47.71	$445.72
Percent of Total	9.3%	24.1%	30.0%	25.9%	10.7%	
Source: G. Richard Swanson & Associates.						

In a similar manner the current capital cost estimates for the New Central Subway of $505.9 million were escalated to the mid-point of construction. The New Central Subway was also subdivided into two phases — Phase I and Phase II. Phase I is estimated to cost approximately $253 million in FY97 dollars and will result in a portion of the line up to Market Street being open for revenue service by July 1, 2013. Phase II (full build-out) would be open for service by July 1, 2018. A specific draw-down schedule for the New Central Subway Phases I and II is included in **Tables 7-13 and 7-14.**

TABLE 7-13

NEW CENTRAL SUBWAY - PHASE I
ESTIMATED ANNUAL CONSTRUCTION DRAW-DOWN
($ millions-escalated)

	FY09	FY10	FY11	FY12	FY13	Total
Cost	36.93	95.55	118.68	102.36	42.38	$395.90
Source: G. Richard Swanson & Associates.						

TABLE 7-14

NEW CENTRAL SUBWAY - PHASE II
ESTIMATED ANNUAL CONSTRUCTION DRAW-DOWN
($ millions-escalated)

	FY14	FY15	FY16	FY17	FY18	Total
Cost	43.86	113.50	140.95	121.58	50.33	$470.22
Source: G. Richard Swanson & Associates.						

Operating and Maintenance Costs

The operating and maintenance costs for the IOS incorporate the incremental operating costs associated with running light rail. Based on the projected operating and maintenance costs,[1] the costs are expected to increase by approximately $1.3 million in 1998 when the MUNI Metro Extension goes into service and by

[1] San Francisco Public Transportation Commission/Municipal Railway; Conceptual Operating and Maintenance Cost Estimates, Working Paper #5B; December 1997; available for review in Project File #96.281E at the Department of City Planning, 1660 Mission, San Francisco.

approximately $5.3 million in FY 2003, when the IOS opens for revenue service. These costs, net of inflation, are expected to increase by an additional $5.7 million by 2015. These additional costs are attributable to increased service being provided along Third Street primarily to accommodate increasing ridership at Mission Bay.

When the New Central Subway is added to the IOS, operating and maintenance costs are expected to increase further as service is added to Market Street and beyond. Operating and maintenance costs associated with the New Central Subway are expected to increase by an additional $3.0 million per year beyond the amounts incurred through the IOS. These increased costs are expected to be realized by FY 2015.

7.3.3 CASH FLOW ANALYSIS

Initial Operating Segment - Capital

The FY 97 figure of $377.7 million is escalated at 3.5 percent per year until it begins to be used to construct the IOS in FY 99. The escalated amount available for use in that year is estimated to be $404.6 million. It should be noted that this amount is conservatively estimated because the annual growth and receipts to the Proposition B program may exceed this growth rate assumption. In addition to the $404.6 million available, tax increment funding of $8.5 million, as well as state funding of an estimated $25.0 million and federal funding through the STP program of $7.6 million is anticipated to contribute to the Project.

Tables 7-15 and 7-16 present the cash flow analyses for the IOS. **Table 7-15** indicates MUNI's ability to fund the Project's capital components while **Table 7-16** presents the Operating Statement Cash Flow. **Table 7-17** shows the combined revenues available for the IOS.

Initial Operating Segment - Operating and Maintenance

It is anticipated that the incremental costs of operating and maintaining the service provided by the light rail line will be shared by several sources of MUNI's operating funds. In particular, fare revenues are expected to meet between 30 and 35 percent of operating and maintenance needs and are expected to grow commensurate with inflation and increasing ridership. The remaining funds will come from a variety of local, discretionary sources. They include parking revenue currently dedicated to MUNI, General Fund revenues or other sources of funding that could potentially be invoked over the next several years. These may include transit impact development fees for properties adjoining the light rail line and allocations from San Francisco's portion of a regional gasoline tax if such a tax were to be passed. However, the cash flow analysis included in **Table 7-16** assumes that operating and maintenance costs are met through existing, current sources of funding.

New Central Subway

At the current time, Phase I of the New Central Subway is not expected to begin construction until FY 2009 with completion in FY 2013. Similarly, Phase II is expected to enter construction in FY 2014 with completion in FY 2019. The combined escalated cost of Phases I and II is estimated at $866.1 million. When added together, the IOS and the New Central Subway total $1,312 million.

TABLE 7-15

Third Street Light Rail Project - Capital Statement
Build Alternative - Initial Operating Segment and Central Subway
($millions in Year-of-Expenditure)

San Francisco Municipal Railway
Full Build Alternative

FY96 - FY15	Actual FY96	Adopted FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	TOTAL
Annual CPI																					
Conversion Factor from 1996$																					
Beginning Cash Balance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
REVENUES																					
Federal																					
FTA Section 9	62.3	34.6	35.7	36.8	41.1	31.2	29.7	29.8	29.9	-	-	-	-	-	-	-	-	-	-	-	331.1
FTA Section 3 (FG)	18.2	21.0	21.0	21.0	21.0	21.0	22.6	-	-	-	-	-	-	-	-	-	-	-	-	-	145.8
FTA Section 3 (Bus)	4.3	9.5	3.7	9.1	3.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30.3
FHWA - STP	16.2	2.0	19.9	3.0	3.0	0.4	6.8	7.4	2.0	-	-	-	-	-	-	-	-	-	-	-	60.7
FTA - Central Subway	-	-	-	-	-	-	-	-	-	-	-	-	-	29.5	76.5	95.0	81.9	33.9	35.0	90.8	442.6
Other Federal	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0
Federal (Sub-total)	101.0	69.1	80.3	69.9	68.8	52.6	59.1	37.2	31.9	-	-	-	-	29.5	76.5	95.0	81.9	33.9	35.0	90.8	1,012.5
State																					
TCI	0.8	2.7	2.6	3.8	3.4	3.5	3.2	1.1	1.1	-	-	-	-	-	-	-	-	-	-	-	22.2
TSM (FCR)	0.1	1.6	1.4	1.1	1.1	1.2	1.3	1.5	1.6	-	-	-	-	-	-	-	-	-	-	-	10.9
State/Local Partnership	0.8	1.4	0.7	1.0	1.0	0.5	0.2	0.2	0.2	-	-	-	-	-	-	-	-	-	-	-	6.0
TFCA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
State/Reg'l Imp Prgm - IOS	-	-	-	8.9	5.5	6.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.6
State/Reg'l Imp Prgm - CS	-	-	-	-	-	-	-	-	-	-	-	-	-	7.4	19.1	23.7	20.5	8.5	8.8	22.7	110.7
State (Sub-total)	1.7	5.7	4.7	14.8	11.0	11.4	4.7	2.8	2.9	-	-	-	-	7.4	19.1	23.7	20.5	8.5	8.8	22.7	170.4
Local																					
SFCTA Prop. B Sales Tax	24.8	13.9	16.6	17.1	16.3	12.7	11.2	10.4	9.2	12.0	12.0	-	-	-	-	-	-	-	-	-	156.2
TIDF	-	20.0	-	(10.9)	(9.1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bridge Tolls	0.5	3.2	3.7	4.1	3.3	3.3	3.3	3.3	3.3	-	-	-	-	-	-	-	-	-	-	-	28.0
SFMRIC	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3
SFCTA - Third Street	-	-	-	32.6	102.0	128.0	100.5	41.5	-	-	-	-	-	-	-	-	-	-	-	-	404.6
Tax Increment Financing	-	-	-	-	-	-	8.6	-	-	-	-	-	-	-	-	-	-	-	-	-	8.6
SFCTA - Debt Service	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Local (Sub-total)	25.6	37.1	20.3	42.9	112.5	144.0	123.6	55.2	12.5	12.0	12.0	-	-	-	-	-	-	-	-	-	597.7
TOTAL - Revenues	$ 128.3	$ 111.9	$ 105.3	$ 127.6	$ 192.3	$ 208.0	$ 187.4	$ 95.2	$ 47.3	$ 12.0	$ 12.0	$ -	$ -	$ 36.9	$ 95.6	$ 118.7	$ 102.4	$ 42.4	$ 43.8	$ 113.5	$ 1,780.6
EXPENDITURES																					
Committed Projects																					
Fleet Rehab/Replacement	111.5	89.6	82.2	62.7	57.7	48.6	46.7	21.0	19.6	9.5	9.5	-	-	-	-	-	-	-	-	-	558.6
Infrastructure	22.6	19.7	20.5	20.7	24.4	23.2	22.9	23.9	25.1	-	-	-	-	-	-	-	-	-	-	-	203.0
Facility Improvement	-	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.5	2.5	-	-	-	-	-	-	-	-	-	25.8
Other Committed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Committed Projects (Sub-total)	134.1	111.9	105.3	86.0	84.7	74.4	72.2	47.5	47.3	12.0	12.0	-	-	-	-	-	-	-	-	-	787.4
New Projects																					
3rd Street IOS	-	-	-	41.6	107.6	133.6	115.2	47.7	-	-	-	-	-	-	-	-	-	-	-	-	445.7
3rd Street Central Subway	-	-	-	-	-	-	-	-	-	-	-	-	-	36.9	95.6	118.7	102.4	42.4	43.8	113.5	553.3
Other New	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
New Projects (Sub-total)	-	-	-	41.6	107.6	133.6	115.2	47.7	-	-	-	-	-	36.9	95.6	118.7	102.4	42.4	43.8	113.5	999.0
TOTAL - Expenditures	$ 134.1	$ 111.9	$ 105.3	$ 127.6	$ 192.3	$ 208.0	$ 187.4	$ 95.2	$ 47.3	$ 12.0	$ 12.0	$ -	$ -	$ 36.9	$ 95.6	$ 118.7	$ 102.4	$ 42.4	$ 43.8	$ 113.5	$ 1,786.4
Annual Surplus (Deficit) Capital		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cumulative Surplus (Deficit)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	

Source: San Francisco Municipal Railway - Short Range Transit Plan 1996-2005; G. R. Swanson & Associates; Pittman & Hames Associates

TABLE 7-16

Third Street Light Rail Project - Operating Statement

Build Alternative - Initial Operating Segment and Central Subway

($millions in Year-of-Expenditure)

San Francisco Municipal Railway Full Build Alternative FY96 - FY15	Annual Growth Rate		FY96	Actual FY97	Adopted FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	TOTAL
Average Annual Growth: Total Revenues/Expenses					4.28%	2.94%	2.59%	2.64%	2.62%	2.67%	4.81%	2.75%	2.80%	2.81%	2.83%	4.01%	2.38%	1.85%	2.66%	2.93%	3.03%	2.98%	
REVENUES																							
Local																							
Passenger Fares [1]	1.7%		$ 94.8	$ 97.7	$ 100.1	$ 102.8	$ 104.5	$ 106.3	$ 108.1	$ 110.0	$ 113.4	$ 115.4	$ 117.3	$ 119.3	$ 121.4	$ 124.9	$ 127.0	$ 129.2	$ 131.4	$ 133.6	$ 136.5	$ 139.2	$ 2,333.1
General Fund [2]			34.6	32.6	46.7	47.0	47.7	47.5	47.7	48.0	48.3	48.5	48.8	47.7	49.4	50.7	50.4	50.4	50.7	51.1	51.8	51.8	951.9
Parking Revenue	4.0%		79.0	79.2	79.1	82.3	85.6	89.0	92.5	96.2	104.8	109.0	113.3	117.9	122.6	129.7	133.9	142.7	147.4	153.3	158.9	165.4	2,281.8
Hetch Hetchy/Water [3]	3.0%		7.5	7.5																			15.0
SFCTA Prop. B Sales Tax [4]	3.7%		3.8	4.7	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.7	6.9	7.2	7.5	7.2	-	-	-	-	-	90.1
Advertising, Misc.	3.7%		3.5	3.3	3.5	3.6	3.8	3.9	4.0	4.2	4.4	4.5	4.7	4.9	5.0	5.8	5.4	5.8	5.8	6.0	6.3	6.5	94.1
Other Local	3.7%		8.3	8.4	6.4	6.6	6.3	7.1	9.4	7.7	8.8	9.1	9.4	9.8	10.1	10.5	10.9	11.3	11.7	12.1	12.6	13.1	188.2
Subtotal - Local			231.5	233.4	240.8	247.5	153.3	259.4	265.6	272.1	285.9	292.9	300.3	307.9	315.7	328.5	335.0	339.2	347.0	356.2	366.1	376.0	5,954.2
State and Regional	3.7%	4.0%	50.4	53.2	58.3	60.5	62.7	65.0	67.4	69.9	72.7	75.6	78.6	81.8	85.1	88.5	92.0	95.7	99.5	103.5	107.6	111.9	1,579.9
Federal	0.0%		2.9	3.0	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	58.1
TOTAL - Revenues			$ 284.8	$ 289.6	$ 302.0	$ 310.9	$ 318.9	$ 327.3	$ 335.9	$ 344.9	$ 361.5	$ 371.4	$ 381.8	$ 392.5	$ 403.7	$ 419.8	$ 429.9	$ 437.8	$ 449.5	$ 462.6	$ 476.6	$ 490.8	$ 7,592.2
EXPENSES																							-
Personnel			218.7	226.5	236.2	243.1	249.4	256.0	262.7	269.7	282.7	290.5	100.8	107.6	315.7	328.4	336.2	342.4	351.5	100.8	342.4	383.9	5,933.9
Non-Personnel			62.8	63.1	65.8	67.7	88.5	71.3	83.2	75.1	78.8	80.0	83.2	85.5	88.0	88.5	93.7	95.7	92.0	100.8	100.8	106.9	1,655.0
Debt Service			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other			3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2
TOTAL- Expenses [5]			$ 284.7	$ 289.6	$ 302.0	$ 310.9	$ 318.9	$ 327.3	$ 335.9	$ 344.9	$ 361.5	$ 371.4	$ 381.8	$ 392.5	$ 403.7	$ 429.9	$ 429.9	$ 437.8	$ 449.5	$ 462.6	$ 476.6	$ 490.8	$ 7,592.1
																							-
Annual Surplus (Deficit) Operations			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cumulative Surplus (Deficit)			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	

Source: Combined Statements of Operations, San Francisco Municipal Railway, FY 96; G. R. Swanson & Associates; Pittman & Hames Associates

[1] On average, passenger fares assumed to grow at an annualized basis of 1.7 percent.

[2] Beginning in FY98, the General Fund includes the Hetch Hetchy Subvention. Contributions from the old General Fund remain flat while the additional Hetch Hetch Subvention grows annually at three percent.

[3] Hetch Hetchy Subvention transferred to General Fund beginning in FY 98, but continues to grow three percent annually.

[4] San Francisco County Transportation Authority Prop. B revenue source assumed to sunset after 2010 because it must be re-authorized by San Francisco voters.

[5] The Build Alternative plan assumes the implementation of MMX service with 5 additional LRVs in 1998, with an operating cost increase of $5.0 million, the Third Street IOS with 15 additional LRVs in 2003 with and operating cost increase of $5.2 million, the Mission Bay N-Judah service with 10 additional LRVs around 2008 with an operating cost of $4.7 million, the Central Subway service with 4 additional LRVs in 2013 with an additional operating cost $2.0 million, and the remaining bus service increase of $1.0 million by 2015.

TABLE 7-17

CAPITAL PROJECT FUNDING
THIRD STREET LRT - INITIAL OPERATING SEGMENT
($ millions)

Revenue Source	Amount
Proposition B	$404.6
Tax Increment Financing	8.5
State Regional Improvement Program	25.0
Federal STP/CMAQ	7.6
Total Revenues	$445.7
Costs	
Capital Costs	$445.7[1]
Note: [1] **Escalated dollars. Please note that the escalated cost for the IOS Financial Plan will be.recalculated at the conclusion of preliminary engineering in December, and the Financial Plan will be adjusted accordingly.**	
Source: G. Richard Swanson & Associates.	

The City believes that on a combined basis, 50 percent of the funding for both the IOS and the New Central Subway should be federally funded. The remaining 50 percent should come from a combination of state, regional and local funding. Under this assumption, the New Central Subway would require the mix of funding indicated in **Table 7-18.**

TABLE 7-18

CAPITAL OPERATING SEGMENT AND NEW CENTRAL PROJECT FUNDING
THIRD STREET LIGHT RAIL PROJECT - INITIAL SUBWAY
($ millions)

Revenue Source	Amount
Federal	$656
State, Regional, Local	656
	$1,312
Source: G. Richard Swanson & Associates.	

8.0 EVALUATION OF ALTERNATIVES

8.1 EVALUATION METHODOLOGY

The evaluation of alternatives provides local decision makers with guidance to selecting a Preferred Investment Strategy. In December 1996, the FTA issued a *Federal Register* Notice describing the revised New Starts justification criteria to be used to evaluate candidate projects for discretionary New Starts funding under Section 5309. These revised Section 5309 criteria reflect a comprehensive set of quantitative and qualitative measures:

- Mobility Improvements;
- Environmental Benefits;
- Operating Efficiencies;
- Cost Effectiveness;
- Transit Supportive Existing Land Use and Future Patterns;
- Other Factors (optional); and
- Local Financial Commitment.

FTA does not suggest that the local project evaluation (to determine the Preferred Investment Strategy) must be based entirely on the recommended performance measures, or that the federal government must limit its consideration of candidate projects to those same performance measures. Therefore, the evaluation includes measures based on the locally-defined goals and objectives discussed above, as well as FTA's recommended measures.

The local goals and objectives have been integrated into the FTA evaluation criteria categories. Project goals and objectives are presented in Section 1.4 of the DEIS/DEIR. For each FTA criteria, performance measures related to the FTA guidelines and local goals and objectives are evaluated. The resulting performance measures categorized by FTA New Starts criteria are presented in each section below.

8.1.1 TRANSIT OPTIONS EVALUATED

The evaluation compares the Light Rail Alternative (IOS and New Central Subway) with the No Build/TSM Alternative. For the IOS, four different traffic lane configurations are being considered for the Third Street commercial core, which is bounded by Kirkwood Avenue on the north and Thomas Avenue on the south. Only two of the lane configuration options are being evaluated. The two lane configuration options being evaluated were selected because of their differences in design and operational characteristics. They are: 1) light rail operating in a dedicated right-of-way (referred to as the "dedicated light rail" option); and 2) light rail operating in traffic (referred to as the "mixed-flow" option). Detailed descriptions of the alternatives can be found in the *Detailed Definition of Alternatives, Working Paper #3*, October 1997.

8.1.2 EVALUATION FRAMEWORK

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 applies a Multiple Measure method, in which New Start projects are analyzed against several evaluation criteria and results are displayed and reported. The Multiple Measure method will also be used to evaluate the alternatives/transit options relative to local goals and objectives. No attempt will be 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 result will not necessarily conform with 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 means of performance ratings assigned to the alternatives. Performance ratings will be assigned to each alternative (including Light Rail Alternative options) based on the how well the alternative meets the objective. In some cases there will be 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, or other criteria, which make a particular alternative significantly more or less desirable than the other. The performance ratings are as follows:

● - Excellent

◕ - Very Good

◐ - Good

◔ - Fair

○ - Poor

More detailed information related to the evaluation is presented in the Evaluation of Alternatives Report[1].

8.2 MOBILITY IMPROVEMENTS

In general, mobility is improved by a transit project if individuals can complete the trips they currently make at lower net costs, or if they can and do make more trips in response to a lowered net cost of trip making. Costs, in this context, include not only the out-of-pocket monetary payments made for their travel (e.g., fares), but also the value of service quality differences, most importantly travel time.

The Travel and Mobility Goal is to improve transit service to, from, and within the Third Street Corridor, thereby enhancing the mobility of Corridor residents, business people, and visitors. The specific supporting objectives and performance measures applied to each of the transit options for the Travel and Mobility Goal are presented in **Table 8-1**.

8.2.1 SUMMARY OF MOBILITY IMPROVEMENTS EVALUATION

Table 8-2 summarizes the evaluation of the alternatives with respect to achieving the Mobility Improvements criteria/objectives.

[1] San Francisco Municipal Railway, *Evaluation of Alternatives Report*, February 1998, available in Project File 96.281E at the Department of City Planning, 1660 Mission Street, San Francisco.

TABLE 8-1

CRITERIA FOR EVALUATING MOBILITY IMPROVEMENTS

Criteria/Objective	Performance Measure
FTA Criteria:	
Mobility Improvements	Value of Travel Time Savings Low Income Households Served
Local Criteria:	
Increase Transit Ridership	Comparison of Daily Linked Transit Trips
Improve Service Reliability	Miles of Exclusive Right-of-Way for Transit
Reduce 2015 Transit Travel Time	Travel Time Between Selected Origin-Destination Pairs
Improve Transit Operating Speed in Downtown/South of Market	Average Operating Speed for Transit
Enhance the Opportunity to Expand MUNI's Light Rail System	Compatibility with San Francisco Transportation Authority's Four Corridor Plan

TABLE 8-2

SUMMARY OF MOBILITY IMPROVEMENTS EVALUATION

Performance Measure	No Build/TSM Alternative	Light Rail Alternative		
		Initial Phase		Full Phase
		IOS Dedicated Light Rail	IOS Mixed-Flow	New Central Subway
Value of Travel Time Savings[1]	n/a	◕	◐	●
Low Income Households Served[1]	●	●	●	●
Daily Linked Transit Trips	n/a	◕	◐	●
Miles of Exclusive ROW for Transit	○	◕	◐	●
Travel Time Between Selected Origins & Destinations	◔	◕	◐	●
Average Operating Speed for Transit	◔	◕	◐	●
Compatibility with SFTA's Four-Corridor Plan	○	◕	◕	●

●-Excellent, ◕-Very Good, ◐-Good, ◔-Fair, ○-Poor.
Note:
(1) FTA performance measure.

The FTA evaluation of projects nationwide in its annual New Starts report will not necessarily produce the same ratings of this project as this evaluation of local alternatives produced.

No Build/TSM Alternative

The No Build/TSM Alternative would not provide high-quality transit service to low income households. It would have slower transit times, have no exclusive right-of-way for transit, and be incompatible with the Four Corridor Plan. The 9X/AX/BX express bus would have higher operating speeds than the New Central Subway, but the New Central Subway would be faster than the 9X/AX/BX bus to Chinatown because light rail would take a more direct route.

Light Rail Alternative-Initial Operating Segment

The IOS would have associated in-vehicle travel time savings of 11 minutes from Arleta/Raymond to Market/Third and six minutes from Third/Palou to Market/Third compared to the 15-Third bus. The IOS would serve a substantial number of low income households. Both the IOS dedicated light rail option and mixed-flow option would perform about the same in terms of mobility, although the mixed-flow option would have slightly slower travel times and less reliable service than the dedicated light rail option. The IOS would be fully compatible with citywide and area-specific plans.

Light Rail Alternative-New Central Subway

The New Central Subway would have the best travel time savings (five minutes over the IOS to Market/Third and eight minutes over the IOS to Chinatown). The New Central Subway would attract the most new riders, it would have the most miles of exclusive right-of-way for transit and the highest transit operating speed. The New Central Subway would serve a substantial number of low income households and would be fully compatible with the Four Corridor Plan.

8.3 ENVIRONMENTAL BENEFITS

Environmental benefits of a transit project can cover a wide variety of topics, including air quality, parkland and cultural resources, noise, vibration, and visual impacts, and other areas that can positively or negatively affect the environment. The Environmental Goal is to provide transit improvements that enhance and preserve the social and physical environment and minimize potential negative construction or operation impacts. The specific supporting objectives and performance measures for the Environmental Goal are presented in **Table 8-3**.

TABLE 8-3

CRITERIA FOR EVALUATING ENVIRONMENTAL BENEFITS

Criteria/Objective	Performance Measure
FTA Criteria:	
Environmental Benefits	Change in Regional Pollutant Emissions Change in Regional Energy Consumption EPA Air Quality Designation for Region
Local Criteria:	
Minimize Permanent Displacement of Homes and Businesses	Number of Partial and Full Acquisitions & Relocations
Minimize Impacts on Parkland/Cultural Resources	Number of Affected Sites
Minimize Visual, Noise, and Vibration Impacts	Number of Negative Impacts
Minimize Adverse Construction Impacts	Displaced Parking

8.3.1 SUMMARY OF ENVIRONMENTAL BENEFITS EVALUATION

Table 8-4 summarizes the evaluation of each alternative with respect to achieving the Environmental Benefits criteria/objectives. The EPA air quality designation for the region applies to present day measures and cannot be evaluated for the Project alternatives in the future.

No Build/TSM Alternative

The No Build/TSM Alternative would require property if a new bus maintenance facility were constructed at the Cargo Way site. It would not affect parklands and cultural sites, or displace parking during construction. However, it would not reduce air pollution or greenhouse gases.

TABLE 8-4

SUMMARY OF ENVIRONMENTAL BENEFITS EVALUATION

Performance Measure	No Build/TSM Alternative	Light Rail Alternative		
		Initial Phase		Full Phase
		IOS Dedicated Light Rail	IOS Mixed-Flow	New Central Subway
Change in Regional Air Pollutant Emissions[1]	○	◕	◕	●
Change in Greenhouse Gases[1]	○	◕	◕	●
Change in Regional Energy Consumption[1]	◔	◐	◐	◕
Partial and Full Property Acquisitions	●	◐	◐	◐
Affected Parkland/Cultural Sites	●	◕	◕	◐
Visual, Noise, and Vibration	●	◐	◐	◐
Displaced Parking During Construction	●	◕	◕	◐

●-Excellent, ◕-Very Good, ◐-Good, ◔-Fair, ○-Poor.
Note:
(1) FTA performance measure.
The FTA evaluation of projects nationwide in its annual New Starts report will not necessarily produce the same ratings of this project as this evaluation of local alternatives produced.

Light Rail Alternative-Initial Operating Segment

The IOS would reduce air pollution and greenhouse gases, and convert energy used for transit from highly polluting fossil-fuel-based energy to non-polluting, renewable hydroelectric power. The IOS would not affect parklands and would have a loss-than-significant effect on cultural sites. Construction impacts to parking would be negligible for the IOS. However, the IOS would require the displacement of one business with between three and five employees and additional businesses if the Cargo Way site were selected.

There would be slight increases in vibration associated with light rail operation for the IOS. The vibration impacts would affect residences but not institutional (e.g., schools, churches) properties. The wider sidewalks and wide landscape medians associated with the mixed-flow option would provide for more beneficial visual impacts in the Third Street nine-block commercial core area due to the inclusion of landscaping and other streetscape amenities. However, there would also be similar beneficial visual impacts associated with the dedicated light rail option.

Light Rail Alternative-New Central Subway

The New Central Subway would lead to the largest reduction in air pollution and greenhouse gases, and provide for the largest shift from fossil fuels to renewable hydroelectric power. The New Central Subway would not displace any residents or businesses. Construction of the New Central Subway would potentially impact numerous historical properties. The New Central Subway would not add to the vibration impacts associated with the IOS. The construction impacts to parking would be basically the same for the New Central Subway and the IOS, except the New Central Subway would temporarily affect the area around Union Square. The New Central Subway would have the same beneficial visual impacts as the IOS.

8.4 OPERATING EFFICIENCIES

Operating efficiencies represent the extent to which the proposed transit investment would produce future resource savings for transit operators relative to existing service or existing service forecasted into the future. The specific supporting objectives and performance measures applied to each of the transit options for the Operating Efficiencies evaluation criteria are presented in **Table 8-5**.

TABLE 8-5

CRITERIA FOR EVALUATING OPERATING EFFICIENCIES

Criteria/Objective	Performance Measure
FTA Criteria:	
Operating Efficiencies	Operating Cost per Passenger Mile
Local Criteria:	
Maximize Transit Operating Efficiency While Accommodating 2015 Demand	Operating Cost per Passenger Operating Cost per Bus Hour Operating Cost per Train Hour Farebox Recovery Ratio

8.4.1 SUMMARY OF OPERATING EFFICIENCIES EVALUATION

Table 8-6 presents a comparison of the Operations Efficiencies calculations for each alternative. **Table 8-7** summarizes the evaluation with respect to achieving the Operating Efficiencies criteria/objectives.

TABLE 8-6

OPERATING EFFICIENCIES - 2015

Performance Measure	No Build/TSM Alternative	Build Alternative		
		Initial Phase		Full Phase
		IOS Dedicated LRT	IOS Mixed-Flow	Central Subway
Operating Cost per Passenger Mile(1,2)	$0.55	$0.55	$0.55	$0.55
Operating Cost per Passenger(2)	$1.07	$1.06	$1.07	$1.07
Operating Cost per Bus Hour(3)	$90.97	$90.93	$90.93	$90.91
Operating Cost per Train Hour(3)	$208.17	$209.52	$208.34	$200.46
Farebox Recovery Ratio(2)	28.7%	29.2%(4)	29.2%(4)	28.4%

Sources: 2015 base system ridership - MUNI, *Ridership Projections to the Year 2015*, April 25, 1997; 2015 Third Street Corridor ridership projections - Korve Engineering, Inc., November 1997; O&M costs, hours – Manuel Padron & Associates, Inc., September 29, 1997; fare revenue - G. Richard Swanson & Associates, November 1997.

Notes:
(1) FTA performance measure.
(2) Includes Cable Car mode.
(3) Excludes Cable Car mode
(4) Farebox recovery for IOS assessed for 2012 in order to differentiate from Central Subway in the combined financial analysis.

TABLE 8-7

SUMMARY OF OPERATING EFFICIENCIES

Performance Measure	No Build/TSM Alternative	Light Rail Alternative		
		Initial Phase		Full Phase
		IOS Dedicated Light Rail	IOS Mixed-Flow	New Central Subway
Operating Cost per Passenger Mile[1]	◐	◐	◐	◐
Operating Cost per Passenger	◐	◐	◐	◐
Operating Cost per Bus Hour	◐	◐	◐	◐
Operating Cost per Train Hour	◐	◐	◐	◕
Farebox Recovery Ratio	◐	◕	◕	◐

●-Excellent, ◕-Very Good, ◐-Good, ◔-Fair, ○-Poor.

Note:

(1) FTA performance measure.

The FTA evaluation of projects nationwide in its annual New Starts report will not necessarily produce the same ratings of this project as this evaluation of local alternatives produced.

No Build/TSM Alternative

The No Build/TSM Alternative would have a higher cost per train hour ($208.71) than the New Central Subway ($200.46), but about the same as the IOS ($208.34). The No Build/TSM Alternative would have a similar farebox recovery ratio to the New Central Subway (28.7 percent), and slightly less than the IOS (29.2 percent).

Light Rail Alternative-Initial Operating Segment

The IOS would provide faster and more reliable transit service than the No Build/TSM Alternative without a loss in operating efficiency. The IOS service would be of higher quality and capacity compared to the No Build/TSM Alternative. The farebox recovery ratio for the IOS would be slightly higher than for the No Build/TSM Alternative, meaning that the improved service would attract enough riders to offset the somewhat higher operating costs associated with the IOS.

Light Rail Alternative-New Central Subway

The New Central Subway would provide even more frequent transit service than the IOS with no perceptible decrease in operating efficiency. The cost per train hour associated with the New Central Subway would be four percent lower than the IOS or No Build/TSM Alternative. Farebox recovery for the New Central Subway would be about the same as the No Build/TSM Alternative, and less than for the IOS.

8.5 COST EFFECTIVENESS

Cost effectiveness, as applied to transportation capital projects, is defined as the extent to which an alternative returns benefits in relation to its costs. Since the early 1980's FTA has used a cost-effectiveness index to evaluate and compare New Start transit projects. The cost-effectiveness index is an attempt to calculate the cost of attracting one new rider to transit. FTA has recently revised its cost effectiveness measure to exclude travel time savings from the calculation. The measures applied for the Cost Effectiveness evaluation criteria are presented in **Table 8-8**.

TABLE 8-8

CRITERIA FOR EVALUATING COST EFFECTIVENESS

Criteria/Objective	Performance Measure
Cost Effectiveness (FTA criteria)	Incremental Cost per Incremental Passenger

8.5.1 SUMMARY OF COST EFFECTIVENESS EVALUATION

Table 8-9 summarizes the evaluation of each alternative with respect to achieving the Cost Effectiveness criteria/objectives.

TABLE 8-9

SUMMARY OF COST EFFECTIVENESS

Performance Measure	No Build/TSM Alternative	Light Rail Alternative		
		Initial Phase		Full Phase
		IOS Dedicated Light Rail	IOS Mixed-Flow	New Central Subway
Incremental Cost per Incremental Passenger[1]	N/A	◕	◐	●

●-Excellent, ◕-Very Good, ◐-Good, ◔-Fair, ○-Poor.

Note:

(1) FTA performance measure.

The FTA evaluation of projects nationwide in its annual New Starts report will not necessarily produce the same ratings of this project as this evaluation of local alternatives produced.

No Build/TSM Alternative

The cost per new rider calculation is not applicable to the No Build/TSM Alternative.

Light Rail Alternative-Initial Operating Segment

The cost per new rider for the IOS dedicated light rail and mixed-flow options would be $30.60 and $34.82, respectively. The IOS mixed-flow option would have a higher cost per new rider because its slower travel time (by two minutes) would increase operating costs and attract fewer riders than the dedicated configuration.

Light Rail Alternative-New Central Subway

The cost per new rider for the New Central Subway would be $28.11, lower than the IOS, since the New Central Subway would attract the most new transit riders relative to the incremental cost of building and operating the light rail line.

8.6 TRANSIT SUPPORTIVE EXISTING LAND USE AND FUTURE PATTERNS

It is difficult to evaluate land use in quantitative terms due to the subjective nature of the topic. The issue is how well (or how poorly) a transportation alternative reinforces local land use policies. For instance, if a given alternative provides improved accessibility to areas where the City wants to stimulate growth, it would support the City's land use policy. On the other hand, if it would intrude upon established neighborhoods or planned developments or worsen traffic congestion, it would not support the City's land use policy.

The Transit Supportive Land Use Goal is to 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. The specific supporting objectives and performance measures evaluate the Transit Supportive Land Use Goal are presented in **Table 8-10**.

TABLE 8-10

CRITERIA FOR EVALUATING TRANSIT SUPPORTIVE LAND USE AND FUTURE PATTERNS

Criteria/Objective	Performance Measure
FTA Criteria:	
Transit Supportive Land Use and Future Patterns	Combined Rating by FTA on Six Land Use Factors
Local Criteria:	
Support the Coordination of Land Use and Transportation Planning	Review Citywide and Area-specific Land Use Plans Related to the Corridor
Support Revitalization Opportunities in Third Street commercial core Adjacent to Transit Stops	Acres of Vacant or Underutilized Land Adjacent to Transit Stops
Project Serves Major Activity Centers in the Corridor	Number of Centers Having Access to Transit

8.6.1 TRANSIT SUPPORTIVE LAND USE EVALUATION

Table 8-11 summarizes the evaluation of achieving the Transit Supportive Land Use and Future Patterns criteria/objectives.

No Build/TSM Alternative

The No Build/TSM Alternative would not be supportive of citywide and area-specific plans, nor would it encourage economic revitalization opportunities in the Third Street commercial core. The No Build/TSM Alternative would serve major activity centers in the Corridor, but light rail service on its own reserved right-of-way would provide higher quality and more reliable service.

Light Rail Alternative-Initial Operating Segment

The IOS would be fully supportive of citywide and area plans. The IOS would encourage revitalization in the Third Street commercial core by incorporating streetscape redesign along this segment of Third Street. The IOS would provide direct transit service to most of the major activity centers in the Corridor. Indirect service would be provided to the Moscone Convention Center, Yerba Buena Gardens/Museum of Modern Art, Downtown, and Chinatown through connections to buses or other light rail lines.

TABLE 8-11

SUMMARY OF TRANSIT SUPPORTIVE LAND USE AND FUTURE PATTERNS

Performance Measure	No Build/TSM Alternative	Light Rail Alternative		
		Initial Phase		Full Phase
		IOS Dedicated Light Rail	IOS Mixed-Flow	New Central Subway
Compatible with City and Area Plans	◔	◕	◕	●
Support Revitalization Opportunities in the Third Street commercial core Adjacent to Transit Stops	○	◕	◕	●
Project Serves Major Activity Centers	◕	◐	◐	◕

●-Excellent, ◕-Very Good, ◐-Good, ◔-Fair, ○-Poor.

The FTA evaluation of projects nationwide in its annual New Starts report will not necessarily produce the same ratings of this project as this evaluation of local alternatives produced.

Light Rail Alternative-New Central Subway

The New Central Subway would be fully supportive of citywide and area plans, and it would also be supportive of the Chinatown Plan. The New Central Subway would provide the most opportunities for economic revitalization in the Third Street commercial core through the increased ridership associated with the extension of the light rail line to Union Square and Chinatown. In addition, the New Central Subway would provide high quality and high capacity transit service to major activity centers in the Corridor.

8.7 OTHER FACTORS

Other Factors is an optional criterion defined by FTA that focuses on local evaluation factors, rather than the FTA-defined evaluation criteria which are applied to all transit operators in the United States. The measures that are applied to each of the transit options for the Other Factors evaluation criteria are presented in **Table 8-12**. For the evaluation of alternatives, this criterion group includes local goals and objectives that cannot be easily categorized into FTA Section 5309 New Starts criteria.

8.7.1 OTHER LOCAL EVALUATION FACTORS

Table 8-13 summarizes the evaluation of each alternative with respect to achieving the Other Factors criteria/objectives.

No Build/TSM Alternative

The No Build/TSM Alternative would provide the slowest travel times from Bayview to Downtown and Visitacion Valley to Chinatown. The No Build/TSM Alternative would not increase net parking in the Third Street commercial core but it would not decrease parking on Third Street as the IOS dedicated light rail configuration would. The No Build/TSM Alternative would provide no pedestrian and landscape/streetscape improvements to sidewalks or to the existing, intermittent center median in the Third Streeet commercial core. In addition, **the 15-line would be one block removed from** the new Giants ballpark. Because the No Build/TSM Alternative would not be supportive of citywide and area-wide land use plans, it would not likely generate community acceptance or political support.

TABLE 8-12

CRITERIA FOR EVALUATING OTHER FACTORS

Criteria/Objective	Performance Measure
Local Criteria:	
Efficiency	Cost per New Rider (former FTA calculation) Cost per User Benefit (former FTA calculation)
Improve Access to Downtown Employment Centers and Chinatown (Equity Goal)	Comparison of Travel Time from Third/Palou to Third/Market, and Bayshore/Arleta to Stockton/Clay
Maintain Adequate Auto & Truck Access in Third Street Commercial Core (Economic Revitalization Goal)	Curb Parking Supply on or Near Third Street in Bayview
Enhance Urban Design/Streetscape Improvements along Third Street in Bayview Hunters Point (Economic Revitalization Goal)	New Areas for Landscape Treatments in the Third Street Commercial Core
Gain Community Support for Preferred Investment Strategy (Community Acceptance Goal)	Not Applicable
Gain City Commissions', Mayor and Board of Supervisors Support for Preferred Investment Strategy (Community Acceptance Goal)	Not Applicable
Gain Support from Appropriate Regional (MTC), State, and Federal Agencies (Community Acceptance Goal)	Not Applicable

TABLE 8-13

SUMMARY OF OTHER LOCAL EVALUATION FACTORS

Performance Measure	No Build/TSM Alternative	Light Rail Alternative		
		Initial Phase		Full Phase
		IOS Dedicated Light Rail	IOS Mixed-Flow	New Central Subway
Cost per New Rider(1)	n/a	●	◐	◕
Cost per User Benefit(1)	n/a	●	◕	◔
Travel Time from Third/Palou to Downtown	◔	◕	◐	●
Travel Time from Bayshore/Arleta to Chinatown	◔	n/a	n/a	●
Parking Supply Along Third Street in Commercial Core(2)	◕	◐	●	n/a(3)
Landscape Treatments in Commercial Core	○	◕	●	n/a(3)
Community Acceptance and Political Support	○	◕	◕	●

●-Excellent, ◕-Very Good, ◐-Good, ◔-Fair, ○-Poor.

Notes:
(1) Former FTA calculation.
(2) For all alternatives/options, 70 close-in spaces (a maximum of 175 spaces) could be added as perpendicular parking on side streets about one-half block on either side of Third Street.
(3) Does not apply to the New Central Subway phase.

The FTA evaluation of projects nationwide in its annual New Starts report will not necessarily produce the same ratings of this project as this evaluation of local alternatives produced.

Light Rail Alternative-Initial Operating Segment

The IOS with dedicated light rail configuration would have the lowest cost per new rider ($9.96) compared to the mixed-flow option and New Central Subway (this measure was not calculated for the No Build/TSM Alternative). The IOS dedicated light rail configuration would provide the most new riders per incremental cost of building and operating the light rail line. The cost per new rider for the IOS mixed-flow option would be higher than for the dedicated light rail option. Although the cost per new rider for the IOS (and New Central Subway) would be near or over $10.00, it is important to note that the Corridor is already a very transit-dependent corridor, and light rail would be implemented at the same time as many of the major new developments in the Corridor.

The IOS with dedicated light rail configuration also would have the lowest cost per user benefit ($1.38), meaning it would provide the most travel time savings relative to costs. The cost per user benefit for the IOS mixed-flow option would be 28 percent higher ($1.76), but still lower than the New Central Subway ($2.20).

Ligh rail would significantly reduce travel times from Bayview to Downtown. The IOS with dedicated light rail configuration would save six minutes and the IOS mixed-flow option would save four minutes of in-vehicle and total travel time compared to the 15-Third bus line.

The dedicated light rail option would displace 46 curb parking spaces on Third Street in the commercial core, while the mixed-flow configuration would increase parking on Third Street by 16 spaces. Up to 175 spaces could be added as perpendicular parking on side streets about one-half block on either side of Third Street for either option. Approximately 70 of the side-street spaces would be very near Third Street.

The wide sidewalks and center median associated with the IOS mixed-flow configuration would provide the greatest opportunity for pedestrian and landscape/streetscape treatments in the Third Street commercial core. The IOS dedicated light rail configuration would not include a center median and sidewalks would not be widened. However, there would be an opportunity for pedestrian and landscape/streetscape treatments at light rail stations. The IOS would be fully compatible with citywide and area-specific plans, and would likely generate community acceptance and political support. Most businesses in the Third Street commercial core favor the mixed-flow configuration because it would have less impact on parking near businesses.

Light Rail Alternative-New Central Subway

The cost per new rider associated with the New Central Subway would be almost $16.00. As mentioned previously, this figure does not reflect thousands of daily new transit trips that would be associated with the No Build/TSM Alternative. The New Central Subway would have the highest cost per user benefit ($2.20). The greater travel time savings associated with the New Central Subway would not be enough to offset its significantly higher capital and operating costs.

The New Central Subway would have the greatest travel time savings. For in-vehicle travel time savings from Bayview to Downtown, the New Central Subway would save eleven minutes per trip compared to the 15-Third bus line. For in-vehicle travel time from Visitacion Valley to Chinatown, the New Central Subway would save 19 minutes per trip compared to the 9X/AX/BX express bus.

The New Central Subway was not evaluated in terms of parking or streetscape/landscape treatments in the Third Street commercial core because it would not directly affect that portion of the Corridor. In terms of the community acceptance and political support objective, the New Central Subway would be superior to the No Build/TSM Alternative and the IOS because it would provide shorter, more direct service into Downtown and Chinatown and would also provide for links to future light rail corridors (e.g., Geary).

8.8 LOCAL FINANCIAL COMMITMENT

This section discusses the financial feasibility of the alternatives and design options. Local financial commitment measures the local agency's contribution to the cost of constructing, operating and maintaining the Project, the stability and reliability of its capital financing plan, and the stability and reliability of its operating financing plan. The Financial Goal is to implement transit improvements that provide for the efficient use of limited financial resources. The specific supporting objectives and performance measures are presented in **Table 8-14**.

TABLE 8-14

CRITERIA FOR EVALUATING LOCAL FINANCIAL COMMITMENT

Criteria/Objective	Performance Measure
FTA and Local Criteria:	
Local Financial Commitment	Local Share of Total Project Capital Costs
Develop Financial Plan to Cover Total Capital Costs	Capital Costs Compared with Available and Projected Capital Funds
Develop Financial Plan to Cover Total Annual Operating & Maintenance Costs (Systemwide)	Annual Operating & Maintenance Costs Compared with Available and Projected Local Funding

8.8.1 LOCAL FINANCIAL COMMITMENT EVALUATION

Table 8-15 summarizes the evaluation of each alternative with respect to achieving the Local Financial Commitment criteria/objectives.

TABLE 8-15

SUMMARY OF LOCAL FINANCIAL COMMITMENT

Performance Measure	No Build/TSM Alternative	Light Rail Alternative		
		Initial Phase		Full Phase
		IOS Dedicated Light Rail	IOS Mixed-Flow	New Central Subway(1)
Local Share to Total Project Capital Cost	◐	●	●	◐
Capital Costs Compared to Funding	●	●	●	◐
Operating Costs Compared to Funding	●	●	●	●

●-Excellent, ◕-Very Good, ◐-Good, ◔-Fair, ○-Poor.
Note:
(1) Data do not fully cover construction and operation of Phase II of the New Central Subway.

The FTA evaluation of projects nationwide in its annual New Starts report will not necessarily produce the same ratings of this project as this evaluation of local alternatives produced.