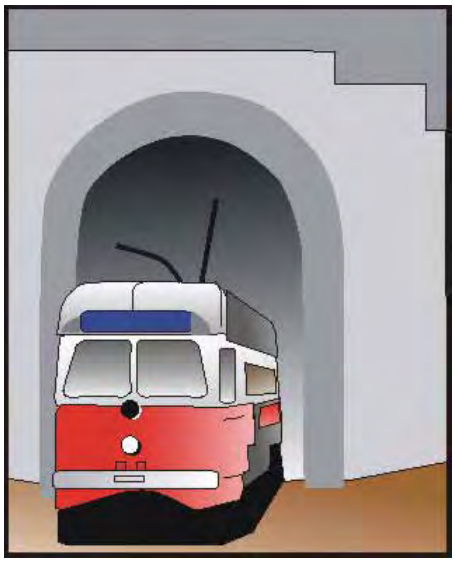
ENVIRONMENTAL IMPACT STATEMENT FOR THE EXTENSION OF HISTORIC STREETCAR SERVICE FROM FISHERMAN'S WHARF TO THE SAN FRANCISCO MARITIME NATIONAL HISTORICAL PARK AND GOLDEN GATE NATIONAL RECREATION AREA'S FORT MASON CENTER



D R A F T

Conceptual Engineering Report

URS

Prepared by URS Corporation for the
National Park Service – Golden Gate National Recreation Area

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SECTION 1 - INTRODUCTION AND PURPOSE

This report provides an engineering analysis of the alternatives developed during Phase 2 of the Alternatives Analysis (AA)/Environmental Impact Statement (EIS) for the Historic Streetcar Extension to San Francisco Maritime National Historical Park (SFMNHP) and the Golden Gate National Recreation Area's (GGNRA) Fort Mason Center, which are both properties owned and operated by the National Park Service (NPS). The proposed project begins at the current terminal of the existing F-Market & Wharves historic streetcar line (F-line) at San Francisco's Fisherman's Wharf, and extends west to Fort Mason Center. The assumption in this Engineering Report is that the project will be constructed and operated by the San Francisco Municipal Railway (Muni), an operating department of the San Francisco Municipal Transportation Agency (MTA), and the current owner and operator of the F-line.

This document reports on the conceptual design engineering work performed on the project alternatives that resulted from the initial screening conducted during the AA process. During the AA, five rail alignment alternatives, two bus alternatives, and two electric trolley coach alternatives were considered for the basic alignment. In addition, thirteen alternatives were considered for the turnaround facility at Fort Mason. After screening, one rail alignment alternative remained, with configuration options in several segments of the alignment. Four turnaround concepts also passed the screening process, and a fifth was introduced during the conceptual engineering process. A full review of the alignment alternatives, the turnaround alternatives and the screening process can be found in Working Paper #2 – Alternatives, and in the Draft Chapter 2 of the EIS – Description of Alternatives.

Two major engineering features of the build alignment alternative are that it includes a 1,500 foot tunnel section (Fort Mason Tunnel), which is an existing single-track, former freight rail tunnel, and a double-track to double-track crossing of the proposed streetcar extension with the existing cable car system, also operated by Muni. The alignment contains alternative configurations discussed in greater detail in this report in the following areas:

- Fort Mason Turnaround;
- Transition area (between the eastern tunnel portal and Beach Street);
- Street running portion along Beach Street;
- Street running portion along Jefferson Street between Jones and Leavenworth;

Included in Appendix A are conceptual design drawings for the alignment and the configuration alternatives, and the turnaround alternatives.

This document identifies the assumptions used to develop the conceptual design, discusses the alignment-specific design considerations, presents detailed alignment descriptions, and summarizes the design elements that should be addressed during future design phases. The report summarizes the alignment alternatives and supplements the attached conceptual plans.

SECTION 2 - GENERAL DESIGN CONSIDERATIONS

This section describes the general design assumptions and considerations for the extension.

2.1 VEHICLES

The determining factor for many aspects of a rail system's design is the choice of vehicles that will operate on the system. The size, geometry and performance characteristics of the vehicles influence all other aspects of the system such as station platform height and length, curve radii, acceptable grades and operational interfaces with auto traffic.

2.1.1 Streetcar types: Historic Trolleys and LRVs

Muni's rail vehicle fleet includes a number of different types of vehicles, including a variety of historic streetcars, cable cars, and modern light rail vehicles (LRVs). The vehicles anticipated to operate on the Fort Mason extension are historic streetcars, from both San Francisco and from cities around the world. The basic design parameters for Muni's light rail and historic streetcar lines stipulate that the clearances along the alignment will accommodate any vehicle in the fleet, including modern LRVs, on any part of the system. Therefore, the design parameters used for this extension will also provide clearances for any of Muni's current fleet, whether or not they are currently planned to run on the extension. As a practical matter, Muni's modern LRVs and historic streetcars fit within the same basic clearance envelope, as Muni's rail system is historically a streetcar system that has been upgraded with certain light rail characteristics over the years. Muni's LRVs and streetcars also have similar structural loading requirements, which determine the type of rail and track slab sections that can be used. Designing the extension to provide clearances or capabilities for any vehicles in the Muni fleet is not anticipated to create additional costs or impacts. The overhead traction power contact systems for streetcar and LRV lines do have different physical characteristics, as do lines where both streetcars and LRVs operate together. The overhead contact system may not necessarily accommodate any car on the system in all locations without modifications.

2.1.2 Historic Streetcars

Muni has many historic streetcars currently in operation, with the most common type in the fleet being the President's Conference Committee (PCC) cars. As the PCC cars are the largest subfleet of historic streetcars currently operating on the F-line, they were used as the design vehicle for operations and platform configurations in this study. Some typical vehicle specifications for PCCs are shown in the figures below. Muni's PCC car fleet contains cars from several different systems, and includes cars with slightly different configurations in terms of doors, car width, seating, and other attributes. Muni also operates a fleet of ex-Milan (Italy) Peter Witt cars, and there are numerous "one-of-a-kind" cars in the fleet, all with slightly different clearance envelopes, but which can all be accommodated on the same general design envelope. A listing of the cars in the fleet is included as Appendix B.

Table 2.1.1 Typical Muni PCC Car Vehicle Configuration	
Length	48’ 5” - 50’5”
Width	8’4” - 9’0”
Height	10’1” - 10’ 3”
Weight	37,990 - 40,140 lbs
Boarding	Right-side or both sides
Source: streetcar.org © 2007 Market Street Railway	

Figure 2.1.1: President's Conference Committee (PCC) car #1051 (former SEPTA)

Figure 2.1.2: Milan Peter Witt Streetcar #1815

Light Rail Vehicles

Muni's 75-foot long modern LRVs (LRV-2, LRV-3), designed and constructed by Breda Costruzioni Ferroviarie, of Pistoia, Italy, operate on the Muni Metro system, and are not proposed for use on the F-line or the Fort Mason extension. The Breda LRVs are slightly longer than the streetcars in the historic fleet but as they are articulated, are capable of navigating similar horizontal curves (45 foot radius). See the tables and figure below for a summary of their characteristics. As discussed in the prior section, Muni's practice is to ensure that all extensions are designed with clearances sufficient for all vehicles in the fleet, and that platform lengths can accommodate LRVs if required in the future.

Table 2.1.2
LRV-2 Configuration

Length	75'0"
Width	9'0"
Height	11'6"
Weight	79,000 lbs
Boarding	Dual-side
Operator cab	Both ends
Contact wire ranges	12' 2" – 19' 0"
Height of car floor	2' 10" +/-

Source: San Francisco Municipal Railway, Contract Proposal #309 – Procurement of Light Rail Vehicles LRV2, January 6, 1992.

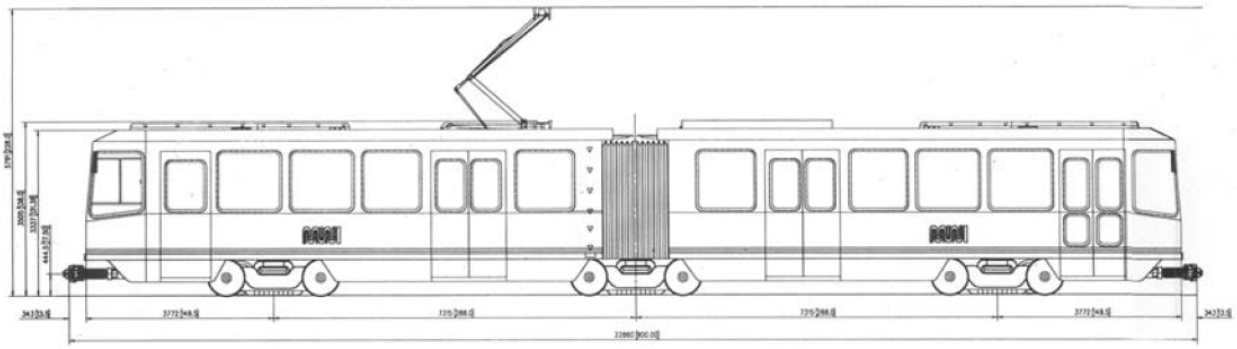

Figure 2.1.3: Breda LRV-2/LRV-3

2.2 DESIGN GUIDELINES AND ASSUMPTIONS

The conceptual design guidelines and assumptions for this project were based on Muni's historic streetcar system design practice as represented by the most recent streetcar line extensions constructed. Muni does not maintain a manual of design standards, but instead uses the design standards from the most recently constructed line as the basis for future designs. Muni provided several reference documents, including the Conceptual Engineering Report and as-built plans for the F-Market Fisherman's Wharf Extension (1990), to be used in setting the minimum design parameters for this project. Additionally, meetings were held with Muni planning and engineering staff at the beginning of design work and at intervals throughout the process. In addition, California Public Utilities Commission (CPUC) guidelines as specified in General Order 26-D and General Order 143-B have been used to determine required clearances. A brief summary of the design standards established for this project, including minimum horizontal curvature, vertical grades, track systems, and platform criteria are included in Table 2.2.1.

2.2.1 Horizontal Curvature

On the Fort Mason extension, standard curvature has been kept to a minimum of 80 feet wherever possible. Muni's existing system includes a few horizontal curves of radius as short as 45 feet, which is the minimum negotiable by the existing vehicles. Curves close to this radius have been used in a few locations in this design where unavoidable due to site conditions and to minimize impacts, though a desirable minimum of 80 feet has been accommodated wherever possible. Vehicle dynamic envelopes, physical constraints, adjacent traffic lanes and other considerations were used to establish the horizontal alignment configuration. Spiral curves and superelevation were not used in layout of the conceptual alignments, but will be applied in future design phases, consistent with current Muni standards.

2.2.2 Vehicle Clearances

Clearance requirements have been established conceptually based on the dynamic envelope of the vehicles to be used on the extension, as specified in CPUC regulations. In the Fort Mason Tunnel, per CPUC regulations, a minimum 30-inch wide walkway will be provided adjacent to the trackway on both sides. For street-running segments, adjacent vehicle striping and stop bars have been preliminarily set based on approximate vehicle clearance envelopes. At the conceptual level of design all clearance envelopes and obstructions are approximate; a more detailed analysis will be required during detailed engineering.

2.2.3 Station Platforms

The current F-line operates with low-level platforms and satisfies ADA boarding requirements with mini-high platforms provided at one end of the boarding platform. The proposed stations and platforms for this project are proposed to be configured similarly. Platform lengths have been designed to accommodate a 75' long vehicle, which will accommodate vehicles of both Muni's historic streetcar and modern LRV fleets.

Table 2.2.1 Design Guidelines and Assumptions		
Design Element	**Project Guidelines**	**Comments**
Typical Section		
Track section (street-running)	Embedded track with girder rail	
Track Section (non-street-running)	Tie and Ballast	Appropriate track sections should be determined during PE
Traffic separation (street-running)	Standard traffic striping/ Pavement treatment	Shared with Autos/Semi-exclusive
Traffic separation (non-street-running)	Curb/retaining wall as required	Fence may be warranted in places to prevent pedestrians from fouling the trackway
Alignment		
Maximum design speed (street running)	25 mph	
Maximum design speed (private right-of-way)	30 mph	Tunnel segment
Minimum horizontal radius	45 inch	Per Muni LRV2 specs
Max grade	9%	Max grade anticipated is less than 5%
Signals (Train Control)		
Street running	Line-of-sight – traffic signal control	
Non-street running	Line-of-sight – ABS signaling	Tunnel and turn around tracks.
Street Operations	Transit–only phases required at several locations. Traffic signal priority possible for several locations.	
Interlocking operation	Call for clear signal to be made at platforms and turn around tracks through track circuit detection.	ABS signals with interlocker. First come, first served. Use directional stick circuitry and switch point detection.
Stations		
Platform height	Low-level platforms	
Platform ADA	Mini-high platforms at one end of platform	
Platform capacity	Varies with alternatives	

2.3 STREETCAR GUIDEWAY

The streetcar guideway for this project will consist of line segments with different track construction configurations, depending on the location of the alignment and the degree of exclusivity of that segment. For street-running trackway, two alternative configurations have been provided for Beach Street; one that shares traffic lanes with auto traffic in both directions, and a second that is configured in a semi-exclusive right-of-way in one direction with mixed traffic in the other direction. Cross sections of the roadway configuration at various points along the alignment are shown in Appendix C, and are keyed to the drawings in Appendix A. For most blocks of street running on Beach Street, which is the main street that the proposed extension would operate on, providing two directions of exclusive streetcar lanes would require converting the street to one-way traffic or widening the street right-of-way. Neither of these configuration changes is proposed for this project at this time. These configurations were considered, and documentation of that is included as Appendix D.

The track construction methodology anticipated for the street-running portion will be similar to the current F-line trackage, consisting of a cast-in-place embedded girder rail section with or without special pavement delineation (i.e. pavers) (See Figure 2.3.1). There are a number of design considerations that should be further evaluated during preliminary engineering for the street-running segments in designing the appropriate track structure. Design elements to be considered include: existing and future utility crossings, road crossings, stray current isolation, maintenance, ease of construction, aesthetics, and cost. Street utility base mapping is provided in Appendix E to this report.

Portions of the alignment alternatives in the turnaround and transition areas may be more conducive to an open track (tie and ballast) section. A typical tie and ballast section is shown in Figure 2.3.2 and should be refined during preliminary engineering. Grass track, with natural turf between the rails, is also a consideration for the non-street running segments, including the transition and several of the turnaround alternatives.

For the Fort Mason Tunnel segment, the design assumed previously in the Jacobs Associates report is also assumed for the purposes of this report.[1] This assumption is for the use of direct fixation track as shown in Figure 2.3.3. For the purpose of this engineering report, the analysis provided in the Jacobs Associates report is assumed to meet all applicable codes and has been assumed as the cost baseline for the Fort Mason Tunnel. However it should be noted that the configuration of the contact wire (trolley wire) and ventilation fan shown in the Jacobs Associates report will need to be refined so as not to preclude the future operation of pantograph-equipped vehicles on this line segment. More importantly, the ventilation fan(s) will need to be located to provide adequate clearance for the trolley pole, adequate signal visibility, and to provide a sufficient clearance for the dynamic envelope for the historic streetcars.

[1] Jacobs Associates, *Tunnel Rehabilitation and Preliminary Cost Estimate Report,* December 30, 2005.

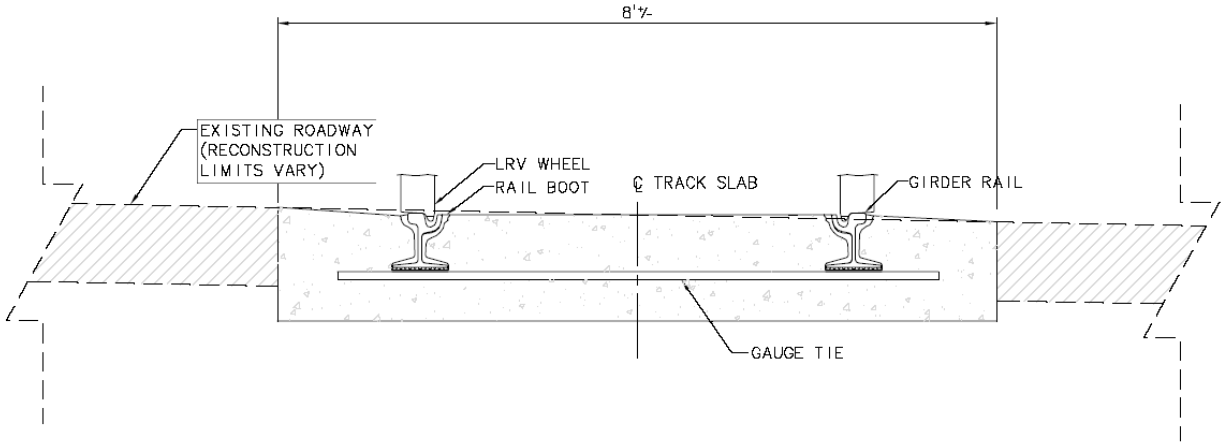

Figure 2.3.1: Typical street-running track section

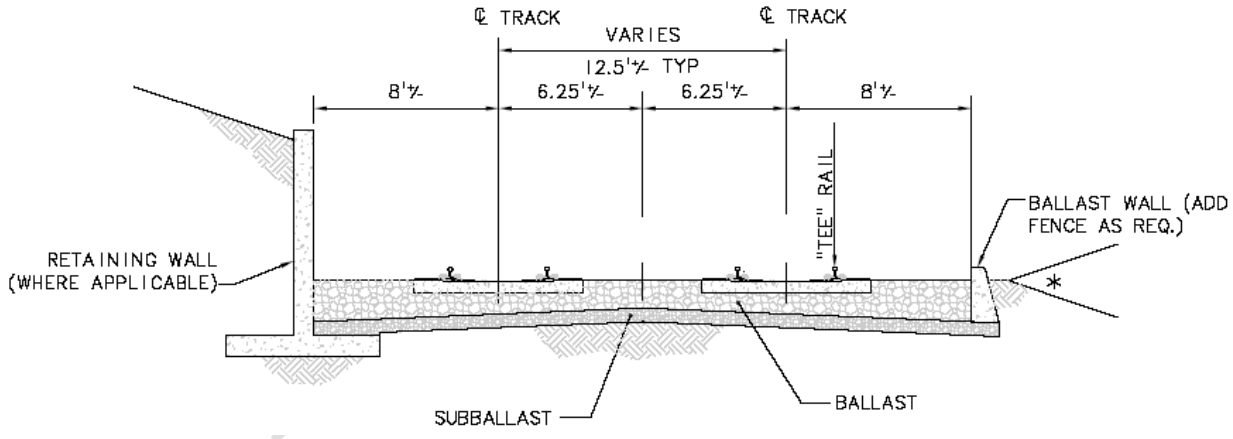

Figure 2.3.2: Typical open tie and ballast track section

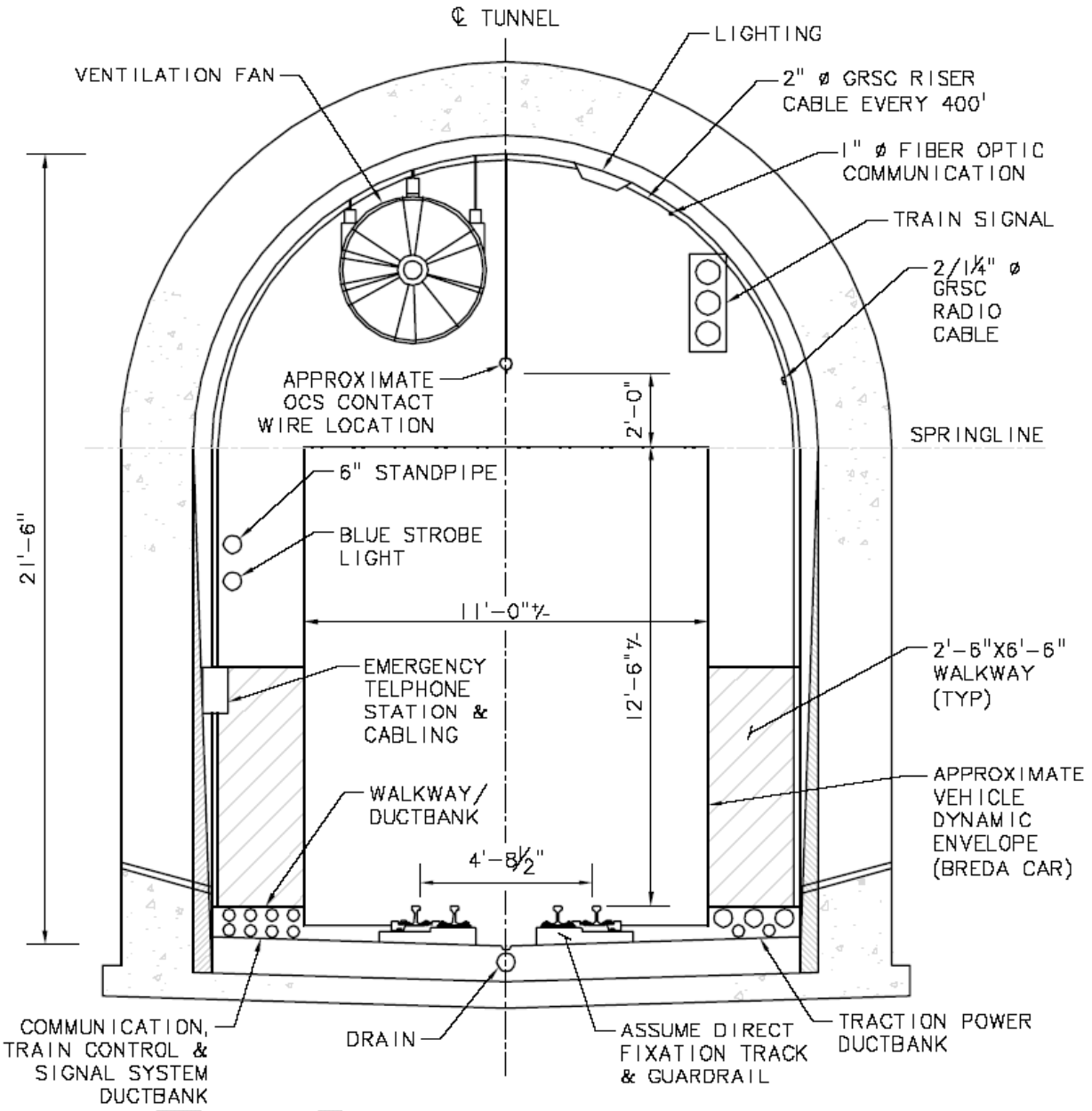

Figure 2.3.3: Fort Mason Tunnel with direct fixation track

2.4 SPECIAL TRACKWORK

Locations where special trackwork such as turnouts and diamonds will be required have been preliminarily identified on the conceptual plans and are important elements to consider in the design of the extension. The design of the individual pieces of trackwork have not been refined in detail at this stage. For the purposes of this study, it was assumed that all street running turnouts will conform to Muni's typical embedded tongue switch and mate turnouts currently installed elsewhere on the system. Any turnouts or special trackwork in non-street running segments with "Tee" rail are assumed to follow standard AREMA design. Once a preferred alignment alternative is selected and a more detailed operational analysis is completed additional

special trackwork may be warranted for additional "dead" car/special event storage and/or dwell areas.

2.5 GRADE CROSSINGS/TRAFFIC SIGNALS

In street-running segments, the streetcars will operate by line-of-sight. Operation at intersections will be traffic signal or stop-sign controlled. Existing traffic signals may require modification with special streetcar phases and additional signals may be required at intersections where no signal currently exists. The traffic signal system may include a separate train signal, interconnected to the traffic signal lights, for semi-exclusive operated alignments or other special circumstances. The grade crossing at Van Ness Avenue will be controlled by stop signs, stopping Van Ness Avenue. Locations where special streetcar signal phases may be required have been preliminarily identified in Table 2.5.

Table 2.5
Streetcar Signal Phases

Location	Reason
Jefferson & Jones	Streetcars turn left from right lane
Jefferson & Leavenworth	Streetcars turn left from right lane
Leavenworth & Beach	Streetcar turns
Beach & Hyde	Streetcar/cable car crossing
Beach & Polk	Streetcar lane transitions

Additional details on streetcar operations in mixed traffic are discussed in a separate traffic report (Appendix C).

2.6 EXISTING TUNNEL SEGMENT

An existing 1,500 foot tunnel section (Fort Mason Tunnel) runs between the east tunnel portal at Van Ness Avenue to the west tunnel portal at Marina Boulevard and Laguna Street. It is a single track tunnel, used for freight train movements until the late 1970s. This tunnel segment will need to accommodate the bi-directional movement of streetcars on a single track. The structural rehabilitation needs of the Fort Mason Tunnel were evaluated in two previous analyses conducted for the National Park Service and used as the basis for the conceptual tunnel design costing in this report. In 2004, NPS conducted an evaluation to determine the structural deficiencies of the tunnel, and to assess the feasibility of rehabilitating the tunnel for use by the future streetcar extension.[2] The study characterized the current condition of the tunnel and portal retaining structures, and developed concepts for rehabilitating these facilities for streetcar use. The study also included a geotechnical and seismic examination of the Fort Mason Tunnel. The study found that the tunnel would need to be rehabilitated and strengthened to correct voids behind the tunnel lining, water infiltration inside the tunnel, large cracks in the interior lining,

[2] Kleinfelder, Inc, *Global Stability Geotechnical Investigation – Fort Mason Tunnel Assessment Project, San Francisco, California*, January 2005.

and potential instability of the slope above the East Portal. The report noted that the tunnel itself was not subject to earthquake damage from liquefaction or lateral spreading. In 2005, NPS conducted a further study looking at methods for conducting the rehabilitation of the tunnel and estimating costs for the work8. The study recommended preliminary construction scope, methods and costs.[3]

Streetcar operations in the tunnel will be governed by an automatic block signal system (ABS). Signals placed at the transition area/east platform and at the turn around tracks at the west portal will act as an interlocking for the single track segment. The system will be designed to allow streetcar operation via the tunnel on a "first come, first served" basis. Signal aspects and the movement of streetcars through the tunnel will be governed by the San Francisco Municipal Railway Rules and Instructions Handbook. Track circuitry will be provided to control the number of streetcars allowed west of the east portal to ensure that more streetcars do not reach Fort Mason than can be accommodated by the terminal trackage there. In general, only one streetcar at a time may enter the single track section in a given direction, although placement of intermediate signals discussed below in Section 2.6.3 would allow streetcars operating in the same direction to follow each other, provided that the total number of cars allowed west of the east portal does not exceed the capacity of the terminal tracks.

2.6.1 Westbound Streetcar Movement

Streetcars proceeding westbound from the platform on the east side of Van Ness Avenue near the Maritime Museum will be controlled at the interlocking before entering the single track segment to enter the tunnel. For a streetcar operator to receive a west bound "Proceed" aspect at the east platform near Van Ness Avenue, the operator must pull the streetcar up to a marked track section equipped with a track circuit. This track circuit will indicate to the signal system that a streetcar is waiting to proceed through the tunnel to the west platform and turn-around tracks at Fort Mason. If there is an eastbound streetcar in the tunnel or an eastbound streetcar waiting at the west platform at Fort Mason to make an eastbound move, then the signal would display a "Stop/Do Not Proceed" aspect.

2.6.2 Eastbound streetcar movement

Streetcars proceeding eastbound from the platform at the Fort Mason terminal will be controlled at the interlocking before entering the single track segment to enter the tunnel. For a streetcar operator to receive an eastbound "Proceed" aspect at the west platform (Fort Mason), the operator must pull the streetcar up to the last eastbound signal (signal closest to the west tunnel portal). The track section associated with this signal will be equipped with a track circuit that will indicate to the signal system that a streetcar is waiting to proceed through the tunnel to the transition area/east platform. If there is a westbound streetcar in the tunnel or waiting at the east platform to make a west bound move, then the signal would display a "Stop/Do Not Proceed" aspect. If two calls are received simultaneously, the eastbound streetcar will have priority to move first, in order to vacate space at the terminal.

[3] Jacobs Associates, *Tunnel Rehabilitation and Preliminary Cost Estimate Report,* December 30, 2005.

Figure –2.6.4 – Photo – Fort Mason Tunnel

2.6.3 West/Eastbound signals in the tunnel

There will be intermediate westbound and eastbound signals in the tunnel, which will give the streetcar operator advance warning of conditions ahead, and enable two streetcars to follow each other in the same direction. The signals will display a "Stop/Do Not Proceed" aspect if a preceding train has dwelt longer at the platform than the designated dwell time, if an opposing streetcar has violated a red signal, or if the switch points are open to allow a conflicting movement. If any of these conditions exist, the streetcar operator will contact OCC for clarification. If these signals display a "Proceed" aspect then the track ahead of the streetcar is clear.

2.7 CABLE CAR CROSSING

At the intersection of Beach Street and Hyde Street the proposed streetcar will cross the existing cable car tracks. The cable car alignment is generally within the Hyde Street right-of-way, however at the Hyde & Beach intersection the tracks curve into an off-street terminal in the northwest quadrant of the intersection, where a turntable is used to turn the cable cars. The cable car alignment is double track through the intersection at Beach Street and continuing southerly on Hyde Street. The northbound cable cars coast through the intersection of Hyde & Beach, due to the vertical grades, which allow non-powered northbound operation through the intersection to

the terminal. A grip channel is located between the northbound rails as it curves through the intersection. The northbound propulsion cables follow a separate alignment, continuing north of Beach Street under Hyde Street to a point immediately east of the turntable. The southbound cable car operates upgrade immediately upon leaving the Hyde Street terminal, and requires propulsion through the intersection. Because of the curved arrangement of the trackage, the propulsion cable is configured through the intersection on a "pull curve." The pull curve is a complex subgrade structure for the cable that provides a horizontal pulley approximately every 6 feet along the alignment in order to guide the propulsion cable through the curve. This structure will require a custom, fabricated crossing to accommodate the cable car appurtenances, maintain traction power, and isolate the cable car trackage and cable machinery from stray current. The cable car system has a track gauge of 42".

The actual design of the cable car crossing structure will be accomplished during preliminary engineering and final design. A conceptual design concept addressing the above mentioned design considerations is demonstrated in figures 2.7.1 and 2.7.2 below.

The position of the streetcar tracks in crossing the cable car tracks is limited to a few possible locations, chiefly due to restrictions imposed by the location of the cable machinery in the intersection of Beach and Hyde Streets. There is a large "sheave pit" in the north-center of the intersection. This is an underground concrete vault that contains winding machinery for the cable. The westbound streetcar track must pass to the north of the sheave pit, and the eastbound track must pass to the south of it. Further, the numerous pulley locations noted above for the southbound pull curve impose restrictions on both the westbound and the eastbound tracks. Each pulley is located within a small vault that is covered by a hatch cover, approximately 3' long by 18" wide. The pulley vault is positioned parallel to the cable car track and at an angle to the proposed streetcar track. Both the eastbound and westbound streetcar tracks will need to cross the cable car in a position that does not alter the locations of the pulleys. Preliminary analysis indicates that the most feasible configuration for accomplishing this is to have the streetcar track straddle a hatch cover and pulley vault as shown in Figure 2.7.1. Given the close spacing (~6ft) there is not enough room between pulleys for two standard gauge running rails to pass between pulleys.

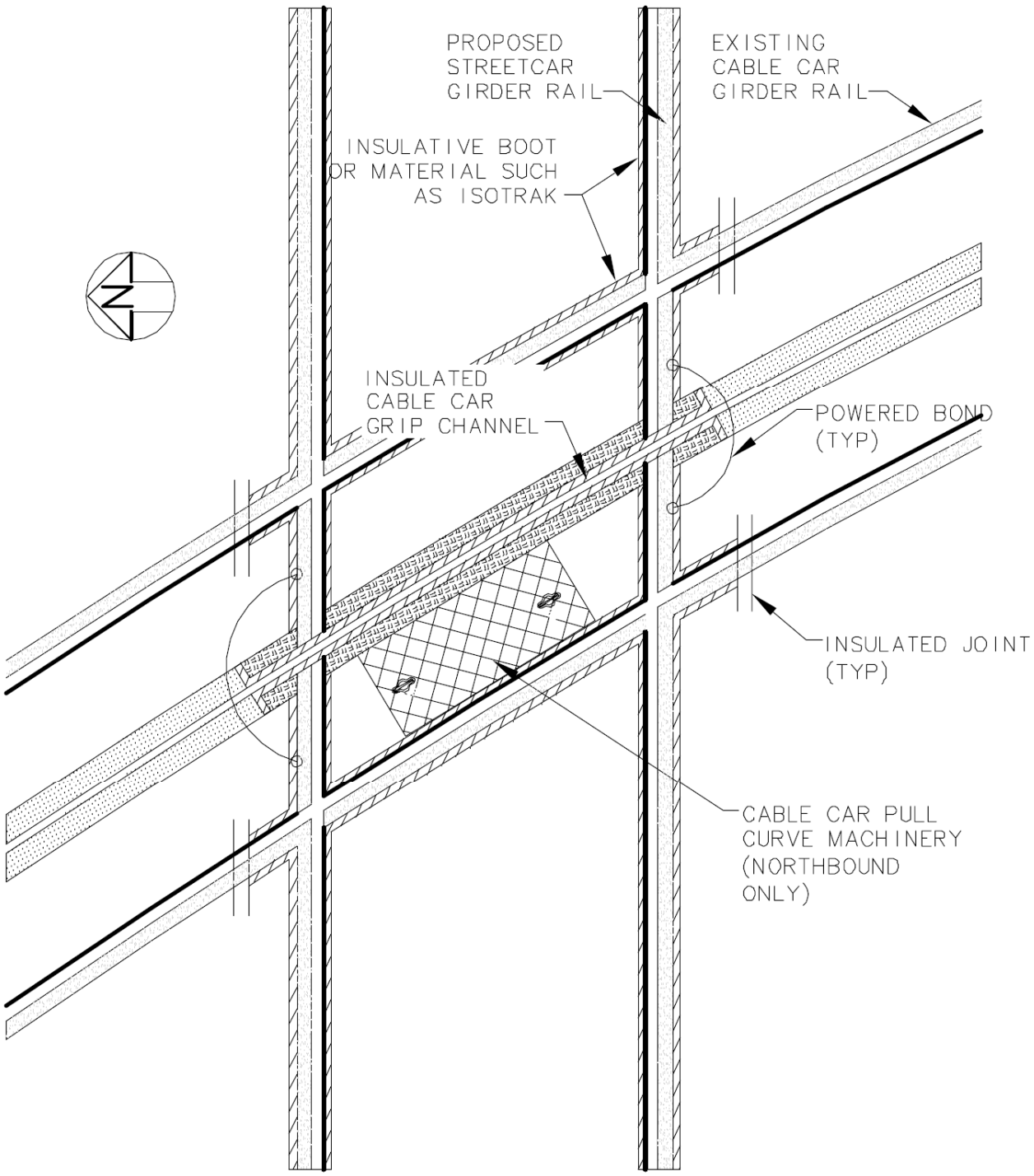

Figure 2.7.1: Typical Cable Car Crossing at Beach and Hyde Street

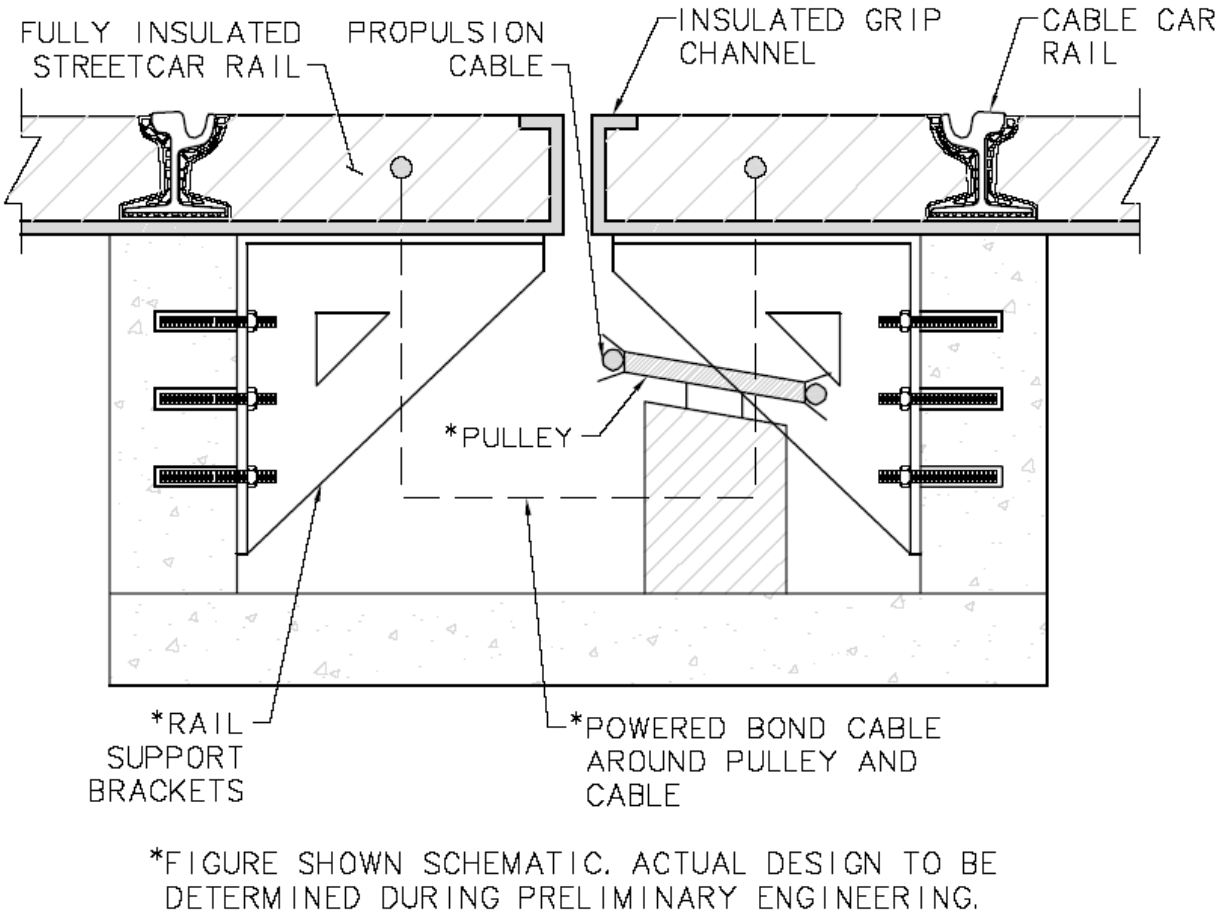

Figure 2.7.2: Conceptual Section of Crossing (Looking down Cable Car Alignment)

Stray current isolation and corrosion control is one of the more challenging design concerns for these crossings. A durable elastomeric bondable material similar to Isotrak (see image below) should be evaluated during preliminary engineering as a potential method for isolating the grip channel, rails and other metals at risk of stray current and corrosion.

(Photo courtesy of Doug Dickenson with PPI Rail Products)

Figure 2.7.3: Example of Isotrak with bonding cables

2.8 UTILITIES

Typically, it is desirable to develop a utility-free zone within the trackway area. A preliminary analysis of potential utility impacts has been accomplished based on existing "as-built" utility information evaluated by the project team. The utility information is approximate and will need to be fully surveyed in future stages of design.

During preliminary engineering, project stakeholders (e.g. San Francisco MTA, DPW, PUC) will need to establish project specific criteria for utility relocations in segments of street-running track. At a minimum, the existing underground utilities parallel to the alignment and located in the limits of the track structure will likely need to be relocated and protected to provide adequate maintenance access and stray current protection.

All crossings of overhead utility/electrical lines, light poles, and traffic signals will need to be evaluated for clearance with the overhead contact system (OCS) for traction power and to ensure that all applicable regulatory codes are satisfied. See Appendix E for a detailed utility report and composite utility drawings used to approximate utility impacts. Please note that utility information in the composite plans is approximate and may not be inclusive of all utilities or illustrate the actual size, type and location of existing utilities accurately.

2.9 BOARDING PLATFORMS

Preliminary boarding platform locations are shown in the conceptual plan set for each alignment option considered. Preliminary proposed platforms are shown at the following locations:

2.9.1 Fort Mason – Terminal

There are five alternatives for platform locations at the Fort Mason terminal. Some alternatives have separate platforms for boarding and alighting activities. In general, vehicles will layover at the boarding location. See Appendix A, Figures A-1 through A-5 and Section 3 of this report for details on each of the Fort Mason terminal alternatives.

2.9.2 Transition area – East of Van Ness Ave near the Maritime Museum

There are two alternatives for platform locations in the transition area, shown in detail in Appendix A, Figures B-1 and B-2. The configuration shown on Appendix A, Figure B-1 would place both the eastbound and the westbound platforms on double track south of the east-west walkway just north of the current site of the bocce courts, and south of the western speaker tower. In Figure B-1, the platforms cannot be north of the walkway, because of the limited amount of space between the walkway and the fouling point of the switch to single track to enter the tunnel. Westbound streetcars waiting at the westbound platform would not have a view of the tunnel mouth while waiting for eastbound streetcars to clear the single track. These platforms would be on a slight grade, with the ADA mini-ramps placed at the southern end of the platforms.

In Figure B-2, both the eastbound and the westbound platforms would be on double track north of the east-west walkway just north of the site of the current bocce courts, and to the west and north of the western speaker tower. In this alternative, the platform locations would be closer to the tunnel, but further from the end of single track. Westbound streetcars waiting at the westbound platform would have a view of the tunnel mouth while waiting for eastbound streetcars to clear the single track. These platforms would be on a slight grade.

2.9.3 Hyde Street & Beach Street – connection with cable car

There are two alternatives for platform locations at Hyde Street & Beach Street, shown in detail in Appendix A, Figures D-1 and D-2. Both alternatives would place the platforms in the same locations on Beach Street just west of Hyde Street, along both the north curb and the south curb. These platforms would consist of bulbed-out sidewalks, with boarding from the bulbed-out sidewalk areas. The eastbound alternative in Figure D-1 would be bulbed out further into the existing travel lane, due to the reduced number of through lanes and the required placement of the track relative to the cable car system propulsion hatch covers.

One option with the westbound platform would be to place it slightly further west on Beach Street, away from the corner. This could reduce incidences of autos blocking the Hyde Street intersection if they are stopped behind a streetcar stopping at the Hyde Street platform.

2.9.4 Leavenworth Street & Jefferson Street – westbound streetcar only

There is one proposed platform location for the westbound streetcar only on Leavenworth Street just south of Jefferson Street, shown in detail in Appendix A, Figures E-1 and E-2. This platform would be on the existing sidewalk, due to the narrow width of the street and the desire to retain two-way traffic and also some parking for the east side of the street.

2.9.5 Jones Street & Beach Street – eastbound streetcar only, at the junction with existing F-line

There is one proposed platform location for the eastbound streetcar only on Beach Street at Jones Street, shown in detail in Appendix A, Figures E-1 and E-2. This platform would be on the existing sidewalk.

Station amenities, furnishings and other station features are expected to be similar to the existing historic streetcar stations, and have not been developed in detail as part of this report.

2.10 STREET IMPROVEMENTS

For street-running segments it is assumed that the existing street reconstruction will be from curb to curb due to the narrow right-of-way, significant utility relocations required and track slab width. Actual limits of reconstruction of the roadway to accommodate the track slab will need to be evaluated and developed during preliminary engineering. More extensive reconstruction is anticipated at intersections and where the alignment enters and exits Beach Street.

It is assumed that all existing curbs and sidewalks not impacted by the alignment and/or station improvements will remain as-is. Estimated sidewalk reconstruction limits are illustrated on the conceptual design plans in Appendix A.

Design standards for these elements will be established during preliminary engineering.

2.11 RIGHT-OF-WAY

It is anticipated that all improvements will be contained within the National Park Service and City-owned rights-of-way. An agreement will be required between the two units of the National Park Service and the City and County of San Francisco for the use of right-of-way through the NPS properties.

2.12 SYSTEMS

2.12.1 Overhead Contact System (OCS)

The overhead contact system (OCS) is assumed to be a simple, single-wire system similar to the existing Muni OCS on the F-line trackage in the Fisherman's Wharf area on Jefferson, Jones and Beach Streets. The system assumed would be configured for trolley pole operation by historic streetcars, and would not be designed for LRV pantograph operation. Poles would be spaced approximately every 100' on tangent track. On streets with only one track the OCS will normally be suspended from a mast arm attached to a pole on the sidewalk, (similar to current poles and mast arms on Jefferson and Beach Streets), incorporating decorative streetlights similar to those used for the F-line project. Figure 2.12.1 is a photograph of a typical section of Jefferson Street with this type of mast-arm suspension of the OCS.

Figure 2.12.1 – Typical pole with mast arm for OCS suspension for single track (Section shown on Jefferson Street)

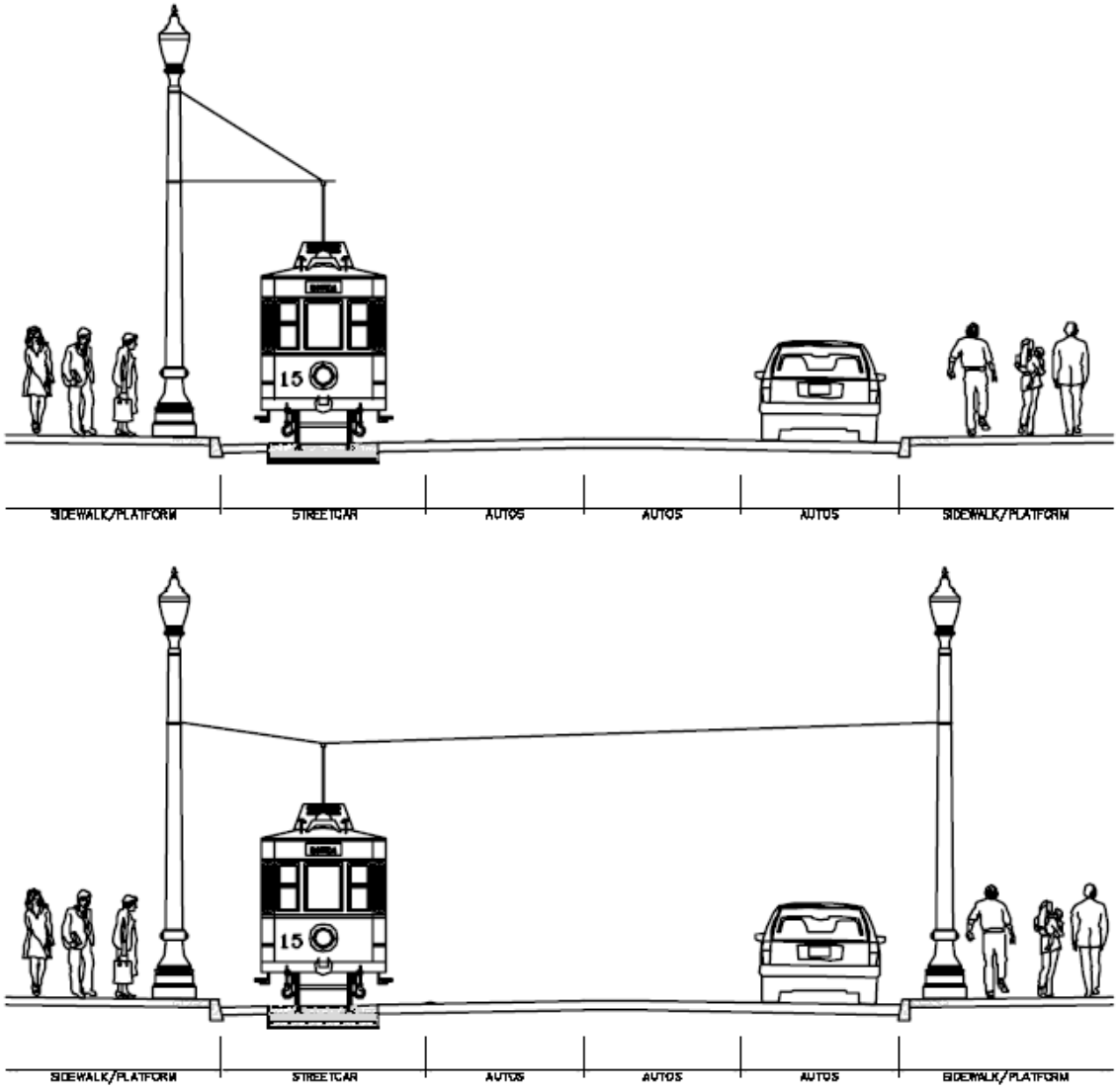

Figure 2.12.2 – Typical Street Cross-Sections with two types of OCS Suspension

On the double-track segment on Beach Street between Leavenworth and Van Ness, OCS can be suspended from either a span wire hanging between two poles (preferred), or from two mast arms attached to two poles, one on each side of the street. In either case, a pole on each side of the street is required. Figure 2.12.2 is a street cross-section illustrating the single track with mast arm suspension or double track with span wire suspension methods outlined above. Figure 2.12.3 illustrates a typical section of Muni double-track with OCS suspended from a span wire. The segment shown is in a reserved right-of-way, but the method of OCS suspension would be the same on a two-way street.

Figure 2.12.3 – Typical Double Track OCS Suspended From Span Wire (Section shown on The Embarcadero at the Ferry Building)

On the private right-of-way segment through NPS property, such as through the transition area between the Maritime Museum and the East Portal of the tunnel at the San Francisco Maritime National Historic Park, OCS can be suspended either from poles on both sides of the trackway with a span wire, or from center poles with two mast arms suspending out over both tracks. Figure 2.12.4 illustrates these two methods. Center poles result in fewer poles and span wires, but require a slightly wider trackway to accommodate clearances for the center position of the poles.

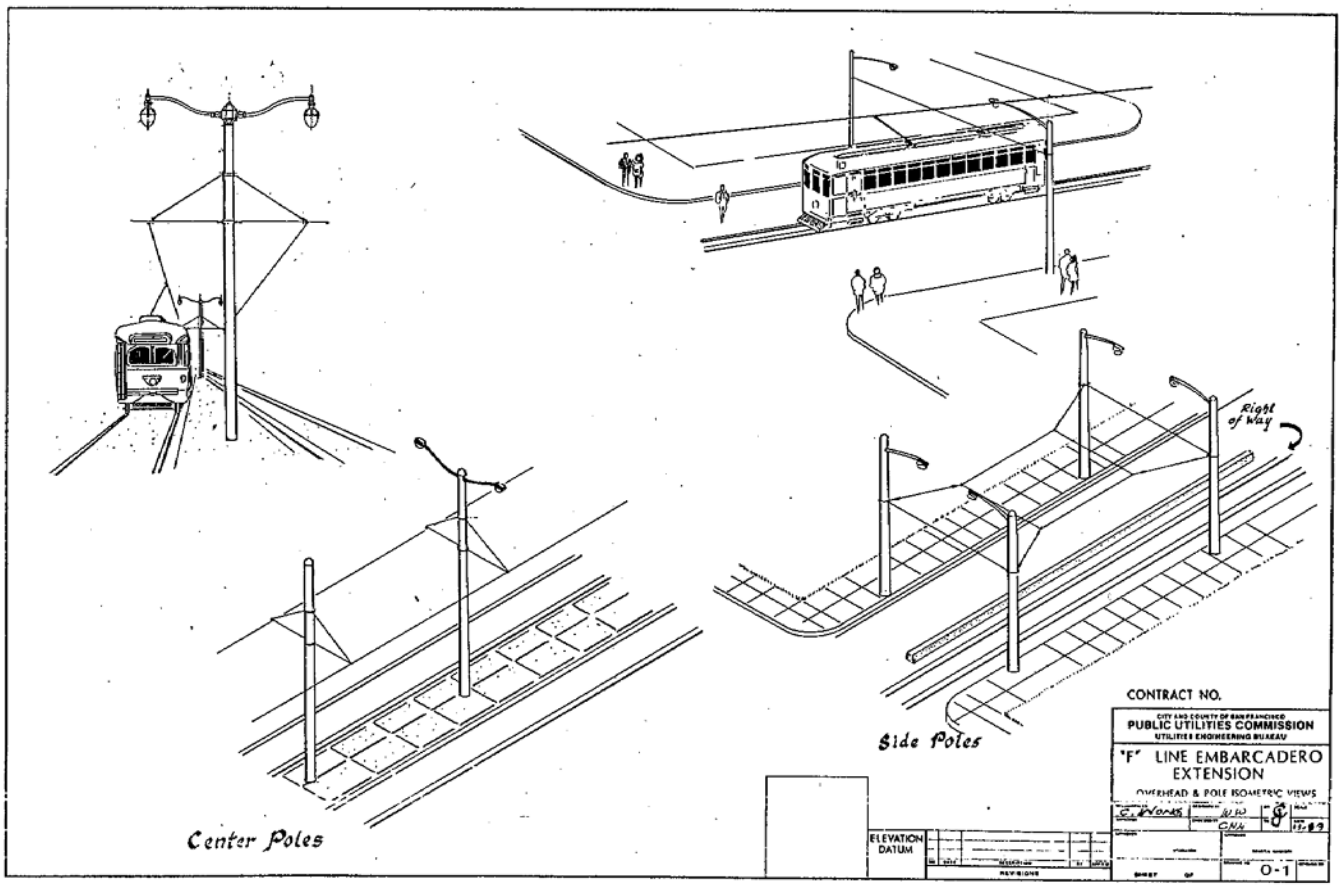

Figure 2.12.4 – Typical Double Track OCS Suspended from Center Pole Mast Arms of from Span Wire

Source-San Francisco Public Utilities Commission (Utilities Engineering Bureau) – Conceptual Engineering Report for F-Line Embarcadero Extension. January 1990.

Track junctions, 90-degree corners and terminal trackage require more specialized OCS suspension. At two locations (Jefferson & Leavenworth and Beach & Leavenworth) the extension will make 90-degree curves at street corners. This situation requires additional pull-off wires for the OCS suspension to hold the trolley wire in the proper position above the trackway, and may require more frequent pole spacing than on tangent track. Figure 2.12.5 illustrates a typical configuration at such a corner.

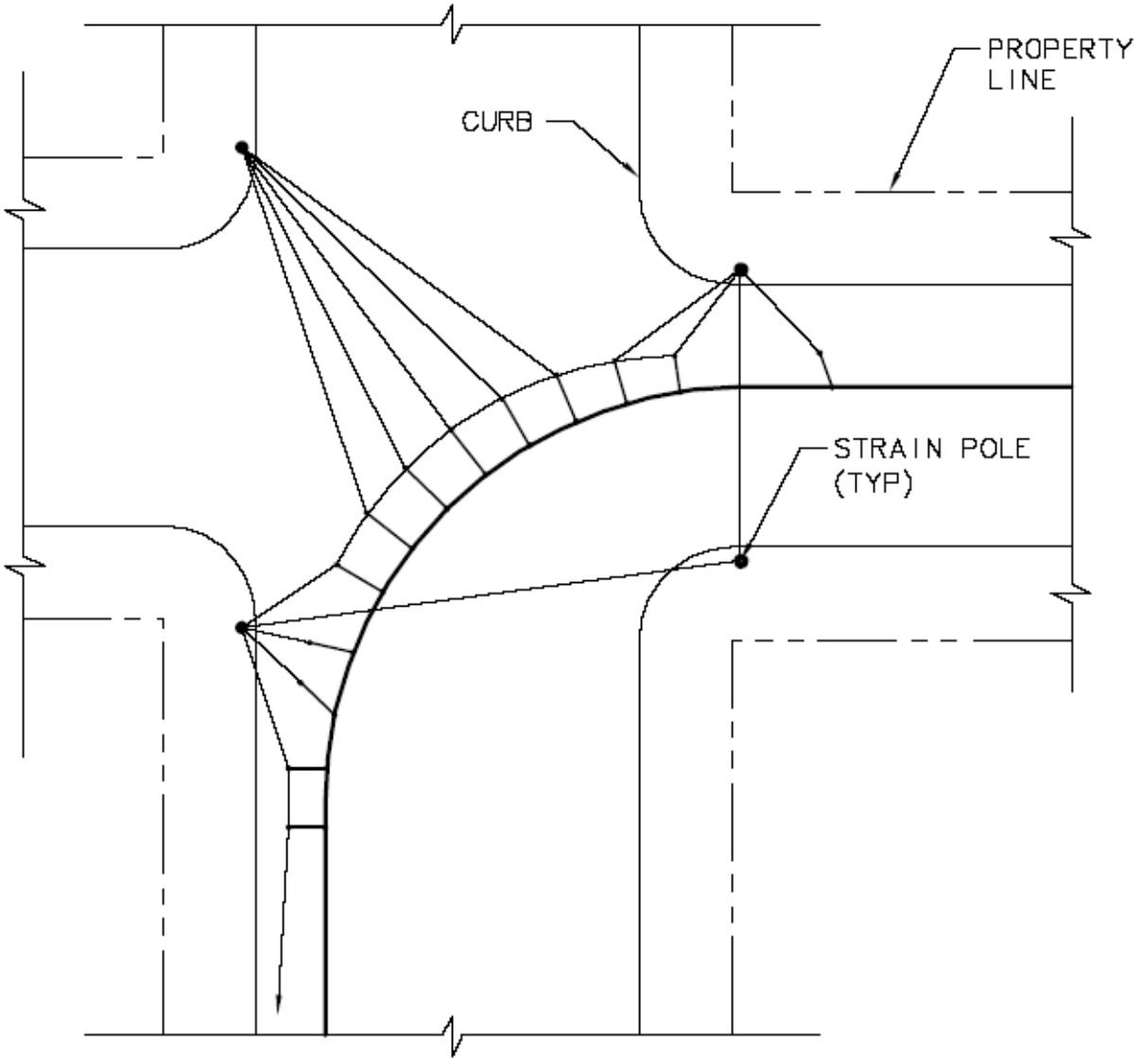

Figure 2.12.5 – Typical 90-degree Corner OCS Configuration

Terminal loop trackage requires poles around the perimeter of the loop, with pull-off wires and span wires similar to a 90-degree intersection. Figure 2.12.6 illustrates a typical OCS configuration for a terminal loop. The loop illustrated is at Ocean Beach on Muni's N-line, but represents a similarly-sized loop to the loop that would be needed at Fort Mason, with similarly configured OCS.

Figure 2.12.6 – Typical Terminal Loop OCS Configuration

2.12.2 Signaling

In street-running segments, streetcar movements will be governed by line-of-sight operations, with movement at intersections controlled by traffic signals. At these intersections a separate signal head may be provided for streetcar control. The streetcar control signal will be interconnected to the traffic signals and provide the streetcar operator an indication of when the streetcar is clear to move or required to stop. In areas of exclusive right-of-way, where streetcars operate on a dedicated trackway, vehicle operations will be governed by an ABS signal system with interlocker. Signal system type can be either relay logic based or microprocessor logic based. This will be determined during the design phase.

Streetcar movements through signals and switches shall be governed by the San Francisco Municipal Railway Rules and Instructions Handbook. Switch manipulation will be done

manually or by train to wayside communication (TWC). To prevent false manipulation of switches and red signal violations, point detection shall be incorporated into the ABS signal system. ABS signal circuitry shall include, and not be limited to, vehicle detection via track circuits, directional stick logic, normal and reverse switch logic, the ability to display three aspects per San Francisco Municipal Railway Rules and Instructions Handbook, and signals to be approach lit. Switch machine and signal placement will be per San Francisco Municipal Railway clearances.

Signaled territory will be marked with wayside signs that state "BEGIN ABS" and "END ABS". Size will be per San Francisco Municipal Railway. See Figure 2.12.7 and Figure B.1

Figure 2.12.7 – Begin/End ABS signage

Impedance bonds will need to be placed at signal system insulated joint locations. Impedance bonds are designed to allow propulsion current to flow around insulated rail joints without interfering with the functioning of adjacent track circuits (see figure 2.12.8).

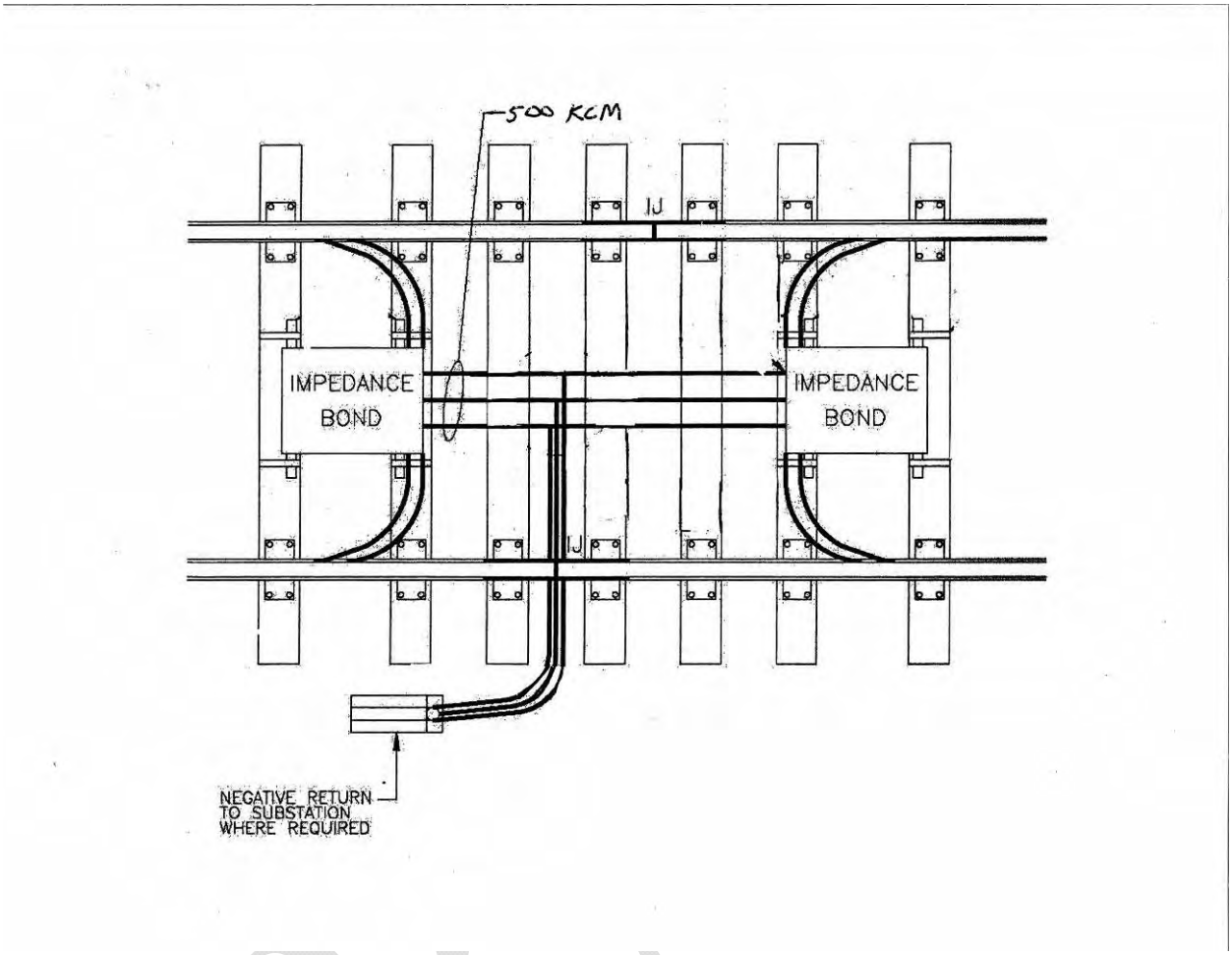

Figure 2.12.8 – Typical Impedance Bonds

2.12.3 Traction Power

The streetcars will be powered by a traction electrification system feeding power to the overhead contact system. The traction power system consists of a substation and underground feeders in duct banks that provide power between the substation and the extension and then for the length of the extension. The closest Muni substation is Marina Station, located at 1575 North Point Street (near Buchanan). In discussions with Muni staff, initial indications are that this substation currently has spare capacity that could be used to provide power for this extension. This is reflected in the alternatives cost estimate and discussed in detail in section 6.3.9

The current draw for a single PCC car is approximately 550 amps with an 80 passenger load and maximum acceleration on a grade. The current draw of a PCC car while coasting is approximately 125 amps. Calculations of frequencies on the line indicate that a maximum of four cars would be operating on the extension at any one time. With a contingency for bunching, the project should plan for six cars to be on the extension at any one time. This is a total of 3300 amps. The voltage draw for this is 912 kw (see Appendix F).

SECTION 3 - TURNAROUND AREA – WEST TUNNEL PORTAL – FORT MASON

3.1 TURNAROUND (WEST TERMINAL) OPTIONS SUMMARY

Five options have been evaluated in the turnaround area at Fort Mason center. All the options enter/exit the turnaround via the existing Fort Mason Tunnel which will be retrofitted to accommodate streetcar operation. Two terminal options are located exclusively in the Fort Mason parking lot, two are located entirely south of the parking lot in the existing park area, and one option extends both northerly into the Fort Mason parking lot and southerly into the park area.

3.2 WYE NORTH (SEE APPENDIX A, FIGURE A.1)

The configuration for this turnaround alternative is a wye track terminal located to the north of the historic railroad alignment, with the north leg of the wye extending into the Fort Mason Center parking lot. This terminal configuration requires streetcars to exit westerly from the Fort Mason tunnel, diverge north through a turnout, and continue north to a deboarding platform located in the southeast corner of the existing Fort Mason parking lot. Streetcars then reverse direction and perform a backup movement south and then west through two turnouts to the boarding platform located between an existing retaining wall and the Fort Mason guard house, near the intersection of Marina Blvd and Laguna Street. Streetcars then reverse direction again and proceed easterly into the single track tunnel.

3.2.1 Structures

There is an existing retaining wall on both sides of the historic rail alignment west of the tunnel that will be impacted. The intent is to maintain the southern retaining wall as constructed and remove the northern wall from Laguna Street east to where it intersects the eastern wall near the tunnel portal. It is anticipated that some minor adjustments may be needed at the intersection of the north/south wall and removed portion of the north wall.

3.2.2 Stations

This option includes two station platforms; one for deboarding and one for boarding. A streetcar immediately exiting the tunnel portal will diverge north to the deboarding platform. The platform is equipped with a mini-high platform for ADA accessibility. Further evaluation of accessible routes to and from platforms needs to be addressed during preliminary engineering should this option move forward. Upon completion of deboarding the operator is required to shift control to the rear of the car and back to the boarding platform that abuts the Laguna Street right-of-way. Both standard and ADA boarding will be accommodated at this station platform.

The position of the boarding platform provides the operator with both line-of-sight and positive train signal verification of clearance to proceed prior to entering single track operation and the tunnel.

3.2.3 Special Conditions and Notable Features

A large sewer vault and appurtenances exist just south of the boarding platform and adjacent to the conceptual streetcar alignment. From preliminary evaluations, it is anticipated that no significant impacts to the vault or sewer lines will result from the proposed improvements. Other notable features are listed below:

- No "dead" car storage is provided with the simple version of this alternative. Variations could be developed with additional tracks incorporating dead car storage.
- Turn-around is operationally limited to 2-car capacity, and overall operation is limited to two cars west of the east portal of the tunnel.
- OCS should be configured with spring switches and back-poling capability, so that operators do not need to change poles twice for the reversing movement.

3.3 LOOP NORTH (SEE APPENDIX A, FIGURE A.2)

The configuration for this turnaround alternative is a loop track terminal located to the north of the historic railroad alignment, with the loop extending into the Fort Mason Center parking lot, with the primary station platform located adjacent to Building A. This terminal configuration requires streetcars to exit westerly from the Fort Mason tunnel, diverge through a turnout, and continues north through semi-exclusive streetcar drive aisles to the northern limits of the existing Fort Mason parking lot. Streetcars would then loop to a station at the west limits of the parking lot, adjacent to Building A. From the platform, streetcars continue south to the historic rail alignment, and a junction where the single track begins to proceed easterly into the tunnel.

3.3.1 Structures

There is an existing retaining wall on both sides of the historic rail alignment west of the tunnel that will be impacted. The intent is to maintain the southern retaining wall as constructed and remove the northern wall from Laguna Street east to where it intersects the eastern wall near the tunnel portal. It is anticipated that some minor adjustments may be needed at the intersection of the north/south wall and removed portion of the north wall.

3.3.2 Stations

This option includes one station platform with two mini-high platforms – one at the north end for deboarding and one at the south end for boarding. A detection circuit calling for a "clear to proceed" signal for the single track segment in the tunnel can be accomplished at the south end of the platform or in a semi-exclusive portion of the trackage closer to the tunnel. Provision could be made for a second platform for deboarding close to the exit from the tunnel, after turning north into the parking lot.

3.3.3 Special Conditions and Notable Features

A large sewer vault and appurtenances exist just north of the historic track alignment and tunnel portal and is adjacent to the conceptual streetcar alignment. From preliminary evaluations, it is

assumed that no significant impacts to the vault or sewer lines will result from the proposed improvements. Other notable features are listed below:

- "Dead" car storage provided for one streetcar on a stub track continuing westerly on the historic rail alignment.
- Turn-around has the capacity for three streetcars at the platform, with room for approximately 5 additional streetcars on the terminal loop if staging is required for special events. Provision of the secondary platform shown in Appendix A, Figure A-2 would allow passenger alighting from additional cars if required.
- "First in/first out" operation (no passing possible without impeding the single track operation).
- Reconfiguration required for the parking configuration in the existing Fort Mason parking lot.

3.4 WYE SOUTH (SEE APPENDIX A, FIGURE A.3)

The configuration for this turnaround alternative is a wye terminal located to the south of the historic railroad alignment, with the wye extending into the open space south of the Fort Mason Center parking lot. This terminal configuration requires streetcars to exit westerly from the Fort Mason tunnel and continues west to a deboarding platform located adjacent to the Marina Blvd/Laguna Street intersection and the Fort Mason Guard House. Streetcars then reverse direction and perform a backup movement to the south and east, to the boarding platform adjacent to a proposed retaining wall in the park area south of the historic rail alignment. Streetcars would then depart the station and proceed north and easterly into the single track tunnel segment.

3.4.1 Structures

There is an existing retaining wall on both sides of the historic rail alignment west of the tunnel that will be impacted. The intent is to maintain the northern retaining wall as constructed and remove the southern wall from Laguna Street east to where it intersects with a proposed eastern wall near the tunnel portal. It is anticipated that some minor adjustments may be needed at the intersection of the north/south wall and existing portion of the south wall.

3.4.2 Stations

This option includes two station platforms; one deboarding and one boarding. A train immediately exiting the tunnel portal will continue west to the deboarding platform. Upon completion of deboarding the operator is required to shift control to the rear of the car and back to the boarding platform. Both standard and ADA boarding will be accommodated at both station platforms.

This option does not provide the preferred operational configuration provided in the Wye North option. The operator at the boarding platform must rely exclusively on signal verification before proceeding to the single track operation and tunnel. This is due to the limitations created by the switch placement in relation to the boarding platform and the site conditions. With this terminal configuration, it is not possible to place the boarding platform on the south side of the main east-

west track near the Guard House, because of space limitations imposed by the position of the switch and track leading to the south leg of the wye. Therefore, boarding cannot take place in this location, and thus the operator of a streetcar waiting to depart easterly does not have a view of the tunnel from the platform location.

3.4.3 Special Conditions and Notable Features

Significant excavation and retaining wall construction will be required to accommodate the southern leg of the wye and boarding platform. Other notable features are listed below:

- No "dead" car storage is provided.
- Turn around operationally limited to 2-car capacity.
- Operates entirely within semi-exclusive right-of-way.
- OCS should be configured with spring switches and back-poling capability, so that operators do not need to change poles twice for the reversing movement.
- Realignment of existing multi-use pedestrian and bicycle path (Bay Trail) required.

3.5 LOOP SOUTH (SEE APPENDIX A, FIGURE A.4)

The configuration for this turnaround alternative is a loop track terminal located to the south of the historic railroad alignment, with the loop extending into the open space south of the Fort Mason Center parking lot. This terminal configuration requires streetcars to exit westbound from the Fort Mason tunnel, enter double track, and continue around a curve to the south to a station platform adjacent to and parallel with Laguna Street. Streetcars would then depart the station, loop through the existing park and turn north to reconnect to single track, and then proceed easterly though the tunnel to the transition area.

3.5.1 Structures

There is an existing retaining wall on both sides of the historic rail alignment west of the tunnel that will be impacted. The intent is to maintain the northern retaining wall as constructed and remove the southern wall from Laguna Street east to where it intersects with a proposed eastern wall approximately 80 feet from Laguna Street It is anticipated that some minor adjustments may be needed at the intersection of the north/south wall and existing portion of the south wall.

3.5.2 Stations

This option includes one station platform with two mini-high platforms – one at the north end for deboarding and one at the south end for boarding. A detection circuit calling for a "clear to proceed" signal can be installed at the south end of the platform or in a semi-exclusive portion of the trackage closer to the tunnel.

3.5.3 Special Conditions and Notable Features

Some excavation and a retaining wall will be required to accommodate the southern loop which encroaches into the existing park. Other notable features are listed below:

- "Dead" car storage can be provided for 1-2 streetcars on a stub track within the loop.
- Turn-around has the capacity for three streetcars at the platform.
- "First in/first out" operation (passing may be possible using the dead car storage track without impeding the single track operation).
- Operates entirely within semi-exclusive right-of-way.
- Realignment of existing multi-use pedestrian and bicycle path (Bay Trail) required.

3.5.4 Options

This alternative offers several additional possible options that could be explored in a detailed design phase to improve operational flexibility:

- The north wall along the historic rail alignment could be removed, and potential deboarding platform could be located between eastern retaining wall and the Guard House, moving the deboarding point approximately 150 feet closer to Fort Mason. Streetcars stopping at this platform would block eastbound streetcars temporarily if sufficient space does not exist to provide double track in this area.
- Double track could be extended closer to the tunnel portal if the north and south walls are entirely removed easterly to the tunnel portal and additional excavation work performed to the south of the historic rail alignment.
- Combining both of the above-noted features could provide a higher capacity terminal.

3.6 NORTH/SOUTH WYE (SEE APPENDIX A, FIGURE A.5)

The configuration for this turnaround alternative is a wye terminal located both partially to the north and partially to the south of the historic railroad alignment, with the wye extending into the open space south of the Fort Mason Center parking lot and into the parking lot. This terminal configuration requires streetcars to exit westbound from the Fort Mason tunnel, diverge northerly through a turnout, and continues north to a deboarding platform located in the southeast corner of the existing Fort Mason parking lot. Streetcars then reverse direction and perform a backup movement to the south and west, to a boarding platform located between a proposed retaining wall and Laguna Street Streetcars then reverse again and depart the station, proceeding north and diverging easterly into the single track tunnel segment.

3.6.1 Structures

There are existing retaining walls on both sides of the historic rail alignment west of the tunnel that will be impacted. Both north and south existing retaining walls will require removal and modification. The northern wall will be removed from Laguna Street east to where it intersects the eastern wall near the tunnel portal, and the southern wall will be removed from Laguna Street east for approximately 130 feet. It is anticipated that some minor adjustments may be needed at the intersection of the north/south wall and removed portions of both walls.

3.6.2 Stations

This option includes two station platforms, one for deboarding and one for boarding. A streetcar immediately exiting the tunnel portal will diverge north to the deboarding platform. The platform is equipped with a mini-high platform to accommodate ADA users. Further evaluation of accessible routes to and from platforms need to be addressed during preliminary engineering should this option move forward. Upon completion of deboarding the operator is required to shift control to the rear of the car and back to the boarding platform on the south side of the historic rail alignment. Both standard and ADA boarding will be accommodated at both station platforms.

This option does not provide the preferred operational configuration provided in the Wye North option. The operator at the boarding platform must rely exclusively on signal verification before proceeding to the single track operation and tunnel. This is due to the limitations created by the platform placement in relation to the tunnel. The operator of a streetcar waiting to depart easterly does not have a view of the tunnel from the platform location.

3.6.3 Special Conditions and Notable Features

A large sewer vault and appurtenances exist just south of the deboarding platform and adjacent to the conceptual streetcar alignment. From preliminary evaluations, it is anticipated that no significant impacts to the vault or sewer lines will result from the proposed improvements. Some excavation and a retaining wall will be required to accommodate the southern wye that encroaches into the existing park. Other notable features are listed below:

- Dead car storage is provided for one streetcar on a stub track
- Turn around operationally limited to approximately 3 car capacity
- Realignment of existing multi-use pedestrian and bicycle path (Bay Trail) required
- “First in/first out” operation
- OCS should be configured with spring switches and back-poling capability, so that operators do not need to change poles twice for the reversing movement.

3.6.4 Options

This alternative offers possible options that could be explored in a detailed design phase to improve operational flexibility:

- An additional platform could be provided at the dead car storage track, which would increase the capacity of this terminal and allow three in-service cars to be present at the terminal at the same time.

Site Photos – Turn around Area

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Photo Locations – Fort Mason Center

1 Historic rail alignment from Laguna (view east)	2 Fort Mason Center Parking lot from retaining wall, including sewer vault (view north)
3 Fort Mason Center parking lot from Gate House (view northeast)	4 Fort Mason Center parking lot and Gate House (view west)
5 Laguna St., from Gate House (view south)	6 Historic rail alignment from west side of Laguna (view east)
7 Great Meadow from Laguna St sidewalk (view southeast)	8 Great Meadow from historic rail alignment (view south)

SECTION 4 - TRANSITION AREA – EAST TUNNEL PORTAL – BEACH STREET

4.1 TRANSITION AREA OPTIONS SUMMARY

Two options have been evaluated in the transition area between the east tunnel portal and Polk Street. Both options traverse the transition area between the existing Fort Mason Tunnel and the street-running segment on Beach Street near Polk Street. Both transition area options are similar except for the alignment bearing through the park area and the proximity of the turnout from single track to double track relative to the tunnel portal.

4.2 SINGLE TRACK ACROSS VAN NESS AVE (SEE APPENDIX A, FIGURE B.1)

This segment alternative consists of single track from the Fort Mason tunnel to a point just east of the east sidewalk on Van Ness Avenue, where there is a switch to double track. The alignment is then double track from that point easterly. Station platforms are located just south of an existing east/west pedestrian path and a speaker tower. The segment is configured as semi-exclusive operation as far east as the street-running segment on Beach Street near Polk Street.

4.2.1 Structures

There is an existing bocce court on NPS property that will be impacted and require relocation. It is anticipated that the bocce court will be relocated in a similar size and configuration in the northwest quadrant of Hyde Street and Beach Street near the cable car turntable. Modifications to some existing retaining walls as well as construction of proposed retaining walls will be needed to accommodate the proposed streetcar alignment. The existing speaker tower will be preserved.

4.2.2 Stations

This option includes dual side platforms just south of the east/west path near the speaker tower. The platforms will be equipped with a mini-high platform in order to comply with ADA requirements.

4.2.3 Special Conditions and Notable Features

The bocce court will need to be relocated. In addition, the existing landscape between the pedestrian paths and guideway will need to be regraded. Other notable features are listed below:

- Point of switch is located approximately 160 feet from the tunnel portal.
- Westbound streetcars can dwell at the platform and maintain boarding operation while waiting for “clear to proceed” signal to enter the single track tunnel segment.
- Parking displaced and reconfiguration of driveway required west of Polk Street.

4.3 DOUBLE TRACK ACROSS VAN NESS AVE (SEE APPENDIX A, FIGURE B.2)

This segment alternative consists of single track from the Fort Mason tunnel to a point just west of the west sidewalk on Van Ness Avenue, where there is a switch to double track. The alignment is then double track from that point easterly. Station platforms are located just north of an existing east/west pedestrian path, behind the existing speaker tower. The segment is configured as semi-exclusive operation as far east as the street-running segment on Beach Street near Polk Street.

4.3.1 Structures

The existing bocce court will need to be relocated. It is anticipated that the bocce court will be relocated in a similar size and configuration in the northwest quadrant of Hyde Street and Beach Street near the cable car turntable. Modifications to some existing retaining walls as well as construction of proposed retaining walls will be needed to accommodate the proposed streetcar alignment. The existing speaker tower will be preserved.

4.3.2 Stations

This option includes dual side platforms just north of the east/west path near the speaker tower. The platforms will be equipped with a mini-high platform in order to comply with ADA requirements.

4.3.3 Special Conditions and Notable Features

The existing bocce court will need to be relocated. In addition, moderate regrading of the existing landscape between the pedestrian paths and guideway will be needed. Other notable features are listed below:

- Point of switch is located approximately 10 feet from the tunnel portal
- Streetcar can dwell at platform and maintain boarding operation while waiting for "clear to proceed" signal to enter the single track tunnel segment
- Signal restricting clearance for the westbound streetcar to proceed through the tunnel is approximately 150' closer to the tunnel portal than in B.1.
- Parking displaced and reconfiguration of driveway required west of Polk Street.

Site Photos – Transition area

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Photo Locations – Transition Area

1 Speaker Tower base and west side of Aquatic Park (view north)	2 View along proposed alignment between Speaker Tower and historic rail alignment (view north)
3 Historic rail alignment and Aquatic Park – from near east portal of tunnel (view east)	4 View along proposed alignment between Speaker Tower and historic rail alignment (view south)
5 Bocce court and Van Ness retaining wall (view south)	6 Beach Street west of Polk with Williams-Sonoma garage (view west)

SECTION 5 - STREET RUNNING SEGMENT – BEACH STREET AND JEFFERSON

5.1 STREET RUNNING OPTIONS SUMMARY

Two options have been evaluated in the street running segment between Polk Street and the existing streetcar terminal at Jones Street. One option consists primarily of shared auto/streetcar operation and a second option consists of semi-exclusive for the eastbound alignment and shared operation for the westbound alignment. Both configurations have been evaluated for this segment. There are portions of the shared option that contain semi-exclusive operations along Jefferson. It is possible to create a hybrid of the two options having some semi-exclusive and some shared for the eastbound alignment. However, for the purpose of this study, the shared and semi-exclusive options have been evaluated separately.

5.2 SHARED AUTO/STREETCAR OPTION (SEE APPENDIX A, FIGURES C.1, D.1 AND E.1)

This segment option extends from the transition area at Beach Street and Polk Street easterly to Beach Street and Jones Street where it connects with the existing F-line. The westbound alignment diverges northerly on Leavenworth Street to Jefferson Street. At Jefferson Street, the westbound alignment turns easterly and continues in semi-exclusive right-of-way easterly to Jones Street, where it connects with the existing F-line. On Jefferson Street between Taylor Street and Jones Street, the existing F-line is realigned away from the curb lane and into the current first travel lane, which is reconfigured as a semi-exclusive streetcar lane. Both the current F-line and the proposed Fort Mason extension share trackage on single track for this block, with a switch close to the Jones Street intersection for diverging movements. This configuration is intended to obviate the need for a diamond crossing in the intersection of Jefferson Street and Jones Street, as described in following Section 5.3 and as shown in E.2. E.2 is the alternative configuration to the configuration shown on E.1. Several variations of the single track alternative on this block of Jefferson Street as shown in E.1 were investigated, and the configuration shown in E.1 is the most practical in terms of streetcar operation if a single track is desired on this block of Jefferson Street. The sidewalk along the north side of Jefferson Street between Jones Street and Taylor Street would be widened. (Note: configuration shown on E.2 along Jefferson Street is interchangeable with this option).

5.2.1 Structures

There are no known structures along the street-running segments.

5.2.2 Stations

This option includes side platforms equipped with a mini-high platform in order to accommodate ADA users at the following locations:

- Dual side platforms on bulbed-out sidewalks west of Hyde Street on Beach Street (note: existing street grades east of Hyde Street are greater than 2.0%, thus not recommended for boarding platforms).
- Eastbound side platform west of Jones Street on Beach Street
- Westbound side platform south of Jefferson Street on Leavenworth Street

5.2.3 Special Conditions and Notable Features

All street-running segments cross the existing cable car at Hyde St (see section 2.7 for details on cable car crossing). Streetcar and traffic operations differ for the street-running options. See traffic analysis for detailed discussion (Appendix C). Other notable features are listed below:

- All streetcar alignments in this option are shared with autos except along Jefferson Street between Leavenworth Street and Taylor Street, where they operate in semi-exclusive right-of-way.
- Two new traffic signals and four existing signals will be added or reconstructed to accommodate streetcar operations (some include transit-only phases as indicated on the conceptual plans).
- Single track operation on the block of Jefferson Street between Taylor Street and Jones Street could be obstructed by F-line cars terminating at the Jones Street terminal if more cars are at the terminal than can be accommodated.

5.3 SEMI-EXCLUSIVE EASTBOUND OPTION (SEE APPENDIX A, FIGURES C.2, D.2 AND E.2)

This segment option extends from the transition area at Beach Street and Polk Street easterly along Beach Street to Jones Street where it connects with the existing F-line. The eastbound track is configured in semi-exclusive right-of-way between Polk Street and Jones Street, largely configured as a semi-exclusive curb track lane, similar to the existing F-line trackage on Beach Street east of Jones Street. The westbound alignment is configured in shared right-of-way on Beach Street between Polk Street and Leavenworth Street, and on Leavenworth Street between Beach Street and Jefferson Street. On Jefferson Street, the westbound alignment is configured in semi-exclusive right-of-way between Leavenworth Street and Jones Street. where it crosses the existing F-line track. There is a diamond crossing of the Fort Mason extension with the existing F-line trackage in the intersection of Jefferson Street and Jones Street. East of Jones Street, the proposed Fort Mason extension is located in the adjacent travel lane to the existing F-line track for approximately 1 block east of Jones Street where the two alignments converge. The existing F-line trackage remains in semi-exclusive right-of-way, and the second track lane is also configured as semi-exclusive right-of-way. (Note: configuration shown on E.1 along Jefferson Street is interchangeable with this option).

5.3.1 Structures

There are no known structures along the street-running segments.

5.3.2 Stations

This option includes side platforms equipped with a mini-high platform in order to accommodate ADA users at the following locations:

- Dual side platforms west of Hyde Street on Beach Street (note: existing road grades east of Hyde Street are greater than 2.0% exceeding ADA requirements).
- Eastbound side platform west of Jones Street on Beach Street
- Westbound side platform south of Jefferson Street on Leavenworth Street

5.3.3 Special Conditions and Notable Features

All street-running segments cross the existing cable car tracks at Hyde Street (see Section 2.7 for details on cable car crossing). Streetcar and Traffic operations differ for the street-running options see traffic analysis for detailed discussion (Appendix C). Other notable features are listed below:

- Eastbound streetcar alignment is semi-exclusive for the entire segment
- Westbound streetcar alignment is shared with autos except along Jefferson Street between Leavenworth Street and Taylor Street, where the operation is in semi-exclusive right-of-way
- Two new traffic signals and four existing signals will be added or reconstructed to accommodate streetcar operations (some include transit-only phases as indicated on the conceptual plans).
- There is a diamond crossing of the existing F-line trackage with the Fort Mason extension in the intersection of Jefferson Street and Jones Street.

5.4 SITE PHOTOS – STREET-RUNNING SEGMENTS

Photos – Beach Street west of Hyde Street

1 

 2

Photo Locations – Beach Street west of Hyde Street

1 Beach Street from Hyde Street (view west)	2 Beach Street sidewalk adjacent to Maritime Museum and Muni 19-Polk terminal (view east)

Photos – Cable Car Crossing

1

2

3

4

Photo Locations – Cable Car crossing

1 Cable car hatch cover with tape measure indicating width of streetcar track straddling hatch cover.	2 Cable car pulley mechanism under hatch cover.
3 Detail of cable car pulley mechanism under hatch cover.	4 Cable car hatch cover with chalked markings indicating approximate proposed position of streetcar track crossing cable car track.

Photos –Beach Street - Hyde Street to Jones Street

1

2

Photo Locations – Beach Street - Hyde Street to Jones Street

1 Beach Street from Columbus Avenue (view west)	2 Beach Street from Leavenworth Street (view east)

Photos – Leavenworth Street


1

2

Photo Locations – Leavenworth Street

1 Leavenworth Street from Beach Street (view north)	2 Leavenworth Street from Jefferson Street (view south)

Photos – Jefferson Street


1


2

Photo Locations – Jefferson Street

1 Jefferson Street near Jones Street (view east)	2 Jefferson Street between Jones Street and Leavenworth Street (view west)

Photos – Jones Street


1


2

Photo Locations – Jones Street

1 F-Market terminal on Jones Street at Beach Street (view north)	2 Jones Street and Jefferson Street intersection, with F-line turn (view northeast)

SECTION 6 - COST COMPARISON METHODOLOGY

6.1 PURPOSE AND SCOPE

This section describes the methodology used to develop capital cost estimates for the purpose of comparing the alignment alternatives in the study area. Cost estimates were developed using a modified Construction Specifications Institute (CSI) format that can be ordered and summarized into FTA Standard Cost Categories.

6.2 ESTIMATE DEVELOPMENT

Estimates of project capital costs were developed in three general steps. First, the alignment alternatives were sufficiently defined in conceptual engineering drawings for cost estimating purposes. Second, project components, consistent with the application of unit costs and appropriate to the level of definition, were identified, then quantities and unit cost data were developed. Third, the quantities were assembled, selective unit costs applied, and summed into the major cost categories defined below to complete the cost estimate.

6.2.1 Unit Costs

Unit costs appropriate to the level of alignment definition were developed from selected San Francisco Municipal Railway historical data including final engineering estimates, and final bid prices for completed projects. In addition, standard estimating manuals and standard estimating practices were consulted. Unit costs include allowances for the contractor's margins and insurance costs.

6.2.2 Cost Categories

Cost categories were used to summarize the project component costs into a comprehensive total estimate for each alternative. The major cost categories are listed below. There are seven fixed facilities cost categories, five system-wide cost categories, two dependent cost categories, and a right-of-way cost category.

- Civil Construction
- Utilities
- Trackwork
- Structures
- Stations
- Park-and-Rides
- Fare Collection
- Maintenance Facility
- Traction Power
- Signal System
- Communications
- Vehicles
- Right-of-Way
- Professional Services
- Contingency

Fixed facility categories encompass site-specific project component costs. Capital costs for these categories were typically calculated by using known unit costs and measured quantities for each component.

System-wide costs were calculated on an alignment length not from measured quantities. A per route-foot unit cost was developed from historical data to apply to the route length of each section.

The professional services categories are dependent on the preceding categories and will be calculated as percentages of the subtotal of facility and system-wide cost categories.

The costs of procuring right-of-way are difficult to assess at this level of design so a cost allowance will be determined and assigned to this category.

The sum of these cost categories will be the total capital cost estimate for an alignment segment.

6.2.3 Year-of-Expenditure Cost Projections

To develop a capital costs estimate in year-of-expenditure dollars, a proposed construction schedule will be developed based on each of the major cost categories. A straight-line projection of cost will be developed based upon a calculated mid-point of construction. An inflation rate of 4.0 percent will be used for escalation, as appropriate, to reflect current inflation tendencies anticipated for the Project. The sum of the major escalated cost categories will equal the total estimated capital costs for the Project in year-of-expenditure dollars.

6.3 PROJECT COST CATEGORIES

This section describes each of the major capital cost categories used to assemble the estimates, together with specific assumptions.

6.3.1 Civil Construction

This category includes the capital costs for basic infrastructure improvements including mobilization, clearing and grubbing, pavement removal and replacement, demolition, excavation and embankment, minor concrete work, walls and foundations, traffic control, streetlights, drainage, landscaping, fences, sub-grade preparation, and aggregate base. Measurement will be by unit cost or the route foot depending on the types of civil construction.

6.3.2 Utilities

This category includes the capital costs for the relocation, upgrade or adjustment of all public or private utilities that may become the responsibility of the Project during construction. It was assumed that all utilities within the immediate trackway envelope will be relocated.

Because utility surveying and mapping has yet to be done for this project, quantities were calculated from project plan sheets and available existing utility mapping with the assumption that the mapping may be outdated or incomplete. Accordingly, a higher contingency (30%) has been applied to utility items.

This category also includes an allowance for storm drainage system modifications associated with introduction of the trackway. The allowance is measured by the track-foot.

New utility services to Project facilities are not included in this capital cost category, but will be included in the cost of the facility where applicable.

6.3.3 Trackwork

This category includes the capital costs for procurement and installation of streetcar tracks including rail, fasteners, special trackwork, crossovers, turnouts, track crossings, welding and miscellaneous track items.

Embedded trackwork with electrically isolated rails fastened to a concrete slab and embedded in pavement is assumed to be the standard track system. Other trackway types, including permeable "grass track" are under consideration for future design phases and would have costs comparable to the assumed track system.

Measurement for trackwork is by the track-foot for general trackway construction and per each for special trackwork.

Costs for new direct fixation trackway in the existing Fort Mason tunnel are included in the separate tunnel lump sum item along with all other elements within the tunnel or associated with its rehabilitation.

6.3.4 Structures

This category includes the capital costs for major structures, which at this design phase includes retaining walls. The capital cost for structures will include temporary support, structural excavation, formwork, structural materials, installation, and finishes. It will include any temporary structures to maintain traffic during construction of the structure. Retained fill and associated earthwork will be included in this category. Retaining walls will be measured on a square foot of face area as calculated from the plans.

6.3.5 Stations

This category includes the capital costs for fixed facilities and amenities for streetcar station stops. The capital costs for stations include platforms, shelters, lighting, signage, landscaping, furnishings, and sidewalks for pedestrian access.

Two cost items were calculated from the plans; standard stop platforms, which are measured by the square foot, and mini-high platforms which provide vehicle floor-level boarding access and are measured per each.

Significant grading or retaining walls will not be included in station costs, but will be estimated separately under other categories.

6.3.6 Park-and-Rides

No park-and-ride facilities are anticipated for this project.

6.3.7 Fare Collection

Fare collection capability is provided entirely on-board the streetcar vehicles, and there is no cost for fare collection equipment anticipated for this project.

6.3.8 Maintenance Facility

This category includes capital costs for maintenance facilities and equipment needed to support streetcar operations. A separate project is providing a new maintenance facility for Muni LRVs, which will provide additional storage capacity for streetcars at the existing streetcar maintenance facility, and therefore no related costs are anticipated for this project.

6.3.9 Traction Power

This category includes capital costs for the system to supply electrical power to the vehicles and consists of traction power substations, the associated overhead contact system (OCS), pole foundations, conduit and corrosion protection. This category also includes installation and testing of the system equipment. Measurement is by the route-foot for traction power and OCS.

A preliminary traction power analysis has indicated that existing streetcar substations will supply adequate power for this extension of the streetcar system; therefore no substation costs are anticipated and have not been included in the cost estimate. However, the current traction power allowance is relatively conservative; if required as a result of subsequent designs, a new substation would add in the range of $1 million plus to the cost of any alternative.

Costs for traction power and OCS in the existing Fort Mason tunnel are included in the separate tunnel lump sum item along with all other elements within the tunnel or associated with its rehabilitation.

6.3.10 Signal System

This category includes capital costs for the wayside signal and train control system. This system consists of track switch control equipment, signal poles, cables, conduit and train detection equipment. Measurement is lump sum based on the number of track switches per plan sheet and includes signal equipment for the single track tunnel section.

Because all grade crossings will be located at intersections controlled by stop signs or traffic signals, grade crossing protection equipment is not included in this or any other category.

6.3.11 Communications

This category includes capital costs for electronic passenger information signs to be located in the shelters, which are measured per each.

6.3.12 Tunnel

This category includes the costs for rehabilitation of the existing 1,500-feet-long Fort Mason Tunnel which formerly served as part of a single track railway and will be upgraded to serve the proposed streetcar extension. The lump sum cost includes rehabilitating and relining the tunnel structure, and addition of track, systems, lighting, ventilation and other equipment within the tunnel.

The cost does not include signal system components, which are included in the Signal System item above.

The tunnel cost was taken from the 2005 document, Fort Mason Tunnel Rehabilitation and Preliminary Cost Estimate Report by Jacobs Associates of San Francisco, and escalated to current dollars.

6.3.13 Professional Services

This category includes the costs for engineering, administration and construction management services. Costs for these services will be based on a percentage of the total cost of all direct capital cost elements. Cost items for this category are as follows:

- Grantee Administration

  Cost of administration, management, design oversight, control, support, implementation, and start-up of the project.

- Design Services

  Cost of professional service consultants for preliminary and final design. Includes civil facilities design, systems facilities design, surveying, geo-technical investigations and design services during construction.

- Project Control Services

  Cost of professional service consultants for project control and construction management. Includes development and maintenance of procedures, schedule, budget, cost estimating and cost tracking, inspection and testing services.

- Other Services

  Costs of professional service consultants for legal assistance, financial advice, audits, permitting, safety\quality assurance assistance, public and community relations, training, and insurance brokerage services. Interim financing, to offset annual funding allocation shortfalls, is included in this item.

- Intergovernmental Agreements

Costs for permits and agreed local jurisdiction involvement in design and construction in accordance with any formal interagency agreements.

The total percentage to be applied to all capital cost categories except contingencies and vehicles is 32 percent.

6.3.14 Contingencies

A contingency will be added to the project costs as a percentage of all the direct cost categories to account for the uncertainty due to the level of design detail. A contingency of 20 percent was allocated to most capital costs categories, with 30 percent applied to utility costs and 35 percent applied to tunnel costs. Contingency should reflect the degree of risk associated with the level of design detail available and the characteristics of the design component. The contingency for future design stages will be reduced as the design process progresses.

6.3.15 Vehicles

This category includes capital costs for procuring streetcar vehicles including spare parts and non-recurring costs. Because no additional vehicles are required for this alignment extension, no vehicle costs are included in the estimate.

6.3.16 Right-of-Way

This category includes the capital costs for securing and providing all the real property rights required for the implementation of the project. These include acquisition of property in fee or easement, temporary easements, site clearing, building demolition, minimum environmental cleanup, and relocation costs.

Right-of-way will be measured by the area or at a parcel-by-parcel level as appropriate. Rates for right-of-way costs will be based on the best available local data. Services to secure the right-of-way will be included in this category.

The proposed alignment alternatives will require no property outside existing City right-of-way and national park property, therefore no right-of-way costs are anticipated at this time.

6.4 PROJECT COST TABLES

Table 6.4.1 summarizes the segment-by-segment cost estimates described above for each of the options and configurations described. Table 6.4.2 summarizes the cost range for the project, which gives the estimated lowest cost possible and the estimated highest cost possible for the project by selecting the lowest cost option for each segment, and also the highest cost option for each segment. This gives a range of possible costs for the project incorporating the range of options. Appendix G gives a detailed cost breakdown for each category described above for each segment.

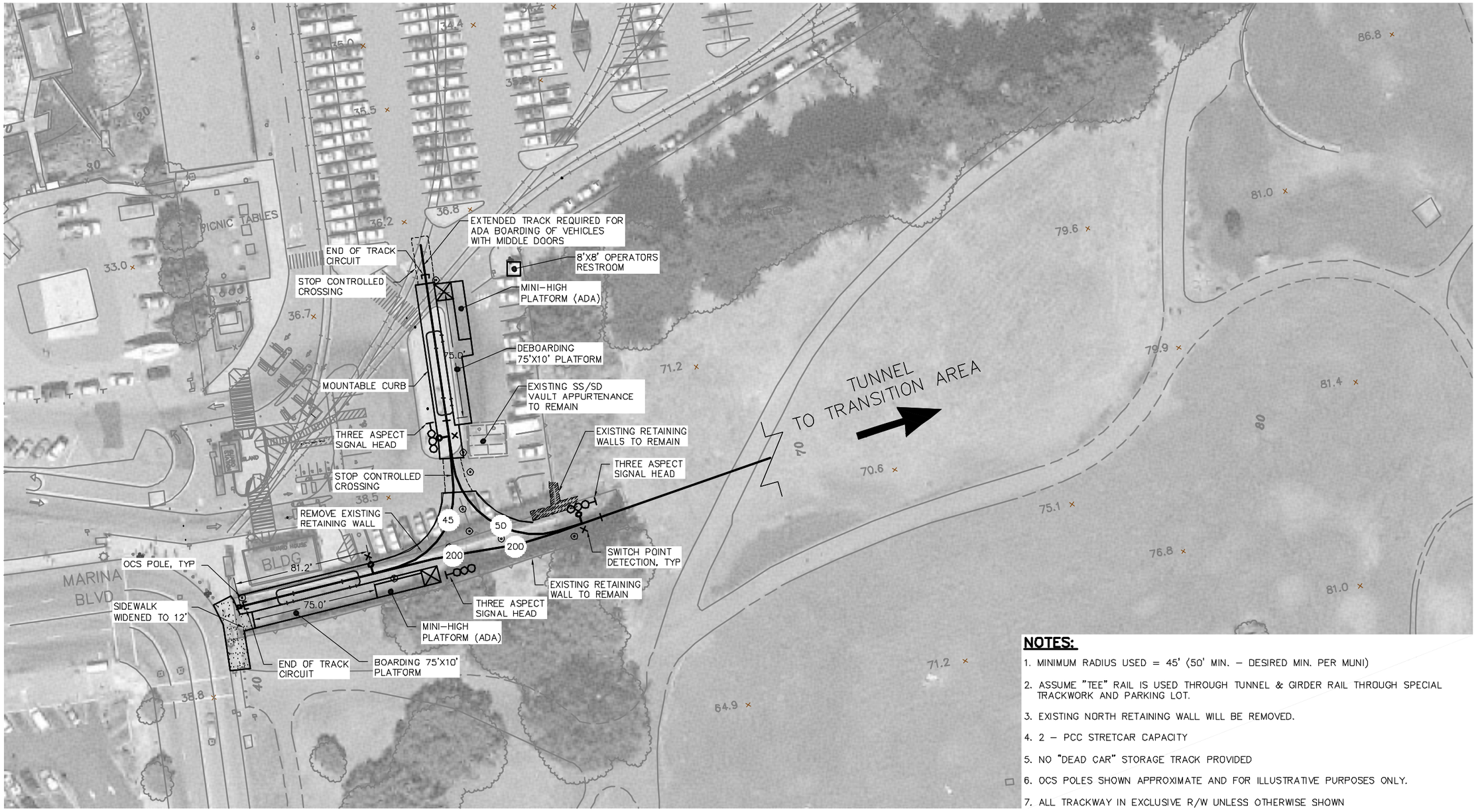
Table 6.4.1 **Cost Summary by Segment** **(See Appendix G for detailed cost breakdown)**					
Option	**Segment A**	**Segment B**	**Segment C**	**Segment D**	**Segment E**
1	$19,860,952	$4,205,392	$4,587,001	$7,722,844	$8,967,015
2	$20,852,304	$4,641,334	$4,780,530	$7,943,239	$9,457,416
3	$21,283,900				
4	$20,681,782				
5	$21,163,885				

Table 6.4.2: Cost Range **(See Appendix G for detailed cost breakdown)**	
Low Total (Segments A-1, B-1, C-1, D-1 and E-1)	$45,006,276
High Total (Segments A-3, B-2, C-2, D-2 and E-2)	$47,818,419

Table 6.4.3 provides detail by cost category for the low and the high cost estimate for the project summarized in Table 6.4.2.

Table 6.4.3 Cost Categories		
	Option 1	**Option 2**
	Low Estimate	**High Estimate**
Segments	A.1,B.1,C.1,D.1, E.1	A.3,B.2,C.2,D.2,E .2
Category		
Construction		
Civil Construction	$4,735,821.67	$5,216,758.33
Structures	$96,000.00	$412,500.00
Tunnel	$10,000,000.00	$10,000,000.00
Traffic Signal	$850,000.00	$900,000.00
Utilities	$3,743,775.00	$3,743,525.00
Trackwork	$5,991,500.00	$6,882,500.00
Stations	$724,800.00	$670,850.00
Park & Ride Lots	$0.00	$0.00
Fare Collection	$0.00	$0.00
Maintenance Facility	$0.00	$0.00
Traction Power	$1,953,300.00	$2,129,700.00
Signal system	$380,000.00	$380,000.00
Communications	$80,000.00	$80,000.00
Vehicles	$0.00	$0.00
Right of Way	$0.00	$0.00
Subtotal Construction	**$28,555,197.00**	**$30,415,833.00**
Professional Services (35% of Construction Costs)		
Preliminary Engineering	$1,108,208.00	$1,180,633.00
Final Design	$1,662,312.00	$1,770,950.00
Project Management for Design and Construction	$1,385,260.00	$1,475,792.00
Construction Administration & Management	$2,216,416.00	$2,361,267.00
Insurance	$554,104.00	$590,317.00
Legal; Permits; Review Fees by other agencies, cities, etc.	$831,156.00	$885,475.00
Surveys, Testing, Investigation, Inspection	$831,156.00	$885,475.00
Start-up Costs & Agency Force Account Work	$277,052.00	$295,158.00
Subtotal Professional Services	**$8,865,663.00**	**$9,445,067.00**
Contingency (20% of Construction Costs)	**$7,585,417.00**	**$7,957,519.00**
TOTAL	**$45,006,276.00**	**$47,818,419.00**
Note - all costs shown in 1st Quarter 2008 dollars.		

Appendix A – Conceptual Design Plans



NOTES:

1. MINIMUM RADIUS USED = 45' (50' MIN. – DESIRED MIN. PER MUNI)
2. ASSUME "TEE" RAIL IS USED THROUGH TUNNEL & GIRDER RAIL THROUGH SPECIAL TRACKWORK AND PARKING LOT.
3. EXISTING NORTH RETAINING WALL WILL BE REMOVED.
4. 2 – PCC STRETCAR CAPACITY
5. NO "DEAD CAR" STORAGE TRACK PROVIDED
6. OCS POLES SHOWN APPROXIMATE AND FOR ILLUSTRATIVE PURPOSES ONLY.
7. ALL TRACKWAY IN EXCLUSIVE R/W UNLESS OTHERWISE SHOWN

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:

- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- SHARED WITH AUTOS

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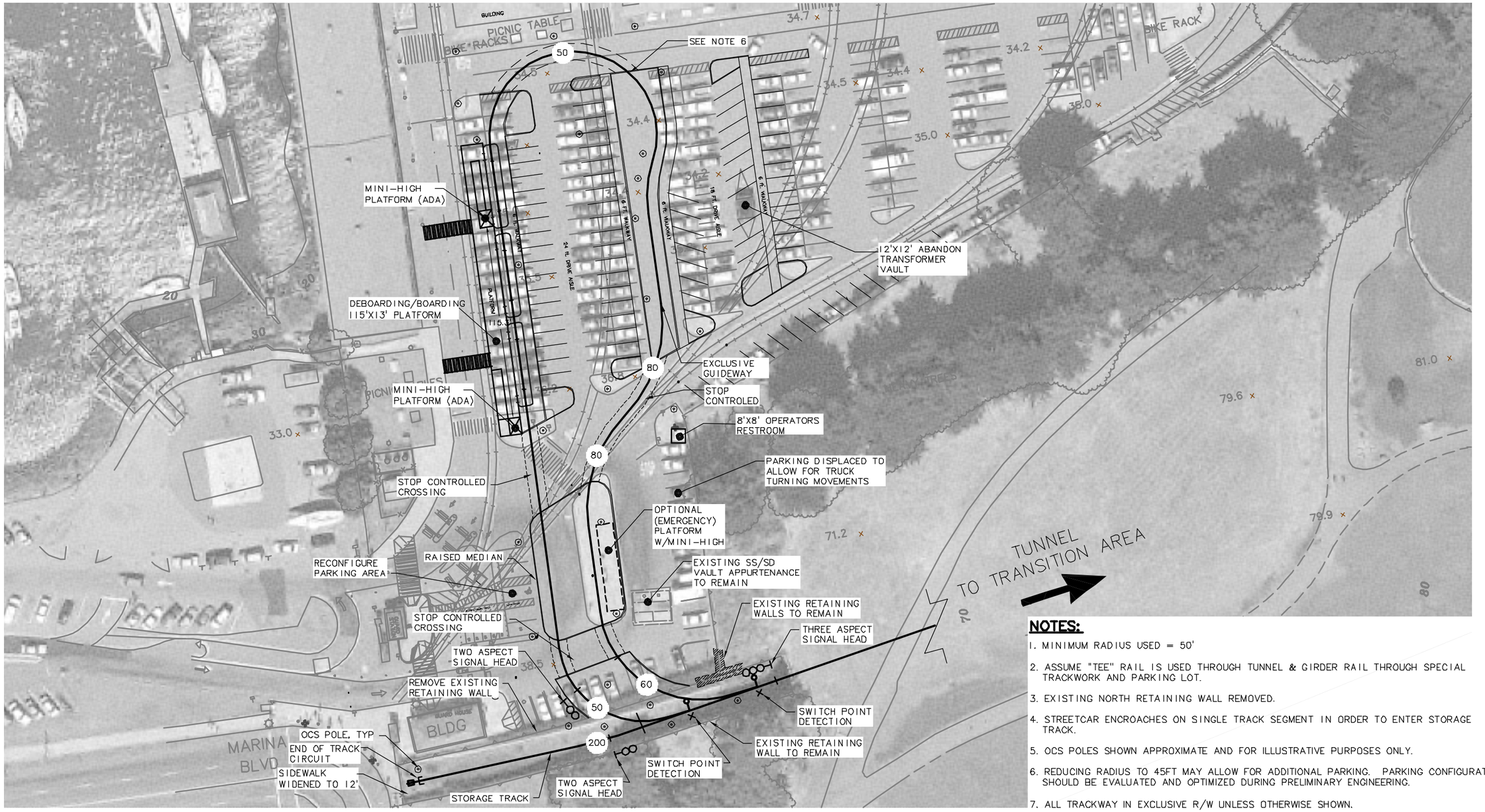
MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

FORT MASON TURN AROUND – "WYE" NORTH

APRIL 2008 | FIGURE A.1



NOTES:

1. MINIMUM RADIUS USED = 50'
2. ASSUME "TEE" RAIL IS USED THROUGH TUNNEL & GIRDER RAIL THROUGH SPECIAL TRACKWORK AND PARKING LOT.
3. EXISTING NORTH RETAINING WALL REMOVED.
4. STREETCAR ENCROACHES ON SINGLE TRACK SEGMENT IN ORDER TO ENTER STORAGE TRACK.
5. OCS POLES SHOWN APPROXIMATE AND FOR ILLUSTRATIVE PURPOSES ONLY.
6. REDUCING RADIUS TO 45FT MAY ALLOW FOR ADDITIONAL PARKING. PARKING CONFIGURATION SHOULD BE EVALUATED AND OPTIMIZED DURING PRELIMINARY ENGINEERING.
7. ALL TRACKWAY IN EXCLUSIVE R/W UNLESS OTHERWISE SHOWN.

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:
- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- SHARED WITH AUTOS

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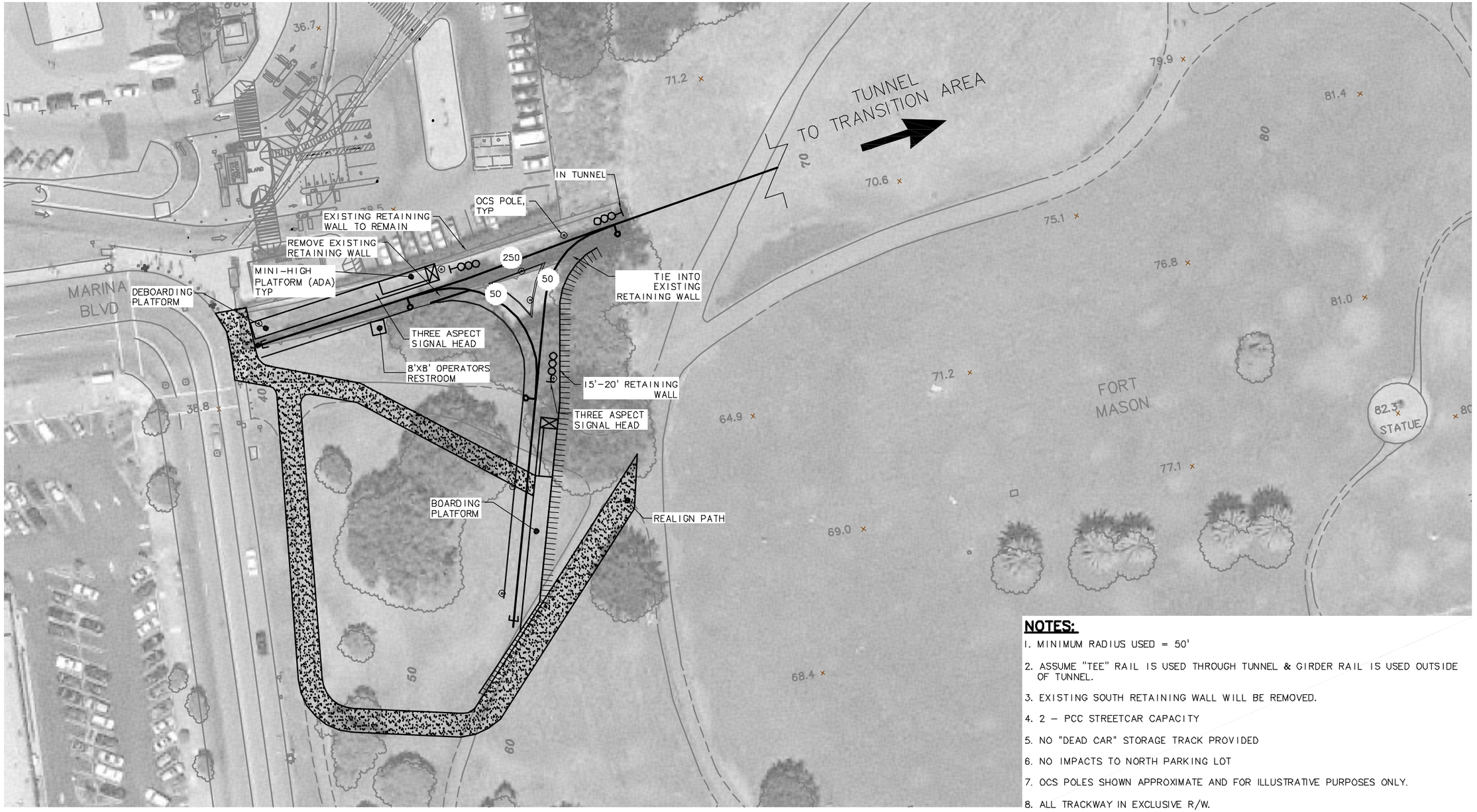
MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

FORT MASON TURN AROUND – LOOP NORTH

APRIL 2008 | FIGURE A.2



NOTES:

1. MINIMUM RADIUS USED = 50'
2. ASSUME "TEE" RAIL IS USED THROUGH TUNNEL & GIRDER RAIL IS USED OUTSIDE OF TUNNEL.
3. EXISTING SOUTH RETAINING WALL WILL BE REMOVED.
4. 2 – PCC STREETCAR CAPACITY
5. NO "DEAD CAR" STORAGE TRACK PROVIDED
6. NO IMPACTS TO NORTH PARKING LOT
7. OCS POLES SHOWN APPROXIMATE AND FOR ILLUSTRATIVE PURPOSES ONLY.
8. ALL TRACKWAY IN EXCLUSIVE R/W.

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:
- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- SHARED WITH AUTOS

URS

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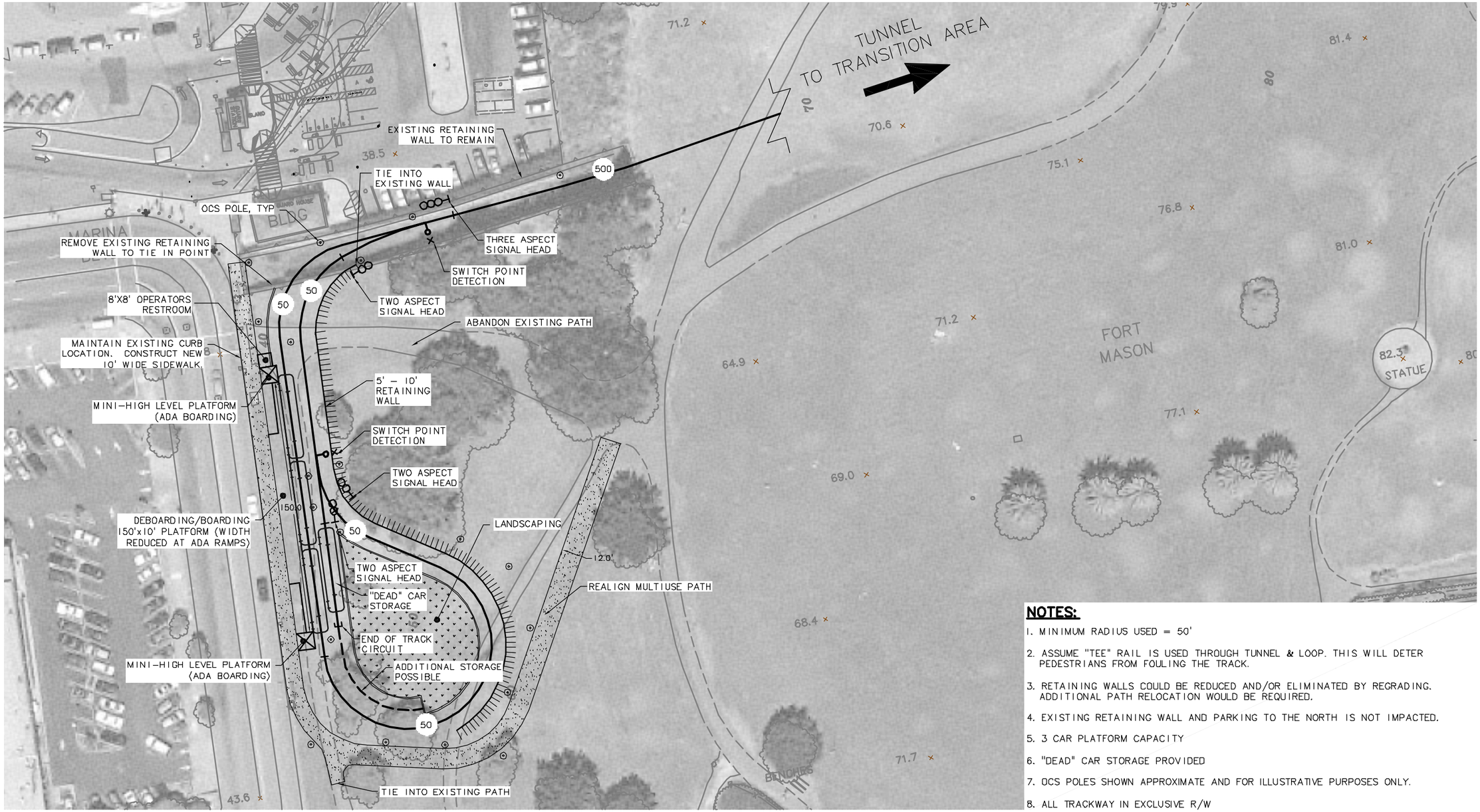
MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

FORT MASON TURN AROUND – SOUTH "Y"

APRIL 2008 | FIGURE A.3



NOTES:

1. MINIMUM RADIUS USED = 50'
2. ASSUME "TEE" RAIL IS USED THROUGH TUNNEL & LOOP. THIS WILL DETER PEDESTRIANS FROM FOULING THE TRACK.
3. RETAINING WALLS COULD BE REDUCED AND/OR ELIMINATED BY REGRADING. ADDITIONAL PATH RELOCATION WOULD BE REQUIRED.
4. EXISTING RETAINING WALL AND PARKING TO THE NORTH IS NOT IMPACTED.
5. 3 CAR PLATFORM CAPACITY
6. "DEAD" CAR STORAGE PROVIDED
7. OCS POLES SHOWN APPROXIMATE AND FOR ILLUSTRATIVE PURPOSES ONLY.
8. ALL TRACKWAY IN EXCLUSIVE R/W

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:

- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- SHARED WITH AUTOS

URS

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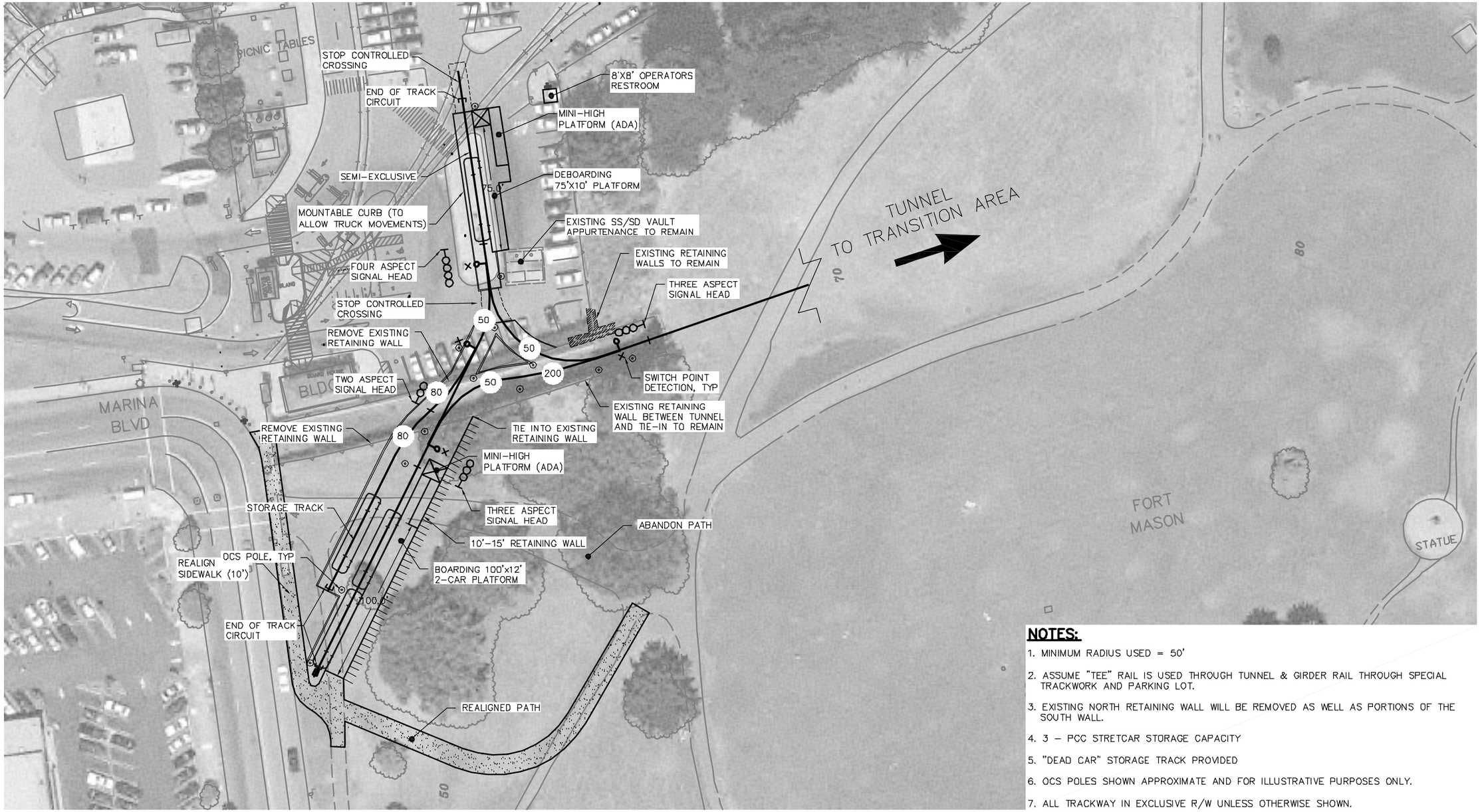
MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

FORT MASON TURN AROUND – SOUTH LOOP

APRIL 2008 | FIGURE A.4



NOTES:

1. MINIMUM RADIUS USED = 50'
2. ASSUME "TEE" RAIL IS USED THROUGH TUNNEL & GIRDER RAIL THROUGH SPECIAL TRACKWORK AND PARKING LOT.
3. EXISTING NORTH RETAINING WALL WILL BE REMOVED AS WELL AS PORTIONS OF THE SOUTH WALL.
4. 3 – PCC STRETCAR STORAGE CAPACITY
5. "DEAD CAR" STORAGE TRACK PROVIDED
6. OCS POLES SHOWN APPROXIMATE AND FOR ILLUSTRATIVE PURPOSES ONLY.
7. ALL TRACKWAY IN EXCLUSIVE R/W UNLESS OTHERWISE SHOWN.

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:
- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- SHARED WITH AUTOS

URS

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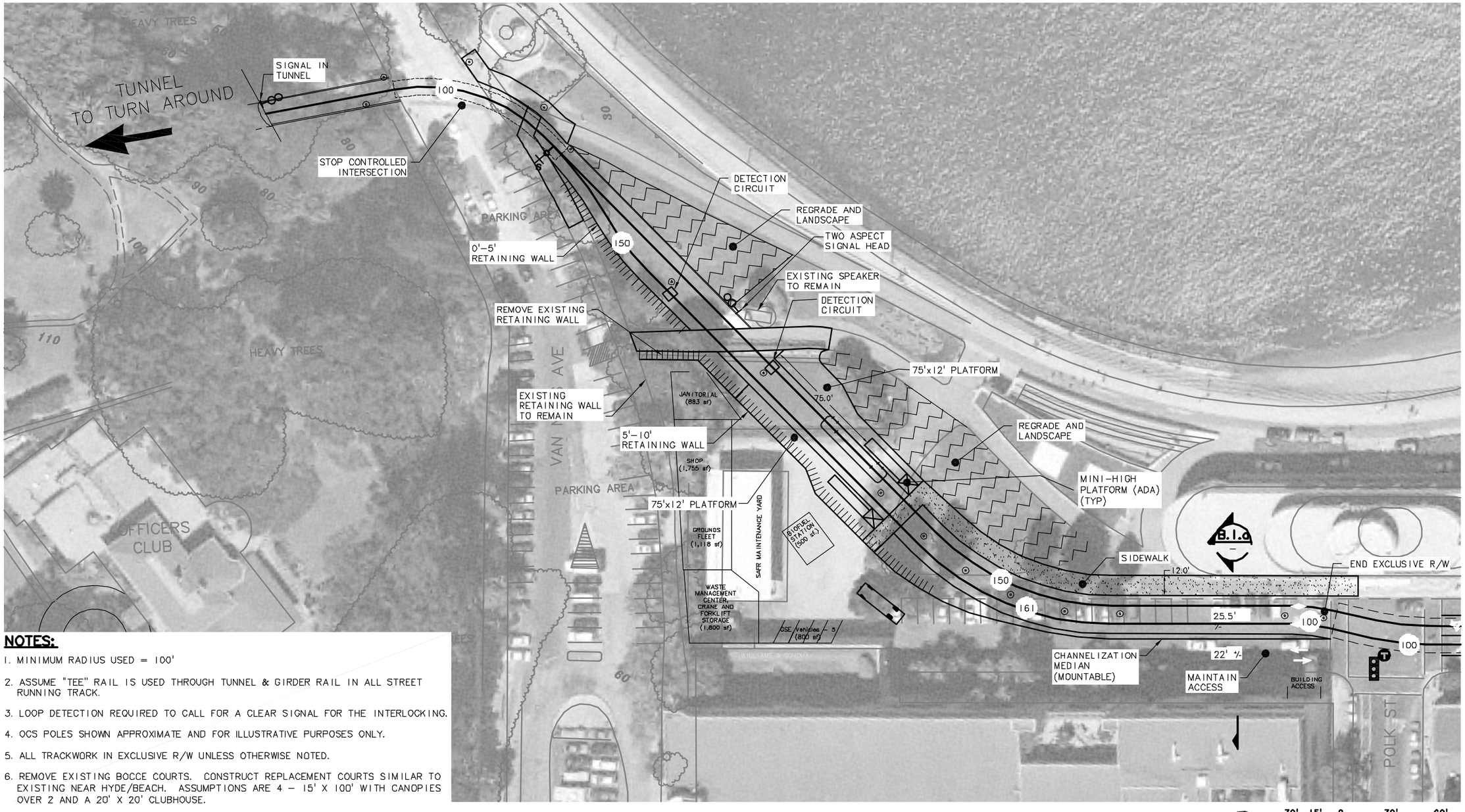
MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

FORT MASON TURN AROUND – "FULL" WYE

APRIL 2008 | FIGURE A.5



NOTES:

1. MINIMUM RADIUS USED = 100'
2. ASSUME "TEE" RAIL IS USED THROUGH TUNNEL & GIRDER RAIL IN ALL STREET RUNNING TRACK.
3. LOOP DETECTION REQUIRED TO CALL FOR A CLEAR SIGNAL FOR THE INTERLOCKING.
4. OCS POLES SHOWN APPROXIMATE AND FOR ILLUSTRATIVE PURPOSES ONLY.
5. ALL TRACKWORK IN EXCLUSIVE R/W UNLESS OTHERWISE NOTED.
6. REMOVE EXISTING BOCCE COURTS. CONSTRUCT REPLACEMENT COURTS SIMILAR TO EXISTING NEAR HYDE/BEACH. ASSUMPTIONS ARE 4 – 15' X 100' WITH CANOPIES OVER 2 AND A 20' X 20' CLUBHOUSE.

LEGEND:

- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- SHARED WITH AUTOS
- NEW TRAFFIC SIGNAL
- RECONSTRUCT EXISTING TRAFFIC SIGNAL
- (T) TRANSIT PHASE

URS

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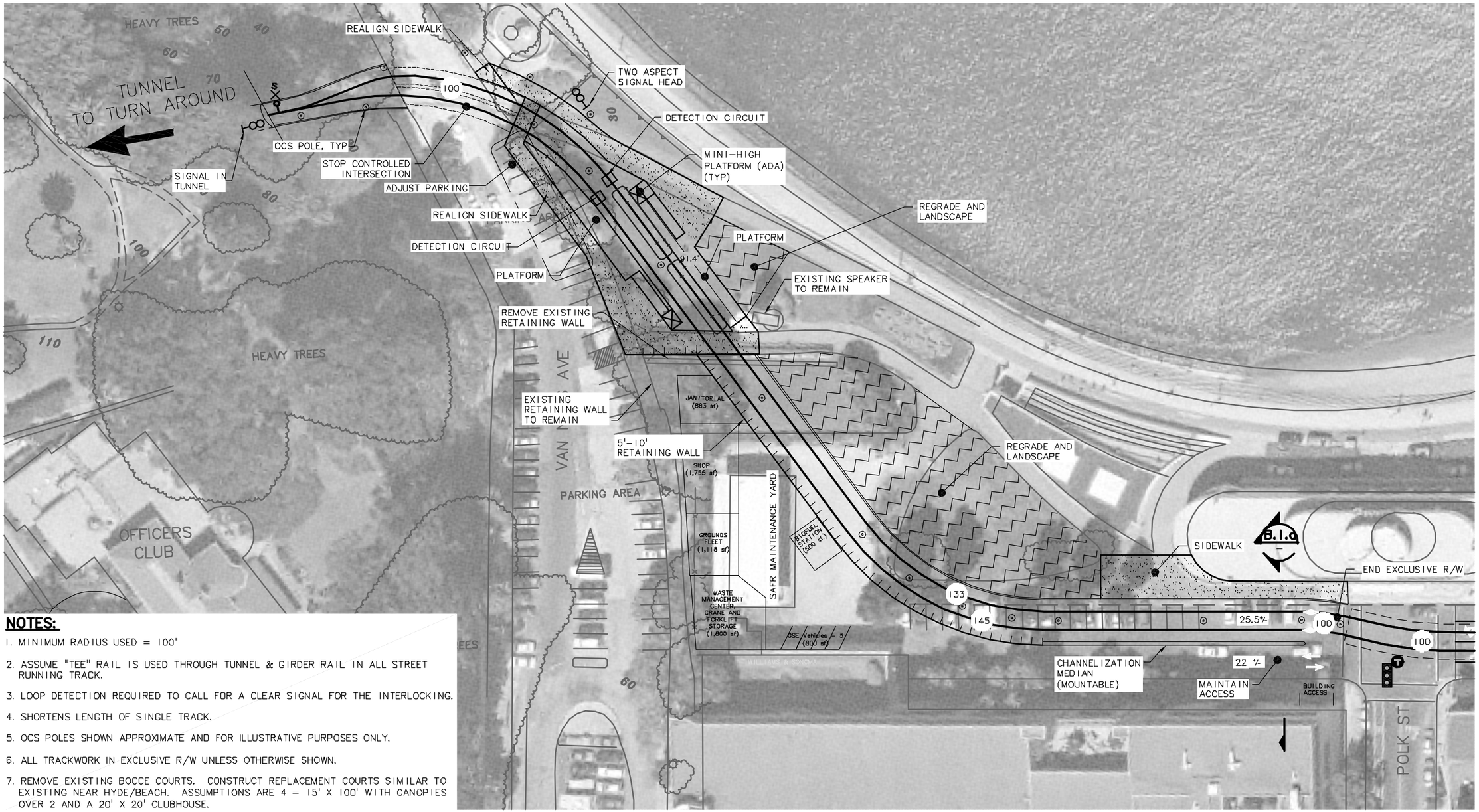
MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

TRANSITION AREA 1 OF 2

APRIL 2008 | FIGURE B.1



NOTES:

1. MINIMUM RADIUS USED = 100'
2. ASSUME "TEE" RAIL IS USED THROUGH TUNNEL & GIRDER RAIL IN ALL STREET RUNNING TRACK.
3. LOOP DETECTION REQUIRED TO CALL FOR A CLEAR SIGNAL FOR THE INTERLOCKING.
4. SHORTENS LENGTH OF SINGLE TRACK.
5. OCS POLES SHOWN APPROXIMATE AND FOR ILLUSTRATIVE PURPOSES ONLY.
6. ALL TRACKWORK IN EXCLUSIVE R/W UNLESS OTHERWISE SHOWN.
7. REMOVE EXISTING BOCCE COURTS. CONSTRUCT REPLACEMENT COURTS SIMILAR TO EXISTING NEAR HYDE/BEACH. ASSUMPTIONS ARE 4 – 15' X 100' WITH CANOPIES OVER 2 AND A 20' X 20' CLUBHOUSE.

LEGEND:

- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- SHARED WITH AUTOS
- NEW TRAFFIC SIGNAL
- RECONSTRUCT EXISTING TRAFFIC SIGNAL
- (T) TRANSIT PHASE

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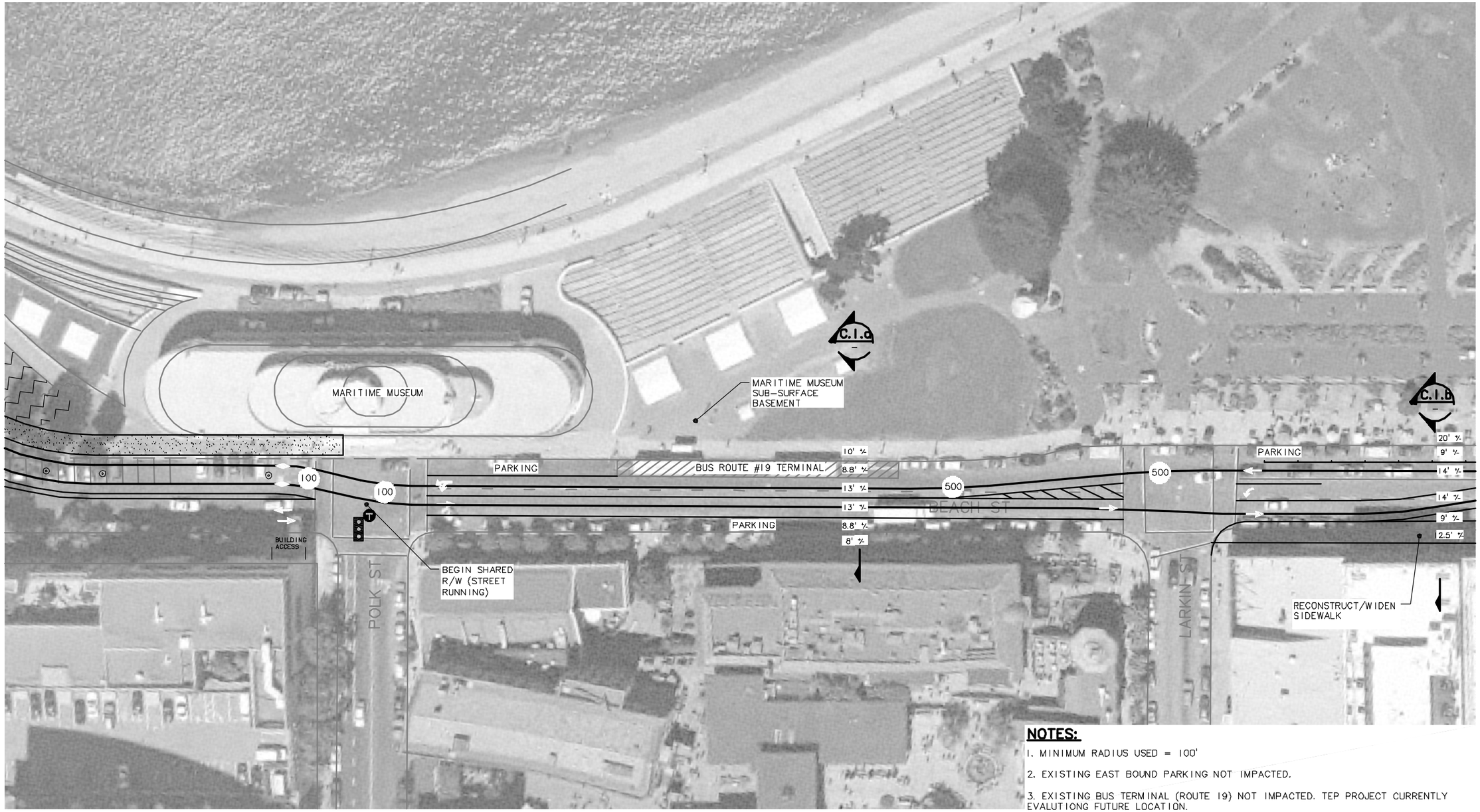
MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

TRANSITION AREA 2 OF 2

APRIL 2008 | FIGURE B.2



NOTES:

1. MINIMUM RADIUS USED = 100'
2. EXISTING EAST BOUND PARKING NOT IMPACTED.
3. EXISTING BUS TERMINAL (ROUTE 19) NOT IMPACTED. TEP PROJECT CURRENTLY EVALUTIONG FUTURE LOCATION.

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:

- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- EXCLUSIVE STREETCAR
- NEW TRAFFIC SIGNAL
- RECONSTRUCT EXISTING TRAFFIC SIGNAL
- (T) TRANSIT PHASE

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MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

BEACH STREET 1 OF 2 – SHARED LANE

APRIL 2008 | FIGURE C.1

NOTES:

1. MINIMUM RADIUS USED = 100'
2. EXISTING EAST BOUND PARKING ELIMINATED FOR EXCLUSIVE STREETCAR LANE.
3. EXISTING BUS TERMINAL (ROUTE 19) NOT IMPACTED. TEP PROJECT CURRENTLY EVALUATING FUTURE LOCATION.

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:

- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- EXCLUSIVE STREETCAR
- NEW TRAFFIC SIGNAL
- RECONSTRUCT EXISTING TRAFFIC SIGNAL
- (T) TRANSIT PHASE

URS

NATIONAL PARK SERVICE

NATIONAL PARK SERVICE – GGNRA & SFMNHP

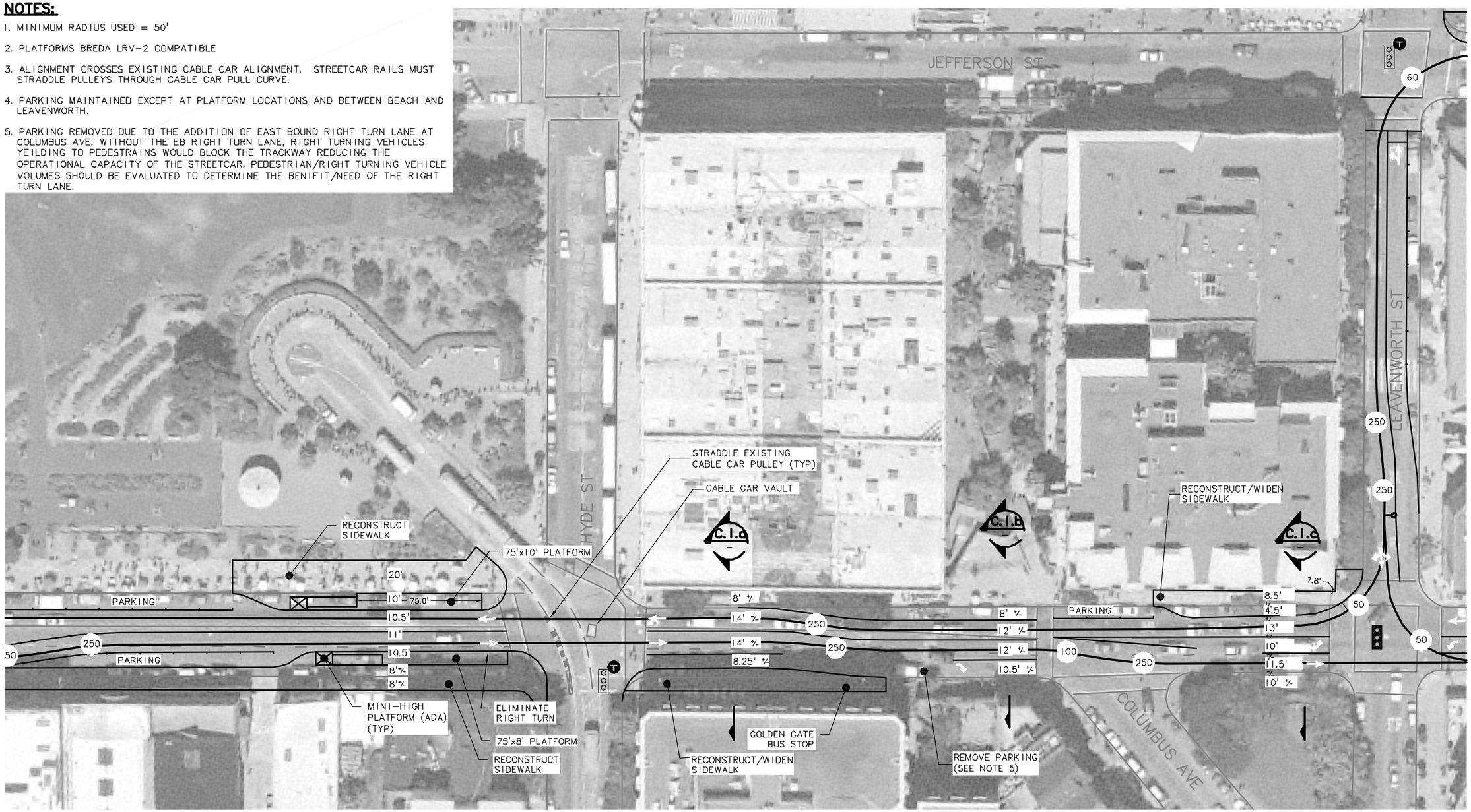
MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

BEACH STREET 2 OF 2 – SEMI-EXCLUSIVE

APRIL 2008 | FIGURE C.2

NOTES:

1. MINIMUM RADIUS USED = 50'
2. PLATFORMS BREDA LRV-2 COMPATIBLE
3. ALIGNMENT CROSSES EXISTING CABLE CAR ALIGNMENT. STREETCAR RAILS MUST STRADDLE PULLEYS THROUGH CABLE CAR PULL CURVE.
4. PARKING MAINTAINED EXCEPT AT PLATFORM LOCATIONS AND BETWEEN BEACH AND LEAVENWORTH.
5. PARKING REMOVED DUE TO THE ADDITION OF EAST BOUND RIGHT TURN LANE AT COLUMBUS AVE. WITHOUT THE EB RIGHT TURN LANE, RIGHT TURNING VEHICLES YEILDING TO PEDESTRAINS WOULD BLOCK THE TRACKWAY REDUCING THE OPERATIONAL CAPACITY OF THE STREETCAR. PEDESTRIAN/RIGHT TURNING VEHICLE VOLUMES SHOULD BE EVALUATED TO DETERMINE THE BENIFIT/NEED OF THE RIGHT TURN LANE.



LEGEND:

- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- EXCLUSIVE STREETCAR
- NEW TRAFFIC SIGNAL
- RECONSTRUCT EXISTING TRAFFIC SIGNAL
- (T) TRANSIT PHASE

URS

NATIONAL PARK SERVICE – GGNRA & SFMNHP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

BEACH STREET 1 OF 2 – SHARED LANE

APRIL 2008 | FIGURE D.1

NOTES:

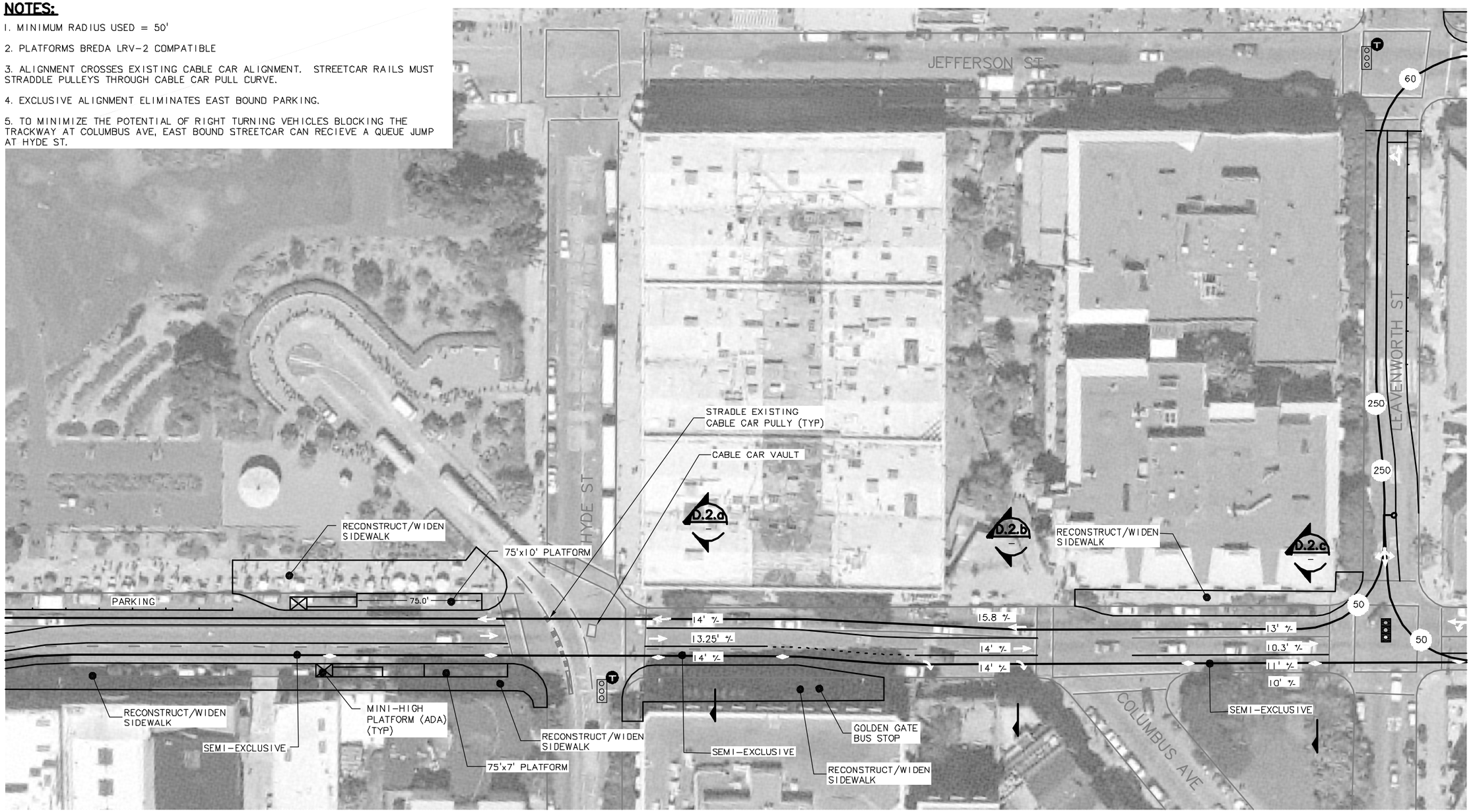
1. MINIMUM RADIUS USED = 50'

2. PLATFORMS BREDA LRV-2 COMPATIBLE

3. ALIGNMENT CROSSES EXISTING CABLE CAR ALIGNMENT. STREETCAR RAILS MUST STRADDLE PULLEYS THROUGH CABLE CAR PULL CURVE.

4. EXCLUSIVE ALIGNMENT ELIMINATES EAST BOUND PARKING.

5. TO MINIMIZE THE POTENTIAL OF RIGHT TURNING VEHICLES BLOCKING THE TRACKWAY AT COLUMBUS AVE, EAST BOUND STREETCAR CAN RECIEVE A QUEUE JUMP AT HYDE ST.



LEGEND:

- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- EXCLUSIVE STREETCAR
- NEW TRAFFIC SIGNAL
- RECONSTRUCT EXISTING TRAFFIC SIGNAL
- TRANSIT PHASE

URS

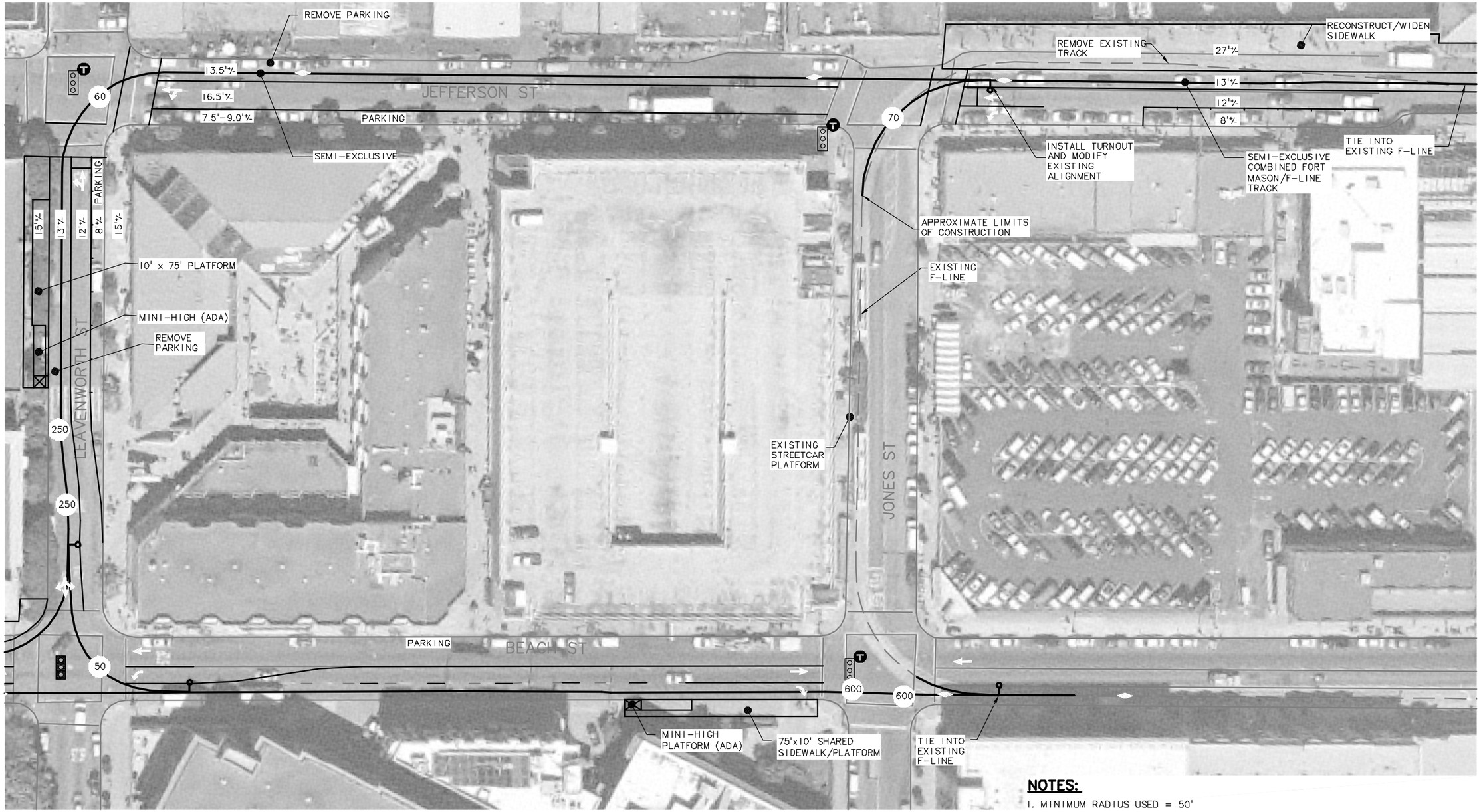
NATIONAL PARK SERVICE

NATIONAL PARK SERVICE – GGNRA & SFMNHP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

BEACH STREET 2 OF 2 – EXCLUSIVE

APRIL 2008 | FIGURE D.2



NOTES:

1. MINIMUM RADIUS USED = 50'

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:

- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- EXCLUSIVE STREETCAR
- NEW TRAFFIC SIGNAL
- RECONSTRUCT EXISTING TRAFFIC SIGNAL
- (T) TRANSIT PHASE

URS

NATIONAL PARK SERVICE

NATIONAL PARK SERVICE – GGNRA & SFMNHP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

CONNECTION TO EXISTING F LINE

APRIL 2008

FIGURE E.1

REMOVE PARKING
75'x8' PLATFORM
MAINTAIN EXISTING TRACK
13.5'+/-
16.5'+/-
7.5'-9.0'+/-
JEFFERSON ST
PARKING
SEMI-EXCLUSIVE
INSTALL DIAMOND CROSSING
SEMI-EXCLUSIVE
INSTALL TURNOUT AND TIE INTO EXISTING ALIGNMENT
APPROXIMATE LIMITS OF CONSTRUCTION
EXISTING F-LINE
15'+/-
13'+/-
12'+/-
8'+/-
15'+/-
75' X 10' PLATFORM
LEAVENWORTH ST
PARKING
MINI-HIGH PLATFORM (ADA)
REMOVE PARKING
EXISTING STREETCAR PLATFORM
JONES ST
60
50
PARKING
BEACH ST
600
600
SEMI-EXCLUSIVE
MINI-HIGH PLATFORM (ADA)
75'x10' SHARED SIDEWALK/PLATFORM
TIE INTO EXISTING F-LINE

NOTES:

1. MINIMUM RADIUS USED = 50'

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:

- PROPOSED STREETCAR ALIGNMENT
- PROPOSED RETAINING WALL
- TURNOUT
- (200) CURVE RADIUS (FT)
- SIDEWALK/ PATH
- APPROXIMATE OCS POLE LOCATION
- EXCLUSIVE STREETCAR
- NEW TRAFFIC SIGNAL
- RECONSTRUCT EXISTING TRAFFIC SIGNAL
- (T) TRANSIT PHASE

URS

NATIONAL PARK SERVICE

NATIONAL PARK SERVICE – GGNRA & SFMNHP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

CONNECTION TO EXISTING F LINE

APRIL 2008

FIGURE E.2

Appendix B – Historic Street Car Fleet

FIGURE 7.38

Historic Vehicle Fleet Inventory

STREETCAR ROSTER

CAR NO	YEAR	MANUFACTURER	ORIGIN/DESCRIPTION	IN SERVICE	NOTES
REGULAR SERVICE VEHICLES=27					
Single Ended (24 cars)					
1050	1946	St. Louis Car	PCC, former SEPTA, Muni wings scheme	1994	
1051	1946	St. Louis Car	PCC, former SEPTA, Muni simplified	1994	
1052	1946	St. Louis Car	PCC, former SEPTA, LA Rwy scheme	1994	
1053	1946	St. Louis Car	PCC, former SEPTA, Brooklym scheme	1994	
1054	1946	St. Louis Car	PCC, former SEPTA, PTC silver/cream	1994	Wrecked/Out of Service
1055	1946	St. Louis Car	PCC, former SEPTA, green/cream	1994	
1056	1946	St. Louis Car	PCC, former SEPTA, Kansas City scheme	1994	
1057	1946	St. Louis Car	PCC, former SEPTA, Cincinnati scheme	1994	
1058	1946	St. Louis Car	PCC, former SEPTA, CTA scheme	1994	
1059	1946	St. Louis Car	PCC, former SEPTA, Bostom Elevated scheme	1994	
1060	1946	St. Louis Car	PCC, former SEPTA, PTC silver/cream	1994	
1061	1946	St. Louis Car	PCC, former SEPTA, PE Rwy scheme	1994	
1062	1946	St. Louis Car	PCC, former SEPTA, Louisville scheme	1994	
1063	1946	St. Louis Car	PCC, former SEPTA, Baltimore scheme`	1994	
1807	1928	Accaio	Milan – purchased 1998 (formerly 1507)	2005	
1811	1928	Accaio	Milan – purchased 1998 (formerly 1911)	2000	
1814	1928	Accaio	Milan – purchased 1998	2000	
1815	1928	Accaio	Milan – purchased 1998 (formerly 1515)	2000	
1818	1928	Accaio	Milan – purchased 1998	2000	
1856	1928	Accaio	Milan – purchased 1998 (formerly 1556)	2000	
1859	1928	Accaio	Milan – purchased 1998	2000	
1888	1928	Accaio	Milan – purchased 1998 (formerly 1588)	2000	
1893	1928	Accaio	Milan – purchased 1998 (formerly 1793)	2000	
1895	1928	Accaio	Milan – purchased 1998 (formerly 1795)	2000	
Double Ended (3 cars)					
1007	1946	St. Louis Car	PCC, double ended, Red Arrow scheme	1994	
1010	1946	St. Louis Car	PCC, double ended, Muni blue/yellow	1994	
1015	1946	St. Louis Car	PCC, double ended, Illinois Term scheme	1994	

FIGURE 7.38

Historic Vehicle Fleet Inventory (continued)

STREETCAR ROSTER

CAR NO	YEAR	MANUFACTURER	ORIGIN/DESCRIPTION	IN SERVICE	NOTES
SPECIAL SERVICE VEHICLES=6					
Double Ended (6 cars)					
1	1912	W.L. Holman	Muni's first car (2-person operation)		CPUC/ADA needed
130	1914	Jewett Car Co.	Muni (2-person operation)		CPUC/ADA needed
228	1934	English Electric	Blackpool "Boat" – open car (2-person operation)		CPUC/ADA needed
496	1039	Melbourne	Melbourne semi-convertible (2-person operation)		CPUC/ADA needed
578S	1895	John Hammond	Market St. Rwy (2-person operation)		CPUC/ADA needed
952	1923	Perley A. Thomas	New Orleans (leased, 2-person operation		CPUC/ADA needed
CARS BEING REHABILITATED=11					
New Jersey PCCs (11 cars)					
1070	1946	St. Louis Car	PCC, former NJT, Newark PSCT Scheme	2007	
1071	1946	St. Louis Car	PCC, former NJT, Twin City Rapid Transit	2007	
1072	1946	St. Louis Car	PCC, former NJT, Mexico City Cream Scheme	2007	
1073	1946	St. Louis Car	PCC, former NJT, El Paso Scheme	2007	
1074	1946	St. Louis Car	PCC, former NJT, Toronto TCC Red Rocket	2007	
1075	1946	St. Louis Car	PCC, former NJT, Cleveland Orange and Brown	2007	
1076	1946	St. Louis Car	PCC, former NJT, Washington DC Blue	2007	
1077	1947	St. Louis Car	PCC, former NJT, Birmingham Cream and Green	2007	
1078	1946	St. Louis Car	PCC, former NJT, San Diego "Balboa Park Zoo"	2007	
1079	1946	St. Louis Car	PCC, former NJT, Detroit Red and Cream	2007	
1080	1946	St. Louis Car	PCC, former NJT, Los Angeles Fruit Salad Scheme	2007	
NON-ACTIVE VEHICLES=44					
Single Ended (21 cars)					
106	1922	Colanna	Moscow/Orel, Russia (2-person operation) (stored Duboce)		
1023	1951	St. Louis Car	PCC (stored outside Marin)		
1025	1951	St. Louis Car	PCC (stored outside Marin)		
1031	1951	St. Louis Car	PCC (stored outside Marin)		
1038	1951	St. Louis Car	PCC (stored outside Marin)		
1040	1952	St. Louis Car	PCC Last PCC Built in US (stored outside Marin)		
1103			PCC (stored outside Marin)		
1105	1946	St. Louis Car	PCC (stored outside Marin)		
1109	1946	St. Louis Car	PCC (stored outside Marin)		
1115	1946	St. Louis Car	PCC (stored outside Marin)		
1125			PCC (stored outside Marin)		
1139	1946	St. Louis Car	PCC (stored outside Marin)		
1155	1946	St. Louis Car	PCC (stored outside Marin)		
1158			PCC (stored outside Marin)		

FIGURE 7.38

Historic Vehicle Fleet Inventory (continued)

STREETCAR ROSTER

CAR NO	YEAR	MANUFACTURER	ORIGIN/DESCRIPTION	IN SERVICE	NOTES
1168	1946	St. Louis Car	PCC (stored outside Marin)		
1704	1946	St. Louis Car	PCC (formerly 1128) (stored at Geneva)		
1834	1928	Accaio	Milan – purchased 1984 (Training Car)		
1979	1928	Accaio	Milan (Parts Car)		Parts Car
2133	1946	St. Louis Car	PCC, SEPTA (stored outside Marin)		
2147	1946	St. Louis Car	PCC, SEPTA (stored outside Marin)		
3557	1951	LHB	Hamburg (stored outside Marin)		Awaiting restoration
Double Ended (12 cars)					
151	1927	Kawasaki	Hankei/Osaka (2-person operation) (stored Pier 80)		
189	1912	J.G. Brill Co.	Oporto, Portugal open car (2-person operation) (Pier 80)		
351	1926	St. Louis Car	Johnstown PA (2-person operation) (stored Duboce)		
578J	1927	Fuginagata	Kobe/Hiroshima (2-person operation) (stored Duboce Yard)		
586	1930	Melbourne	Melbourne semi-convertible (2-person operation) (stored Pier 80)		
798	1924	Market St. Rwy	Muni (2-person operation) (stored Pier 80)		
913	1923	Perley A. Thomas	New Orleans (2-person operation)		Awaiting restoration
1006	1948	St. Louis Car	PCC – Muni – double ended (stored outside Marin)		
1009	1948	St. Louis Car	PCC – Muni – double ended (stored outside Marin)		
1011	1948	St. Louis Car	PCC – Muni – double ended (stored outside Marin)		
1264	1973	Boeing Vertol	US SLRV		
1320	1973	Boeing Vertol	US SLRV		Workcar
New (8 cars)					
162			From Orange Empire		Needs ADA/PUC
1026			From S. Lake Tahoe (stored at Marin)		Needs ADA/PUC
1027			From S. Lake Tahoe (stored outside Marin)		Needs ADA/PUC
1028			From S. Lake Tahoe (stored outside Marin)		Needs ADA/PUC
1033			PCC from Orange Empire (stored at Marin)		Needs ADA/PUC
1039			PCC from Orange Empire (stored at Marin)		Needs ADA/PUC
4008			From Pittsburgh, PA (stored at Marin)	1990	Needs ADA/PUC
4009			From Pittsburgh, PA (stored at Marin)	1990	Needs ADA/PUC
Status Unknown (2 cars)					
1130			PCC (stored inside Pier 80)		

TOTAL HISTORIC VEHICLE FLEET=86

Appendix C – Traffic Analysis Report

Definition Of Alternatives
Street Configuration Analysis

1.0 INTRODUCTION

The proposed extension of historic streetcar service westward from its current Fisherman's Wharf terminus at Jones Street to a new terminus at Fort Mason Center would utilize segments of Jefferson Street, Leavenworth Street and Beach Street. It would operate westbound on Jefferson Street to Leavenworth Street where it would turn south for one block and then turn right onto Beach Street passed the Maritime Museum (Polk Street) where it would exit the public street network. In the eastbound direction the streetcars would run along Beach Street and meet the current eastbound tracks at Jones Street. A two direction track crossing of Van Ness Avenue would transition the streetcar extension to the rail tunnel portal leading to Fort Mason Center.

2.0 Multimodal Transportation Network Extension Project Setting

The following sections describe the main traffic integration features of the extension alignment.

2.1 Regional Access

A network of highways and major arterials provide direct access between the Project site and other destinations in the city. Regional access to the Project site is provided by three freeways: U.S. 101 to the north via Van Ness Avenue and Lombard Street; Interstate 80 to the East Bay and Central Valley via The Embarcadero; and U.S. 101/I-280 to the Peninsula and the South Bay via Van Ness Avenue.

2.2 Local Traffic Access Facilities

This section describes the existing local roadway system of the Project site including roadway designation, number of lanes, and traffic flow directions. Many of these streets are identified as Major Arterials in the San Francisco *General Plan*. Major Arterials are designated to cross-town thoroughfares whose primary function is to link districts within the city and to distribute traffic to and from the freeways.

Jefferson Street: Jefferson Street is an east-west westbound one-way roadway extending from The Embarcadero to Hyde Street. It is designated as a Recreational Street, a Transit Preferential Street, and a Neighborhood Pedestrian Street in the *San Francisco General Plan*. Between The Embarcadero and Jones Street, Jefferson Street provides two westbound travel lanes plus an exclusive F-Line streetcar-only lane on its north side; once past Jones Street, the roadway drops to two westbound travel lanes. Jefferson Street is a heavily used pedestrian street in the Fisherman's Wharf area. On-street metered parking, with one- or two-hour limits, is provided on the south side between The Embarcadero and Jones Street; passed Jones Street, metered parking is offered on both sides. Sidewalks are generally 12 to 14 feet wide. The curb to curb widths on Jefferson Street on the extension segment block Jones to Leavenworth is approximately 38 feet.

Beach Street: Beach Street is a two-way east-west roadway that extends from The Embarcadero on the east to Polk Street on the west It is identified as a Recreational Street, a Transit Preferential Street and a Neighborhood Pedestrian Street in the *San Francisco General Plan*. Between the Embarcadero and Jones Street, Beach Street provides one travel lane in the westbound direction and a travel lane plus an exclusive MUNI F-Line streetcar-only lane in the eastbound direction. West of Jones Street, Beach Street provides one westbound lane and two eastbound travel lanes (no streetcar tracks). On-street metered parking is provided on both sides between Polk and Hyde Street and north side only in the remaining part affected by the Project. Sidewalks on both sides of the street are ten foot wide. The segment between Jones and Polk streets varies in width from 34 feet to 52 feet.

Jones Street: Jones Street is a two-way north-south collector road that extends from Jefferson to Market Street. Within the study area, Jones provides one travel lane in both directions for general traffic. However, between Jefferson and Beach Street in the southbound direction, Jones provides an extra exclusive lane where a layover stop for the F-line is located. F-line cars are scheduled to dwell an average of 12 minutes in this location. Up to four streetcars can be accommodated, but occasionally, when the dwell area is full, trams are stationing upstream along Jefferson. Nine free of charge parking spaces are provided along the northbound direction. Sidewalks on both sides of the street are 12 feet wide.

Leavenworth Street: Leavenworth Street is a two-way north-south collector road that extends from Jefferson to Market Street. Within the Project site, Jefferson provides one travel lane in both directions. On-street metered parking, with 30 minutes limits, is provided on both sides; the east side has four spaces reserved for tour buses. Sidewalks are 15 feet wide, and a mid-block crossing location is provided between Jefferson and Beach. The curb to curb street width is about 33 feet between Jefferson and Beach Streets.

Hyde Street: Hyde Street is a north-south collector road that extends from Market to Jefferson Street. Hyde is generally a one way southbound street, but between California and Beach Street, where the Powel-Hyde cable car line goes, it has travel lanes in both directions. On-street metered parking is provided on both sides with the exception of the east side between Jefferson and Beach, where all spaces are for tour buses. Sidewalks are generally 12 to 15 feet wide.

Larkin Street: Larkin Street is a two-way north-south collector road that extends from Market to Beach Street. On-street metered parking is provided on both sides. Sidewalks are 14 feet wide.

Polk Street: Polk Street is a two-way north-south collector road that extends from Market to Beach Street. On-street metered parking is provided on the east side and partially on the west side. Sidewalks are 12 feet wide.

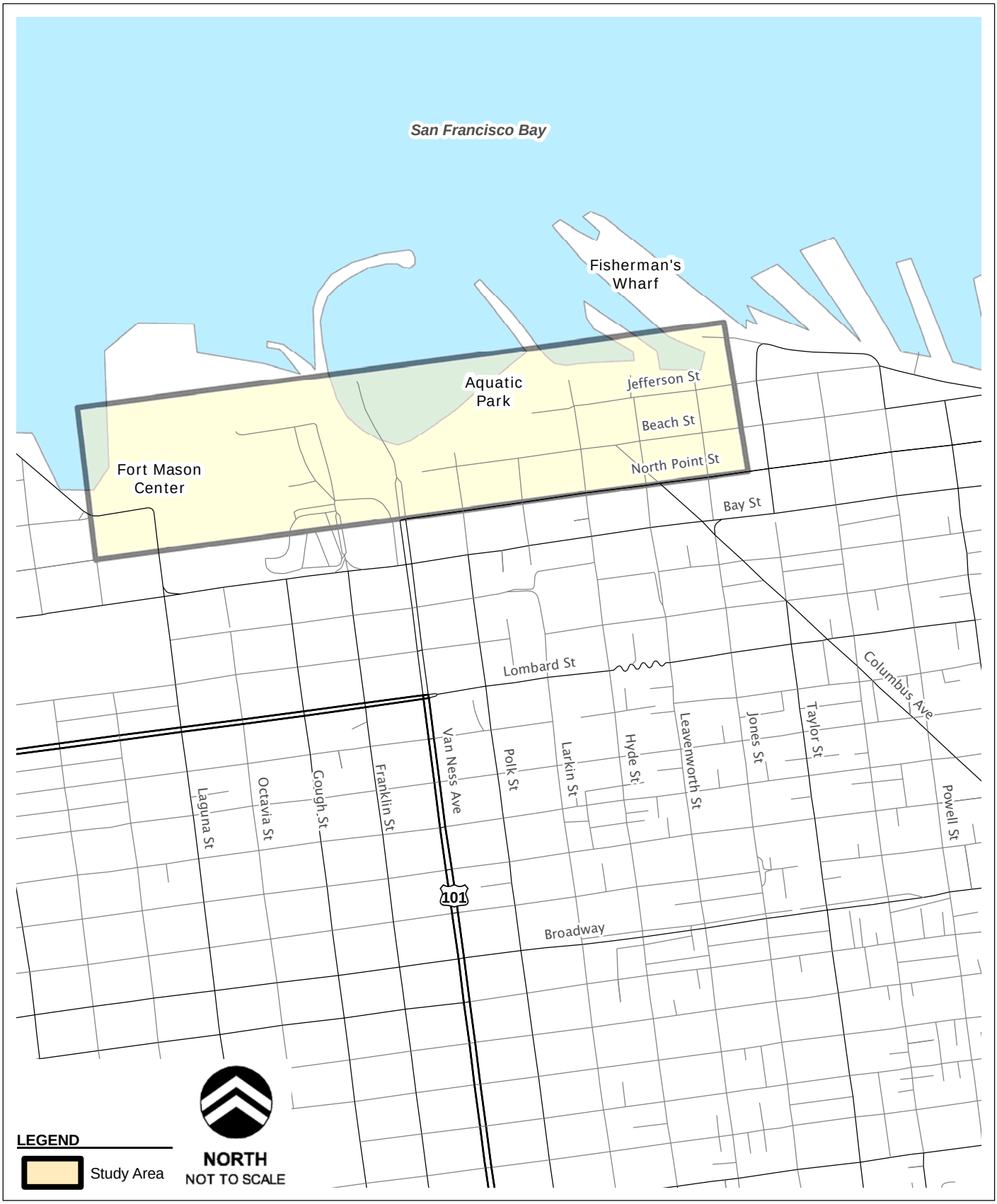
Columbus Street: Columbus Street is a two-way roadway that goes diagonally from north-west to south-east and extends from Washington to Beach Street. It is identified as a major arterial in the *San Francisco General Plan.* On-street metered parking is provided on both sides. Sidewalks are generally 12 to 15 feet wide.

North Point Street: North Point Street is a two-way street with one travel lane eastbound and two travel lanes westbound direction from The Embarcadero to Van Ness Avenue. It is identified as a Major Arterial, a Transit Preferential Street and a Congestion Management Network street in the *San Francisco General Plan*. The entire length of North Point Street is a shared (Class III) bikeway, Route #2. One hour metered parking is generally permitted on both sides of the street.

Van Ness Avenue: Van Ness Avenue is a two-way north-south roadway that runs between North Point Street and Cesar Chavez Street. South of Market Street, Van Ness Avenue turns into South Van Ness Avenue. In the *San Francisco General Plan*, Van Ness Avenue is classified as a Major Arterial, a Transit Preferential Street and part of the Citywide Pedestrian Network and a Neighborhood Pedestrian Street. In general, Van Ness Avenue operates as a six-lane roadway with three travel lanes in each direction and metered parking on both sides of the street. However, in the vicinity of Fort Mason, between North Point and Bay Street, the northbound direction goes from three to two lanes, while in the southbound direction a bus lane is in lieu of the metered parking spaces. North of North Point Street, Van Ness Avenue drops to one lane and it is used by buses to perform a u-turn maneuver; moreover 90 degree parking is provided in the middle of the street. Sidewalks along the avenue are generally 12 to 15 feet wide.

Laguna Street: Laguna Street is a two-way north-south secondary-arterial that extends from Market to Marina Boulevard. In the vicinity of the Project site, Laguna Street has two lanes in each direction, no metered parking, and it is delimited by a 15 ft sidewalk on the west side and Fort Mason Park on the east side.

Marina Boulevard: Marina Boulevard is a two-way east-west secondary arterial that extends from Laguna Street to Lyon Street. The roadway has two lanes in each direction and it is delimited by the Bay Trail on the north side and a 20 ft sidewalk on the south side. Parking spaces are located on the south side with a 2-hour time limit; residential permit parking holders have no time restrictions.



PROJECT STUDY AREA LOCATION

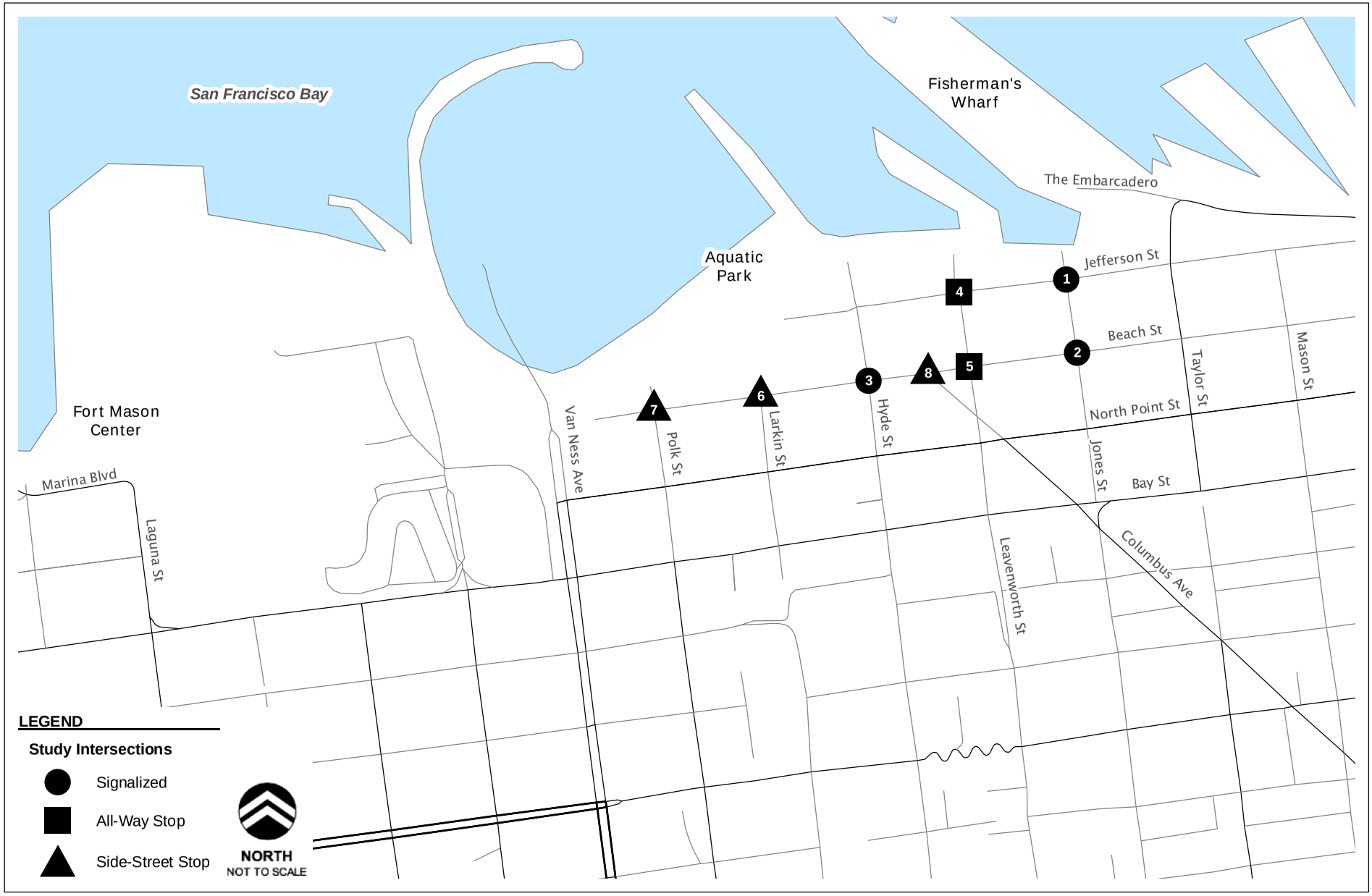
FIGURE 1

WilburSmith ASSOCIATES

3.3 Key Intersections

The project site is located mainly along two streets, specifically Beach and Jefferson Street. Jones and Polk Street delimit the primary east and west traffic boundaries of the area, respectively. Three intersections within the study area are signalized and they all implement a transit priority/preemption plan. A list of study intersections is provided below:

- Jefferson @ Jones
- Jefferson @ Leavenworth
- Beach @ Jones
- Beach @ Leavenworth
- Beach @ Hyde
- Beach @ Larkin
- Beach @ Polk
- Beach @ Columbus



PROJECT STUDY INTERSECTIONS
FIGURE 2

WilburSmith ASSOCIATES

Traffic orientation and general information for each intersection is presented below.

- **Jefferson** (east/west) and **Jones** (north/south): A signalized, three-way approach intersection. The signal timing includes a transit dedicated phase, which is initiated when the F-line priority signal is triggered by the V-tag loop located approximately 20 feet east of the intersection (east of Jones: this is the ENTRY CALL loop). Priority sequence is defined as displaying solid Red for all directions including pedestrian signals. During F-line phase, the white "T" will be on for 7 seconds, followed by 3 seconds "FWT" (Flashing White T) and 2 seconds RED "T" before the vehicle phase. A 7 seconds extension for the white "T" phase is granted till the streetcar triggers the EXIT loop on Jones. A 22 seconds pedestrian scramble phase is also included in the signal timing plan.

- **Jefferson** (east/west) and **Leavenworth** (north/south) - An unsignalized, four-way approach intersection.

- **Beach** (east/west) and **Jones** (north/south) - A signalized, four-way approach. The signal timing includes a transit phase which has the same features as the one described for the intersection of Jefferson and Jones. The entry V-tag loop is located before the stop bar on Jones' southbound approach.

- **Beach** (east/west) and **Leavenworth** (north/south) - An unsignalized, four-way approach intersection.

- **Beach** (east/west) and **Hyde** (north/south) - A signalized, five-way approach intersection. The fifth leg, which has a north-west/south-east orientation, is the cable car turnaround's access street. Transit preemption is provided for cable cars entering and/or exiting the cable car terminal and traveling northbound or southbound on Hyde Street. The southbound preemption entrance/exit switches are located within the cable car track 8 feet north of the northwestern property line and 51 feet south of the southern property line of Beach Street, respectively. The northbound entrance/exit switches are located 12 feet south of the southern property line of Beach Street and 24 feet southeast of the northwestern property line, respectively. The preemption provides "X" seconds of a green "X" indication to the departing cable cars, and is terminated when the exit switch is activated. The preemption override time is set at 60 seconds.

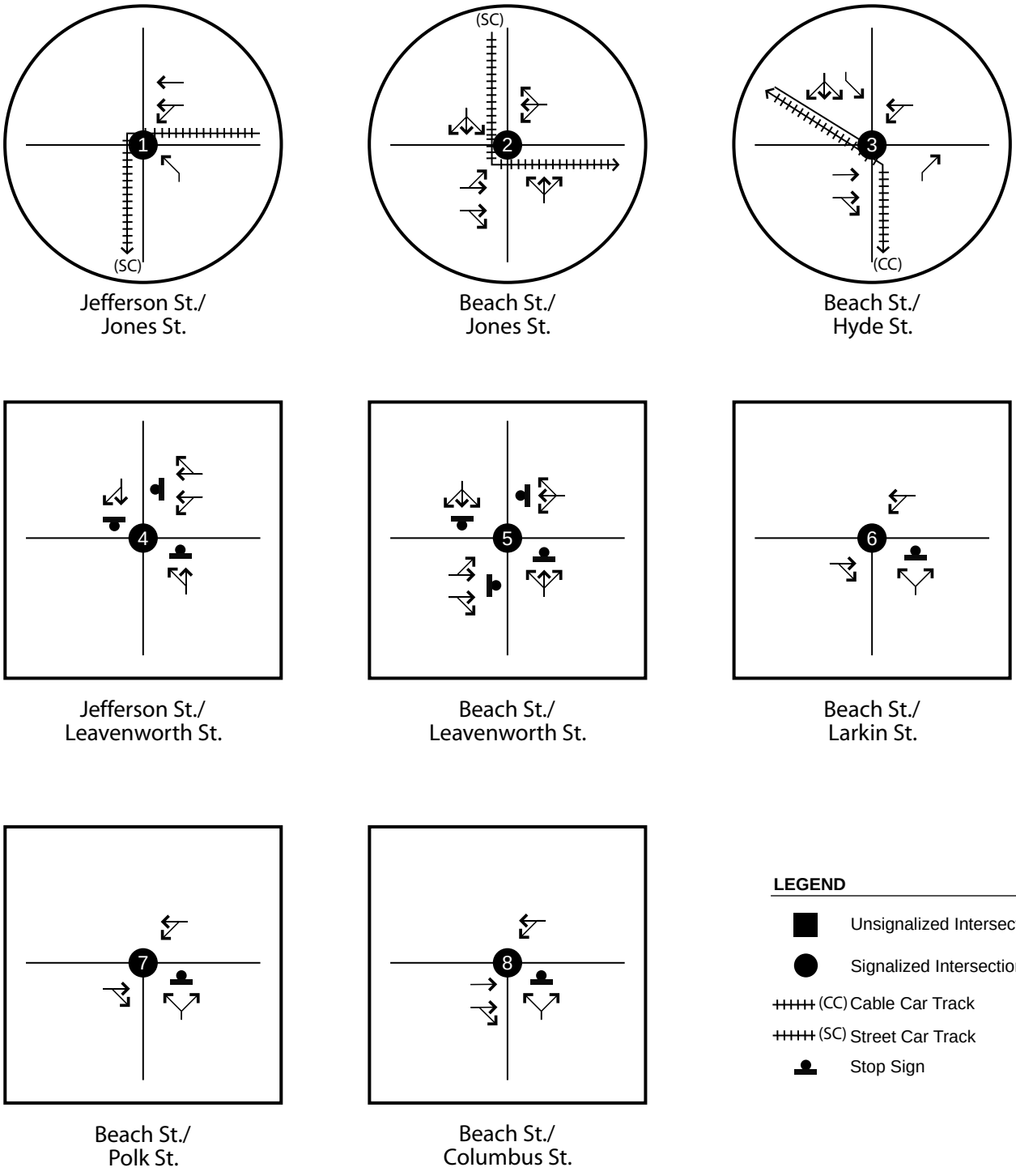
- **Beach** (east/west) and **Larkin** (north/south) - An unsignalized, three-way approach intersection.

- **Beach** (east/west) and **Polk** (north/south) - An unsignalized, three-way approach intersection.

- **Beach** (east/west) and **Columbus** (north-west/south-east) - An unsignalized, three-way approach intersection.

The study area also includes the Van Ness Avenue rail crossing near the Fort Mason Tunnel portal and the main entry driveway into Fort Mason Center. The Van Ness Avenue rail crossing

is along the dead-end access way to the public pier. Traffic volumes are very low, mostly consisting of vehicles searching for curb parking. Speeds are very low for the uncontrolled abandoned rail crossing. The main driveway into Fort Mason Center is an uncontrolled driveway off of Laguna Street's right angle transition into Marina Boulevard.



EXISTING LANE CONFIGURATIONS

FIGURE 3

WilburSmith ASSOCIATES

3.4 Parking Resources

Table 1 shows existing on-street parking in more detail for the streets that streetcars currently operate or might possibly operate on in the future. In general, there are very few on-street parking spaces available during peak hours; the occupancy rate is approximately 90 to 100% for all streets within the Project site. With respect to off-street parking, the Fort Mason Center lot is the only one directly affected by the Project; currently there are 446 spaces, of which: 20 are for disabled drivers, 4 are reserved to National Park Service permit holders and the rest require a parking fee. The occupancy rate of Fort Mason parking facility is generally low during weekday (highest peak is 33% during midday) and mid-high during weekend (highest peak is 68% during midday and evening). Please refer to Table 2 for more detailed occupancy data.

Table 1: On-Street Parking Survey

Roadway	From	To	Meter	Yellow	White	Blue	Transit	Other
Jefferson	Jones	Leavenworth	9		2			
	Leavenworth	Jones	14					
Jones	Jefferson	Beach					F-Line	
	Beach	Jefferson						9
Leavenworth	Jefferson	Beach	3	8				
	Beach	Jefferson	2	3	4	1		
Beach	Jones	Leavenworth	3	6	4	1		
	Leavenworth	Hyde	7		3	1		
	Hyde	Polk	25		4	3	MUNI	23
	End Street	Polk						10
	Polk	Larkin	12	1	4			
	Larkin	Hyde	16	2				
	Hyde	Columbus		4	3		Golden Gate	
	Columbus	Leavenworth			2			
	Leavenworth	Jones		14				

Notes:

- Meter – normal meter parking
- Yellow – temporary parking, usually for commercial truck loading/unloading operations
- White – temporary parking, usually for tour buses and vans
- Blue – handicap parking
- Transit – bus, cable car or streetcar stop present
- Other – either free or special parking schedule

Table 2: Fort Mason Center Parking Survey and Occupancy

Day of the Week	Supply	Morning		Midday		Evening	
		Occupancy	%	Occupancy	%	Occupancy	%
Weekday	446	124	28	145	33	123	28
Weekend	446	152	34	306	68	300	67

Source: WSA project – *Fort Mason Center Parking Monitoring Study*, July 2007

Table 3 provides a survey of the major off-street public parking facilities within and in proximity of the Project site. The table includes hotels that allow public parking.

Table 3: Off-Street Parking Survey

Parking Garage/Lot	Supply
Pier 45 Shed A	200
Pier 43 1/2	102
Fisherman's Wharf Triangle Lot	273
Mason Street/Jefferson Street Lot	40
Anchorage Garage	587
Wharf Parking Inc.	150
Taylor Street/Beach Street *Park and Lock*	40
The Wharf Garage	250
Radisson	235
Pier 39 Parking Garage	978
Ghirardelli Square	275
655 Beach Street	119
Holiday Inn Fisherman's Wharf	210
Nunzio's Public Parking	24
Longshoreman's Union Hall	50
Sheraton Fisherman's Wharf	230
Academy of Art College	140

Source: Department of Parking and Traffic - *Existing Transportation Conditions Report for the Fisherman's Wharf Area Plan*, August 2003

The study area extends west of Fort Mason Center to Fillmore Street, north of Bay Street. This western area would not see streetcar service operating on its streets, but potential could experience parking impacts associated with the project. In addition to off- street parking that is provided at Fort Mason Center, this western area includes off-street parking related to the marina and the Safeway complex as well as neighborhood on-street parking. Fort Mason Center has approximately 450 off-street parking spaces, which are free for the first hour and max out at $8 after three hours of stay. Parking use varies depending on events at Fort Mason Center, but typically is about 50 percent used at noon time on weekends and 40 percent used on weekdays. Sometimes large semi trucks also use the parking lot for staging and loading purposes. One observation found ten large trucks staging on the parking lot. The Safeway off-street parking lot was typically two-third full at noon time on weekdays and weekends. It fills in evening hours. The on-street parking is controlled by the city's residential permit program (Area M) and limits parking on weekdays to two hours for those without permits between 8am and 6pm. At noontime on weekdays the on street spaces are about 70% used and at noontime on weekends the spaces are 95% to 100% used.

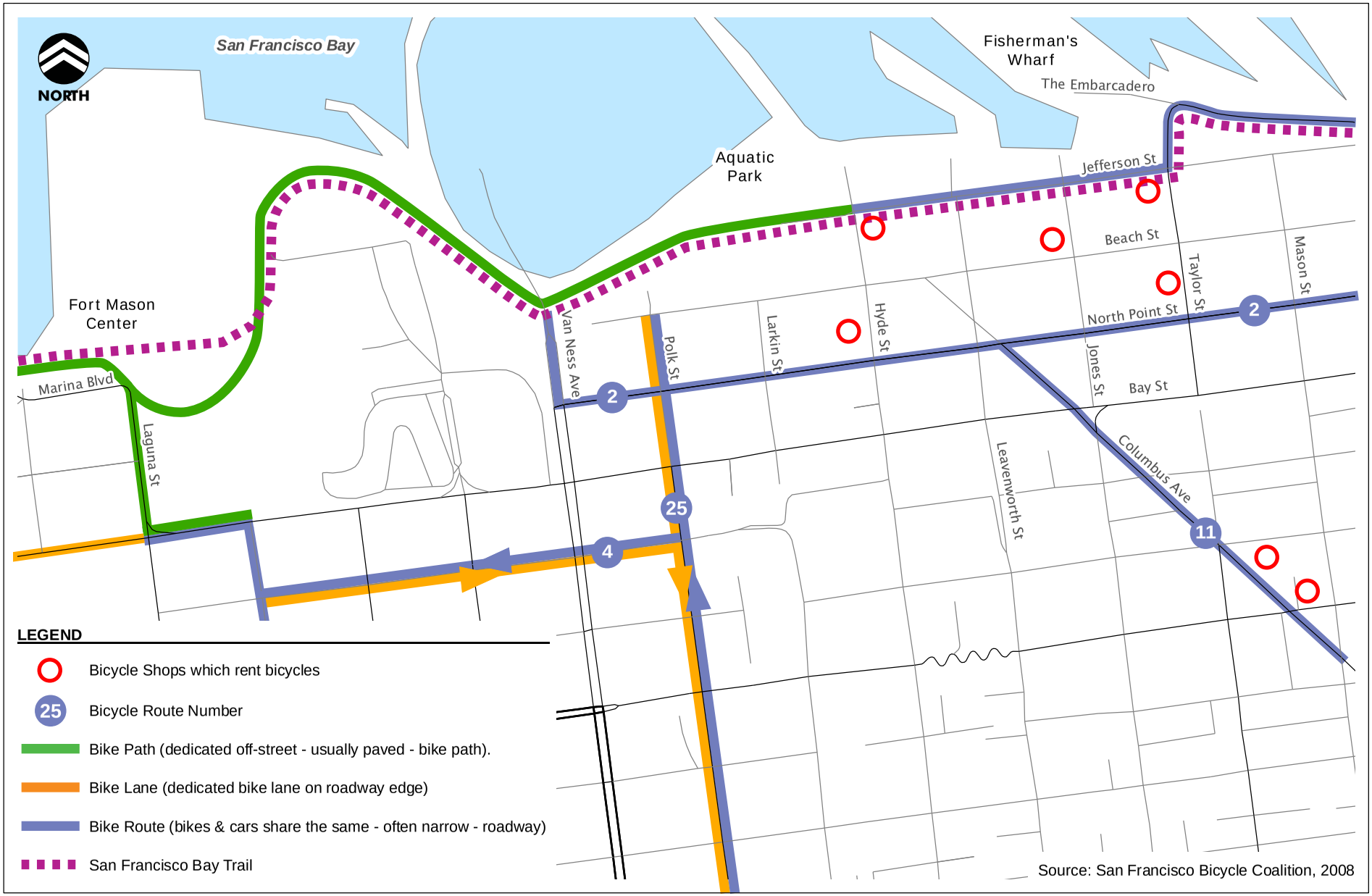
3.5 Pedestrian Facilities

The Project site is located in the proximity of several San Francisco's tourist attractions, including: Fort Mason Center, Ghirardelli Square, Aquatic Park, Anchorage shopping center and Fisherman's Wharf. Pedestrian activity levels are generally light in the morning, and increase following the opening of tourist attractions between 9:00 and 10:00 AM. The highest volume of pedestrians are located along Jefferson Street; crossing locations at Leavenworth and Jones Street experience an average of 1,500 or more pedestrians per hour during weekday and up to 5,000 pedestrians during the weekend peak hours. Sidewalks are in good condition and range from 10 to 15 foot wide; however, there are several locations where the capacity is reduced by street vendors and artists' stands (i.e. on the north side of Beach Street between Larkin and Hyde Street), and outdoor restaurant seating (i.e. along the north side of Jefferson Street, between Leavenworth and Jones Street). Crosswalks are striped at each roadway of each of the study intersections.

The Bay Trail traverses the Project site with an alignment that connects with the Embarcadero on the east side to the Marina Green on the west side via Jefferson Street, the Aquatic Park promenade north of the Maritime Museum, McDowell Avenue, a connecting trail in Upper Fort Mason, the eastern sidewalk along Laguna Street (crossing the Main Gate to Fort Mason Center) and continuing along the northern edge of Marina Boulevard. The Bay Trail was created by Assemble Bill 100 and was directed by the Association of Bay Area Governments. The Bay Trail is intended to complement, rather than supplant local regulations and guidelines.

3.6 Bicycle Facilities

As shown in Figure 4, with the exception of Polk Street, which has bike lanes on the roadway edge, there are no others on-street bicycle facilities along the roads affected by the Project; cyclists have to either use sidewalks or share the right of way with vehicles. There are five bike routes within and in the proximity of the Project area. Route number two goes east-west along North Point Street and terminates at the north end of Van Ness Avenue. Route number eleven runs diagonally on Columbus Avenue and terminates at North Point Street. Route number twenty-five runs north-south along Polk Street. Route number four goes east-west along Francisco and Bay Street. The Bay Trail runs along the northern portion of the Project site. Coming from east, the Trail goes along the Embarcadero and provides on street bike lanes on the right end side of the roadway. However, once passed Taylor Street, the Trail operates along Jefferson Street and does not have any designated bike lanes. After reaching the west end of Jefferson Street, the Bay Trail continues off street and consists of a shared-use paved path, which runs through the Golden Gate National Recreation Area, the Aquatic Park and the Fort Mason Center. Past Fort Mason Center, the Trail continues on the north side of Marina Boulevard. Within the Project site there are four bicycle shops which only rent bicycles (i.e. no sell/repair).



WilburSmith ASSOCIATES

BICYCLE FACILITIES
FIGURE 4

3.7 Transit Resources

The Project location and vicinity is served by local public transit, including San Francisco Municipal Railway (MUNI), motor coach, trolley bus, cable car and street car service. Transit service between San Francisco and the North Bay is provided by Golden Gate Transit (bus and ferry lines); between San Francisco and the East Bay by Alameda-Contra Costa Transit (AC Transit), Bay Area Rapid Transit (BART), and ferry lines; and between San Francisco and the South Bay by San Mateo County Transit (SamTrans), BART, and CalTrain.

MUNI: In the vicinity and within the Project site area, MUNI operates several bus routes, the Powell-Hyde cable car, and the F-Line streetcar. Bus number 19 runs terminate at Ghirardelli Square, going westbound on Beach Street between Polk and Larkin Street. Buses number 10, 20, 30, 47 and 49 run through the Project area on Van Ness Avenue and North Point Street. Bus number 28 services the Fort Mason Area along Laguna Street in the eastbound/southbound direction. The F-Line streetcar goes westbound on Jefferson, turns southbound at Jones, and then eastbound along Beach Street. The Powell-Hyde cable car operates north-south along Hyde Street, and has one turntable on the north-west corner of the Hyde and Beach intersection.

Golden Gate Transit: Golden Gate Transit, operated by the Golden Gate Bridge, Highway and Transportation District (GGBHTD), provides bus service between the North Bay (Marin and Sonoma Counties) and San Francisco. In the study area, Golden Gate Transit's buses operate only during weekday peak-hour in the peak-direction; the service times are generally 6 to 9 AM and 4 to 7 PM. Only morning buses, which traverse Beach Street eastbound, will be affected directly by this Project; the afternoon commute buses travel westbound on North Point Street. The bus lines transiting along Beach Street are: 2, 4, 8, 18, 24, 26, 27, 38, 44, 54, 56, 58, 60, 72, 73, 74, and 76. The morning commute bus services enter the study area northbound on Polk Street, turn eastbound onto Beach Street, and then continue onto the Embarcadero making a passenger stop at Hyde Street (far side).

BART: BART operates heavy rail passenger service in the San Francisco Bay Area. BART currently operates five lines: Pittsburg/Bay Point to Millbrae, Fremont to Daly City, Richmond to Colma, Fremont to Richmond, and Dublin/Pleasanton to San Francisco International Airport. In downtown San Francisco, BART operates along Market and Mission Streets. In general, BART operates at 5 to 15 minute headways per line on a weekday daily basis (generally between 5:00 AM and 7:00 or 8:00 PM), and at 20 minute headways on weekends. The BART station closest to the Project site is the Embarcadero Station, with nearby connections to the F-line to reach the Project site.

AC Transit: AC Transit is the primary bus operator for the East Bay, including Alameda and western Contra Costa Counties. AC Transit operates 37 routes between the East Bay and San Francisco, terminating at the Transbay Terminal. Most Transbay service is peak hour and peak direction, to San Francisco during the AM peak period (generally 6:00 to 9:00 AM) and from San Francisco during the PM peak period (generally 3:00 to 6:00 PM), with 15 to 30 minute headways per route. Four routes operate throughout the day on weekdays (with 30 to 45 minute headways per route), and two routes operate on weekends (with 30 to 60 minute headways per

route). From the vicinity of the Transbay Terminal, the F- line provides service to the Project site.

Sam Trans: Sam Trams is the primary public transit operator for San Mateo County. In addition, SamTrans provides service between San Mateo County and San Francisco. SamTrans operates 14 bus routes that serve San Francisco, including 12 routes into the downtown area (ending at the Transbay Terminal). Three of the downtown San Francisco routes provide service on a weekday daily and weekend basis (with 30 minute headways per route). From the vicinity of the Transbay Terminal, the F- line provides service to the Project site.

Ferries: The ferry service at Fisherman's Wharf is generally recreational with limited commuter service available. Most of the commute service is provided at the Ferry Building, at the foot of Market Street. Golden Gate Transit operates ferry services between the North Bay and San Francisco. During the morning and evening commute periods, ferries are operated between Larkspur and San Francisco and between Sausalito and San Francisco. The San Francisco terminal is located at the Ferry Building, near Market Street and The Embarcadero. The Blue and Gold fleet operates commuter ferry service between San Francisco and Alameda/Oakland, Vallejo, Sausalito, Tiburon and Angel Island. Service is provided from the Ferry Building and Pier 41 at Fisherman's Wharf. The Blue and Gold fleet also provides ferry service to Alcatraz from Pier 41. In addition, the Red and White fleet provides recreational sightseeing services from Pier 43½.

Caltrain: Caltrain is a commuter rail line operated by Amtrak that runs along the San Francisco Peninsula and Santa Clara Valley. The northern terminal of the rail line is in San Francisco, at 4th and King Street, while the southern terminal is located in Gilroy. Trains operate out of San Francisco and San Jose on a half hourly basis every weekday, with more frequent service provided during commute hours (5:30-8:30 AM and 5:00-8:00 PM). Service between San Jose and Gilroy is limited to three daily commute-hour round trips. During weekend and holidays trains have hourly frequency.

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TRANSIT MAP
FIGURE 5

4.0 TRAFFIC SETTING

This section presents the methodology used to describe existing traffic conditions of the Project site.

4.1 Traffic Counts

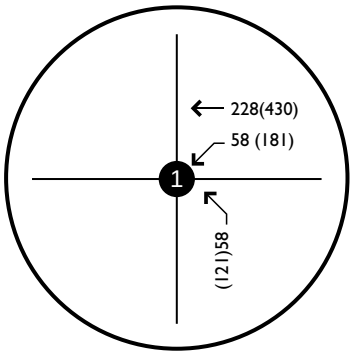
Existing intersection operating conditions were evaluated for the weekday PM (generally between 4:00 and 6:00 PM) and weekend midday peak hour (generally between 12:00 and 2:30 PM). Turning movement volume counts were conducted as part of the Proposed Project on Wednesday, January 16, 2008 and Saturday, February 16, 2008 for the weekday and weekend scenario, respectively. Results of the traffic counts performed are presented in Appendix A.

Due to the tourist-oriented nature of the land uses in the Project area, it was judged that conducting traffic volume counts in February would not represent typical conditions during the tourist season which typically occurs in the spring and summer months. WSA undertook further analyses in order to develop a set of turning movement counts that represent typical summer traffic conditions in the Project area. To achieve representative summer volumes, pedestrian and vehicular counts were also performed at the Embarcadero and Bay Street intersection; the results were compared to traffic counts performed by WSA at the same intersection in June 2007[1].

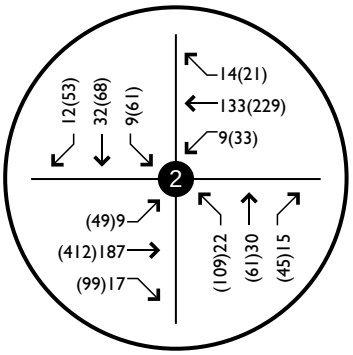
The analysis of the Bay Street intersection indicated that traffic in the area on a good weather day in late January or early February represents approximately 80 percent of the traffic volumes that can be expected on a typical summer day. As a result, a 1.22 for the weekday and 1.24 for the weekend seasonality factor was applied to all turning movement and pedestrian counts collected as part of this study, in order to establish base conditions for the peak tourist season. This adjustment procedure and factors are similar to the method used by WSA for a study nearby the Project site[2].

[1] Please refer to WSA project 100919 – *Exploratorium Relocation EIR*

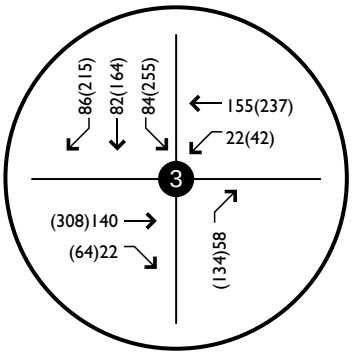
[2] Please refer to WSA project 388250 - *SF BOUDIN BAKERY AND CAFÉ TRANSPORTATION STUDY*



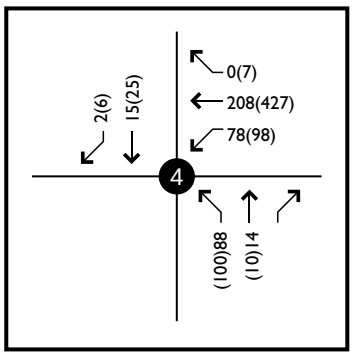
Jefferson St./
Jones St.



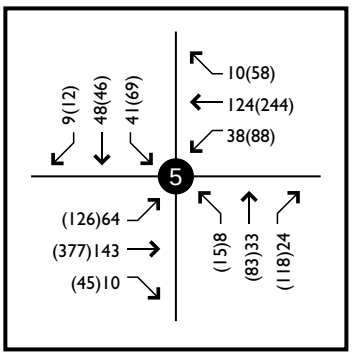
Beach St./
Jones St.



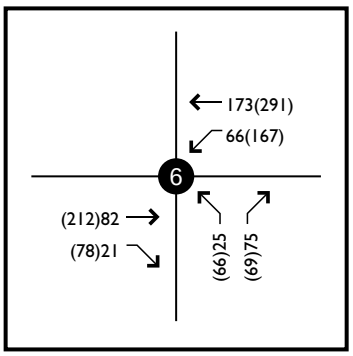
Beach St./
Hyde St.



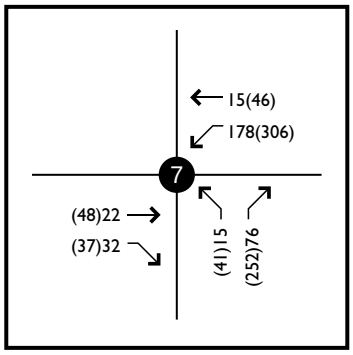
Jefferson St./
Leavenworth St.



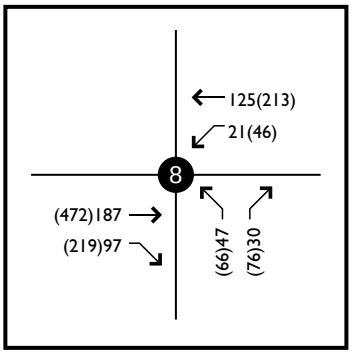
Beach St./
Leavenworth St.



Beach St./
Larkin St.



Beach St./
Polk St.



Beach St./
Columbus St.

LEGEND

- Unsignalized Intersection
- Signalized Intersection
- # Weekday PM Peak
- (#) Weekend MIDDAY Peak

WilburSmith ASSOCIATES

EXISTING WEEKDAY PM & MIDDAY WEEKEND PEAK HOUR
FIGURE 6

4.2 Level of Service Threshold of Significance

The Level of Service (LOS) is a qualitative description of the performance of an intersection based on the average delay per vehicle (in seconds per vehicle) for the various movements within the intersection. For this analysis, the operational impact on signalized intersections is considered significant when project-related traffic causes the intersection level of service to deteriorate from LOS D or better to LOS E or F, or from LOS E to LOS F. The operational impacts on unsignalized intersections are considered potentially significant if project-related traffic causes the level of service at the worst approach to deteriorate from LOS D or better to LOS E or F and Caltrans signal warrants would be met, or would cause Caltrans signal warrants to be met when the worst approach is already operating at LOS E or F. The project may result in significant adverse impacts at intersections that operate at LOS E or F under existing conditions depending upon the magnitude of the project's contribution to the worsening of the average delay per vehicle. In addition, the project would have a significant adverse impact if it would cause major traffic hazards or contribute considerably to cumulative traffic increases that would cause deterioration in levels of service to unacceptable levels.

Table 4 and Table 5 illustrate the LOS criteria for both intersection types.

Table 4: Level of Service Criteria – Signalized

Level of Service	Description of Operations	Average Delay
A	Operations with very low delay occurring with favorable progression and/or short cycle length.	≤ 10.0
B	Operations with low delay occurring with good progression and/or short cycle lengths.	10.1 – 20.0
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.1 – 35.0
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1 – 55.0
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	55.1 – 80.0
F	Operation with delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths.	≥ 80.1

Table 5: Level of Service Criteria – Unsignalized

Level of Service	Description of Operations	Average Delay
A	No Delay for stop-controlled approaches.	≤ 10.0
B	Operations with minor delays.	10.1 – 15.0
C	Operations with moderate delays.	15.1 – 25.0
D	Operations with some delays.	25.1 – 35.0
E	Operations with high delays, and long queues.	35.1 – 50.0
F	Operations with extreme congestion, with very high delays and long queues unacceptable to most drivers.	≥ 50.1

4.3 Synchro Analysis

The Synchro transportation program was used to determine the LOS of the study intersections. Synchro calculates LOS for signalized and unsignalized intersections using the *Highway Capacity Manual 2000* (HCM 2000) methodology.

Table 6 and 7 show the results of the Synchro HCM analysis for the existing Weekday PM and Weekend Mid-day Peak scenario, respectively.

Table 6: Existing Weekday PM Intersection Level of Service and Delay

Intersection	Control	HCM	
		LOS	Delay
1. Jefferson @ Jones	Signalized	C	20.2
2. Beach @ Jones	Signalized	B	13
3. Beach @ Hyde	Signalized	B	12.1
4. Jefferson @ Leavenworth	AWSC	A	8.4
5 Beach @ Leavenworth	AWSC	A	8.8
6. Beach @ Larkin[1]	SSSC	A	8.7
7. Beach @ Polk[1]	SSSC	A	8.3
8. Beach @ Columbus[1]	SSSC	A	8.1

(1) Modeled as AWSC, from field observations it was noted that most of the vehicles on the major street come to a full stop due to high pedestrian volumes

Table 7: Existing Weekend MID Intersection Level of Service and Delay

Intersection	Control	HCM	
		LOS	Delay
1. Jefferson @ Jones	Signalized	C	23
2. Beach @ Jones	Signalized	C	24.5
3. Beach @ Hyde	Signalized	C	20.1
4. Jefferson @ Leavenworth	AWSC	B	10.3
5 Beach @ Leavenworth	AWSC	C	19.3
6. Beach @ Larkin[1]	SSSC	C	16.4
7. Beach @ Polk[1]	SSSC	B	12
8. Beach @ Columbus[1]	SSSC	B	12.1

(1) Modeled as AWSC, from field observations it was noted that most of the vehicles on the major street come to a full stop, even if they are not required to

With respect to weekday conditions, most of the intersections operate at an acceptable LOS. The LOS ranges between A and B, with the exception of the intersection at Jefferson and Jones, which operates at LOS C.

Weekend conditions have also acceptable LOS, with no intersection operating at LOS D or worse. However, the deterioration of LOS, when compared to weekday condition, is noticeable. All intersections experience a drop of one (intersection 2, 3, 4, 7, 8) or two (intersection 5 and 6) LOS levels, with the exception of the Jefferson and Jones one, which remains at LOS C.

5.0 Scenario Alternatives

The current F-Line historic streetcar service operates through Fisherman's Wharf on a one way couplet. It travels westbound on Jefferson Street and eastbound on Beach Street. The line terminus is located on Jones Street. Jefferson Street is basically a two lane street with parking allowed along the southern curb-front and streetcars operating along the northern curb-front. Beach Street is also a two lane street, but has curb parking along its northern curb-front and the semi-exclusive streetcar right-of-way on the southern curb-front. General traffic is allowed to use the semi-exclusive streetcar lane for right turns.

The E-Line extension alignment is envisioned to allow E-Line streetcars to continue westward from the F-Line tracks, past Jones Street to Leavenworth Street, then turn south onto Leavenworth Street for one block and finally turn west onto Beach Street. E-Line streetcars would then continue west to Fort Mason Center on Beach Street passing over the cable car tracks on Hyde Street, past Ghirardelli Square and through an abandoned railroad tunnel. In the eastbound direction, the E-Line streetcars would emerge from the railroad tunnel and travel on Beach Street to Jones Street where they would continue on tracks currently used by the F-Line

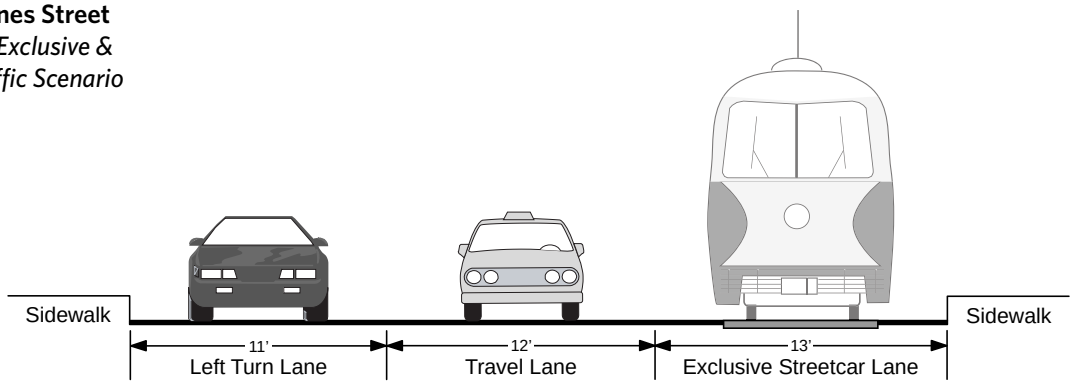
streetcars. Three new traffic signals would be installed on the extension alignment to facilitate streetcar priority. Special measures would be provided to coordinate the streetcar priority with the cable car priority at the Hyde Street junction. Two alternative scenarios were proposed as part of the proposed streetcar extension depending on the streetcar operation. The Semi-Exclusive alternative would provide exclusive right-of-way to the streetcar along certain stretches of the route whereas the Mixed-Traffic alternative would provide a shared right-of-way to the streetcar along with general purpose traffic.

5.1 Typical Roadway Cross-sections

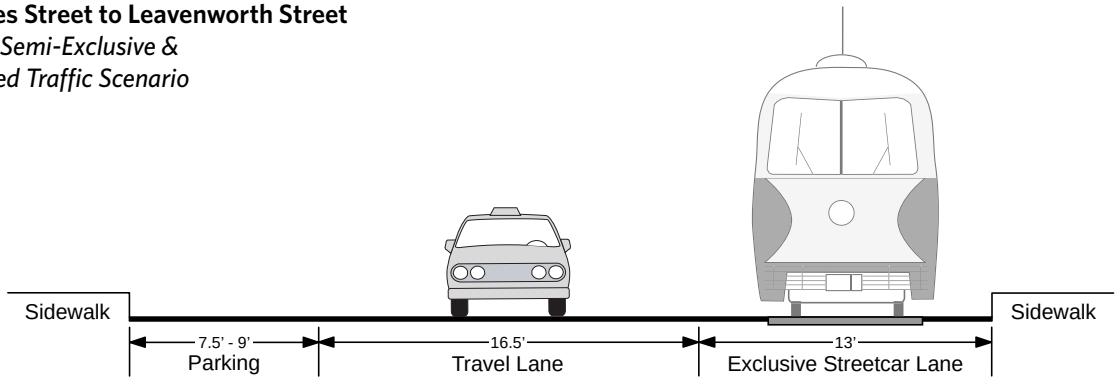
The following graphics illustrate the roadway configurations proposed under both Semi-Exclusive and Mixed-Traffic alternatives. Figure 7 shows the roadway cross sections along Jefferson and Leavenworth Streets. Figures 8A-8C show typical cross sections along Beach Street. The roadway cross section drawings are referenced on the alignment drawings included in Appendix D.

Jefferson Street

East of Jones Street
WB Semi-Exclusive &
Mixed Traffic Scenario

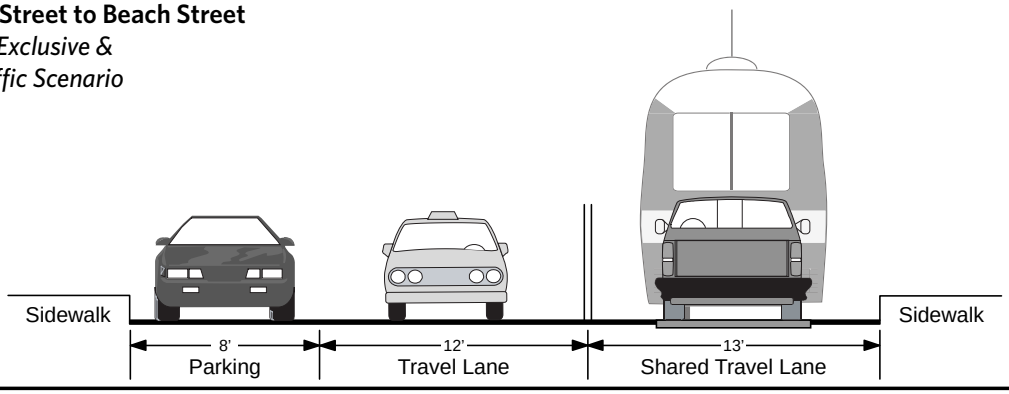


Jones Street to Leavenworth Street
WB Semi-Exclusive &
Mixed Traffic Scenario



Leavenworth Street

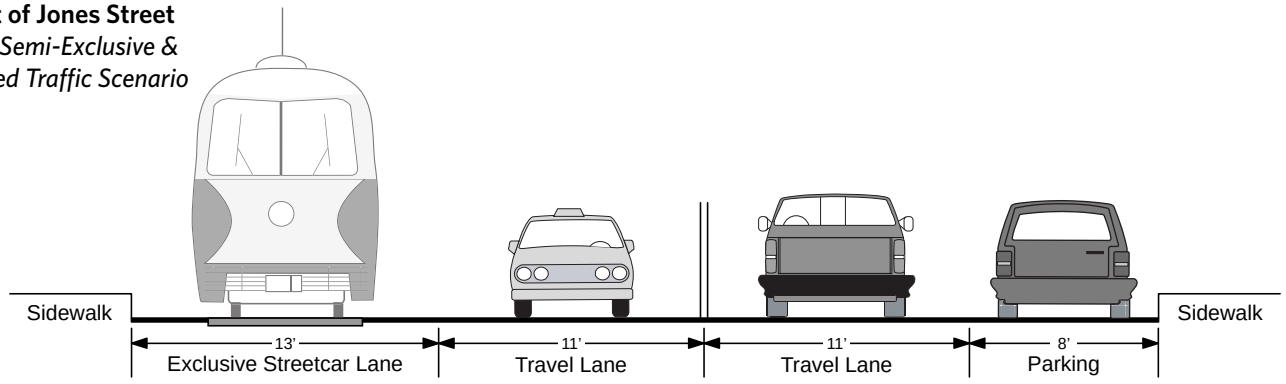
Jefferson Street to Beach Street
WB Semi-Exclusive &
Mixed Traffic Scenario



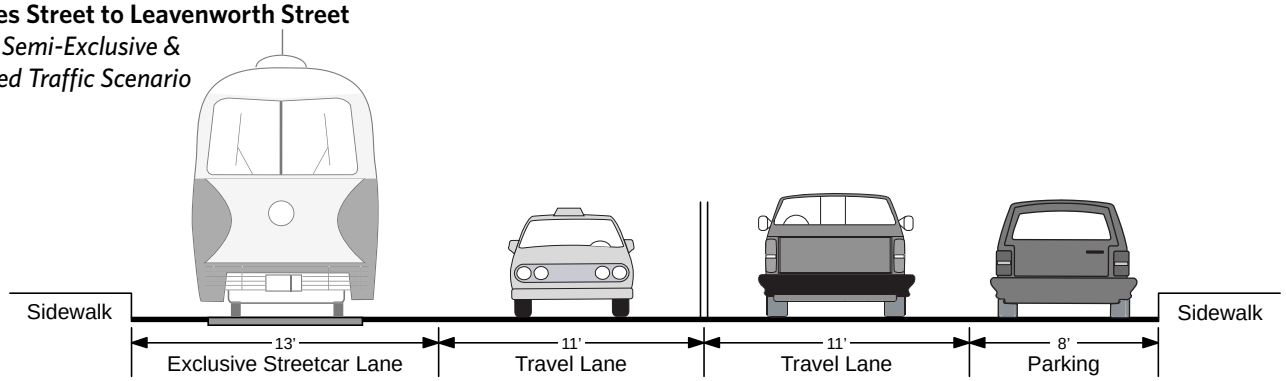
ROADWAY CROSS-SECTIONS ALONG JEFFERSON AND LEAVENWORTH STREETS
FIGURE 7

WilburSmith ASSOCIATES

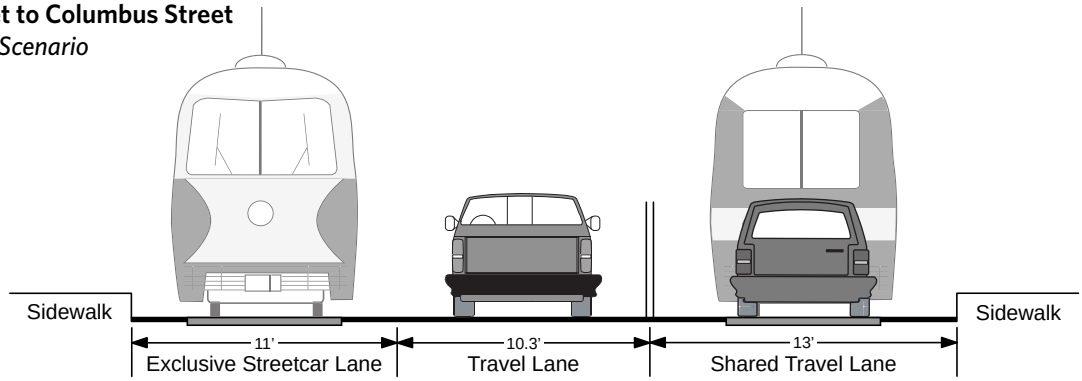
East of Jones Street
WB Semi-Exclusive & Mixed Traffic Scenario



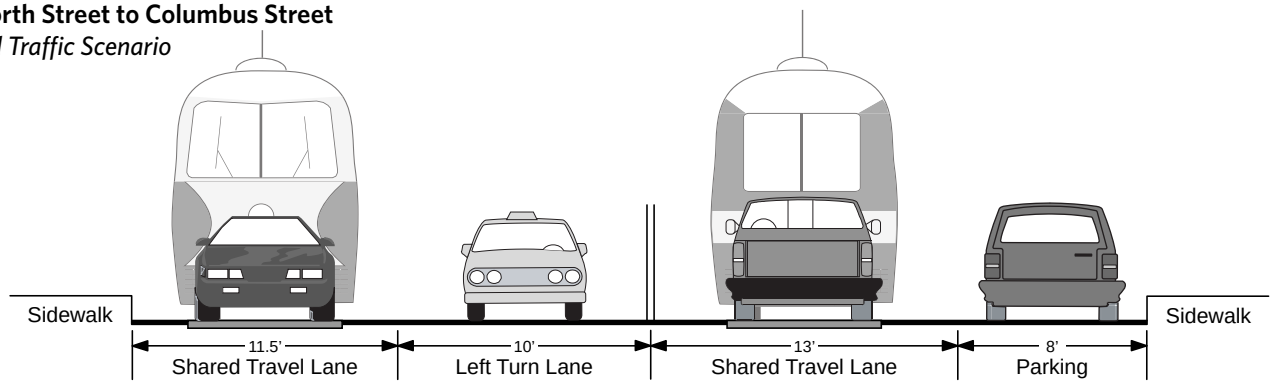
Jones Street to Leavenworth Street
WB Semi-Exclusive & Mixed Traffic Scenario



Leavenworth Street to Columbus Street
WB Semi-Exclusive Scenario



Leavenworth Street to Columbus Street
WB Mixed Traffic Scenario



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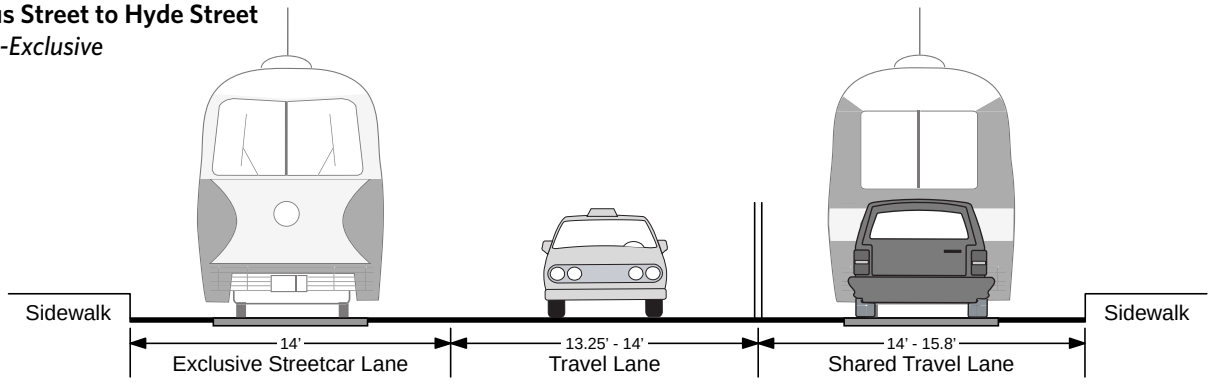
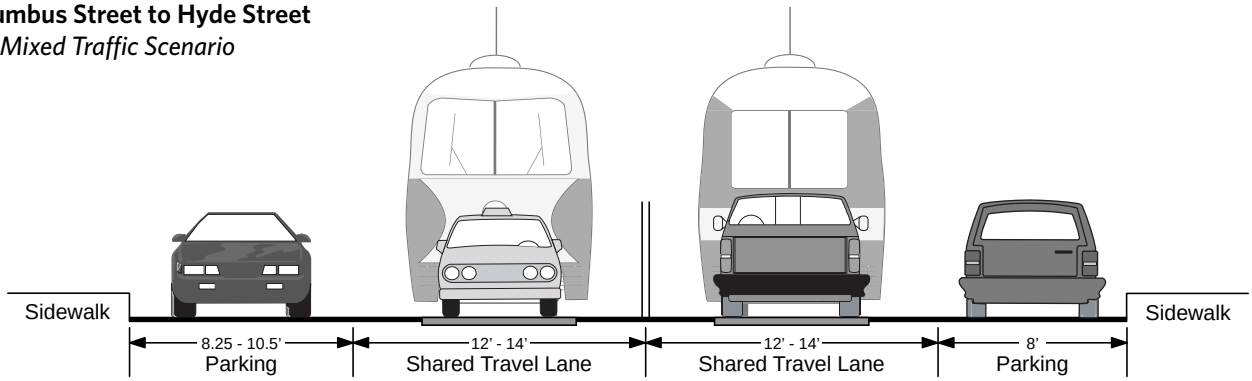
ROADWAY CROSS-SECTIONS ALONG BEACH STREET
FIGURE 8A

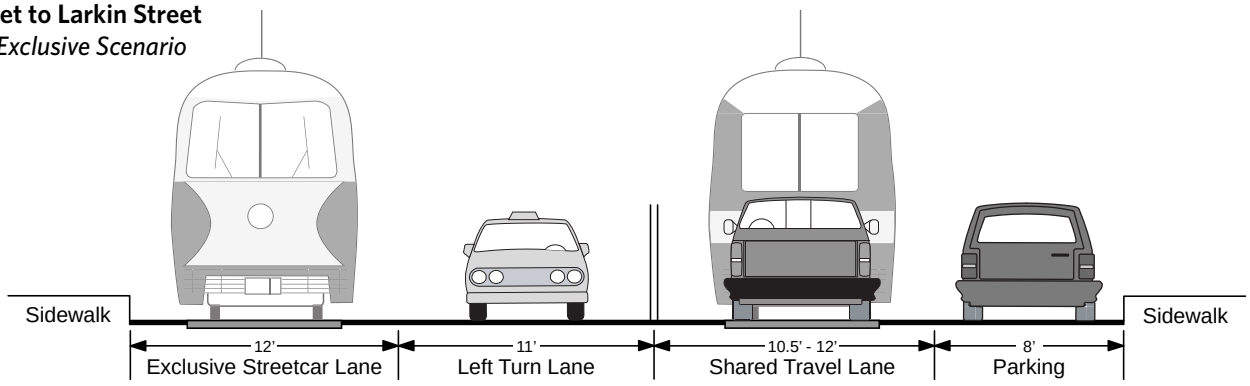
Columbus Street to Hyde Street
WB Semi-Exclusive



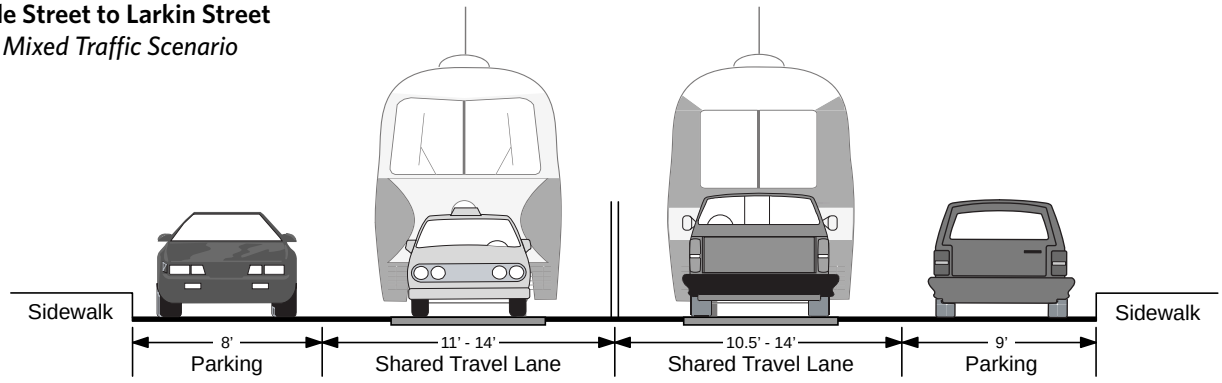
Columbus Street to Hyde Street
WB Mixed Traffic Scenario



Hyde Street to Larkin Street
WB Semi-Exclusive Scenario

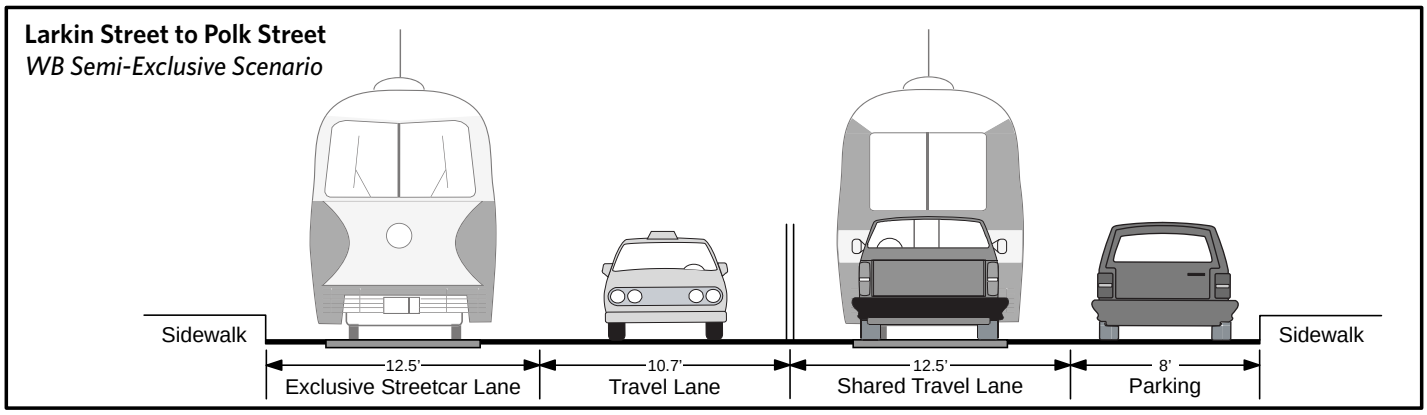


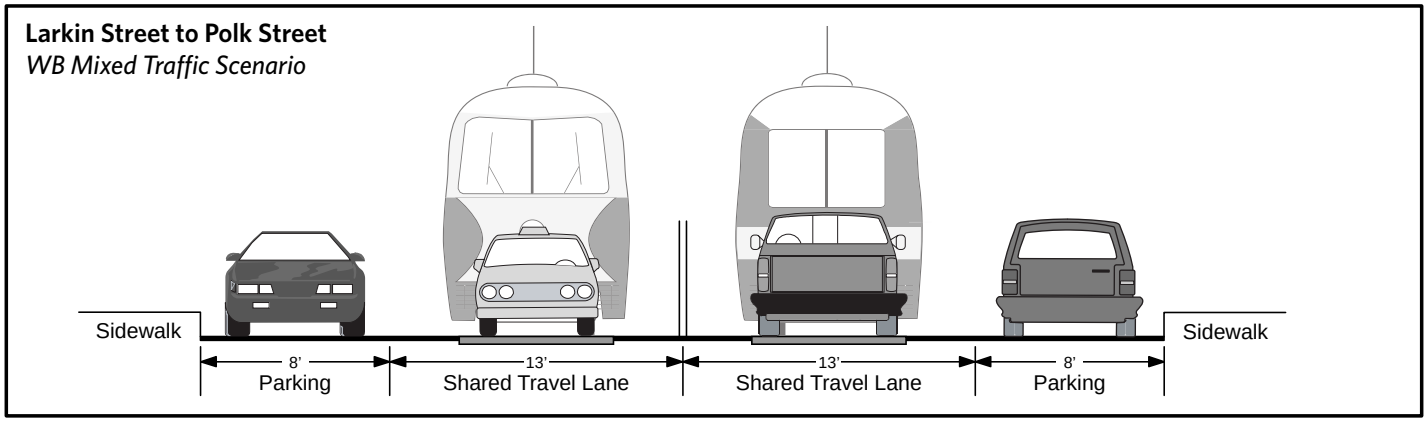
Hyde Street to Larkin Street
WB Mixed Traffic Scenario

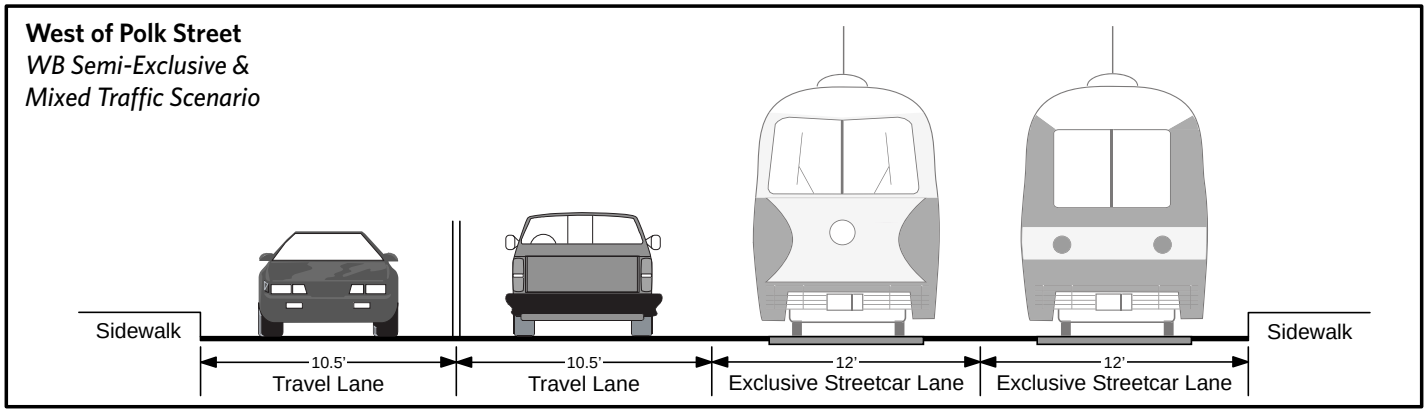


WilburSmith ASSOCIATES

ROADWAY CROSS-SECTIONS ALONG BEACH STREET
FIGURE 8B







ROADWAY CROSS-SECTIONS ALONG BEACH STREET
FIGURE 8C

WilburSmith ASSOCIATES

5.2 Streetcar Stop Locations

Streetcar stop locations are the same in both scenarios. Including the terminal station at Fort Mason, there will be four stop locations in both directions of service, specifically:

- Westbound direction
  - West side of Leavenworth Street between Jefferson and Beach Streets
  - North side of Beach Street between Hyde and Larkin Streets
  - North end of Van Ness Avenue
  - Fort Mason parking lot
- Eastbound direction
  - Fort Mason parking lot
  - North end of Van Ness Avenue
  - South side of Beach Street between Larkin and Hyde Streets
  - South side of Beach Street between Leavenworth and Jones Streets

5.3 Traffic Control

Several signal controls are being modified as part of the proposed project. A new stop sign control plan is being proposed for the track crossing at Van Ness Avenue, while signalization is being proposed for the following three unsignalized intersections:

- Beach Street and Polk Street
  - Transit priority is being implemented along Beach Street under both Semi-Exclusive and Mixed traffic scenarios.
  - A four-phase signal plan is being proposed under both Semi-Exclusive and Mixed traffic scenarios:
    - A separate phase for each of the general traffic movements in the westbound, eastbound and northbound directions is being proposed
    - A dedicated transit-only phase for the eastbound through movement is being proposed (this phase is skipped if no transit actuation is detected)
- Beach Street and Leavenworth Street
  - Transit priority is being implemented along Leavenworth Street in the southbound direction under both Semi-Exclusive and Mixed traffic scenarios
  - A two-phase signal plan is being proposed under the Semi-Exclusive scenario
    - The northbound and southbound movements will be allowed concurrently through the intersection
    - The westbound and eastbound movements will be allowed to move concurrently through the intersection
  - A three-phase signal plan is being proposed under the Mixed-traffic scenario:
    - The northbound and southbound movements will be allowed concurrently through the intersection
    - The westbound and eastbound through and right-turn movements will be allowed concurrently through the intersection
    - A protected left-turn phase is being proposed for the westbound and eastbound movements.
- Jefferson Street and Leavenworth Street

- A four-phase signal plan is proposed for both Semi-Exclusive and Mixed-traffic scenarios
    - The westbound movement is allowed through the intersection as part of the general vehicular traffic phase. In addition, a separate phase is proposed for the northbound and southbound movements as part of the signal plan
    - A dedicated transit-only phase for the westbound left-turn movement is proposed (this phase is skipped if no transit actuation is detected)
    - Additionally, a pedestrian scramble phase is proposed which prohibits vehicular movement during the time this phase is active.

5.4 Parking

Parking spaces will be removed along the following locations in order to minimize impact to streetcar operations and general purpose traffic.

- Semi-exclusive scenario
    - Beach Street west of Polk Street
        - All spaces along the north side are proposed to be removed
    - Beach Street between Polk and Larkin Streets
        - All spaces along the south side are proposed to be removed
    - Beach Street between Larkin and Hyde Streets
        - All spaces along the south side are proposed to be removed
        - Half of the spaces along the north side are proposed to be removed
    - Beach Street between Hyde and Leavenworth Streets
        - All spaces along the north side are proposed to be removed
    - Leavenworth Street between Jefferson and Beach Streets
        - All spaces on the west side are proposed to be removed
        - Half of the spaces on the east side are proposed to be removed
    - Jefferson Street between Leavenworth and Jones Streets
        - All spaces along the north side are proposed to be removed
    - Jefferson Street between Jones and Taylor Streets
        - Half of the spaces along the south side are proposed to be removed
- Mixed-Traffic scenario
    - Beach St west of Polk Street
        - All spaces along the north side are proposed to be removed
    - Beach Street between Larkin and Hyde Streets
        - Half of the spaces along the south side are proposed to be removed
        - Half of the spaces along the north side are proposed to be removed
    - Beach Street between Hyde and Leavenworth Streets
        - Half of the spaces along the north side are proposed to be removed
    - Leavenworth Street between Jefferson and Beach Streets
        - All spaces on the west side are proposed to be removed
        - Half of the spaces on the east side are proposed to be removed
    - Jefferson Street between Leavenworth and Jones Streets
        - All spaces along the north side are proposed to be removed

- Jefferson Street between Jones and Taylor Streets
  - Half of the spaces along the south side are proposed to be removed

More spaces are proposed to be removed at the terminal station in Fort Mason. The location and number of spaces removed will depend on which configuration is selected out of the five configurations proposed.

5.5 Qualitative Assessment of Relative Impacts

The Semi-Exclusive Streetcar Extension alternative will eliminate several blockfaces of on-street parking and will prohibit truck loading activities on these blockfaces. This alternative will slightly reduce traffic levels of service, but should enhance streetcar operations schedule reliability. The Mixed Traffic Alternative will have only minor impacts on curb parking to allow for passenger platforms, facilitate turning streetcars and to enhance safe traffic sight distances. The Mixed Traffic Alternative will have very minor impacts on traffic levels of service.

Appendix D – Beach Street Semi-Exclusive Right-of-Way Analysis

SUPPLEMENTARY INFORMATION

Bi-Directional Semi-Exclusive Trackway on Beach Street

Issue
SFMTA/Muni prefers LRT and streetcar trackway in city streets to be configured in a semi-exclusive ROW as much as possible. For the Historic Streetcar Extension project, the engineering team investigated if this could be accommodated on Beach Street.

Finding
On Beach Street, limited street width on several blocks means that configuring the street in this manner for both the eastbound and westbound trackway for the Fort Mason extension would require converting some or all blocks of Beach Street between Jones and Polk Streets to one-way auto traffic, and would result in unusual street and lane configurations that could create pedestrian safety issues.

Explanation
CPUC clearance requirements specify that for the type of cars operated by Muni, a semi-exclusive double track rail right-of-way must be 25' wide, or 13' wide for each track if the tracks are separated. Muni has used a 13' wide ROW on eastern Beach Street for the existing F-line ROW. Beach Street blocks vary in width, and many are not wide enough for a semi-exclusive streetcar trackway that is wide enough for two tracks, plus two directions of auto travel. This means that Beach Street would need to be made one-way (direction TBD) for all or portions of the alignment between Leavenworth and Polk, with parking and loading eliminated on both sides of the street for some of the blocks to accommodate the two semi-exclusive streetcar lanes plus one or two directions of auto traffic. In general, a street needs to be a minimum of 45 feet to 47 feet wide in order to accommodate two-way semi-exclusive trackway plus two directions of auto travel. More width may be required as a minimum in certain situations, depending on the street configuration. The information below documents the street widths, whether or not the block is wide enough for two-way auto traffic with two semi-exclusive track lanes, and what would be needed in each block to make this work.

> **West of Polk - 47'6" – OK -** This block can accommodate 2-way autos with 2 tracks in semi-exclusive ROW (width 47'6", with 25' for trackway width leaves 22'6" for autos, or room for two 11' lanes), and in fact needs to accommodate 2-way traffic because of the dead end nature of the street and access to Williams-Sonoma. OK for 2-way traffic. All parking on north curb would be eliminated, but parallel parking would be retained on south curb. This block is configured in the project's engineering drawings with both tracks in semi-exclusive trackway, due to the need for the tracks to begin curving to the north, and to begin gaining elevation for the grade change required in the transition section.
>
> **Polk to Larkin - 43'7" - not OK –** This block is 43'7" wide. If the tracks are in the center in this block, the trackway width is 25', which leaves 18'7" for autos, which results in a 9' lane and a 9'7" lane, both up against the curb. 9' lanes running up against a curb are too narrow for trucks to operate safely immediately adjacent to pedestrians. All parking would be eliminated for this. Realistically – this block would need to be made one lane, one way for autos to accommodate this track configuration.
>
> If the tracks are separated at the curb in this block (width 43'7" with 26' for the two track lanes, leaving 17'7" for two lanes in the center, or one 8'6" lane and one 9'1" lane in the center). In this configuration the autos are trapped between the two semi-exclusive trackways, and no legal stopping or passenger drop-off/pick-up could occur. If auto drivers did let off or pick up passengers, this

would occur onto the semi-exclusive trackway, which would be a safety issue. All parking would be eliminated for this. Realistically - this block would need to be made one lane, one way to accommodate this track configuration.

Both options would eliminate the 19-line terminal at Beach & Polk, which may be eliminated anyway if the TEP proposed route change is approved. This block also has a white zone and blue zone along the north curb for the senior center, which would be eliminated.

If the tracks are both pushed up against the north curb, there could be a one-way street with a 10'7" travel lane and an 8' parking lane along the south curb.

Larkin to Hyde - 50' – OK - The tracks could be in the center in this block (width 50' with 25' trackway, leaving 25', or two 12'6" lanes, one on each side against the curb for autos). All parking would be eliminated. Lane widths are OK for two-way traffic. HOWEVER - at the Hyde Street end of the block, the EB track cannot be in the center of the street because of the position of the cable car sheave pit, so the streetcar track would need to weave over to the south side of the roadway to cross the CC track. Therefore, either the EB traffic lane and the EB track would need to switch positions via a crossover in the last half of the block, or the EB track could merge into a mixed flow configuration for a portion of the block. If the tracks are in the center, boarding islands are needed for the Hyde St stop, which would need to be placed in the auto travel lanes, which would make this configuration infeasible. If station stops at Hyde are eliminated, this could be feasible, but awkward for the streetcar operation without a stop at this major traffic generator.

This block is 50' wide. If the tracks are separated at the curb in this block, this would result in a 26' trackway, with 24' for two auto lanes in the center, or two 12' lanes, which is sufficient width. In this configuration the cars are trapped between the two semi-exclusive ROWs. All parking would be eliminated for this. HOWEVER - at the Hyde Street end of the block, the WB track cannot be at the curb because of the position of a hatch cover that must be straddled at the CC crossing, so the streetcar track would need to cross the CC track in a mixed traffic lane, then weave to the north side curb after crossing the intersection. Some portion of this would need to be in mixed traffic, or both the EB and WB auto lanes could not reach the Hyde Street intersection, and necessitating one-way auto operation. If the tracks are curb running, the Hyde St stop would be on the sidewalks. The north sidewalk has sufficient width, but the south sidewalk is only 8' wide, so it may not be feasible to accommodate the required wheelchair ramp in a sidewalk of that width. In the mixed flow options, this sidewalk is proposed to be bulbed out, which accommodates the wheelchair ramp. The sidewalk could not be bulbed-out in the configuration described above.

If the tracks in the block to the west are both pushed up against the north curb and that configuration continues into this block, both tracks would need to weave southward midblock as you approach Hyde to cross the CC track in the proper positions relative to the sheave pit and the pulley hatches. The EB track would need to weave across all auto lanes midblock, requiring a midblock signal.

Hyde to Columbus - 41'3" - not OK - The tracks cannot be in the center in this block because of the configuration crossing the cable car, and the street width and alignment changes that occur between this block and the block to the west. Both tracks would need to be in curb configuration (41'3" width with 26' trackway leaves only 15'3" for auto lanes - not enough for two lanes or two-way traffic). This block would need to be one lane, one way. All parking would be eliminated.

Columbus to Leavenworth - 38'10" - not OK - The WB track here needs to be in the center of the street at the east end of the block because of the curve from Leavenworth, and the EB track is against the south curb here because of the position the track must be in to cross the CC at Hyde, so the tracks are separated, requiring 26' for semi-exclusive ROW (width 38'10" with 26' trackway leaves 12'10" for auto lanes - not enough for two lanes or two-way traffic). This block would need to be one lane, one way. All parking would be eliminated.

East of Leavenworth - trackage on Beach east of Leavenworth is one direction only - EB - so only a single track is needed.

Illustrations
The attached four illustrations demonstrate the different conditions on Beach Street that would be created if the situations discussed above were to be implemented.

Figure 1 - Option A – demonstrates the condition if the two-track semi-exclusive trackway were constructed against the north curb between Hyde and Polk.

Figure 2 - Option B – demonstrates the condition if two single-track semi-exclusive trackways were separated between Hyde and Polk and placed against the curbs with the autos in the center.

Figure 3 - Option C – demonstrates the condition if the two-track semi-exclusive trackway were constructed in the center of the street between Hyde and Polk.

Figure 4 - Option D – demonstrates the condition if the two-track semi-exclusive trackway were constructed against the south curb between Hyde and Polk.

Potential Solutions
If two tracks in semi-exclusive ROW is required, three possible alternative solutions could be explored:

1. Work with current street width and make blocks one-way or two-way, depending on street width. Either EB or WB could be discontinuous, and direction for each block could be determined by local circulation needs. Eliminate parking on both sides of Beach for most blocks.
2. Make all of Beach Street between Polk and Leavenworth one-way for autos for a continuous one-way flow (direction TBD). Eliminate all parking on both sides of Beach for most blocks.
3. Make major changes to widen Beach Street in several blocks by reducing the sidewalk widths and/or eliminate sidewalks on portions of Beach Street, and/or take parkland in the block between Larkin and Polk and/or Columbus to Leavenworth and convert it to roadway space. On some blocks, 10-12' of sidewalk width and/or parkland would need to be converted to roadway space to make the desired configuration work and retain two-way traffic on every block.

SUMMARY - The streetcar extension could not be installed on Beach Street with two tracks in a semi-exclusive ROW and still retain two-way auto traffic on all of the blocks as Beach is currently configured. There could be discontinuous one-way/two-way configured blocks in sequence, but this would be an awkward traffic situation. Three potential solutions to this problem are listed above.

The situation is further complicated at several points along the alignment where the streetcar track needs to be in specific locations due to the specific geometry requirements of the alignment and track or because of interactions with existing cable car

infrastructure. These locations are not in the same positions from block to block relative to the curbs or to the street centerline:

- At Polk, the tracks both need to be together against the north curb to begin making the curve to the north and to begin rising to gain elevation for the vertical grade change through the transition section.

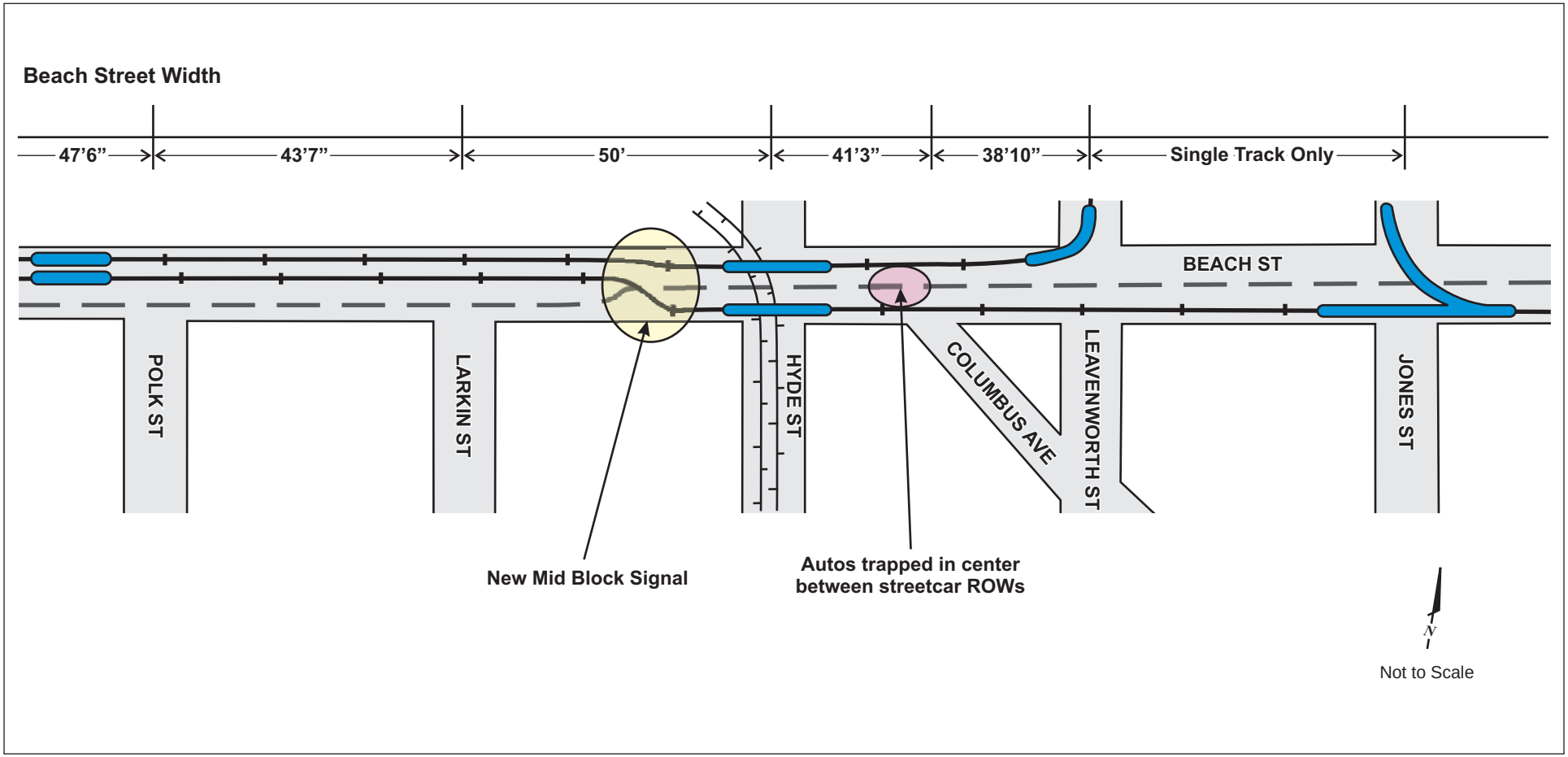
- At Hyde, the tracks need to be separated to cross the cable car track.

- Between Leavenworth and Jones, the EB track needs to be against the south curb to align with the existing tracks east of Jones.

- Between Leavenworth and Jones, the WB track needs to be in the center of the street to align with the cable car crossing at Hyde.

All options to put both tracks into a semi-exclusive ROW require that at some point, the auto traffic must be in the center of the street between the two semi-exclusive track lanes, isolated from the curbs and sidewalk. This is a condition that does not exist anywhere in San Francisco currently, and would be an unusual traffic condition with significant issues for both streetcar and auto traffic operations, and for the safety of any auto passengers that may attempt to enter or exit autos in these blocks by stepping to or from autos directly onto the trackway. In addition, all options would require that the auto lane move across at least one of the semi-exclusive track lanes midway between Hyde and Larkin, which would likely require a new midblock signalized transition area for this movement.

Due to the reasons noted above, the project team does not recommend placing both tracks in semi-exclusive trackway on the Beach Street segment.



LEGEND

- Fixed Track Location
- Streetcar Track in Semi-Exclusive Right-of-Way
- Cable Car Track
- Auto Travel Lane

OPTION A
TRACKS TOGETHER AGAINST NORTH CURB

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28067144

Preliminary Draft
Environmental Impact Report
Historic Streetcar Extension
San Francisco, California

FIGURE 1

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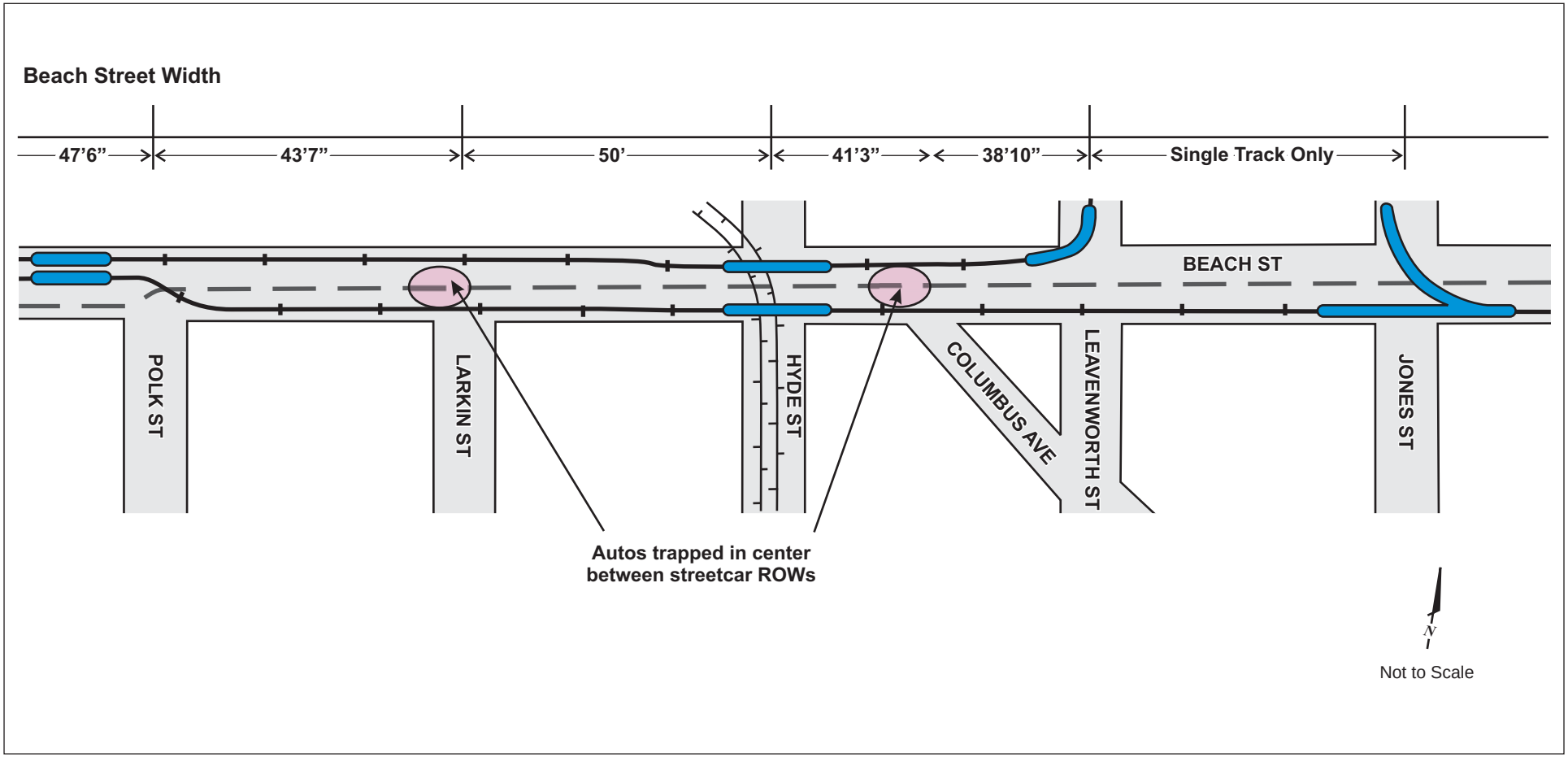

LEGEND

- Fixed Track Location
- Streetcar Track in Semi-Exclusive Right-of-Way
- Cable Car Track
- Auto Travel Lane

OPTION B
TRACKS SEPARATED

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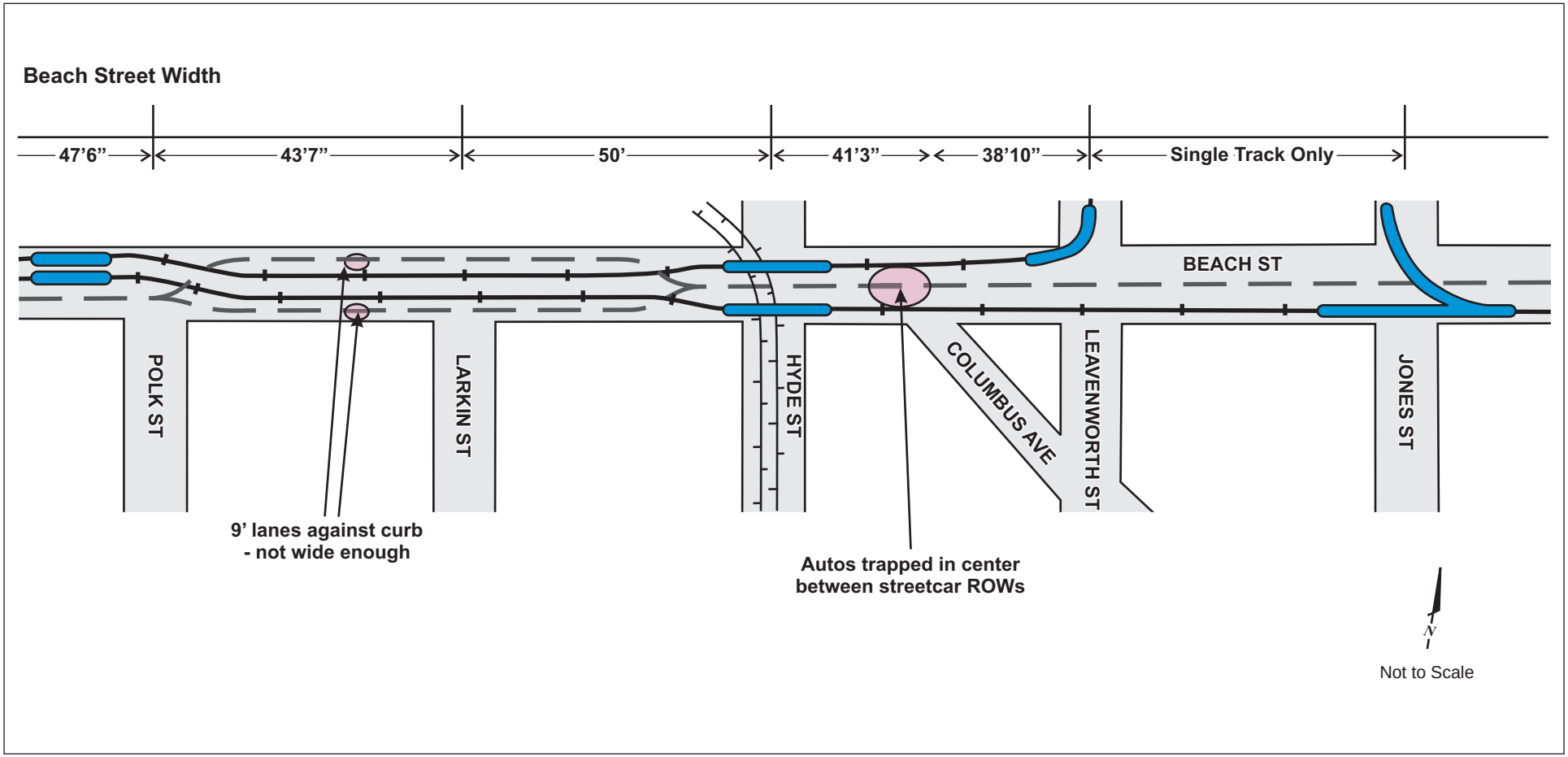
Environmental Impact Report
Historic Streetcar Extension
San Francisco, California

FIGURE 2

1/21/09 hk T:\28067144 Historic Streetcar EIS\EIS 2009\F2_Opt B.cdr



LEGEND

- Fixed Track Location
- Streetcar Track in Semi-Exclusive Right-of-Way
- Cable Car Track
- Auto Travel Lane

OPTION C
TRACKS IN CENTER OF STREET

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Historic Streetcar Extension
San Francisco, California

January 2009
28067144

FIGURE 3

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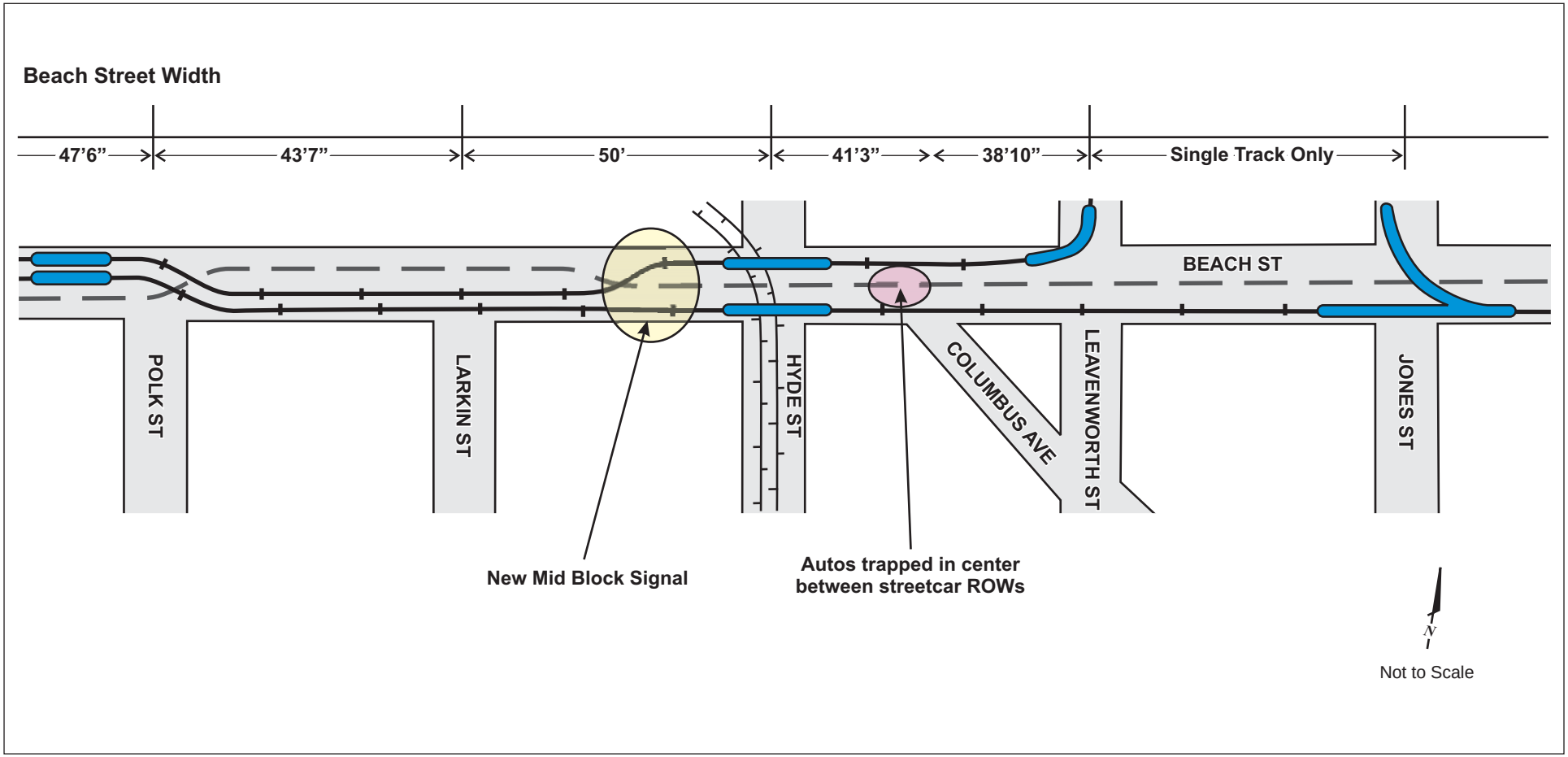

LEGEND

- Fixed Track Location
- Streetcar Track in Semi-Exclusive Right-of-Way
- Cable Car Track
- Auto Travel Lane

OPTION D
TRACKS AGAINST SOUTH CURB

January 2009
28067144

Preliminary Draft
Environmental Impact Report
Historic Streetcar Extension
San Francisco, California

FIGURE 4

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Appendix E – Utility Memo & Basemapping

ENVIRONMENTAL IMPACT STATEMENT FOR THE
EXTENSION OF HISTORIC STREETCAR SERVICE FROM FISHERMAN'S WHARF
TO THE SAN FRANCISCO MARITIME NATIONAL HISTORICAL PARK
AND GOLDEN GATE NATIONAL RECREATION AREA'S FORT MASON CENTER

TECHNICAL STUDY
UTILITIES
September 2008

1.0 INTRODUCTION

This memorandum provides a background understanding of the existing utility systems that are along the proposed Historic Street Car Extension alignment. This utility information will be used in the infrastructure design development process. Utilities reviewed were:

- Auxiliary Water Supply System (AWSS)
- Domestic Water
- Sanitary Sewer/Storm Drain System (combined system)
- Electric
- Gas
- Telecommunication

The information is presented by two distinct areas: West of Tunnel (Lower Fort Mason) and East of Tunnel (Aquatic Park). The project boundary with the individual utility elements identified is shown in Figure 1. A summary of the existing utility elements is provided in Table 1.

2.0 REGULATORY SETTING

NPS will adhere to all applicable provisions of Executive Order 11752 for the prevention, control, and abatement of environmental pollution for all facilities under its jurisdiction. This includes adequate sewage collection and disposal, solid waste collection and disposal, and protection of the quality of waters within, of flowing through, the area. To accomplish this goal, sewage and water systems will be connected to public utilities wherever possible. NPS will strive to sell or transfer government-owned electrical, telephone, and natural gas distribution systems to public utilities.

City of San Francisco regulations governing the installation and repair of utilities can be found in the following codes:

- **San Francisco Department of Public Works Article 14: Underground Pipes, Wires and Conduits. Section 670. Privilege Granted for Laying Pipes**. The privilege is hereby granted to any person, firm or corporation, organized under the laws of the State of California, to lay down, maintain and operate in the public streets and thoroughfares of the City and County of San Francisco, pipes, wires and conduits, and connections therewith, so far as may be necessary for introducing into and supplying said city and its inhabitants with gas and electricity for lighting, heating and power purposes, upon the terms and conditions set forth in Section 671 to 680, inclusive, of this Article.
- **San Francisco Department of Public Works Article 18: Utility Facilities. Section 901. Permits – Consent.** Every owner or operator of any utility facility before installing, locating or relocating any utility facility shall file with the Director of Public Works a written application for a permit to do such work and obtain a written permit for the work as provided in Article 2.4. In accepting such permit the permittee expressly consents to regulation by any applicable rules or ordinances.

3.0 AUXILIARY WATER SUPPLY SOURCE

The Auxiliary Water Supply Source (AWSS), which is operated by the San Francisco Public Utilities Commission (SFPUC), is a separate and distinct water supply system used only for fire protection. It was developed after the 1906 earthquake, when the need for a reliable firewater supply system was identified. It can be fed with salt water through pumping stations (such as the one at the north end of Van Ness Avenue adjacent to Fort Mason) or fireboats.

Utility information for the Lower Fort Mason was obtained from Mr. James Kren/NPS Historical Architect (415/561-4966). The drawings reviewed were by the U.S. Army Corps of Engineers, titled "Master Plan, Basic Information Maps," dated September 1961. It should be noted that utility work performed after September 1961 may not be represented on the drawings per Mr. Kren.

3.1 EXISTING SYSTEM

West of Tunnel

The AWSS serving Fort Mason is a 14-inch line. The pipe is cast iron (CI) with double-beaded lead joints. Typical pressures within the project boundary are 300 pounds per square inch (psi). The typical burial depth is 5 feet from top of pipe to grade, but can vary. There is a fireboat manifold at the north end of Pier 1. This will allow the AWSS to be charged with sea water from this location. The 14-inch line parallels the west side of Pier 1 to Laguna Street.

Pipe sections at intersections are typically double-spigot pipe with cast sleeves. Some of the lines are lugged, that is, large tie rods are used to hold the joints together (similar to a flanged fitting), which is necessary due to the high pressure and potential for area settlement. This type of installation maybe present at Lower Fort Mason because of the significant amount of fill material placed in the area.

The line appears to be west of the tunnel portal and does not appear to be affected by the Historic Street Car Turnaround alignment.

A 20-inch-diameter cast iron AWSS line runs north along the west side of Van Ness Avenue, then turns west approximately 33 degrees and enters a tunnel located within Fort Mason, and then enters another tunnel prior to entering Pump Station No. 2. There are two types of tunnel sections: (1) the light section, 7.75 feet tall and 5.5 feet wide with 9-inch-thick reinforced concrete walls; and (2) the heavy section, 8.5 feet tall and 7.0 feet wide with 18-inch-thick reinforced concrete walls. The first tunnel is 278 linear feet; all of which is light section except for 60 linear feet, which is heavy section. The second tunnel is 150 linear feet, and is all light section (AWSS Maps 60, 61, 64, 65). See Elements A1 and A3 in Figure 1.

The contact for AWSS projects in the City and County of San Francisco is Mr. Michael Smith, Bureau of Engineering (michael.smith@ci.sf.ca.us, (415) 558-4536).

East of Tunnel

Beach Street. A 14-inch cast iron AWSS line runs along Beach Street, between Jones Street and Leavenworth (located 19.5 feet north of the south side of Beach Street). The depth of the pipe ranges from 5.75 feet to 6.4 feet (top of asphalt to bottom of trench). One lateral connects main line to hydrant located on sidewalk on northeastern corner of Beach Street and Jones Street (AWSS Maps 455, 613). See Element A2 in Figure 1.

Jefferson Street. The AWSS line is 14-inch-diameter cast iron pipe located 19.83 feet north of south side of Jefferson Street. The bottom of the pipe is 5.75 feet from the top of asphalt. One lateral supplies a hydrant on the south side of Jefferson Street, approximately 209.5 feet east of Leavenworth Street (AWSS Map 456). See Element A4 in Figure 1.

Jones Street. The AWSS line is 14-inch-diameter cast iron pipe located 26.5 feet west of the east side of Jones Street. The bottom of the pipe is 5.67 feet from the top of asphalt. One lateral supplies a hydrant on the southwestern corner of the intersection of Jones and Jefferson Streets, 13 feet south of Jefferson Street on Jones Street (AWSS Map 457). See Element A5 in Figure 1.

Leavenworth Street. The AWSS is 16-inch-diameter cast iron pipe located 27.5 feet east of the west side of Leavenworth Street. Depths (top of asphalt to bottom of trench) range from 5.5 feet to 7.0 feet. No laterals are shown (AWSS Map 454). See Element A6 in Figure 1.

3.2 CONDITION

West of Tunnel

Per a conversation with Mr. Smith, the AWSS lines west of the tunnel within the project boundary were installed during the period from 1910 to 1920 and are considered to be in fair to poor condition. One of the issues facing the system in the area is settlement, which can damage piping. Settlement is likely in Lower Fort Mason because it is in a fill area.

East of Tunnel

The AWSS lines east of the tunnel within the project boundary were installed during the period from 1910 to 1920 and are considered to be in fair to poor condition. One of the issues facing the system in the area is settlement. At the end of Van Ness Avenue is a key pump station (referred to as Pump Station No. 2) supplying sea water into the AWSS system. From the pump station, the discharge pipeline travels through two tunnels. The tunnels may be as little as 1 foot below grade. The condition of both tunnels is not known.

Construction in the immediate area may require relocating lines or settlement monitoring (as determined by the City and County of San Francisco Bureau of Engineering).

3.3 OPERATION

West and East of Tunnel

The AWSS lines within the project boundary have a higher pressure (300 psi) than typical in the system and supply a tank located at Jones and Sacramento Streets, along with hydrants along the route.

3.4 APPURTENANCES

West and East of Tunnel

The system uses fire hydrants that are typically located along the sidewalk of the street parallel to pipeline. The AWSS fire hydrants are larger in diameter than normal hydrants and are painted white with blue tops.

4.0 WATER SYSTEM

4.1 EXISTING SYSTEM

West of Tunnel

Fort Mason domestic water lines are governed by the NPS; therefore, the City and County of San Francisco has no information regarding domestic water lines inside the boundary of Fort Mason.

The NPS owns and operates the water system within Fort Mason. The San Francisco Water Department (SFWD) supplies potable water system at Van Ness Avenue and Bay Street via 8-inch cast iron pipes (CIP). Lower Fort Mason is supplied with a 12-inch CIP line that enters the site parallel to Pier 2 and coming down the hillside. It is sleeved in a 21-inch corrugated metal pipe under the former railroad tracks in the parking area. A 6-inch line runs along the base of the retaining wall. There is also an 8-inch line that parallels Pier 1 on Laguna Street and enters Fort Mason near the main entrance. See Elements W1 and W6 on Figure 1.

East of Tunnel

The San Francisco Water Department (SFWD) potable water system in the proposed project area has a working pressure of approximately 74 psi (per a conversation with Ms. Arleen Chan, SFWD).

These pipelines are expected to be ductile or cast iron, which is typical for lines with diameters of less than 20 inches. The ages of the lines vary, but most are expected to be greater than 40 years old (pre-1970). Existing pipelines installed before 1970 are assumed to be cast iron, while those installed after 1970 are assumed to be ductile iron (per Ms. Chan, SFWD).

The typical depth of the pipelines is 36 inches from top of the pipe to grade. There have not been any recent problems with pipelines in the immediate area, nor are there plans to excavate over the next 5 years (per conversation with Ms. Chan, SFWD).

Contacts for SFWD water projects are: Ms. Arleen Chan, San Francisco Water Department (achan@sfwater.org, (415) 550-4931); and Mr. Thinh Nguyen, Engineering Manager (tnguyen@sfwater.org).

Beach Street. The water main size alternates between 6 and 8 inches along Beach Street. All lines along Beach Street are assumed to be cast iron except for those in the block bounded by Polk and Larkin Streets, which are ductile iron (DI). The water main at Jones Street is north of the south side of Beach Street and continues west down Beach Street. Before crossing Leavenworth Street, the main crosses Beach Street, running south of north side of Beach Street.

Between Leavenworth and Hyde Streets, the water main runs through the center of the street and terminates at Polk Street. Laterals run between Leavenworth and Hyde Streets (two, both connecting to the south side of Beach Street), Larkin and Hyde Streets (two, both connecting to the south side of Beach Street; four, two of which connect to south side of Beach Street, the other two connecting to the north side of Beach Street)(SFPUC Map 1B). See Element W2 in Figure 1.

Jefferson Street. The water main along Jefferson Street is an 8-inch-diameter pipe and is located north of south Jefferson Street. Its installation date and as the pipe material are unknown. One lateral at the middle of the block connects to a building on the south side of Jefferson Street (SFPUC Map 2). See Element W3 in Figure 1.

Jones Street. The water main along Jefferson Street is an 8-inch line that is west of the east side of the street. The installation date and pipe material are unknown. There are two laterals on Jones Street, both connecting to the west side of the street (SFPUC Map 2). See Element W4 in Figure 1.

Leavenworth Street. The water main along Jefferson Street is a 6-inch-diameter pipe in the center of the street. The installation date and pipe material are unknown. There are six laterals on Leavenworth Street, with two connecting to the east side and four connecting to west side of Leavenworth Street (SFPUC Map 2). See Element W5 in Figure 1.

Van Ness Street. No domestic water lines are shown north of Beach Street (SFPUC Map 15).

4.2 CONDITION

West and East of Tunnel

The pipelines are assumed to be in good working condition with no major problems reported.

4.3 APPURTENANCES

West of Tunnel

Fire hydrants are indicated along the base of the retaining wall. There are various air release and blow-off valves, although not in the area of the proposed track.

East of Tunnel

Various air release and blow-off valves are located along the proposed line. The locations of appurtenances from curb edge and relative depths are unknown.

5.0 SANITARY SEWER/STORM DRAIN SYSTEM

5.1 EXISTING SYSTEM

West of Tunnel

The Lower Fort Mason sanitary sewer system is partially separated from the stormwater system and operated by the NPS. The sanitary sewer system uses 6- to 18-inch lines in Lower Fort Mason that drain to a wet well just south of Building 312. The roof leaders appear to be connected into the sanitary sewer lines. The dock drains nearest to the piers discharge directly into the Bay. The wet well at Building 312 then drains to the large vault south of the gate house visible on the ground. This vault (referred to as Sewer Box 202A) is connected to the city's North Shore Outfall Tunnel. The rail road tunnel is approximately 27 feet above the city's Outfall Tunnel. See Element S in Figure 1.

According to the Army's files, the Upper Fort Mason sanitary sewer system connects to city sewers on Bay Street and Laguna Street, with the possible exception of the Youth Hostel buildings, which appear to connect to the sewer in lower Fort Mason. The flows from Quarters 1, 2, 3, and 4, which used to drain to the Van Ness sewer by a line running down by the tunnel mouth, are now all intercepted by sewer lift stations and are carried back up into the main Upper Fort Mason sewer system.

Moisture was noted in the tunnel. This condition may be caused by outflow in the sewer system, but likely has various sources that include groundwater and irrigation water. This condition may warrant additional investigation prior to design.

Information on the system can be obtained from Mr. James Kren, NPS Historical Architect and Army files reviewed at Fort Mason..

East of Tunnel

The City and County of San Francisco uses a combined sanitary sewer and storm drain (SS/SD) system. When it rains, storm flows are carried into the system along with sanitary sewer. The system is operated by the San Francisco Public Utilities Commission (SFPUC) Water Pollution Control Division on Van Ness, Beach and Jefferson Streets. The Golden Gate National Recreation Area operates the system at Fort Mason. The trunk line system described is comprised of various types of pipe and materials. (Note: the service laterals connecting to the trunk lines are not discussed because of the lack of information on their locations and type.) The trunk pipelines include a combination of 15- to 54-inch-diameter lines comprised of vitrified clay pipe (VCP) and reinforced concrete pipe (RCP).

The primary contact for this effort was Mr. Nathaniel Lee, Department of Public Works, 1680 Mission Street, (415) 554-8318. Other engineering-related contacts are Mr. Henry Anderson (handerson@sfwater.org; (415) 648-6882) assisted by Mr. Kent Eickman (keickman@sfwater.org).

Information on the system can be obtained through the geographic information system (GIS) operated for the SS/SD system by Mr. John Seagrave, Bureau of Engineering, (415) 297-0286) (john.seagrave@sfdpw.org).

Beach Street. West of Polk Street, a 12-inch VCP runs down the middle of Beach Street. This connects to a manhole structure on the southeast side of Polk and Beach Streets leading to a manhole structure between Polk and Leavenworth Streets. After the manhole structure, the line size increases to a 30-inch reinforced concrete pipe (RCP), installed in 1973 (reference Contract A-38,321, Hyde Street Sewer Outfall Construction 3/24/74). The invert elevation of the 30-inch RCP is approximately 7 feet below grade. The alignment is roughly in the middle of the street, approximately 34 feet north of the southern curb line. There is a former 12-inch VCP line that runs parallel to the 30-inch pipe to the south. This line has apparently been abandoned since 1973. See Element S2 in Figure 1.

Jefferson Street. Jefferson Street carries two SS/SD lines. One is a 30-inch force main line that ultimately comes from the Marina. This line runs along the southern edge of Jefferson Street with an invert elevation at approximately 5 feet below grade. A 45-inch RCP line runs just south of the street centerline with an invert elevation of 6 feet below grade. The line was installed in 1973. See Element S3 in Figure 1.

Tunnel. No SS/SD lines were identified in the tunnel beneath Fort Mason.

Van Ness Avenue. There is a 30-inch gravity discharge line from the Marina Pump Station that appears to be beneath the former railroad right-of-way along the shore in front of the Maritime Museum. There is also a 4-inch force main that discharges to the 12-inch line on Beach Street north of the Williams-Sonoma building. See Element S4 in Figure 1.

5.2 CONDITION

West of Tunnel

Information on the system's condition was not readily available. However, NPS personnel who were contacted were not aware of ongoing problems with the system.

East of Tunnel

The trunk system condition appears to be in fair to good condition. The generally stout RCP construction material and relatively recent construction (1973) indicate this condition.

5.3 OPERATIONS

West of Tunnel

All SS lines flow to the City's combined system, with the exception of surface drains near the piers.

East of Tunnel

All lines flow to an overflow structure on Beach Street at Powell Street. From there, the flow is to a juncture box on Beach Street and The Embarcadero. During severe wet weather events, the manhole covers have been known to be lifted off their supports.

5.4 APPURTENANCES

West of Tunnel

There are various manhole structures on the site. A lift station south of Building 312 ultimately discharges to the City/County operated force main.

East of Tunnel

There are manhole structures approximately every block. An abandoned pump station is located on the southwestern side of Jefferson and Hyde Streets.

6.0 ELECTRICAL SYSTEM

6.1 EXISTING SYSTEM

West of Tunnel

PG&E operates the entire electrical system in Lower Fort Mason. Service is fed to the site near Building 304 north of the Gate House. This transformer feeds an underground 4 kV system that runs at the site. The primary switching gear is located near the firehouse (Building 322).

The Upper Fort Mason electrical system is a combination underground and aboveground system maintained by the National Park Service. It is a 4 kV campus system fed from the PG&E substation in Lower Fort Mason by an underground line running east and north across Lower Fort Mason to a transformer house above the retaining wall in Upper Fort Mason. See Element E1 in Figure 1.

The PG&E contact for work on the electrical system is Mr. Ed Chan, Pacific Gas and Electric, (415) 695-3339 (etc2@pge.com).

East of Tunnel

PG&E operates the entire electrical system in this area. Electrical lines are typically 24 to 48 inches below grade; however, all cover depths given are approximations based on design drawings, not as-built drawings, and therefore are subject to discrepancies. The cover distances are from top of grade to bottom of trench.

The PG&E contact for work on the electrical system is Mr. Ed Chan.

Beach Street

- **Between Jones and Leavenworth Streets**

  The service in this area is four 4-inch ABS lines running approximately 5 feet south of the north curb (Beach Street), starting at Jones Street and continuing west toward Leavenworth Street into Vault 5483 (14 by 10 by 9 feet). At 220 feet west of Jones Street, one 3-inch plastic conduit crosses the street to a building on south side of Beach Street. At Leavenworth Street, four 4-inch plastic pipes, one 3-inch ABS line, and one 4-inch ABS line run north along east side of Leavenworth Street; one 3-inch and two 4-inch ABS lines cross Beach Street, continuing south down Leavenworth Street, with an indicated 15 inches of cover; and one 4-inch ABS line continues west along Beach Street. Running west, north of southern curb (Beach Street), one 4-inch ABS line crosses Leavenworth Street and terminates approximately 15 feet west of Leavenworth Street. There are two transformers at the northern curb (Beach Street) that are 190 and 215 feet west of Jones Street (PGE Maps 146-E, 146-H). See Element E2 in Figure 1.

- **Between Leavenworth and Hyde Streets**

  Continuing from Leavenworth Street, one 4-inch ABS line runs west 163 feet, approximately 8 feet south of the northern curb (Beach Street). Continuing west 77 feet are three 4-inch ABS lines that intercept Vault 5481 (14 feet by 10 feet by 9 feet). West of Vault 5481 are two 4-inch ABS lines that continue to Hyde Street, running 22 feet south of the northern curb (Beach Street), with 3 feet of cover. Upon crossing Hyde Street, the line splits to the north and south, 6 feet west of the eastern curb (Hyde Street). The north split feed into a 5-foot by 5-foot box, approximately 5 feet south of the northern curb (Beach Street), and then continues both north and west. South of Vault 5481 is one 4-inch plastic conduit with 3 feet of cover, which runs approximately 7 feet

north of the southern curb (Beach Street) and turns east for 104 feet before terminating (PGE Maps 146-D, 146-WW). See Element E3 in Figure 1.

- **Between Hyde and Larkin Streets**

  From Hyde Street, one 4-inch ABS line, approximately 12 feet south of the northern curb (Beach Street) runs to Vault 5479 (16 feet by 10 feet by 9 feet). Vault 5479 from the south has three 4-inch plastic conduits that travel within 4 feet north of the southern curb (Beach Street). Both lines continue west on Beach Street approximately 11 feet north of the southern curb (Beach Street), with one terminating 65 feet east of Larkin Street, and one 4-inch conduit (30 inches of cover) extending to the center of Beach Street approximately 130 feet west of Vault 5479. There is also a transformer due north of the southern curb (Beach Street), approximately 125 feet east of Larkin Street (PGE Maps 146-SS, 20-GG). See Element E4 in Figure 1.

- **Between Larkin and Polk Streets**

  From Hyde Street, one 4-inch soap stone conduit runs west along the center of the street (30 inches of cover), and continues to Vault 2885, which is located approximately 225 feet west of western Polk Street. There is also a privately owned pipe that runs across Beach Street, starting at the southeastern corner of Polk and Beach Streets, and runs northeast (PGE Map 20-GG). See Element E5 in Figure 1.

Jefferson Street. One 4-inch fiber duct coming from Leavenworth Street terminates approximately 220 feet to the east, approximately 5 feet north of the southern curb (Jefferson Street). Approximately 84 feet east of Leavenworth Street, one 4-inch plastic line travels from the southern curb (Jefferson Street) across Jefferson Street to approximately 5 feet south of the northern curb and continues east to Handhole 588 (42 by 42 by 36 inches) alternating as a 4-inch fiber duct and 4-inch plastic conduit. (The amount of cover is not known for this segment of the line.) East of Handhole 588 are two 4-inch plastic conduits, and one 4-inch ABS at 6 feet, 16 feet, and 22 feet south of the northern curb (Jefferson Street) (PGE Map 146-S). See Element E6 in Figure 1.

Jones Street. Starting from Beach Street, one 4-inch plastic pipe travels north (8 feet west of the eastern curb (Jones Street)) approximately 275 feet to Vault 5482 (which is 10 feet by 14 feet by 9 feet). Three additional lines leave Vault 5482 (south), the most notable ties back into a 4-inch plastic pipe 115 feet south of Vault 5482 and runs 15 feet west of the eastern curb (Jones Street). North of Vault 5482 are two 4-inch ASB lines and two 4-inch plastic pipes that are

approximately 15 feet west of the eastern curb (Jones Street) and turn west after crossing the center of Jefferson Street (PGE Map 146-V). See Element E7 in Figure 1.

Laguna Street. Electrical service along Laguna Street includes four 3-inch plastic pipes and one 4-inch plastic pipe. The line runs east of the west curb and connects to an 11.5- by 12.5- by 7.5-foot vault set 31 inches below grade, 9.3 feet north of south Marina and 21.4 feet east of west Laguna Street. North of the vault, one 4-inch plastic conduit and one 3.5-inch plastic conduit travel west of northwest, and two plastic pipes connect to a vault (12 kV system) approximately 160 feet south and 3 feet east of Building A, adjacent to the turnaround loop at the western side of Fort Mason (the depth of pipe vault is not known). See Element E8 in Figure 1.

Leavenworth Street. Starting at Beach Street, there are one 4-inch ABS line and one 3-inch ABS line 15 inches below grade, 10 feet west of the eastern curb, which connect to a 24-inch by 36-inch vault (Vault 5480) 166 feet north of Beach Street. The line then continues with 18-inch cover to Vault 5480 (which is 10 feet by 16 feet by 9 feet), 12 feet south of Jefferson Street. Two transformers are 50 feet and 80 feet south of Jefferson Street, 5 feet west of the eastern curb. A 4-inch plastic pipe also starts at Beach Street (ranging 7 to 8 feet west of east curb with 52 inches of cover) and continues north approximately 130 feet and terminates into adjacent building. A 36-inch by 42-inch vault is located just north of Beach Street, approximately 1 foot west of the eastern curb (Leavenworth Street). Vault 5480 has one 4-inch plastic conduit (with 30 inches of cover) traveling west approximately 25 feet, which then heads north past Jefferson Street, and two 4-inch ABS conduits (42 inches of cover) traveling north and turning west at the center of Jefferson Street. In addition, one 4-inch ABS line begins at the southeastern corner of the intersection of Jefferson and Leavenworth Streets, and travels southwest to 15 feet east of the western curb (Leavenworth Street), then runs north onto Jefferson Street, where the line turns west 18 feet north of the southern curb (Jefferson Street) (PG&E Map 146-U). See Element E9 in Figure 1.

Van Ness Avenue. The electrical service on Van Ness Avenue consists of two 3-inch plastic pipes, starting at transformer T-1818, adjacent to City and County of San Francisco Pumping Station 2, and traveling south along Van Ness Avenue. The line crosses Van Ness Avenue (west to east) approximately 120 feet south of the pumping station and connects to a vault approximately 10 feet west of the eastern curb. A 220-foot line of unknown size connects a vending stand to the vault (additional confirmation of the line's size and use is needed). The 3-inch plastic pipe continues south for 400 feet or more until crossing to the western side of Van Ness Avenue (approximately 10 feet east of the western curb) (PG&E Map 20 RR). See Element E10 in Figure 1.

6.2 CONDITION

West of Tunnel

No problems with the electrical system have been reported. There are plans to upgrade the portion of the system in Upper Form Mason to 12 kV, likely within the next 5 to 10 years, per Mr. Kren, NPS. The system will become the responsibility of PG&E.

East of Tunnel

Per conversation with Mr. Ed Chan, all electrical lines within the project boundary are in good working condition without recent problems. The most current drawings available are dated between 1970 and 1978.

7.0 GAS SYSTEM

The PG&E contact for work on the gas system is Mr. Ed Chan.

7.1 EXISTING SYSTEM

West of Tunnel

PG&E operates the entire gas system in Lower Fort Mason and the natural gas distribution system above the tunnel in Upper Fort Mason. Gas is supplied to a regulator station north of Building 304. The lines within the Lower Fort Mason site are typically 2 and 3 inches in diameter. No lines are noted in the vicinity of the train portal or area of track layout.

A 2-inch main travels west (out of the west boundary of Fort Mason) to 7 feet west of the eastern curb (Laguna Street), and 15 feet north of the southern curb (Marina). The line then travels over 200 feet north along Laguna Street and intercepts a pressure monitor. A 2-inch line then travels north 23 feet and 15 feet east of existing Warehouse building. The line then continues north along adjacent to existing buildings (PG&E Map 1-DI6A). See Element G1 in Figure 1.

East of Tunnel

All existing gas pipelines in the area are high pressure, and either plastic or metal. PG&E operates the entire gas system. Gas lines are typically 24 inches to 36 inches below grade.

Beach Street. From Jones Street to Leavenworth Street, the gas main is a 2-inch-diameter plastic line. The line starts 23 feet west of Leavenworth Street and 5 feet north of the southern curb, continues east down Beach Street until terminating a half block east of Hyde Street, where it is approximately 19 feet north of the southern curb. A 4-inch-diameter gas main continues along Beach Street at Hyde Street and is approximately 12.3 feet north of the southern curb, which

becomes a 2-inch-diameter gas main west of Polk Street. The gas main terminates just short of the west end of Beach Street (prior to intersecting Van Ness Avenue) and is more than 12.3 feet north of south curb. Laterals include two plastic lines west of Polk Street (one running north, one running south), two lines that are assumed to be plastic between Larkin and Polk Streets (one running north, one running south), two lines that are assumed to be plastic between Leavenworth and Hyde Streets (both running north), and one line that is assumed to be plastic between Jones and Leavenworth Streets running north (PG&E Maps 2-CID, 1-DI6B, 2-CIC). See Element G2 in Figure 1.

Jefferson Street. The 2-inch main is approximately 10 feet north of the southern curb, has two laterals running to the northern curb and a tee running north (48 feet west of Jones) which has a lateral running west approximately 123 feet, 1 foot south of the northern curb) (PG&E Map 2-CID). See Element G3 in Figure 1.

Jones Street. The 2-inch main starts on Jefferson Street, travels south for 45 feet then terminates, and is an unknown distance east of the western curb,. There is one lateral at the end terminal end of line, traveling west (PG&E Map 2-CID). See Element G4 in Figure 1.

Leavenworth Street. A 6-inch main exists an unknown distance east of the western curb. One lateral 101 feet south of Jefferson Street connects to the eastern side of Leavenworth Street (PG&E Map 2-CID). See Element G5 in Figure 1.

Van Ness Avenue. The 3-inch-diameter plastic gas main along Van Ness Avenue begins adjacent to the San Francisco City Pumping Station and continues south, approximately 10 feet east of the western curb (Van Ness Avenue) for 165 feet, then travels laterally across Van Ness Avenue to approximately 10 feet east of the eastern curb (Van Ness Avenue). A 4-inch-diameter line then continues south for 200 feet and then runs laterally (west) to 10 feet west of the eastern curb (Van Ness Avenue). The line then (10 feet west of the eastern curb) extends south down Van Ness Avenue past Beach Street, where it is more than 35 feet west of the eastern curb (Van Ness Avenue) (PG&E Map 1-DI6B). See Element G6 in Figure 1.

7.2 CONDITION

West and East of Tunnel

There was no indication of underperforming or problematic gas pipelines in discussions with PG&E.

8.0 TELECOMMUNICATIONS

West of Tunnel

Telecommunication utility information was taken from U.S. Army Corps of Engineers drawings dated 1961. This information identified conduit and manhole structures at the retaining wall south of Building 314. See Element T1 in Figure 1.

East of Tunnel

Telecommunication utility information is pending. See Table 2 for a summary of utilities that have been contacted and their current status. For the five telecommunication organizations, all but one reported that no utilities are within the project boundary. The typical telecommunication infrastructure will consist of below grade vaults within the street right-of-way serviced with conduits. The vaults are commonly approximately 4 feet to 6 feet wide and up to 10 feet long with a height of 6 feet. The conduits will typically be 4 inches in diameter, and there will be between 25 and 50 of them. See Element T2 in Figure 1.

Table 1
Existing Utility Infrastructure

UTILITY	LINE SIZE AND MATERIAL
AWSS	
A1	14 inch, CI
A2	14 inch, CI
A3	20-inch, CI
A4	14-inch, CI
A5	14-inch, CI
A6	16-inch, CI
WATER	
W1	12-inch, CI
W2	6/8-inch, DI
W3	8-inch, DI
W4	8-inch, DI
W5	6-inch
W6	8-inch
SS/SD	
S1	6 to 18-inch
S2	12-inch, VCP
S3	30- and 45-inch
S4	30-inch, 4-inch force main, 12-inch,
ELECTRICAL	
E1	Transformer for underground 4kV system
E2	Up to four 4-inch conduits, two buried transformers
E3	Up to two 4-inch conduits
E4	Up to three 4-inch conduits
E5	One 4-inch conduit
E6	Typically one 4-inch conduit
E7	Up to four 4-inch conduits
E8	Up to five 4-inch conduits, below grade 12kV transformer
E9	Numerous conduits and vaults
E10	Two (or more) 4-inch conduits
GAS	
G1	2 to 3-inch lines w/i Ft. Mason
G2	2-inch line
G3	2-inch line
G4	2-inch line
G5	6-inch line
G6	4-inch line
TELECOM	
T1/T2	Information not received from utility companies.

Abbreviations:
CI – cast iron
DI – ductile iron
VCP – vitrified clay pipe

Table 2
Telecommunication Contacts

Organization	Utility	Representative	Representative Phone	Representative Email	Status
NRG	Steam	Nick Joseph	(415) 725-1814	Nick.Joseph@nrgenergy.com	No utilities in project area
ATT–Local	Telecom	Renee Stevens	(415) 644-7054	rs2364@att.com	Utilities in project area
ATT–Transcontinental	Telecom	James Robinett	(925) 944-8414	james.robinette@worldnet.att.net	No utilities in project area (will follow-up with formal document)
Comcast	Telecom	Gino Graziani	(415) 503-4506	Gino_Graziani@cable.comcast.com	No utilities in project area (will follow-up with drawings)
Level 3	Telecom	Rick Miller	(720) 888-3813	Rick.Miller@Level3.com	No utilities in project area
Verizon/MCI	Telecom	Pam Brown	(415) 970-2109	not available	No utilities in project area

LEGEND

- F Market (existing)
- Platform (existing)
- A — Aux. Water Supply System (Fire)
- W — Water (Potable)
- S — Combined Sanitary Sewer/Storm Drain
- E — Electrical
- G — Gas
- T — Telecommunications
- Tunnel Portal

10/17/07 vsa/hk \28067144 Historic Streetcar EIS\EIS Oct 2007\utility schem.cdr

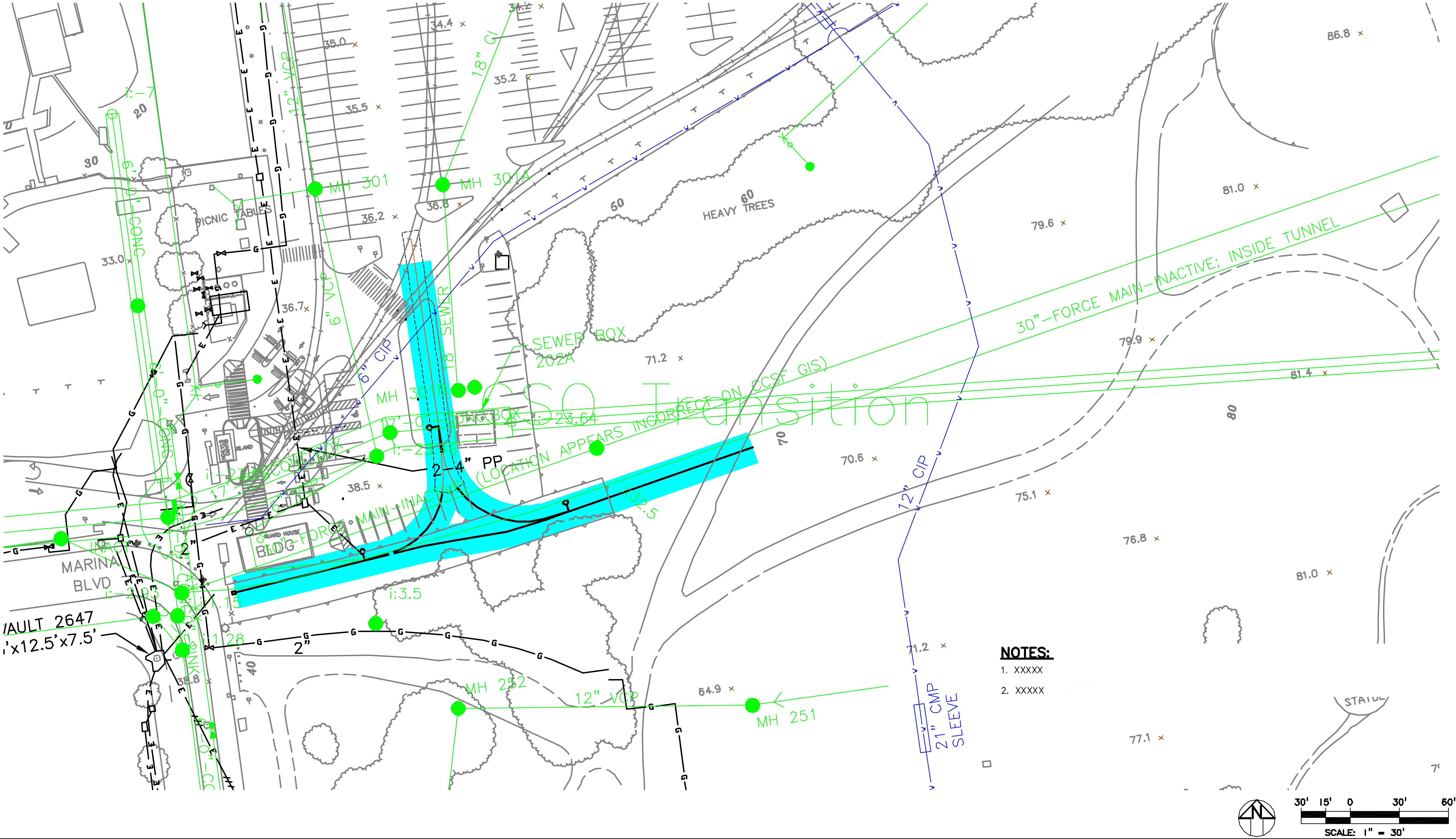
UTILITY SCHEMATIC

October 2007
280667144

Historic Streetcar Extension EIS
San Francisco, California

URS

FIGURE 1



LEGEND:

- EXISTING ELECTRIC
- EXISTING GAS
- EXISTING SEWER
- EXISTING TELECOM
- EXISTING WATER

URS

NATIONAL PARK SERVICE

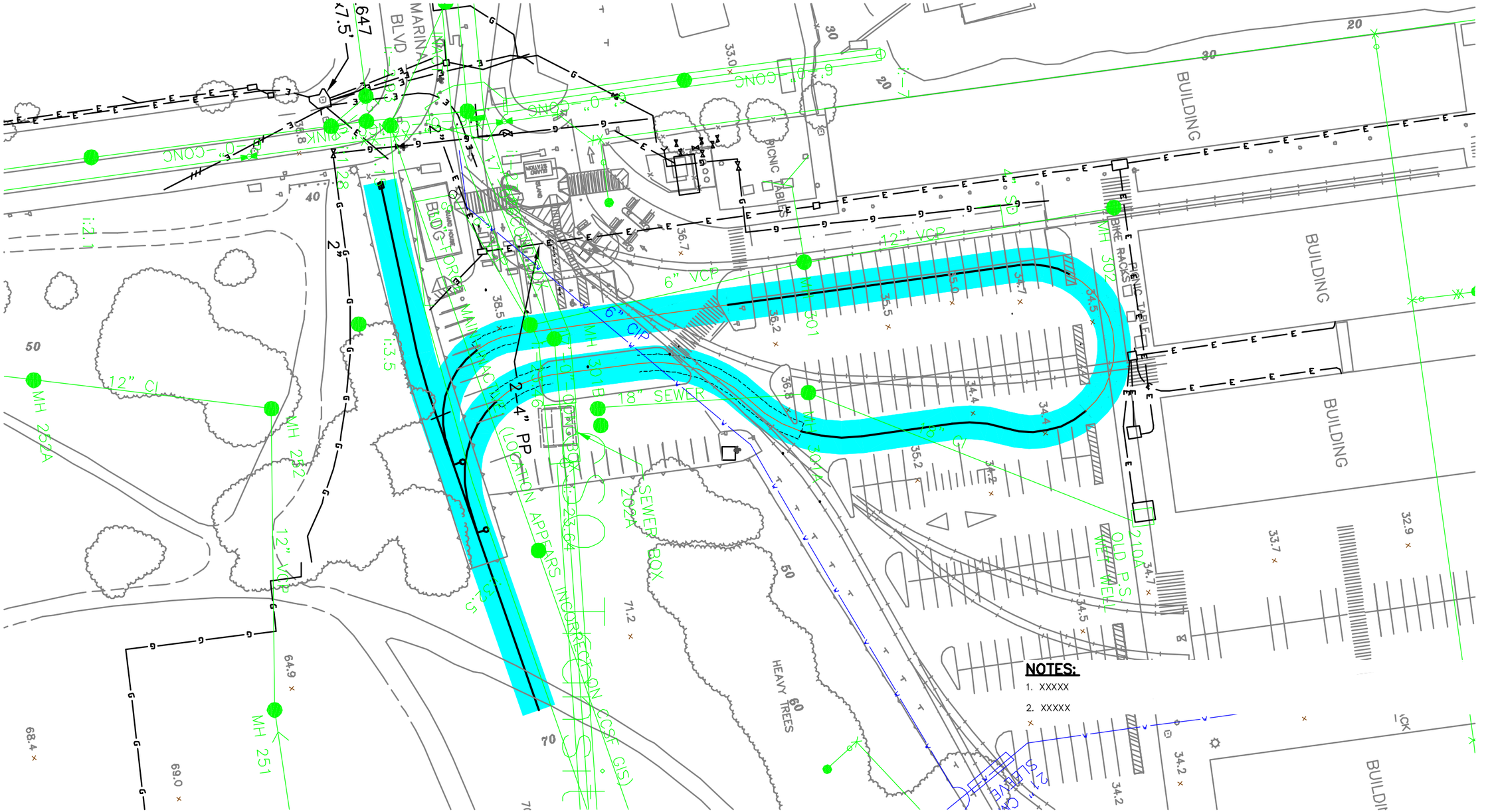
NATIONAL PARK SERVICE – GGNRA & SFMNHP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

FORT MASON TURN AROUND – EXISTING UTILITIES

JANUARY 2008

FIGURE U.A.1



LEGEND:

- EXISTING ELECTRIC
- EXISTING GAS
- EXISTING SEWER
- EXISTING TELECOM
- EXISTING WATER

URS

NATIONAL PARK SERVICE

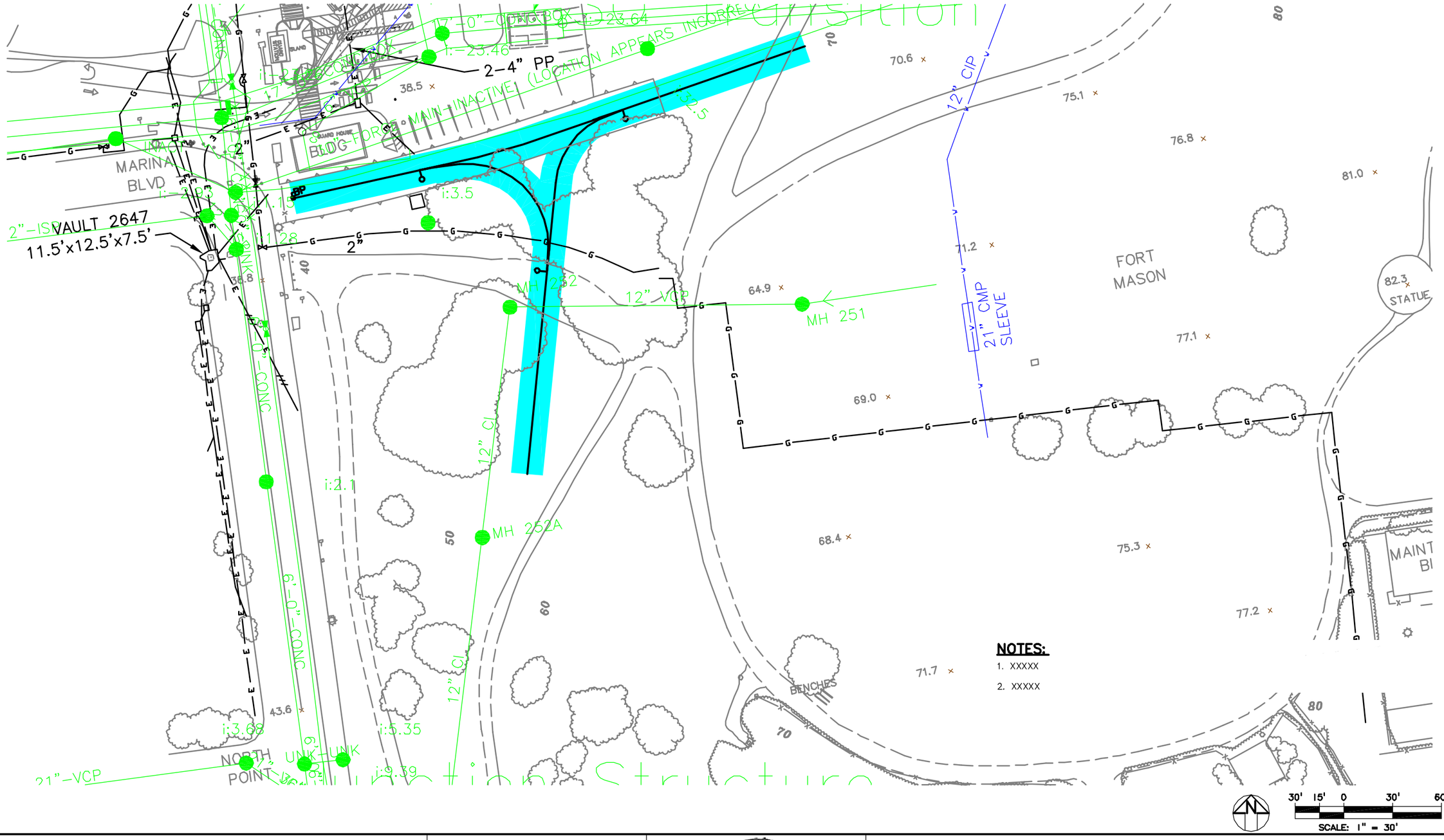
NATIONAL PARK SERVICE – GGNRA & SFMNHP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

FORT MASON TURN AROUND – EXISTING UTILITIES

JANUARY 2008

FIGURE U.A.2



LEGEND:

- E — EXISTING ELECTRIC
- G — EXISTING GAS
- EXISTING SEWER
- T — EXISTING TELECOM
- W — EXISTING WATER

URS

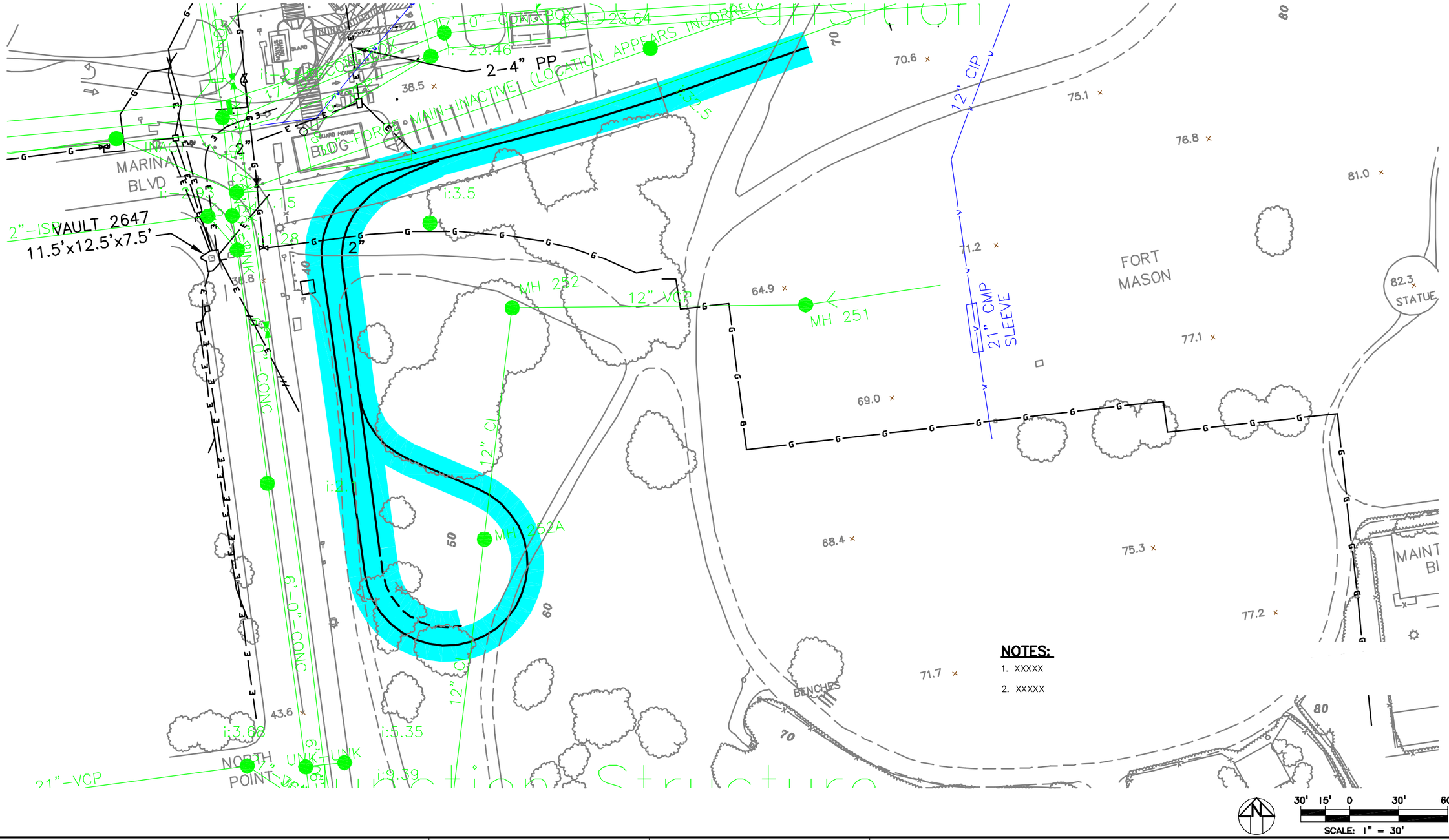
NATIONAL PARK SERVICE

NATIONAL PARK SERVICE – GGNRA & SFMNHP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

FORT MASON TURN AROUND – EXISTING UTILITIES

JANUARY 2008 | FIGURE U.A.3



NOTES:

1. XXXXX
2. XXXXX

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:

- E — EXISTING ELECTRIC
- G — EXISTING GAS
- EXISTING SEWER
- T — EXISTING TELECOM
- W — EXISTING WATER

URS

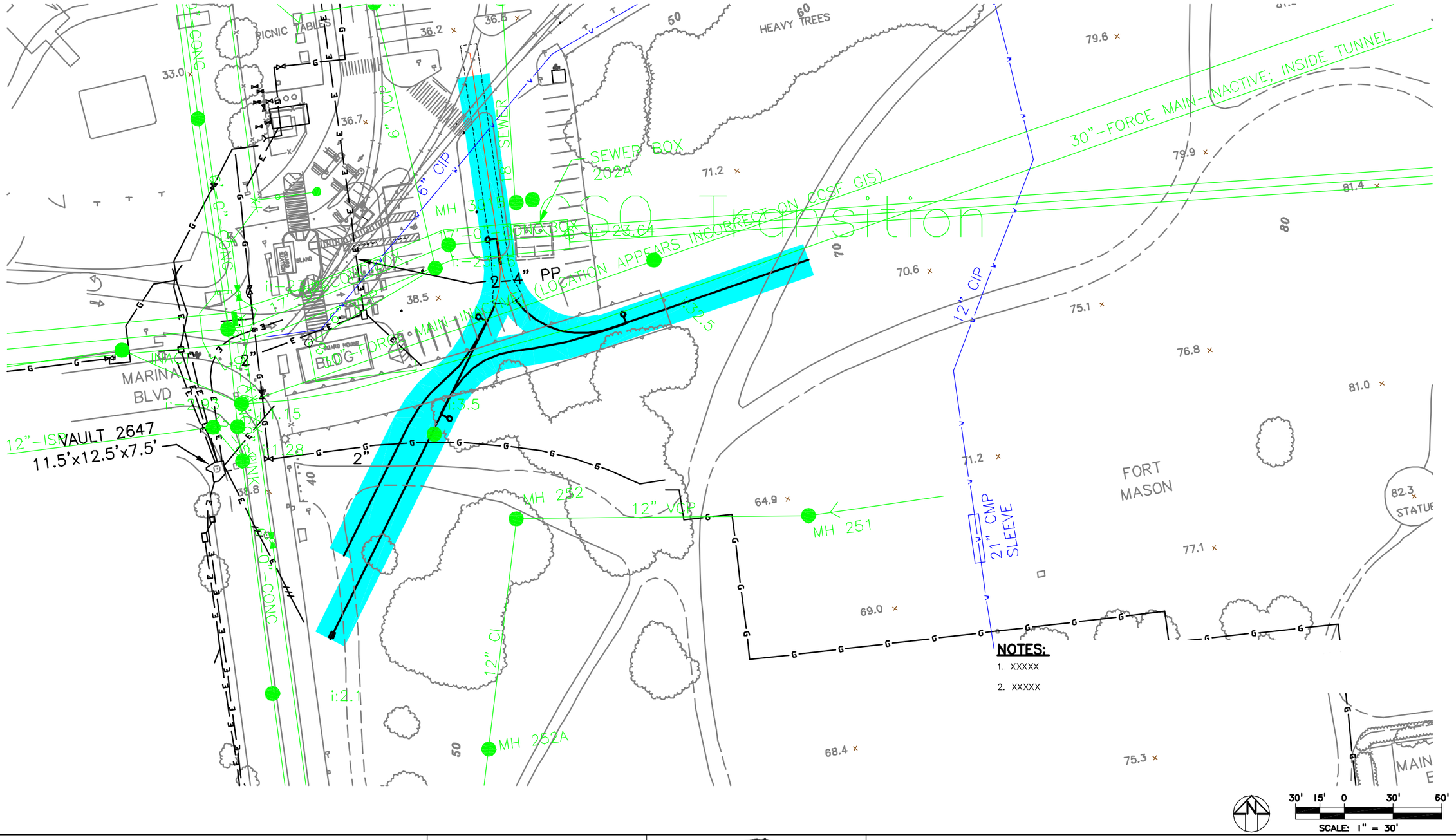
NATIONAL PARK SERVICE – GGNRA & SFMNHP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

FORT MASON TURN AROUND – EXISTING UTILITIES

JANUARY 2008

FIGURE U.A.4



LEGEND:

- E — EXISTING ELECTRIC
- G — EXISTING GAS
- EXISTING SEWER
- T — EXISTING TELECOM
- W — EXISTING WATER

URS

NATIONAL PARK SERVICE – GGNRA & SFMNHP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

FORT MASON TURN AROUND – EXISTING UTILITIES

JANUARY 2008 | FIGURE U.A.5

HEAVY TREES

OFFICERS CLUB

HEAVY TREES

HEAVY TREES

PARKING AREA

PARKING AREA

VAN NESS AVE

POLK ST

i:3.75

i:6.43

i:9

12" VCP

2"

4"

NOTES:

1. XXXX
2. XXXX

OPTION 1 OF 1

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:

- E — EXISTING ELECTRIC
- G — EXISTING GAS
- EXISTING SEWER
- T — EXISTING TELECOM
- W — EXISTING WATER

URS

NATIONAL PARK SERVICE

NATIONAL PARK SERVICE – GGNRA & SFMNFP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

TRANSITION AREA – EXISTING UTILITIES

JANUARY 2008

FIGURE U.B.1

HEAVY TREES

OFFICERS CLUB

HEAVY TREES

HEAVY TREES

PARKING AREA

PARKING AREA

VAN NESS AVE

POLK ST

12"-VCP

2"

4"

i:6.43

i:3.75

i:9

NOTES:

1. XXXX
2. XXXX

OPTION 1 OF 1

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:

- EXISTING ELECTRIC
- EXISTING GAS
- EXISTING SEWER
- EXISTING TELECOM
- EXISTING WATER

URS

NATIONAL PARK SERVICE

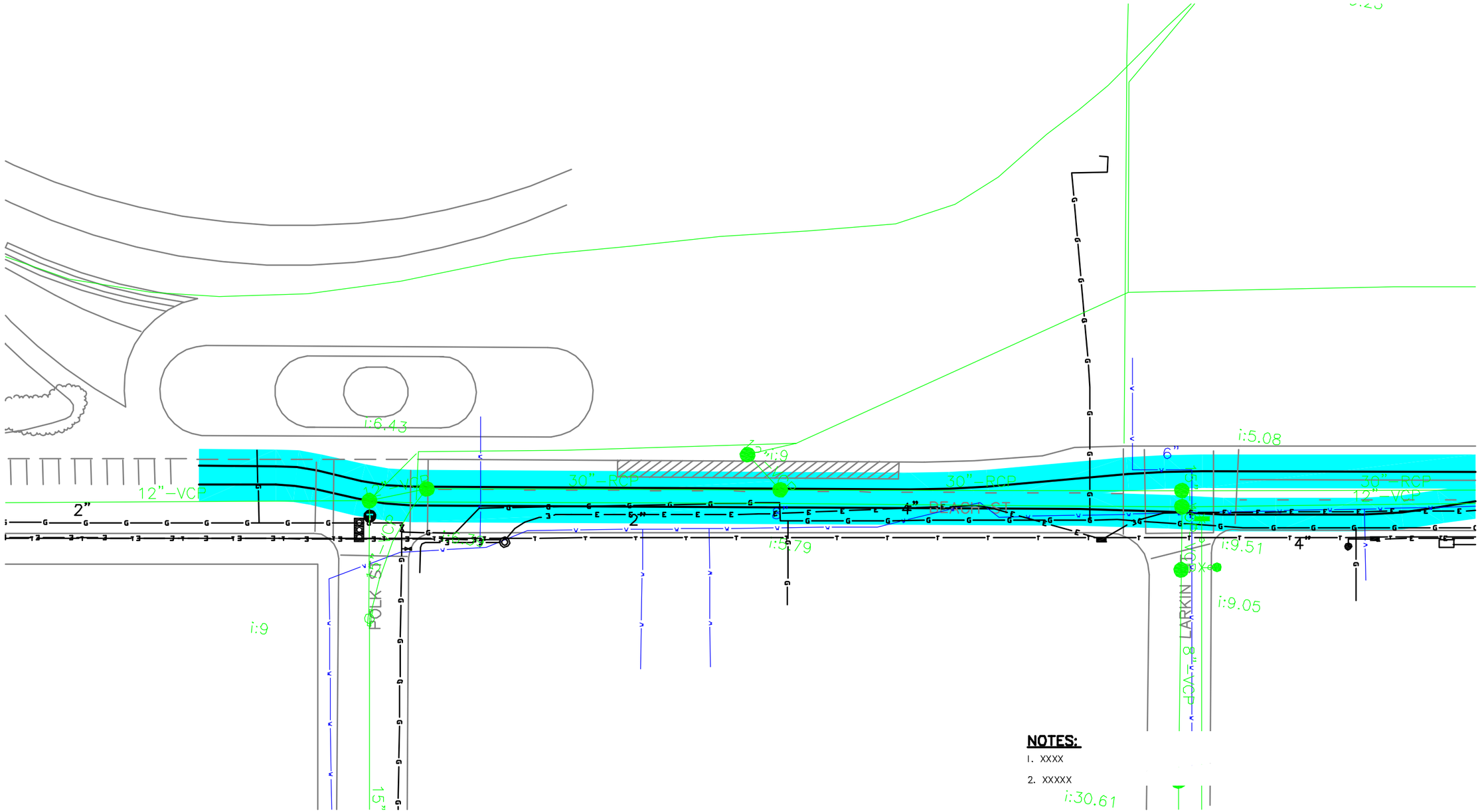
NATIONAL PARK SERVICE – GGNRA & SFMNFP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

TRANSITION AREA – EXISTING UTILITIES

JANUARY 2008

FIGURE U.B.2



NOTES:

1. XXXX
2. XXXXX

30' 15' 0 30' 60'

SCALE: 1" = 30'

LEGEND:

- EXISTING ELECTRIC
- EXISTING GAS
- EXISTING SEWER
- EXISTING TELECOM
- EXISTING WATER

URS

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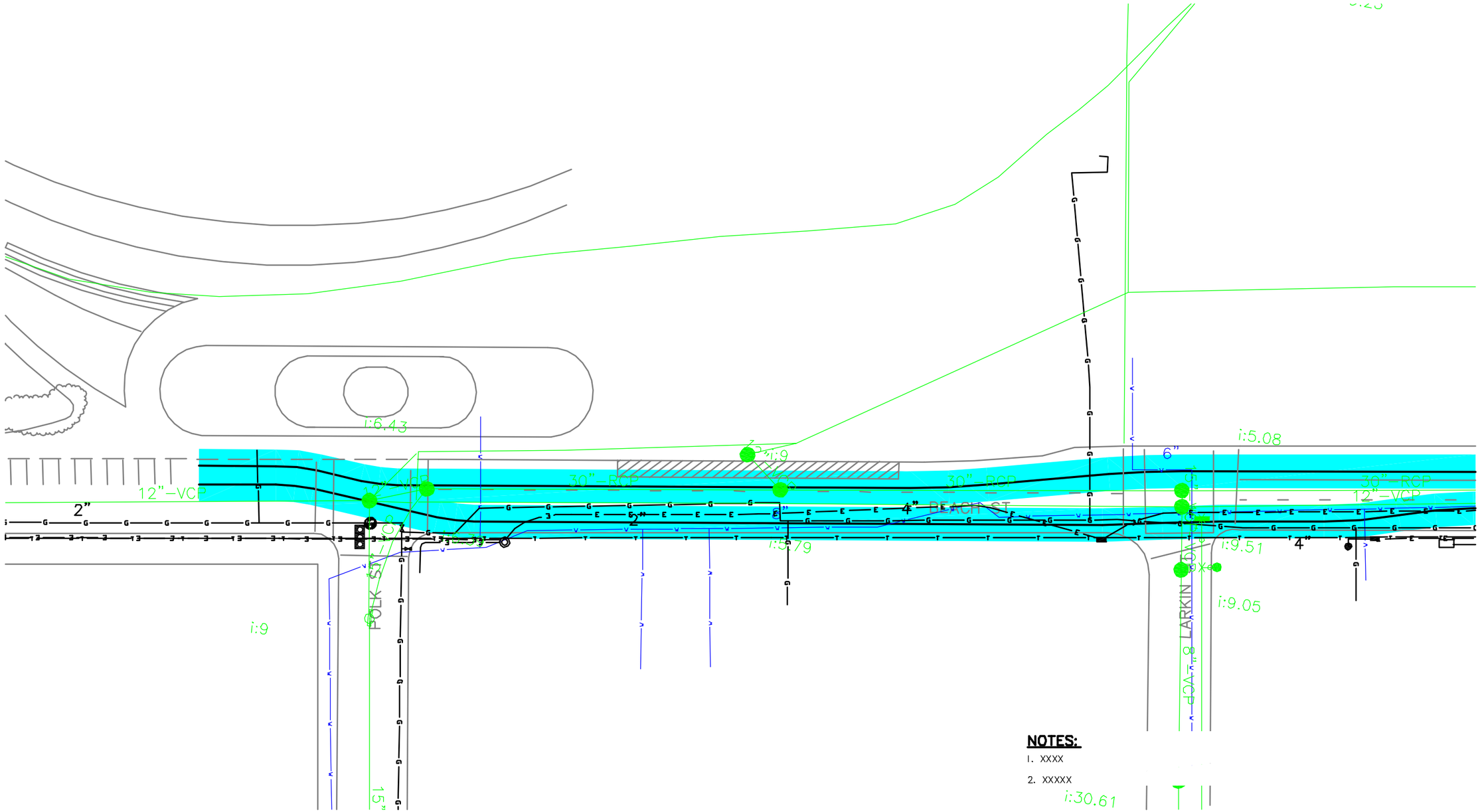
NATIONAL PARK SERVICE – GGNRA & SFMNFP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

BEACH STREET 1 OF 2 – EXISTING UTILITIES

JANUARY 2008

FIGURE U.C.1



LEGEND:

- EXISTING ELECTRIC
- EXISTING GAS
- EXISTING SEWER
- EXISTING TELECOM
- EXISTING WATER

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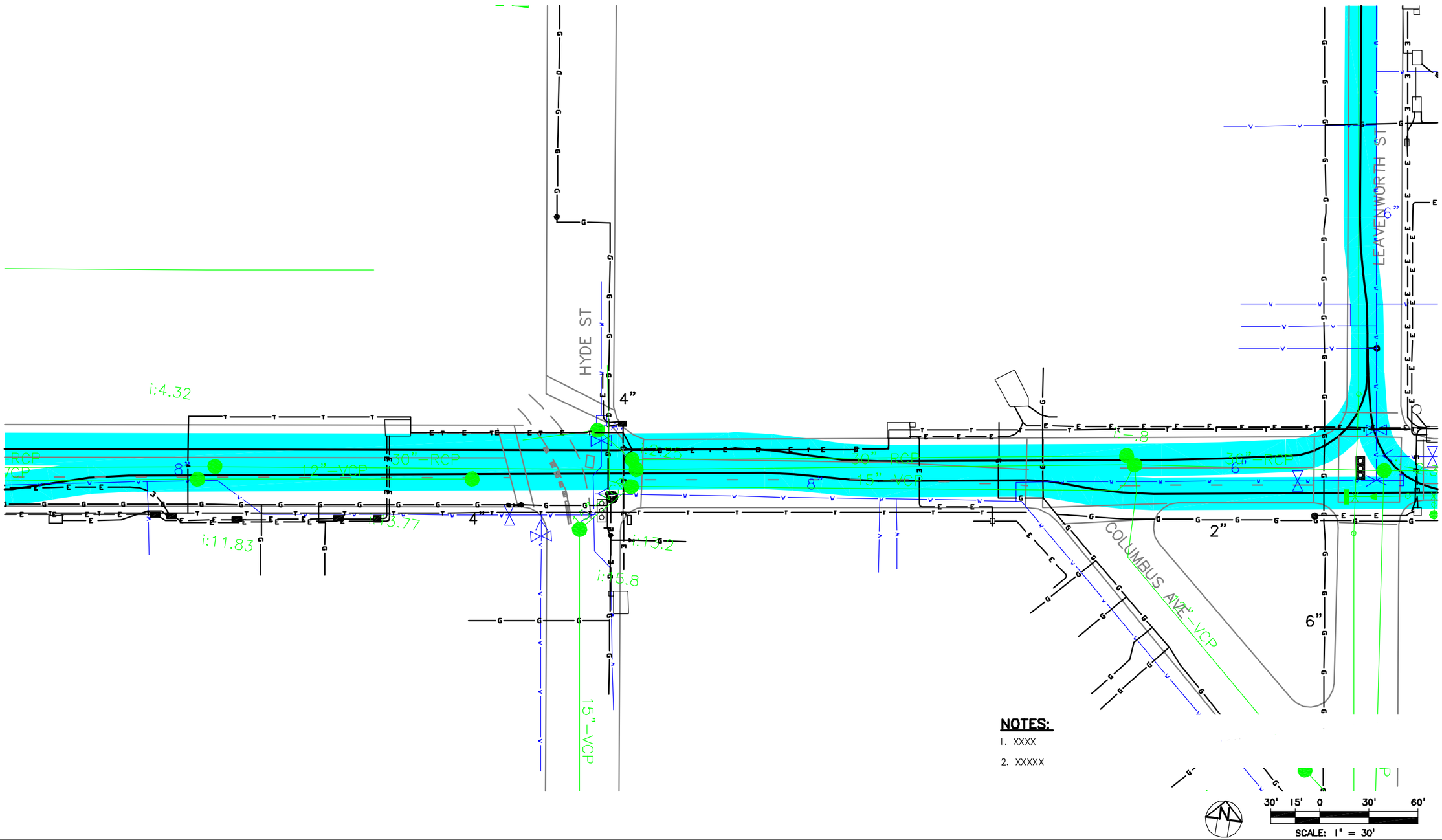
MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

BEACH STREET 2 OF 2 – EXISTING UTILITIES

JANUARY 2008

FIGURE U.C.2



LEGEND:

- EXISTING ELECTRIC
- EXISTING GAS
- EXISTING SEWER
- EXISTING TELECOM
- EXISTING WATER

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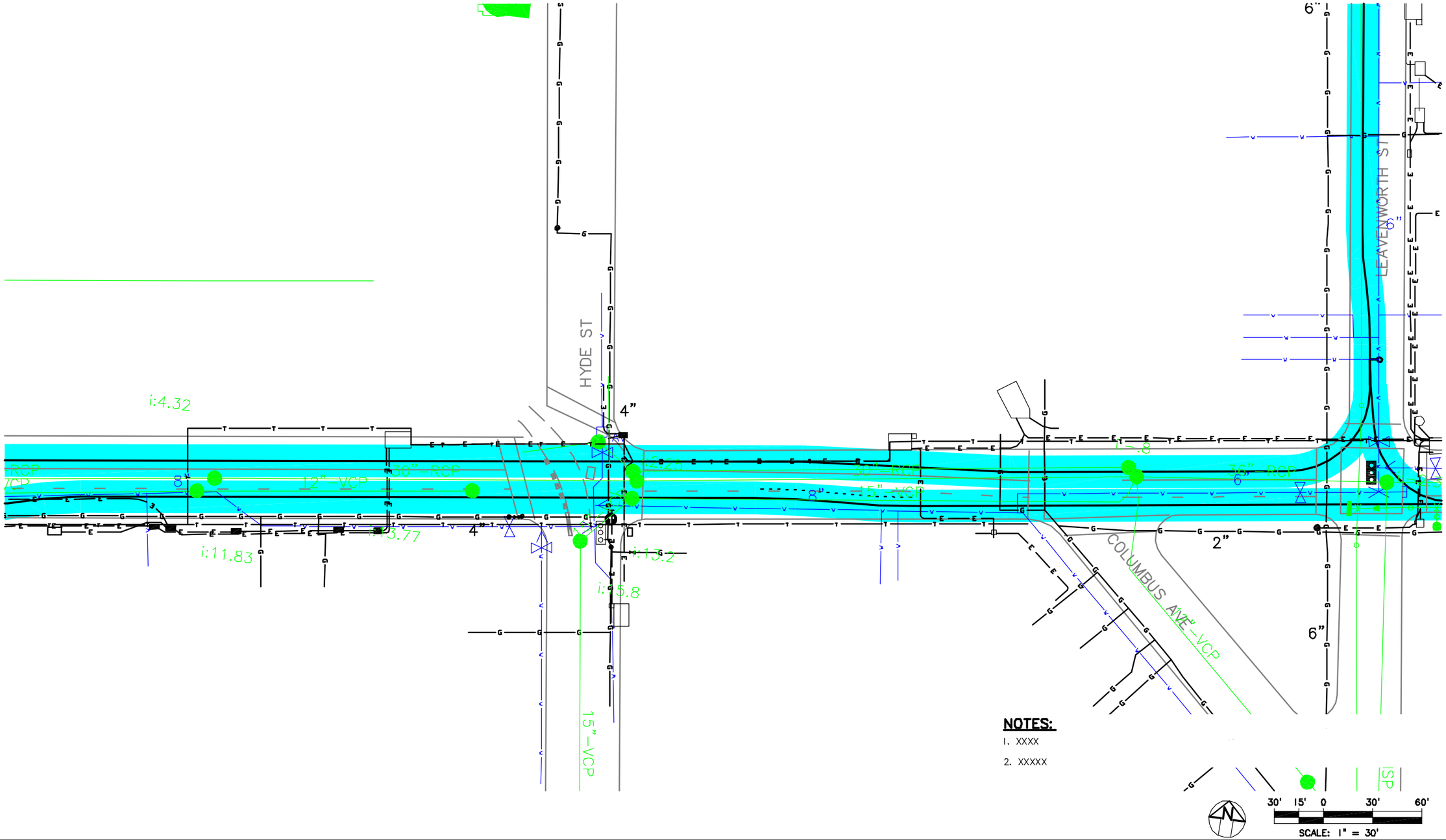
MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

BEACH STREET 1 OF 2 – EXISTING UTILITIES

JANUARY 2008

FIGURE U.D.1



LEGEND:

- EXISTING ELECTRIC
- EXISTING GAS
- EXISTING SEWER
- EXISTING TELECOM
- EXISTING WATER

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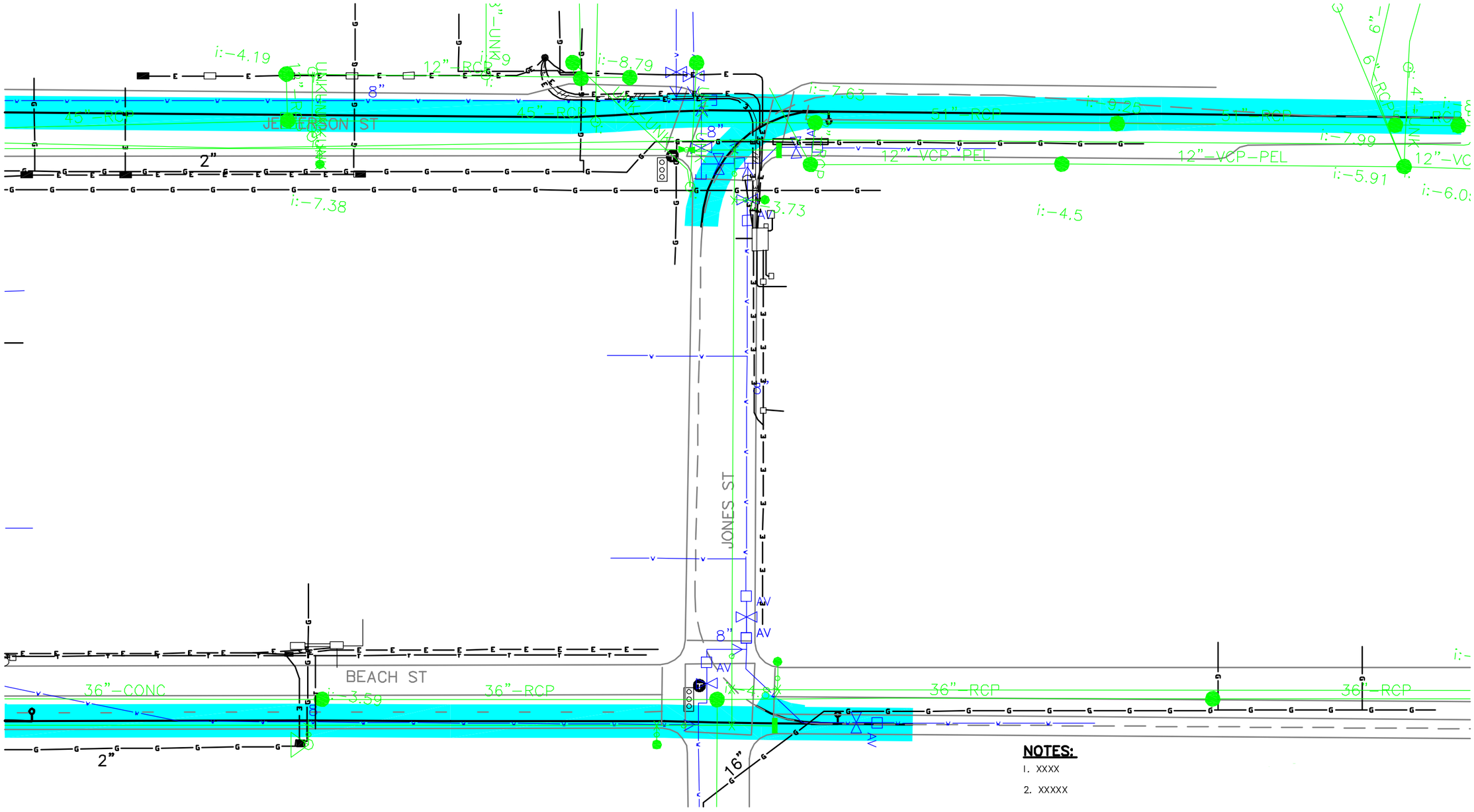
MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

BEACH STREET 2 OF 2 – EXISTING UTILITIES

JANUARY 2008

FIGURE U.D.2



LEGEND:

- E — EXISTING ELECTRIC
- G — EXISTING GAS
- EXISTING SEWER
- T — EXISTING TELECOM
- W — EXISTING WATER

URS

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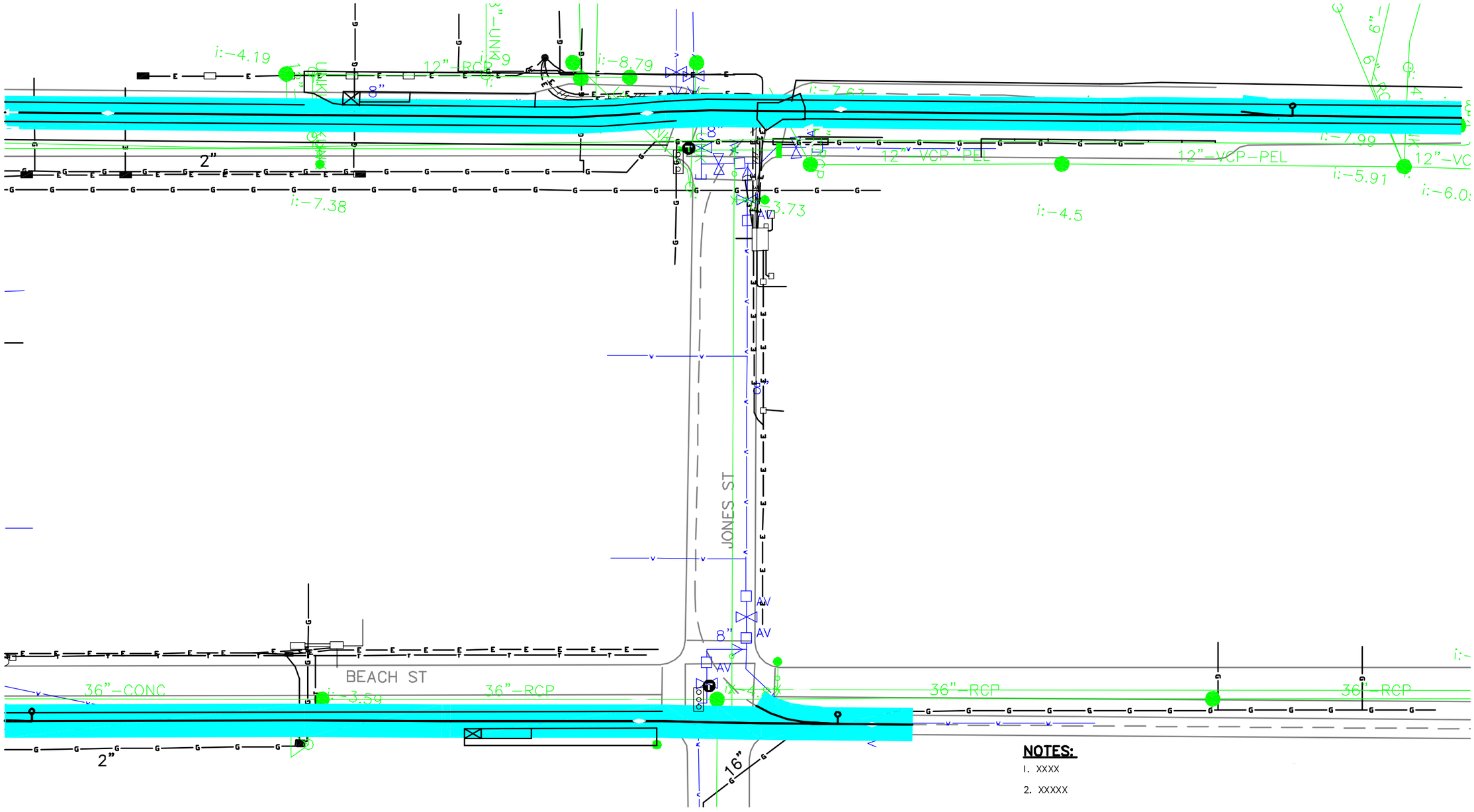
MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

CONNECTION TO EXISTING F LINE – EXISTING UTILITIES

JANUARY 2008

FIGURE U.E.1



LEGEND:

- E — EXISTING ELECTRIC
- G — EXISTING GAS
- EXISTING SEWER
- T — EXISTING TELECOM
- W — EXISTING WATER

URS

NATIONAL PARK SERVICE

NATIONAL PARK SERVICE – GGNRA & SFMNFP

MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE

CONNECTION TO EXISTING F LINE – EXISTING UTILITIES

JANUARY 2008

FIGURE U.E.2

Appendix F – Traction Power Calculations

Appendix F

Traction Power Estimated Calculations

The traction power estimated calculation where based on the following conditions:

1) Vehicle headways – **6 minutes**
2) Route average speed – **3.7 mph** (30 mph maximum design speed)
3) Current draw (amps) **- 1483**
4) Out of schedule "Bunching" factor **- 1.5**
5) Average Load – **912 kw**

1) The vehicle headway for this proposed length of track circuit has been calculated to be 6 minutes.

2) The route estimated speed uses two calculations. The first defines the estimated circuit length. Circuit length (ft) = Segment A + Segment B + Segment C.
Average travel time (Min) = circuit length/average speed x 60 / 5280
Average speed (ft/min) = circuit length/travel time.

Calculations:

Circuit length: 855'+1553'+1500'+165'+671'+488'=**5232' +/-**

Average travel time: 5232'/3.7mph x 60 / 5280' = 1**6 minutes**
Average speed: 5232'/16 min = **327 ft/min**

Number of cars with **Bunching** factor:

Number of cars = Total Circuit Length/Average speed x headway
855'+3105'+3000'+165'+671'+488=8284'/(327 x 6) = **4.22**

Bunch Factor = Number of Cars x 1.5 4.22 x 1.5 = 6.3

Current draw: Bunch factor[125 + 550 (.82 Bunch factor -1)]
6.3[125+550 (.82 6.3-1)] = **1483 amps**

Average Load: I x 615 v / 1000
1483 x 615 / 1000 = 912 kw

Appendix G – Detailed Cost Estimate

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
101

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 101	**Fort Mason Turn Around**										1st Quarter
			"WYE" North										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$763,253
2		40.01	Common Excavation	0	CY	$14.00	$0	32%	$0	20%	$0	$0	
3		40.01	Roadway Excavation - 18" Depth	91	CY	$30.00	$2,733	32%	$875	20%	$547	$4,155	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	292	CY	$30.00	$8,767	32%	$2,805	20%	$1,753	$13,325	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	1,640	SF	$15.00	$24,600	32%	$7,872	20%	$4,920	$37,392	
6		40.07	AC Pavement Grind & Overlay (3")	178	SY	$30.00	$5,340	32%	$1,709	20%	$1,068	$8,117	
7		40.06	Standard PCC Sidewalk	65	SY	$70.00	$4,550	32%	$1,456	20%	$910	$6,916	
8		40.07	Standard PCC Curb and Gutter	450	LF	$50.00	$22,500	32%	$7,200	20%	$4,500	$34,200	
9		40.06	Landscaping	0	SF	$10.00	$0	32%	$0	20%	$0	$0	
10		40.06	Erosion Control Allowance	526	LF	$25.00	$13,150	32%	$4,208	20%	$2,630	$19,988	
11		40.05	Operators Restroom Facilities	1	LS	$80,000.00	$80,000	32%	$25,600	20%	$16,000	$121,600	
12		40.08	Temporary Traffic Control	300,000	LS	$1.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
13		40.01	Remove Existing Structure	2,700	SF	$15.00	$40,500	32%	$12,960	20%	$8,100	$61,560	
14		40.05	Relocate Bocce Ball Facilities	0	LS	$120,000.00	$0	32%	$0	20%	$0	$0	
22	**Structures**												$0
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	0	SF	$65.00	$0	32%	$0	20%	$0	$0	
25		40.05	Retaining Walls 10-20 feet high	0	SF	$70.00	$0	32%	$0	20%	$0	$0	
28	**Tunnel**												$16,700,000
29		10.07	Existing Tunnel Rehab & Improvements	1	LS	$10,000,000.00	$10,000,000	32%	$3,200,000	35%	$3,500,000	$16,700,000	
34	**Traffic Signal**												$0
35		50.02	Beach / Polk	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
36		50.02	Beach / Hyde	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
37		50.02	Beach / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
38		50.02	Beach / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
39		50.02	Jefferson / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
40		50.02	Jefferson / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
73	**Utilities**												$123,703
74		40.02	Water System Improvements	41,860	LS	$1.00	$41,860	32%	$13,395	30%	$12,558	$67,813	
75		40.02	Sanitary & Storm Sewer Improvements	34,500	LS	$1.00	$34,500	32%	$11,040	30%	$10,350	$55,890	
76		40.02	Track Drainage Allowance	0	TF	$75.00	$0	32%	$0	30%	$0	$0	
77		40.02	AWSS Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
115	**Trackwork**												$1,220,560
116		10.03	Ri53 in Track Slab (Single)	526	TF	$500.00	$263,000	32%	$84,160	20%	$52,600	$399,760	
117		10.09	Allowance for Semi-Exclusive Delineation	450	TF	$200.00	$90,000	32%	$28,800	20%	$18,000	$136,800	
118		10.12	Turnout/Track Crossing Installation	3	EA	$150,000.00	$450,000	32%	$144,000	20%	$90,000	$684,000	
119		10.03	Cable Car Crossing Installation	0	EA	$250,000.00	$0	32%	$0	20%	$0	$0	
148	**Stations**											$0	$266,380
149		20.01	Standard Stop Platforms	2,305	SF	$50.00	$115,250	32%	$36,880	20%	$23,050	$175,180	
150		20.01	Mini High Stop Platforms	2	EA	$30,000.00	$60,000	32%	$19,200	20%	$12,000	$91,200	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$239,856
171		50.04	Traction Power and OCS	526	TF	$300.00	$157,800	32%	$50,496	20%	$31,560	$239,856	
177	**Signal system**												$516,800

Draft

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
101

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 101	**Fort Mason Turn Around**										1st Quarter
			"WYE" North										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	340,000	LS	$1.00	$340,000	32%	$108,800	20%	$68,000	$516,800	
180	**Communications**												$30,400
181		50.05	Passenger Information Sign	2	EA	$10,000.00	$20,000	32%	$6,400	20%	$4,000	$30,400	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$3,863,856		$3,922,546	$19,860,952	$19,860,952
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$482,982						
208		80.02	Final Design			6%	$724,473						
209		80.03	Project Management for Design and Construction			5%	$603,728						
210		80.04	Construction Administration & Management			8%	$965,964						
211		80.05	Insurance			2%	$241,491						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$362,237						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$362,237						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$120,746						
215						32%	$3,863,856						
216	**Contingency**												
217		90.01	Unallocated Contingency				$3,922,546						

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
101

San Francisco, California

Historic Streetcar

Order of Magnitude Estimate

Estimate Spread to FTA Descriptions

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
102

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 102	**Fort Mason Turn Around**										1st Quarter
			LOOP North										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$973,109
2		40.01	Common Excavation	0	CY	$14.00	$0	32%	$0	20%	$0	$0	
3		40.01	Roadway Excavation - 18" Depth	211	CY	$30.00	$6,333	32%	$2,027	20%	$1,267	$9,627	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	660	CY	$30.00	$19,800	32%	$6,336	20%	$3,960	$30,096	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	3,800	SF	$15.00	$57,000	32%	$18,240	20%	$11,400	$86,640	
6		40.07	AC Pavement Grind & Overlay (3")	1,244	SY	$30.00	$37,320	32%	$11,942	20%	$7,464	$56,726	
7		40.06	Standard PCC Sidewalk	65	SY	$70.00	$4,550	32%	$1,456	20%	$910	$6,916	
8		40.07	Standard PCC Curb and Gutter	1,300	LF	$50.00	$65,000	32%	$20,800	20%	$13,000	$98,800	
9		40.06	Landscaping	0	SF	$10.00	$0	32%	$0	20%	$0	$0	
10		40.06	Erosion Control Allowance	1,188	LF	$25.00	$29,700	32%	$9,504	20%	$5,940	$45,144	
11		40.05	Operators Restroom Facilities	1	LS	$80,000.00	$80,000	32%	$25,600	20%	$16,000	$121,600	
12		40.08	Temporary Traffic Control	300,000	LS	$1.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
13		40.01	Remove Existing Structure	2,700	SF	$15.00	$40,500	32%	$12,960	20%	$8,100	$61,560	
14		40.05	Relocate Bocce Ball Facilities	0	LS	$120,000.00	$0	32%	$0	20%	$0	$0	
22	**Structures**												$0
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	0	SF	$65.00	$0	32%	$0	20%	$0	$0	
25		40.05	Retaining Walls 10-20 feet high	0	SF	$70.00	$0	32%	$0	20%	$0	$0	
28	**Tunnel**												$16,700,000
29		10.07	Existing Tunnel Rehab & Improvements	1	LS	$10,000,000.00	$10,000,000	32%	$3,200,000	35%	$3,500,000	$16,700,000	
34	**Traffic Signal**												$0
35		50.02	Beach / Polk	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
36		50.02	Beach / Hyde	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
37		50.02	Beach / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
38		50.02	Beach / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
39		50.02	Jefferson / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
40		50.02	Jefferson / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
73	**Utilities**												$254,259
74		40.02	Water System Improvements	10,350	LS	$1.00	$10,350	32%	$3,312	30%	$3,105	$16,767	
75		40.02	Sanitary & Storm Sewer Improvements	57,500	LS	$1.00	$57,500	32%	$18,400	30%	$17,250	$93,150	
76		40.02	Track Drainage Allowance	1,188	TF	$75.00	$89,100	32%	$28,512	30%	$26,730	$144,342	
77		40.02	AWSS Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
115	**Trackwork**												$1,632,480
116		10.03	Ri53 in Track Slab (Single)	1,188	TF	$500.00	$594,000	32%	$190,080	20%	$118,800	$902,880	
117		10.09	Allowance for Semi-Exclusive Delineation	900	TF	$200.00	$180,000	32%	$57,600	20%	$36,000	$273,600	
118		10.12	Turnout/Track Crossing Installation	2	EA	$150,000.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
119		10.03	Cable Car Crossing Installation	0	EA	$250,000.00	$0	32%	$0	20%	$0	$0	
148	**Stations**											$0	$264,328
149		20.01	Standard Stop Platforms	2,278	SF	$50.00	$113,900	32%	$36,448	20%	$22,780	$173,128	
150		20.01	Mini High Stop Platforms	2	EA	$30,000.00	$60,000	32%	$19,200	20%	$12,000	$91,200	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$541,728
171		50.04	Traction Power and OCS	1,188	TF	$300.00	$356,400	32%	$114,048	20%	$71,280	$541,728	
177	**Signal system**												$456,000

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
102

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 102	**Fort Mason Turn Around**										1st Quarter
			LOOP North										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	300,000	LS	$1.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
180	**Communications**												$30,400
181		50.05	Passenger Information Sign	2	EA	$10,000.00	$20,000	32%	$6,400	20%	$4,000	$30,400	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$4,070,865		$4,059,986	$20,852,304	$20,852,304
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$508,858						
208		80.02	Final Design			6%	$763,287						
209		80.03	Project Management for Design and Construction			5%	$636,073						
210		80.04	Construction Administration & Management			8%	$1,017,716						
211		80.05	Insurance			2%	$254,429						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$381,644						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$381,644						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$127,215						
215						32%	$4,070,865						
216	**Contingency**												
217		90.01	Unallocated Contingency				$4,059,986						

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
102

San Francisco, California

Historic Streetcar

Order of Magnitude Estimate

Estimate Spread to FTA Descriptions

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
103

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 103	**Fort Mason Turn Around**										1st Quarter
			SOUTH "Y"										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$1,487,624
2		40.01	Common Excavation	12,800	CY	$14.00	$179,200	32%	$57,344	20%	$35,840	$272,384	
3		40.01	Roadway Excavation - 18" Depth	0	CY	$30.00	$0	32%	$0	20%	$0	$0	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	353	CY	$30.00	$10,600	32%	$3,392	20%	$2,120	$16,112	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	0	SF	$15.00	$0	32%	$0	20%	$0	$0	
6		40.07	AC Pavement Grind & Overlay (3")	0	SY	$30.00	$0	32%	$0	20%	$0	$0	
7		40.06	Standard PCC Sidewalk	950	SY	$70.00	$66,500	32%	$21,280	20%	$13,300	$101,080	
8		40.07	Standard PCC Curb and Gutter	350	LF	$50.00	$17,500	32%	$5,600	20%	$3,500	$26,600	
9		40.06	Landscaping	26,400	SF	$10.00	$264,000	32%	$84,480	20%	$52,800	$401,280	
10		40.06	Erosion Control Allowance	636	LF	$25.00	$15,900	32%	$5,088	20%	$3,180	$24,168	
11		40.05	Operators Restroom Facilities	1	LS	$80,000.00	$80,000	32%	$25,600	20%	$16,000	$121,600	
12		40.08	Temporary Traffic Control	300,000	LS	$1.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
13		40.01	Remove Existing Structure	3,000	SF	$15.00	$45,000	32%	$14,400	20%	$9,000	$68,400	
14		40.05	Relocate Bocce Ball Facilities	0	LS	$120,000.00	$0	32%	$0	20%	$0	$0	
22	**Structures**												$478,800
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	0	SF	$65.00	$0	32%	$0	20%	$0	$0	
25		40.05	Retaining Walls 10-20 feet high	4,500	SF	$70.00	$315,000	32%	$100,800	20%	$63,000	$478,800	
28	**Tunnel**												$16,700,000
29		10.07	Existing Tunnel Rehab & Improvements	1	LS	$10,000,000.00	$10,000,000	32%	$3,200,000	35%	$3,500,000	$16,700,000	
34	**Traffic Signal**												$0
35		50.02	Beach / Polk	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
36		50.02	Beach / Hyde	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
37		50.02	Beach / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
38		50.02	Beach / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
39		50.02	Jefferson / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
40		50.02	Jefferson / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
73	**Utilities**												$177,876
74		40.02	Water System Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
75		40.02	Sanitary & Storm Sewer Improvements	62,100	LS	$1.00	$62,100	32%	$19,872	30%	$18,630	$100,602	
76		40.02	Track Drainage Allowance	636	TF	$75.00	$47,700	32%	$15,264	30%	$14,310	$77,274	
77		40.02	AWSS Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
115	**Trackwork**												$1,360,400
116		10.03	Ri53 in Track Slab (Single)	636	TF	$500.00	$318,000	32%	$101,760	20%	$63,600	$483,360	
117		10.09	Allowance for Semi-Exclusive Delineation	635	TF	$200.00	$127,000	32%	$40,640	20%	$25,400	$193,040	
118		10.12	Turnout/Track Crossing Installation	3	EA	$150,000.00	$450,000	32%	$144,000	20%	$90,000	$684,000	
119		10.03	Cable Car Crossing Installation	0	EA	$250,000.00	$0	32%	$0	20%	$0	$0	
148	**Stations**											$0	$241,984
149		20.01	Standard Stop Platforms	1,984	SF	$50.00	$99,200	32%	$31,744	20%	$19,840	$150,784	
150		20.01	Mini High Stop Platforms	2	EA	$30,000.00	$60,000	32%	$19,200	20%	$12,000	$91,200	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$290,016
171		50.04	Traction Power and OCS	636	TF	$300.00	$190,800	32%	$61,056	20%	$38,160	$290,016	
177	**Signal system**												$516,800

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
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		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 103	**Fort Mason Turn Around**										1st Quarter
			SOUTH "Y"										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	340,000	LS	$1.00	$340,000	32%	$108,800	20%	$68,000	$516,800	
180	**Communications**												$30,400
181		50.05	Passenger Information Sign	2	EA	$10,000.00	$20,000	32%	$6,400	20%	$4,000	$30,400	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$4,105,376		$4,076,840	$21,283,900	$21,283,900
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$513,172						
208		80.02	Final Design			6%	$769,758						
209		80.03	Project Management for Design and Construction			5%	$641,465						
210		80.04	Construction Administration & Management			8%	$1,026,344						
211		80.05	Insurance			2%	$256,586						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$384,879						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$384,879						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$128,293						
215						32%	$4,105,376						
216	**Contingency**												
217		90.01	Unallocated Contingency				$4,076,840						

National Park Service - GGNRA - SFMNHP
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San Francisco, California

Historic Streetcar

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Historic Streetcar Extension
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		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 104	**Fort Mason Turn Around**										1st Quarter
			SOUTH LOOP										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$932,239
2		40.01	Common Excavation	2,300	CY	$14.00	$32,200	32%	$10,304	20%	$6,440	$48,944	
3		40.01	Roadway Excavation - 18" Depth	53	CY	$30.00	$1,600	32%	$512	20%	$320	$2,432	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	565	CY	$30.00	$16,950	32%	$5,424	20%	$3,390	$25,764	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	960	SF	$15.00	$14,400	32%	$4,608	20%	$2,880	$21,888	
6		40.07	AC Pavement Grind & Overlay (3")	0	SY	$30.00	$0	32%	$0	20%	$0	$0	
7		40.06	Standard PCC Sidewalk	740	SY	$70.00	$51,800	32%	$16,576	20%	$10,360	$78,736	
8		40.07	Standard PCC Curb and Gutter	360	LF	$50.00	$18,000	32%	$5,760	20%	$3,600	$27,360	
9		40.06	Landscaping	6,454	SF	$10.00	$64,540	32%	$20,653	20%	$12,908	$98,101	
10		40.06	Erosion Control Allowance	1,017	LF	$25.00	$25,425	32%	$8,136	20%	$5,085	$38,646	
11		40.05	Operators Restroom Facilities	1	LS	$80,000.00	$80,000	32%	$25,600	20%	$16,000	$121,600	
12		40.08	Temporary Traffic Control	300,000	LS	$1.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
13		40.01	Remove Existing Structure	560	SF	$15.00	$8,400	32%	$2,688	20%	$1,680	$12,768	
14		40.05	Relocate Bocce Ball Facilities	0	LS	$120,000.00	$0	32%	$0	20%	$0	$0	
22	**Structures**												$177,840
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	1,800	SF	$65.00	$117,000	32%	$37,440	20%	$23,400	$177,840	
25		40.05	Retaining Walls 10-20 feet high	0	SF	$70.00	$0	32%	$0	20%	$0	$0	
28	**Tunnel**												$16,700,000
29		10.07	Existing Tunnel Rehab & Improvements	1	LS	$10,000,000.00	$10,000,000	32%	$3,200,000	35%	$3,500,000	$16,700,000	
34	**Traffic Signal**												$0
35		50.02	Beach / Polk	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
36		50.02	Beach / Hyde	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
37		50.02	Beach / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
38		50.02	Beach / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
39		50.02	Jefferson / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
40		50.02	Jefferson / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
73	**Utilities**												$224,168
74		40.02	Water System Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
75		40.02	Sanitary & Storm Sewer Improvements	62,100	LS	$1.00	$62,100	32%	$19,872	30%	$18,630	$100,602	
76		40.02	Track Drainage Allowance	1,017	TF	$75.00	$76,275	32%	$24,408	30%	$22,883	$123,566	
77		40.02	AWSS Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
115	**Trackwork**												$1,537,784
116		10.03	Ri53 in Track Slab (Single)	1,017	TF	$500.00	$508,500	32%	$162,720	20%	$101,700	$772,920	
117		10.09	Allowance for Semi-Exclusive Delineation	1,016	TF	$200.00	$203,200	32%	$65,024	20%	$40,640	$308,864	
118		10.12	Turnout/Track Crossing Installation	2	EA	$150,000.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
119		10.03	Cable Car Crossing Installation	0	EA	$250,000.00	$0	32%	$0	20%	$0	$0	
148	**Stations**											$0	$220,400
149		20.01	Standard Stop Platforms	1,700	SF	$50.00	$85,000	32%	$27,200	20%	$17,000	$129,200	
150		20.01	Mini High Stop Platforms	2	EA	$30,000.00	$60,000	32%	$19,200	20%	$12,000	$91,200	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$463,752
171		50.04	Traction Power and OCS	1,017	TF	$300.00	$305,100	32%	$97,632	20%	$61,020	$463,752	
177	**Signal system**												$395,200

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		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 104	**Fort Mason Turn Around**										1st Quarter
			SOUTH LOOP										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	260,000	LS	$1.00	$260,000	32%	$83,200	20%	$52,000	$395,200	
180	**Communications**												$30,400
181		50.05	Passenger Information Sign	2	EA	$10,000.00	$20,000	32%	$6,400	20%	$4,000	$30,400	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$4,025,053		$4,029,496	$20,681,782	$20,681,782
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$503,132						
208		80.02	Final Design			6%	$754,697						
209		80.03	Project Management for Design and Construction			5%	$628,915						
210		80.04	Construction Administration & Management			8%	$1,006,263						
211		80.05	Insurance			2%	$251,566						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$377,349						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$377,349						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$125,783						
215						32%	$4,025,053						
216	**Contingency**												
217		90.01	Unallocated Contingency				$4,029,496						

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San Francisco, California									
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Order of Magnitude Estimate									
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		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 105	**Fort Mason Turn Around**										1st Quarter
			"FULL" Wye										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$1,046,768
2		40.01	Common Excavation	1,400	CY	$14.00	$19,600	32%	$6,272	20%	$3,920	$29,792	
3		40.01	Roadway Excavation - 18" Depth	67	CY	$30.00	$2,000	32%	$640	20%	$400	$3,040	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	421	CY	$30.00	$12,633	32%	$4,043	20%	$2,527	$19,203	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	1,200	SF	$15.00	$18,000	32%	$5,760	20%	$3,600	$27,360	
6		40.07	AC Pavement Grind & Overlay (3")	0	SY	$30.00	$0	32%	$0	20%	$0	$0	
7		40.06	Standard PCC Sidewalk	564	SY	$70.00	$39,480	32%	$12,634	20%	$7,896	$60,010	
8		40.07	Standard PCC Curb and Gutter	500	LF	$50.00	$25,000	32%	$8,000	20%	$5,000	$38,000	
9		40.06	Landscaping	11,600	SF	$10.00	$116,000	32%	$37,120	20%	$23,200	$176,320	
10		40.06	Erosion Control Allowance	758	LF	$25.00	$18,950	32%	$6,064	20%	$3,790	$28,804	
11		40.05	Operators Restroom Facilities	1	LS	$80,000.00	$80,000	32%	$25,600	20%	$16,000	$121,600	
12		40.08	Temporary Traffic Control	300,000	LS	$1.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
13		40.01	Remove Existing Structure	3,800	SF	$15.00	$57,000	32%	$18,240	20%	$11,400	$86,640	
14		40.05	Relocate Bocce Ball Facilities	0	LS	$120,000.00	$0	32%	$0	20%	$0	$0	
22	**Structures**												$180,880
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	0	SF	$65.00	$0	32%	$0	20%	$0	$0	
25		40.05	Retaining Walls 10-20 feet high	1,700	SF	$70.00	$119,000	32%	$38,080	20%	$23,800	$180,880	
28	**Tunnel**												$16,700,000
29		10.07	Existing Tunnel Rehab & Improvements	1	LS	$10,000,000.00	$10,000,000	32%	$3,200,000	35%	$3,500,000	$16,700,000	
34	**Traffic Signal**												$0
35		50.02	Beach / Polk	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
36		50.02	Beach / Hyde	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
37		50.02	Beach / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
38		50.02	Beach / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
39		50.02	Jefferson / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
40		50.02	Jefferson / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
73	**Utilities**												$295,569
74		40.02	Water System Improvements	29,000	LS	$1.00	$29,000	32%	$9,280	30%	$8,700	$46,980	
75		40.02	Sanitary & Storm Sewer Improvements	96,600	LS	$1.00	$96,600	32%	$30,912	30%	$28,980	$156,492	
76		40.02	Track Drainage Allowance	758	TF	$75.00	$56,850	32%	$18,192	30%	$17,055	$92,097	
77		40.02	AWSS Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
115	**Trackwork**												$1,679,600
116		10.03	Ri53 in Track Slab (Single)	758	TF	$500.00	$379,000	32%	$121,280	20%	$75,800	$576,080	
117		10.09	Allowance for Semi-Exclusive Delineation	630	TF	$200.00	$126,000	32%	$40,320	20%	$25,200	$191,520	
118		10.12	Turnout/Track Crossing Installation	4	EA	$150,000.00	$600,000	32%	$192,000	20%	$120,000	$912,000	
119		10.03	Cable Car Crossing Installation	0	EA	$250,000.00	$0	32%	$0	20%	$0	$0	
148	**Stations**											$0	$307,420
149		20.01	Standard Stop Platforms	2,845	SF	$50.00	$142,250	32%	$45,520	20%	$28,450	$216,220	
150		20.01	Mini High Stop Platforms	2	EA	$30,000.00	$60,000	32%	$19,200	20%	$12,000	$91,200	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$345,648
171		50.04	Traction Power and OCS	758	TF	$300.00	$227,400	32%	$72,768	20%	$45,480	$345,648	
177	**Signal system**												$577,600

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		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 105	**Fort Mason Turn Around**										1st Quarter
			"FULL" Wye										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	380,000	LS	$1.00	$380,000	32%	$121,600	20%	$76,000	$577,600	
180	**Communications**												$30,400
181		50.05	Passenger Information Sign	2	EA	$10,000.00	$20,000	32%	$6,400	20%	$4,000	$30,400	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$4,129,652		$4,099,278	$21,163,885	$21,163,885
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$516,207						
208		80.02	Final Design			6%	$774,310						
209		80.03	Project Management for Design and Construction			5%	$645,258						
210		80.04	Construction Administration & Management			8%	$1,032,413						
211		80.05	Insurance			2%	$258,103						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$387,155						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$387,155						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$129,052						
215						32%	$4,129,652						
216	**Contingency**												
217		90.01	Unallocated Contingency				$4,099,278						

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
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San Francisco, California

Historic Streetcar

Order of Magnitude Estimate

Estimate Spread to FTA Descriptions

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
201

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 201	0										1st Quarter
			Transition Area 1 of 2										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$1,076,206
2		40.01	Common Excavation	1,900	CY	$14.00	$26,600	32%	$8,512	20%	$5,320	$40,432	
3		40.01	Roadway Excavation - 18" Depth	117	CY	$30.00	$3,500	32%	$1,120	20%	$700	$5,320	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	740	CY	$30.00	$22,200	32%	$7,104	20%	$4,440	$33,744	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	2,100	SF	$15.00	$31,500	32%	$10,080	20%	$6,300	$47,880	
6		40.07	AC Pavement Grind & Overlay (3")	0	SY	$30.00	$0	32%	$0	20%	$0	$0	
7		40.06	Standard PCC Sidewalk	760	SY	$70.00	$53,200	32%	$17,024	20%	$10,640	$80,864	
8		40.07	Standard PCC Curb and Gutter	404	LF	$50.00	$20,200	32%	$6,464	20%	$4,040	$30,704	
9		40.06	Landscaping	9,753	SF	$10.00	$97,530	32%	$31,210	20%	$19,506	$148,246	
10		40.06	Erosion Control Allowance	1,332	LF	$25.00	$33,300	32%	$10,656	20%	$6,660	$50,616	
11		40.05	Operators Restroom Facilities	0	LS	$80,000.00	$0	32%	$0	20%	$0	$0	
12		40.08	Temporary Traffic Control	300,000	LS	$1.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
13		40.01	Remove Existing Structure	0	SF	$15.00	$0	32%	$0	20%	$0	$0	
14		40.05	Relocate Bocce Ball Facilities	1	LS	$120,000.00	$120,000	32%	$38,400	20%	$24,000	$182,400	
22	**Structures**												$145,920
23		40.05	Retaining Walls to 5' High	300	SF	$60.00	$18,000	32%	$5,760	20%	$3,600	$27,360	
24		40.05	Retaining Walls 5-10 feet high	1,200	SF	$65.00	$78,000	32%	$24,960	20%	$15,600	$118,560	
25		40.05	Retaining Walls 10-20 feet high	0	SF	$70.00	$0	32%	$0	20%	$0	$0	
28	**Tunnel**												$0
29		10.07	Existing Tunnel Rehab & Improvements	0	LS	$10,000,000.00	$0	32%	$0	35%	$0	$0	
34	**Traffic Signal**												$0
35		50.02	Beach / Polk	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
36		50.02	Beach / Hyde	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
37		50.02	Beach / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
38		50.02	Beach / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
39		50.02	Jefferson / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
40		50.02	Jefferson / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
73	**Utilities**												$310,878
74		40.02	Water System Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
75		40.02	Sanitary & Storm Sewer Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
76		40.02	Track Drainage Allowance	1,332	TF	$75.00	$99,900	32%	$31,968	30%	$29,970	$161,838	
77		40.02	AWSS Improvements	92,000	LS	$1.00	$92,000	32%	$29,440	30%	$27,600	$149,040	
115	**Trackwork**												$1,629,440
116		10.03	Ri53 in Track Slab (Single)	1,332	TF	$500.00	$666,000	32%	$213,120	20%	$133,200	$1,012,320	
117		10.09	Allowance for Semi-Exclusive Delineation	1,280	TF	$200.00	$256,000	32%	$81,920	20%	$51,200	$389,120	
118		10.12	Turnout/Track Crossing Installation	1	EA	$150,000.00	$150,000	32%	$48,000	20%	$30,000	$228,000	
119		10.03	Cable Car Crossing Installation	0	EA	$250,000.00	$0	32%	$0	20%	$0	$0	
148	**Stations**											$0	$344,356
149		20.01	Standard Stop Platforms	3,331	SF	$50.00	$166,550	32%	$53,296	20%	$33,310	$253,156	
150		20.01	Mini High Stop Platforms	2	EA	$30,000.00	$60,000	32%	$19,200	20%	$12,000	$91,200	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$607,392
171		50.04	Traction Power and OCS	1,332	TF	$300.00	$399,600	32%	$127,872	20%	$79,920	$607,392	
177	**Signal system**												$60,800

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
201

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 201	**0**										1st Quarter
			Transition Area 1 of 2										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	40,000	LS	$1.00	$40,000	32%	$12,800	20%	$8,000	$60,800	
180	**Communications**												$30,400
181		50.05	Passenger Information Sign	2	EA	$10,000.00	$20,000	32%	$6,400	20%	$4,000	$30,400	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$872,794		$564,686	$4,205,392	$4,205,392
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$109,099						
208		80.02	Final Design			6%	$163,649						
209		80.03	Project Management for Design and Construction			5%	$136,374						
210		80.04	Construction Administration & Management			8%	$218,198						
211		80.05	Insurance			2%	$54,550						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$81,824						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$81,824						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$27,275						
215						32%	$872,794						
216	**Contingency**												
217		90.01	Unallocated Contingency				$564,686						

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
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San Francisco, California

Historic Streetcar

Order of Magnitude Estimate

Estimate Spread to FTA Descriptions

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
202

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 202	0										1st Quarter
			Transition Area 2 of 2										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$1,215,726
2		40.01	Common Excavation	1,900	CY	$14.00	$26,600	32%	$8,512	20%	$5,320	$40,432	
3		40.01	Roadway Excavation - 18" Depth	117	CY	$30.00	$3,500	32%	$1,120	20%	$700	$5,320	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	840	CY	$30.00	$25,200	32%	$8,064	20%	$5,040	$38,304	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	2,100	SF	$15.00	$31,500	32%	$10,080	20%	$6,300	$47,880	
6		40.07	AC Pavement Grind & Overlay (3")	0	SY	$30.00	$0	32%	$0	20%	$0	$0	
7		40.06	Standard PCC Sidewalk	921	SY	$70.00	$64,470	32%	$20,630	20%	$12,894	$97,994	
8		40.07	Standard PCC Curb and Gutter	732	LF	$50.00	$36,600	32%	$11,712	20%	$7,320	$55,632	
9		40.06	Landscaping	15,415	SF	$10.00	$154,150	32%	$49,328	20%	$30,830	$234,308	
10		40.06	Erosion Control Allowance	1,512	LF	$25.00	$37,800	32%	$12,096	20%	$7,560	$57,456	
11		40.05	Operators Restroom Facilities	0	LS	$80,000.00	$0	32%	$0	20%	$0	$0	
12		40.08	Temporary Traffic Control	300,000	LS	$1.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
13		40.01	Remove Existing Structure	0	SF	$15.00	$0	32%	$0	20%	$0	$0	
14		40.05	Relocate Bocce Ball Facilities	1	LS	$120,000.00	$120,000	32%	$38,400	20%	$24,000	$182,400	
22	**Structures**												$148,200
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	1,500	SF	$65.00	$97,500	32%	$31,200	20%	$19,500	$148,200	
25		40.05	Retaining Walls 10-20 feet high	0	SF	$70.00	$0	32%	$0	20%	$0	$0	
28	**Tunnel**												$0
29		10.07	Existing Tunnel Rehab & Improvements	0	LS	$10,000,000.00	$0	32%	$0	35%	$0	$0	
34	**Traffic Signal**												$0
35		50.02	Beach / Polk	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
36		50.02	Beach / Hyde	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
37		50.02	Beach / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
38		50.02	Beach / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
39		50.02	Jefferson / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
40		50.02	Jefferson / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
73	**Utilities**												$407,268
74		40.02	Water System Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
75		40.02	Sanitary & Storm Sewer Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
76		40.02	Track Drainage Allowance	1,512	TF	$75.00	$113,400	32%	$36,288	30%	$34,020	$183,708	
77		40.02	AWSS Improvements	138,000	LS	$1.00	$138,000	32%	$44,160	30%	$41,400	$223,560	
115	**Trackwork**												$1,802,720
116		10.03	Ri53 in Track Slab (Single)	1,512	TF	$500.00	$756,000	32%	$241,920	20%	$151,200	$1,149,120	
117		10.09	Allowance for Semi-Exclusive Delineation	1,400	TF	$200.00	$280,000	32%	$89,600	20%	$56,000	$425,600	
118		10.12	Turnout/Track Crossing Installation	1	EA	$150,000.00	$150,000	32%	$48,000	20%	$30,000	$228,000	
119		10.03	Cable Car Crossing Installation	0	EA	$250,000.00	$0	32%	$0	20%	$0	$0	
148	**Stations**											$0	$286,748
149		20.01	Standard Stop Platforms	2,573	SF	$50.00	$128,650	32%	$41,168	20%	$25,730	$195,548	
150		20.01	Mini High Stop Platforms	2	EA	$30,000.00	$60,000	32%	$19,200	20%	$12,000	$91,200	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$689,472
171		50.04	Traction Power and OCS	1,512	TF	$300.00	$453,600	32%	$145,152	20%	$90,720	$689,472	
177	**Signal system**												$60,800

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Historic Streetcar Extension
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		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 202	0										1st Quarter
			Transition Area 2 of 2										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	40,000	LS	$1.00	$40,000	32%	$12,800	20%	$8,000	$60,800	
180	**Communications**												$30,400
181		50.05	Passenger Information Sign	2	EA	$10,000.00	$20,000	32%	$6,400	20%	$4,000	$30,400	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$963,318		$627,214	$4,641,334	$4,641,334
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$120,415						
208		80.02	Final Design			6%	$180,622						
209		80.03	Project Management for Design and Construction			5%	$150,519						
210		80.04	Construction Administration & Management			8%	$240,830						
211		80.05	Insurance			2%	$60,207						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$90,311						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$90,311						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$30,104						
215						32%	$963,318						
216	**Contingency**												
217		90.01	Unallocated Contingency				$627,214						

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
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San Francisco, California	
Historic Streetcar	
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		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 301	**Polk to Larkin St**										1st Quarter
			Beach Street 1 of 2 - Shared Lane										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$1,390,101
2		40.01	Common Excavation	0	CY	$14.00	$0	32%	$0	20%	$0	$0	
3		40.01	Roadway Excavation - 18" Depth	1,120	CY	$30.00	$33,592	32%	$10,749	20%	$6,718	$51,059	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	744	CY	$30.00	$22,333	32%	$7,147	20%	$4,467	$33,947	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	20,155	SF	$15.00	$302,325	32%	$96,744	20%	$60,465	$459,534	
6		40.07	AC Pavement Grind & Overlay (3")	156	SY	$30.00	$4,680	32%	$1,498	20%	$936	$7,114	
7		40.06	Standard PCC Sidewalk	163	SY	$70.00	$11,410	32%	$3,651	20%	$2,282	$17,343	
8		40.07	Standard PCC Curb and Gutter	134	LF	$50.00	$6,700	32%	$2,144	20%	$1,340	$10,184	
9		40.06	Landscaping	0	SF	$10.00	$0	32%	$0	20%	$0	$0	
10		40.06	Erosion Control Allowance	1,340	LF	$25.00	$33,500	32%	$10,720	20%	$6,700	$50,920	
11		40.05	Operators Restroom Facilities	0	LS	$80,000.00	$0	32%	$0	20%	$0	$0	
12		40.08	Temporary Traffic Control	500,000	LS	$1.00	$500,000	32%	$160,000	20%	$100,000	$760,000	
13		40.01	Remove Existing Structure	0	SF	$15.00	$0	32%	$0	20%	$0	$0	
14		40.05	Relocate Bocce Ball Facilities	0	LS	$120,000.00	$0	32%	$0	20%	$0	$0	
22	**Structures**												$0
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	0	SF	$65.00	$0	32%	$0	20%	$0	$0	
25		40.05	Retaining Walls 10-20 feet high	0	SF	$70.00	$0	32%	$0	20%	$0	$0	
28	**Tunnel**												$0
29		10.07	Existing Tunnel Rehab & Improvements	0	LS	$10,000,000.00	$0	32%	$0	35%	$0	$0	
34	**Traffic Signal**												$380,000
35		50.02	Beach / Polk	250,000	LS	$1.00	$250,000	32%	$80,000	20%	$50,000	$380,000	
36		50.02	Beach / Hyde	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
37		50.02	Beach / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
38		50.02	Beach / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
39		50.02	Jefferson / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
40		50.02	Jefferson / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
73	**Utilities**												$1,187,460
74		40.02	Water System Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
75		40.02	Sanitary & Storm Sewer Improvements	632,500	LS	$1.00	$632,500	32%	$202,400	30%	$189,750	$1,024,650	
76		40.02	Track Drainage Allowance	1,340	TF	$75.00	$100,500	32%	$32,160	30%	$30,150	$162,810	
77		40.02	AWSS Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
115	**Trackwork**												$1,018,400
116		10.03	Ri53 in Track Slab (Single)	1,340	TF	$500.00	$670,000	32%	$214,400	20%	$134,000	$1,018,400	
117		10.09	Allowance for Semi-Exclusive Delineation	0	TF	$200.00	$0	32%	$0	20%	$0	$0	
118		10.12	Turnout/Track Crossing Installation	0	EA	$150,000.00	$0	32%	$0	20%	$0	$0	
119		10.03	Cable Car Crossing Installation	0	EA	$250,000.00	$0	32%	$0	20%	$0	$0	
148	**Stations**											$0	$0
149		20.01	Standard Stop Platforms	0	SF	$50.00	$0	32%	$0	20%	$0	$0	
150		20.01	Mini High Stop Platforms	0	EA	$30,000.00	$0	32%	$0	20%	$0	$0	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$611,040
171		50.04	Traction Power and OCS	1,340	TF	$300.00	$402,000	32%	$128,640	20%	$80,400	$611,040	
177	**Signal system**												$0

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
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		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 301	**Polk to Larkin St**										1st Quarter
			Beach Street 1 of 2 - Shared Lane										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
180	**Communications**												$0
181		50.05	Passenger Information Sign	0	EA	$10,000.00	$0	32%	$0	20%	$0	$0	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$950,253		$667,208	$4,587,001	$4,587,001
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$118,782						
208		80.02	Final Design			6%	$178,172						
209		80.03	Project Management for Design and Construction			5%	$148,477						
210		80.04	Construction Administration & Management			8%	$237,563						
211		80.05	Insurance			2%	$59,391						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$89,086						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$89,086						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$29,695						
215						32%	$950,253						
216	**Contingency**												
217		90.01	Unallocated Contingency				$667,208						

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
301

San Francisco, California

Historic Streetcar

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Estimate Spread to FTA Descriptions

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
302

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 302	**Polk to Larkin St**										1st Quarter
			Beach Street 2 of 2 - Exclusive										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$1,374,480
2		40.01	Common Excavation	0	CY	$14.00	$0	32%	$0	20%	$0	$0	
3		40.01	Roadway Excavation - 18" Depth	1,120	CY	$30.00	$33,592	32%	$10,749	20%	$6,718	$51,059	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	756	CY	$30.00	$22,667	32%	$7,253	20%	$4,533	$34,453	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	20,155	SF	$15.00	$302,325	32%	$96,744	20%	$60,465	$459,534	
6		40.07	AC Pavement Grind & Overlay (3")	156	SY	$30.00	$4,680	32%	$1,498	20%	$936	$7,114	
7		40.06	Standard PCC Sidewalk	100	SY	$70.00	$7,000	32%	$2,240	20%	$1,400	$10,640	
8		40.07	Standard PCC Curb and Gutter	0	LF	$50.00	$0	32%	$0	20%	$0	$0	
9		40.06	Landscaping	0	SF	$10.00	$0	32%	$0	20%	$0	$0	
10		40.06	Erosion Control Allowance	1,360	LF	$25.00	$34,000	32%	$10,880	20%	$6,800	$51,680	
11		40.05	Operators Restroom Facilities	0	LS	$80,000.00	$0	32%	$0	20%	$0	$0	
12		40.08	Temporary Traffic Control	500,000	LS	$1.00	$500,000	32%	$160,000	20%	$100,000	$760,000	
13		40.01	Remove Existing Structure	0	SF	$15.00	$0	32%	$0	20%	$0	$0	
14		40.05	Relocate Bocce Ball Facilities	0	LS	$120,000.00	$0	32%	$0	20%	$0	$0	
22	**Structures**												$0
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	0	SF	$65.00	$0	32%	$0	20%	$0	$0	
25		40.05	Retaining Walls 10-20 feet high	0	SF	$70.00	$0	32%	$0	20%	$0	$0	
28	**Tunnel**												$0
29		10.07	Existing Tunnel Rehab & Improvements	0	LS	$10,000,000.00	$0	32%	$0	35%	$0	$0	
34	**Traffic Signal**												$380,000
35		50.02	Beach / Polk	250,000	LS	$1.00	$250,000	32%	$80,000	20%	$50,000	$380,000	
36		50.02	Beach / Hyde	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
37		50.02	Beach / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
38		50.02	Beach / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
39		50.02	Jefferson / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
40		50.02	Jefferson / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
73	**Utilities**												$1,189,890
74		40.02	Water System Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
75		40.02	Sanitary & Storm Sewer Improvements	632,500	LS	$1.00	$632,500	32%	$202,400	30%	$189,750	$1,024,650	
76		40.02	Track Drainage Allowance	1,360	TF	$75.00	$102,000	32%	$32,640	30%	$30,600	$165,240	
77		40.02	AWSS Improvements	0	LS	$1.00	$0	32%	$0	30%	$0	$0	
115	**Trackwork**												$1,216,000
116		10.03	Ri53 in Track Slab (Single)	1,360	TF	$500.00	$680,000	32%	$217,600	20%	$136,000	$1,033,600	
117		10.09	Allowance for Semi-Exclusive Delineation	600	TF	$200.00	$120,000	32%	$38,400	20%	$24,000	$182,400	
118		10.12	Turnout/Track Crossing Installation	0	EA	$150,000.00	$0	32%	$0	20%	$0	$0	
119		10.03	Cable Car Crossing Installation	0	EA	$250,000.00	$0	32%	$0	20%	$0	$0	
148	**Stations**											$0	$0
149		20.01	Standard Stop Platforms	0	SF	$50.00	$0	32%	$0	20%	$0	$0	
150		20.01	Mini High Stop Platforms	0	EA	$30,000.00	$0	32%	$0	20%	$0	$0	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$620,160
171		50.04	Traction Power and OCS	1,360	TF	$300.00	$408,000	32%	$130,560	20%	$81,600	$620,160	
177	**Signal system**												$0

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		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 302	**Polk to Larkin St**										1st Quarter
			Beach Street 2 of 2 - Exclusive										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
180	**Communications**												$0
181		50.05	Passenger Information Sign	0	EA	$10,000.00	$0	32%	$0	20%	$0	$0	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$990,964		$692,803	$4,780,530	$4,780,530
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$123,871						
208		80.02	Final Design			6%	$185,806						
209		80.03	Project Management for Design and Construction			5%	$154,838						
210		80.04	Construction Administration & Management			8%	$247,741						
211		80.05	Insurance			2%	$61,935						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$92,903						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$92,903						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$30,968						
215						32%	$990,964						
216	**Contingency**												
217		90.01	Unallocated Contingency				$692,803						

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National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
401

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 401	**Larkin to Leavenworth**										1st Quarter
			Beach Street 1 of 2 - Shared Lane										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$1,740,919
2		40.01	Common Excavation	0	CY	$14.00	$0	32%	$0	20%	$0	$0	
3		40.01	Roadway Excavation - 18" Depth	814	CY	$30.00	$24,430	32%	$7,818	20%	$4,886	$37,134	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	857	CY	$30.00	$25,717	32%	$8,229	20%	$5,143	$39,089	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	14,658	SF	$15.00	$219,870	32%	$70,358	20%	$43,974	$334,202	
6		40.07	AC Pavement Grind & Overlay (3")	333	SY	$30.00	$9,990	32%	$3,197	20%	$1,998	$15,185	
7		40.06	Standard PCC Sidewalk	1,363	SY	$70.00	$95,410	32%	$30,531	20%	$19,082	$145,023	
8		40.07	Standard PCC Curb and Gutter	627	LF	$50.00	$31,350	32%	$10,032	20%	$6,270	$47,652	
9		40.06	Landscaping	0	SF	$10.00	$0	32%	$0	20%	$0	$0	
10		40.06	Erosion Control Allowance	1,543	LF	$25.00	$38,575	32%	$12,344	20%	$7,715	$58,634	
11		40.05	Operators Restroom Facilities	0	LS	$80,000.00	$0	32%	$0	20%	$0	$0	
12		40.08	Temporary Traffic Control	700,000	LS	$1.00	$700,000	32%	$224,000	20%	$140,000	$1,064,000	
13		40.01	Remove Existing Structure	0	SF	$15.00	$0	32%	$0	20%	$0	$0	
14		40.05	Relocate Bocce Ball Facilities	0	LS	$120,000.00	$0	32%	$0	20%	$0	$0	
22	**Structures**												$0
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	0	SF	$65.00	$0	32%	$0	20%	$0	$0	
25		40.05	Retaining Walls 10-20 feet high	0	SF	$70.00	$0	32%	$0	20%	$0	$0	
28	**Tunnel**												$0
29		10.07	Existing Tunnel Rehab & Improvements	0	LS	$10,000,000.00	$0	32%	$0	35%	$0	$0	
34	**Traffic Signal**												$152,000
35		50.02	Beach / Polk	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
36		50.02	Beach / Hyde	100,000	LS	$1.00	$100,000	32%	$32,000	20%	$20,000	$152,000	
37		50.02	Beach / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
38		50.02	Beach / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
39		50.02	Jefferson / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
40		50.02	Jefferson / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
73	**Utilities**												$2,160,797
74		40.02	Water System Improvements	125,600	LS	$1.00	$125,600	32%	$40,192	30%	$37,680	$203,472	
75		40.02	Sanitary & Storm Sewer Improvements	747,500	LS	$1.00	$747,500	32%	$239,200	30%	$224,250	$1,210,950	
76		40.02	Track Drainage Allowance	1,543	TF	$75.00	$115,725	32%	$37,032	30%	$34,718	$187,475	
77		40.02	AWSS Improvements	345,000	LS	$1.00	$345,000	32%	$110,400	30%	$103,500	$558,900	
115	**Trackwork**												$2,692,680
116		10.03	Ri53 in Track Slab (Single)	1,543	TF	$500.00	$771,500	32%	$246,880	20%	$154,300	$1,172,680	
117		10.09	Allowance for Semi-Exclusive Delineation	0	TF	$200.00	$0	32%	$0	20%	$0	$0	
118		10.12	Turnout/Track Crossing Installation	0	EA	$150,000.00	$0	32%	$0	20%	$0	$0	
119		10.03	Cable Car Crossing Installation	4	EA	$250,000.00	$1,000,000	32%	$320,000	20%	$200,000	$1,520,000	
148	**Stations**											$0	$242,440
149		20.01	Standard Stop Platforms	1,990	SF	$50.00	$99,500	32%	$31,840	20%	$19,900	$151,240	
150		20.01	Mini High Stop Platforms	2	EA	$30,000.00	$60,000	32%	$19,200	20%	$12,000	$91,200	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$703,608
171		50.04	Traction Power and OCS	1,543	TF	$300.00	$462,900	32%	$148,128	20%	$92,580	$703,608	
177	**Signal system**												$0

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401

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 401	**Larkin to Leavenworth**										1st Quarter
			Beach Street 1 of 2 - Shared Lane										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
180	**Communications**												$30,400
181		50.05	Passenger Information Sign	2	EA	$10,000.00	$20,000	32%	$6,400	20%	$4,000	$30,400	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$1,597,781		$1,131,996	$7,722,844	$7,722,844
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$199,723						
208		80.02	Final Design			6%	$299,584						
209		80.03	Project Management for Design and Construction			5%	$249,653						
210		80.04	Construction Administration & Management			8%	$399,445						
211		80.05	Insurance			2%	$99,861						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$149,792						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$149,792						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$49,931						
215						32%	$1,597,781						
216	**Contingency**												
217		90.01	Unallocated Contingency				$1,131,996						

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402

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 402	**Larkin to Leavenworth**										1st Quarter
			Beach Street 2 of 2 - Exclusive										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$1,726,869
2		40.01	Common Excavation	0	CY	$14.00	$0	32%	$0	20%	$0	$0	
3		40.01	Roadway Excavation - 18" Depth	814	CY	$30.00	$24,430	32%	$7,818	20%	$4,886	$37,134	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	856	CY	$30.00	$25,683	32%	$8,219	20%	$5,137	$39,039	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	14,658	SF	$15.00	$219,870	32%	$70,358	20%	$43,974	$334,202	
6		40.07	AC Pavement Grind & Overlay (3")	333	SY	$30.00	$9,990	32%	$3,197	20%	$1,998	$15,185	
7		40.06	Standard PCC Sidewalk	1,300	SY	$70.00	$91,000	32%	$29,120	20%	$18,200	$138,320	
8		40.07	Standard PCC Curb and Gutter	532	LF	$50.00	$26,600	32%	$8,512	20%	$5,320	$40,432	
9		40.06	Landscaping	0	SF	$10.00	$0	32%	$0	20%	$0	$0	
10		40.06	Erosion Control Allowance	1,541	LF	$25.00	$38,525	32%	$12,328	20%	$7,705	$58,558	
11		40.05	Operators Restroom Facilities	0	LS	$80,000.00	$0	32%	$0	20%	$0	$0	
12		40.08	Temporary Traffic Control	700,000	LS	$1.00	$700,000	32%	$224,000	20%	$140,000	$1,064,000	
13		40.01	Remove Existing Structure	0	SF	$15.00	$0	32%	$0	20%	$0	$0	
14		40.05	Relocate Bocce Ball Facilities	0	LS	$120,000.00	$0	32%	$0	20%	$0	$0	
22	**Structures**												$0
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	0	SF	$65.00	$0	32%	$0	20%	$0	$0	
25		40.05	Retaining Walls 10-20 feet high	0	SF	$70.00	$0	32%	$0	20%	$0	$0	
28	**Tunnel**												$0
29		10.07	Existing Tunnel Rehab & Improvements	0	LS	$10,000,000.00	$0	32%	$0	35%	$0	$0	
34	**Traffic Signal**												$152,000
35		50.02	Beach / Polk	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
36		50.02	Beach / Hyde	100,000	LS	$1.00	$100,000	32%	$32,000	20%	$20,000	$152,000	
37		50.02	Beach / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
38		50.02	Beach / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
39		50.02	Jefferson / Jones	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
40		50.02	Jefferson / Leavenworth	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
73	**Utilities**												$2,160,554
74		40.02	Water System Improvements	125,600	LS	$1.00	$125,600	32%	$40,192	30%	$37,680	$203,472	
75		40.02	Sanitary & Storm Sewer Improvements	747,500	LS	$1.00	$747,500	32%	$239,200	30%	$224,250	$1,210,950	
76		40.02	Track Drainage Allowance	1,541	TF	$75.00	$115,575	32%	$36,984	30%	$34,673	$187,232	
77		40.02	AWSS Improvements	345,000	LS	$1.00	$345,000	32%	$110,400	30%	$103,500	$558,900	
115	**Trackwork**												$2,928,280
116		10.03	Ri53 in Track Slab (Single)	1,541	TF	$500.00	$770,500	32%	$246,560	20%	$154,100	$1,171,160	
117		10.09	Allowance for Semi-Exclusive Delineation	780	TF	$200.00	$156,000	32%	$49,920	20%	$31,200	$237,120	
118		10.12	Turnout/Track Crossing Installation	0	EA	$150,000.00	$0	32%	$0	20%	$0	$0	
119		10.03	Cable Car Crossing Installation	4	EA	$250,000.00	$1,000,000	32%	$320,000	20%	$200,000	$1,520,000	
148	**Stations**											$0	$242,440
149		20.01	Standard Stop Platforms	1,990	SF	$50.00	$99,500	32%	$31,840	20%	$19,900	$151,240	
150		20.01	Mini High Stop Platforms	2	EA	$30,000.00	$60,000	32%	$19,200	20%	$12,000	$91,200	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$702,696
171		50.04	Traction Power and OCS	1,541	TF	$300.00	$462,300	32%	$147,936	20%	$92,460	$702,696	
177	**Signal system**												$0

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
402

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 402	**Larkin to Leavenworth**										1st Quarter
			Beach Street 2 of 2 - Exclusive										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
180	**Communications**												$30,400
181		50.05	Passenger Information Sign	2	EA	$10,000.00	$20,000	32%	$6,400	20%	$4,000	$30,400	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$1,644,183		$1,160,982	$7,943,239	$7,943,239
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$205,523						
208		80.02	Final Design			6%	$308,284						
209		80.03	Project Management for Design and Construction			5%	$256,904						
210		80.04	Construction Administration & Management			8%	$411,046						
211		80.05	Insurance			2%	$102,761						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$154,142						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$154,142						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$51,381						
215						32%	$1,644,183						
216	**Contingency**												
217		90.01	Unallocated Contingency				$1,160,982						

San Francisco, California

Historic Streetcar

Order of Magnitude Estimate

Estimate Spread to FTA Descriptions

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
501

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 501	**On Beach - Leavenworth to Jones**										1st Quarter
			Connection to Existing "F" Line w/ TO										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$2,276,762
2		40.01	Common Excavation	0	CY	$14.00	$0	32%	$0	20%	$0	$0	
3		40.01	Roadway Excavation - 18" Depth	1,475	CY	$30.00	$44,250	32%	$14,160	20%	$8,850	$67,260	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	983	CY	$30.00	$29,500	32%	$9,440	20%	$5,900	$44,840	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	26,550	SF	$15.00	$398,250	32%	$127,440	20%	$79,650	$605,340	
6		40.07	AC Pavement Grind & Overlay (3")	889	SY	$30.00	$26,670	32%	$8,534	20%	$5,334	$40,538	
7		40.06	Standard PCC Sidewalk	1,800	SY	$70.00	$126,000	32%	$40,320	20%	$25,200	$191,520	
8		40.07	Standard PCC Curb and Gutter	579	LF	$50.00	$28,950	32%	$9,264	20%	$5,790	$44,004	
9		40.06	Landscaping	0	SF	$10.00	$0	32%	$0	20%	$0	$0	
10		40.06	Erosion Control Allowance	1,770	LF	$25.00	$44,250	32%	$14,160	20%	$8,850	$67,260	
11		40.05	Operators Restroom Facilities	0	LS	$80,000.00	$0	32%	$0	20%	$0	$0	
12		40.08	Temporary Traffic Control	800,000	LS	$1.00	$800,000	32%	$256,000	20%	$160,000	$1,216,000	
13		40.01	Remove Existing Structure	0	SF	$15.00	$0	32%	$0	20%	$0	$0	
14		40.05	Relocate Bocce Ball Facilities	0	LS	$120,000.00	$0	32%	$0	20%	$0	$0	
22	**Structures**												$0
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	0	SF	$65.00	$0	32%	$0	20%	$0	$0	
25		40.05	Retaining Walls 10-20 feet high	0	SF	$70.00	$0	32%	$0	20%	$0	$0	
28	**Tunnel**												$0
29		10.07	Existing Tunnel Rehab & Improvements	0	LS	$10,000,000.00	$0	32%	$0	35%	$0	$0	
34	**Traffic Signal**												$760,000
35		50.02	Beach / Polk	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
36		50.02	Beach / Hyde	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
37		50.02	Beach / Leavenworth	300,000	LS	$1.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
38		50.02	Beach / Jones	50,000	LS	$1.00	$50,000	32%	$16,000	20%	$10,000	$76,000	
39		50.02	Jefferson / Jones	50,000	LS	$1.00	$50,000	32%	$16,000	20%	$10,000	$76,000	
40		50.02	Jefferson / Leavenworth	100,000	LS	$1.00	$100,000	32%	$32,000	20%	$20,000	$152,000	
73	**Utilities**												$2,298,213
74		40.02	Water System Improvements	223,100	LS	$1.00	$223,100	32%	$71,392	30%	$66,930	$361,422	
75		40.02	Sanitary & Storm Sewer Improvements	747,500	LS	$1.00	$747,500	32%	$239,200	30%	$224,250	$1,210,950	
76		40.02	Track Drainage Allowance	1,770	TF	$75.00	$132,750	32%	$42,480	30%	$39,825	$215,055	
77		40.02	AWSS Improvements	315,300	LS	$1.00	$315,300	32%	$100,896	30%	$94,590	$510,786	
115	**Trackwork**												$2,546,000
116		10.03	Ri53 in Track Slab (Single)	1,770	TF	$500.00	$885,000	32%	$283,200	20%	$177,000	$1,345,200	
117		10.09	Allowance for Semi-Exclusive Delineation	950	TF	$200.00	$190,000	32%	$60,800	20%	$38,000	$288,800	
118		10.12	Turnout/Track Crossing Installation	4	EA	$150,000.00	$600,000	32%	$192,000	20%	$120,000	$912,000	
119		10.03	Cable Car Crossing Installation	0	EA	$250,000.00	$0	32%	$0	20%	$0	$0	
148	**Stations**											$0	$248,520
149		20.01	Standard Stop Platforms	2,070	SF	$50.00	$103,500	32%	$33,120	20%	$20,700	$157,320	
150		20.01	Mini High Stop Platforms	2	EA	$30,000.00	$60,000	32%	$19,200	20%	$12,000	$91,200	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$807,120
171		50.04	Traction Power and OCS	1,770	TF	$300.00	$531,000	32%	$169,920	20%	$106,200	$807,120	
177	**Signal system**												$0

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
501

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 501	**On Beach - Leavenworth to Jones**										1st Quarter
			Connection to Existing "F" Line w/ TO										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
180	**Communications**												$30,400
181		50.05	Passenger Information Sign	2	EA	$10,000.00	$20,000	32%	$6,400	20%	$4,000	$30,400	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$1,857,926		$1,303,069	$8,967,015	$8,967,015
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$232,241						
208		80.02	Final Design			6%	$348,361						
209		80.03	Project Management for Design and Construction			5%	$290,301						
210		80.04	Construction Administration & Management			8%	$464,482						
211		80.05	Insurance			2%	$116,120						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$174,181						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$174,181						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$58,060						
215						32%	$1,857,926						
216	**Contingency**												
217		90.01	Unallocated Contingency				$1,303,069						

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
501

San Francisco, California

Historic Streetcar

Order of Magnitude Estimate

Estimate Spread to FTA Descriptions

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
502

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 502	**On Beach - Leavenworth to Jones**										1st Quarter
			Connection to Existing "F" Line w/ Xing										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$2,124,773
2		40.01	Common Excavation	0	CY	$14.00	$0	32%	$0	20%	$0	$0	
3		40.01	Roadway Excavation - 18" Depth	1,475	CY	$30.00	$44,250	32%	$14,160	20%	$8,850	$67,260	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	1,139	CY	$30.00	$34,167	32%	$10,933	20%	$6,833	$51,933	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	26,550	SF	$15.00	$398,250	32%	$127,440	20%	$79,650	$605,340	
6		40.07	AC Pavement Grind & Overlay (3")	889	SY	$30.00	$26,670	32%	$8,534	20%	$5,334	$40,538	
7		40.06	Standard PCC Sidewalk	482	SY	$70.00	$33,740	32%	$10,797	20%	$6,748	$51,285	
8		40.07	Standard PCC Curb and Gutter	191	LF	$50.00	$9,550	32%	$3,056	20%	$1,910	$14,516	
9		40.06	Landscaping	0	SF	$10.00	$0	32%	$0	20%	$0	$0	
10		40.06	Erosion Control Allowance	2,050	LF	$25.00	$51,250	32%	$16,400	20%	$10,250	$77,900	
11		40.05	Operators Restroom Facilities	0	LS	$80,000.00	$0	32%	$0	20%	$0	$0	
12		40.08	Temporary Traffic Control	800,000	LS	$1.00	$800,000	32%	$256,000	20%	$160,000	$1,216,000	
13		40.01	Remove Existing Structure	0	SF	$15.00	$0	32%	$0	20%	$0	$0	
14		40.05	Relocate Bocce Ball Facilities	0	LS	$120,000.00	$0	32%	$0	20%	$0	$0	
22	**Structures**												$0
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	0	SF	$65.00	$0	32%	$0	20%	$0	$0	
25		40.05	Retaining Walls 10-20 feet high	0	SF	$70.00	$0	32%	$0	20%	$0	$0	
28	**Tunnel**												$0
29		10.07	Existing Tunnel Rehab & Improvements	0	LS	$10,000,000.00	$0	32%	$0	35%	$0	$0	
34	**Traffic Signal**												$836,000
35		50.02	Beach / Polk	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
36		50.02	Beach / Hyde	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
37		50.02	Beach / Leavenworth	300,000	LS	$1.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
38		50.02	Beach / Jones	50,000	LS	$1.00	$50,000	32%	$16,000	20%	$10,000	$76,000	
39		50.02	Jefferson / Jones	100,000	LS	$1.00	$100,000	32%	$32,000	20%	$20,000	$152,000	
40		50.02	Jefferson / Leavenworth	100,000	LS	$1.00	$100,000	32%	$32,000	20%	$20,000	$152,000	
73	**Utilities**												$2,128,923
74		40.02	Water System Improvements	165,600	LS	$1.00	$165,600	32%	$52,992	30%	$49,680	$268,272	
75		40.02	Sanitary & Storm Sewer Improvements	690,000	LS	$1.00	$690,000	32%	$220,800	30%	$207,000	$1,117,800	
76		40.02	Track Drainage Allowance	2,050	TF	$75.00	$153,750	32%	$49,200	30%	$46,125	$249,075	
77		40.02	AWSS Improvements	304,800	LS	$1.00	$304,800	32%	$97,536	30%	$91,440	$493,776	
115	**Trackwork**												$3,154,000
116		10.03	Ri53 in Track Slab (Single)	2,050	TF	$500.00	$1,025,000	32%	$328,000	20%	$205,000	$1,558,000	
117		10.09	Allowance for Semi-Exclusive Delineation	1,500	TF	$200.00	$300,000	32%	$96,000	20%	$60,000	$456,000	
118		10.12	Turnout/Track Crossing Installation	5	EA	$150,000.00	$750,000	32%	$240,000	20%	$150,000	$1,140,000	
119		10.03	Cable Car Crossing Installation	0	EA	$250,000.00	$0	32%	$0	20%	$0	$0	
148	**Stations**											$0	$248,520
149		20.01	Standard Stop Platforms	2,070	SF	$50.00	$103,500	32%	$33,120	20%	$20,700	$157,320	
150		20.01	Mini High Stop Platforms	2	EA	$30,000.00	$60,000	32%	$19,200	20%	$12,000	$91,200	
156	**Park & Ride Lots**												$0
157		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00		0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$934,800
171		50.04	Traction Power and OCS	2,050	TF	$300.00	$615,000	32%	$196,800	20%	$123,000	$934,800	
177	**Signal system**												$0

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
502

		San Francisco Historic Streetcar Estension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 502	**On Beach - Leavenworth to Jones**										1st Quarter
			Connection to Existing "F" Line w/ Xing										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
180	**Communications**												$30,400
181		50.05	Passenger Information Sign	2	EA	$10,000.00	$20,000	32%	$6,400	20%	$4,000	$30,400	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$1,963,369		$1,358,520	$9,457,416	$9,457,416
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$245,421						
208		80.02	Final Design			6%	$368,132						
209		80.03	Project Management for Design and Construction			5%	$306,776						
210		80.04	Construction Administration & Management			8%	$490,842						
211		80.05	Insurance			2%	$122,711						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$184,066						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$184,066						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$61,355						
215						32%	$1,963,369						
216	**Contingency**												
217		90.01	Unallocated Contingency				$1,358,520						

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
502

San Francisco, California

Historic Streetcar

Order of Magnitude Estimate

Estimate Spread to FTA Descriptions

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
LOW

		San Francisco Historic Streetcar Extension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 1001	**Option 1**										1st Quarter
			A.1,B.1,C.1,D.1,E.1										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$7,198,449
2		40.01	Common Excavation	1,900	CY	$14.00	$26,600	32%	$8,512	20%	$5,320	$40,432	
3		40.01	Roadway Excavation - 18" Depth	3,617	CY	$30.00	$108,505	32%	$34,722	20%	$21,701	$164,928	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	3,617	CY	$30.00	$108,517	32%	$34,725	20%	$21,703	$164,945	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	65,103	SF	$15.00	$976,545	32%	$312,494	20%	$195,309	$1,484,348	
6		40.07	AC Pavement Grind & Overlay (3")	1,556	SY	$30.00	$46,680	32%	$14,938	20%	$9,336	$70,954	
7		40.06	Standard PCC Sidewalk	4,151	SY	$70.00	$290,570	32%	$92,982	20%	$58,114	$441,666	
8		40.07	Standard PCC Curb and Gutter	2,194	LF	$50.00	$109,700	32%	$35,104	20%	$21,940	$166,744	
9		40.06	Landscaping	9,753	SF	$10.00	$97,530	32%	$31,210	20%	$19,506	$148,246	
10		40.06	Erosion Control Allowance	6,511	LF	$25.00	$162,775	32%	$52,088	20%	$32,555	$247,418	
11		40.05	Operators Restroom Facilities	1	LS	$80,000.00	$80,000	32%	$25,600	20%	$16,000	$121,600	
12		40.08	Temporary Traffic Control	2,600,000	LS	$1.00	$2,600,000	32%	$832,000	20%	$520,000	$3,952,000	
13		40.01	Remove Existing Structure	560	SF	$15.00	$8,400	32%	$2,688	20%	$1,680	$12,768	
14		40.05	Relocate Bocce Ball Facilities	1	LS	$120,000.00	$120,000	32%	$38,400	20%	$24,000	$182,400	
22	**Structures**												$145,920
23		40.05	Retaining Walls to 5' High	300	SF	$60.00	$18,000	32%	$5,760	20%	$3,600	$27,360	
24		40.05	Retaining Walls 5-10 feet high	1,200	SF	$65.00	$78,000	32%	$24,960	20%	$15,600	$118,560	
25		40.05	Retaining Walls 10-20 feet high	0	SF	$70.00	$0	32%	$0	20%	$0	$0	
28	**Tunnel**												$16,700,000
29		10.07	Existing Tunnel Rehab & Improvements	1	LS	$10,000,000.00	$10,000,000	32%	$3,200,000	35%	$3,500,000	$16,700,000	
34	**Traffic Signal**												$1,020,000
35		50.02	Beach / Polk	250,000	LS	$1.00	$250,000	0%	$0	20%	$50,000	$300,000	
36		50.02	Beach / Hyde	100,000	LS	$1.00	$100,000	0%	$0	20%	$20,000	$120,000	
37		50.02	Beach / Leavenworth	300,000	LS	$1.00	$300,000	0%	$0	20%	$60,000	$360,000	
38		50.02	Beach / Jones	50,000	LS	$1.00	$50,000	0%	$0	20%	$10,000	$60,000	
39		50.02	Jefferson / Jones	50,000	LS	$1.00	$50,000	0%	$0	20%	$10,000	$60,000	
40		50.02	Jefferson / Leavenworth	100,000	LS	$1.00	$100,000	0%	$0	20%	$20,000	$120,000	
73	**Utilities**												$6,064,916
74		40.02	Water System Improvements	385,100	LS	$1.00	$385,100	32%	$123,232	30%	$115,530	$623,862	
75		40.02	Sanitary & Storm Sewer Improvements	2,157,500	LS	$1.00	$2,157,500	32%	$690,400	30%	$647,250	$3,495,150	
76		40.02	Track Drainage Allowance	5,985	TF	$75.00	$448,875	32%	$143,640	30%	$134,663	$727,178	
77		40.02	AWSS Improvements	752,300	LS	$1.00	$752,300	32%	$240,736	30%	$225,690	$1,218,726	
115	**Trackwork**												$9,107,080
116		10.03	Ri53 in Track Slab (Single)	6,511	TF	$500.00	$3,255,500	32%	$1,041,760	20%	$651,100	$4,948,360	
117		10.09	Allowance for Semi-Exclusive Delineation	2,680	TF	$200.00	$536,000	32%	$171,520	20%	$107,200	$814,720	
118		10.12	Turnout/Track Crossing Installation	8	EA	$150,000.00	$1,200,000	32%	$384,000	20%	$240,000	$1,824,000	
119		10.03	Cable Car Crossing Installation	4	EA	$250,000.00	$1,000,000	32%	$320,000	20%	$200,000	$1,520,000	
148	**Stations**												$1,101,696
149		20.01	Standard Stop Platforms	9,696	SF	$50.00	$484,800	32%	$155,136	20%	$96,960	$736,896	
150		20.01	Mini High Stop Platforms	8	EA	$30,000.00	$240,000	32%	$76,800	20%	$48,000	$364,800	
156	**Park & Ride Lots**												$0
157		0.00	0	0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00	0	0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00	0	0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$2,969,016
171		50.04	Traction Power and OCS	6,511	TF	$300.00	$1,953,300	32%	$625,056	20%	$390,660	$2,969,016	
177	**Signal system**												$577,600

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		San Francisco Historic Streetcar Extension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 1001	**Option 1**										1st Quarter
			A.1,B.1,C.1,D.1,E.1										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	380,000	LS	$1.00	$380,000	32%	$121,600	20%	$76,000	$577,600	
180	**Communications**												$121,600
181		50.05	Passenger Information Sign	8	EA	$10,000.00	$80,000	32%	$25,600	20%	$16,000	$121,600	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$8,857,151		$7,580,097	$45,006,276	$45,006,276
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$1,107,144						
208		80.02	Final Design			6%	$1,660,716						
209		80.03	Project Management for Design and Construction			5%	$1,383,930						
210		80.04	Construction Administration & Management			8%	$2,214,288						
211		80.05	Insurance			2%	$553,572						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$830,358						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$830,358						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$276,786						
215						32%	$8,857,151						
216	**Contingency**												
217		90.01	Unallocated Contingency				$7,580,097						

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LOW

San Francisco, California									
Historic Streetcar									
Order of Magnitude Estimate									
Estimate Spread to FTA Descriptions									

National Park Service - GGNRA - SFMNHP
Historic Streetcar Extension
HIGH

		San Francisco Historic Streetcar Extension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 1002	**Option 2**										1st Quarter
			A.3,B.2,C.2,D.2,E.2										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
1	**Civil Construction**												$7,929,473
2		40.01	Common Excavation	14,700	CY	$14.00	$205,800	32%	$65,856	20%	$41,160	$312,816	
3		40.01	Roadway Excavation - 18" Depth	3,526	CY	$30.00	$105,772	32%	$33,847	20%	$21,154	$160,773	
4		40.01	Track Slab Excavation - 18" Depth, 10' Width	3,944	CY	$30.00	$118,317	32%	$37,861	20%	$23,663	$179,841	
5		40.07	General Pavement Reconstruction 2"ACP/10"PCC	63,463	SF	$15.00	$951,945	32%	$304,622	20%	$190,389	$1,446,956	
6		40.07	AC Pavement Grind & Overlay (3")	1,378	SY	$30.00	$41,340	32%	$13,229	20%	$8,268	$62,837	
7		40.06	Standard PCC Sidewalk	3,753	SY	$70.00	$262,710	32%	$84,067	20%	$52,542	$399,319	
8		40.07	Standard PCC Curb and Gutter	1,805	LF	$50.00	$90,250	32%	$28,880	20%	$18,050	$137,180	
9		40.06	Landscaping	41,815	SF	$10.00	$418,150	32%	$133,808	20%	$83,630	$635,588	
10		40.06	Erosion Control Allowance	7,099	LF	$25.00	$177,475	32%	$56,792	20%	$35,495	$269,762	
11		40.05	Operators Restroom Facilities	1	LS	$80,000.00	$80,000	32%	$25,600	20%	$16,000	$121,600	
12		40.08	Temporary Traffic Control	2,600,000	LS	$1.00	$2,600,000	32%	$832,000	20%	$520,000	$3,952,000	
13		40.01	Remove Existing Structure	3,000	SF	$15.00	$45,000	32%	$14,400	20%	$9,000	$68,400	
14		40.05	Relocate Bocce Ball Facilities	1	LS	$120,000.00	$120,000	32%	$38,400	20%	$24,000	$182,400	
22	**Structures**												$627,000
23		40.05	Retaining Walls to 5' High	0	SF	$60.00	$0	32%	$0	20%	$0	$0	
24		40.05	Retaining Walls 5-10 feet high	1,500	SF	$65.00	$97,500	32%	$31,200	20%	$19,500	$148,200	
25		40.05	Retaining Walls 10-20 feet high	4,500	SF	$70.00	$315,000	32%	$100,800	20%	$63,000	$478,800	
28	**Tunnel**												$16,700,000
29		10.07	Existing Tunnel Rehab & Improvements	1	LS	$10,000,000.00	$10,000,000	32%	$3,200,000	35%	$3,500,000	$16,700,000	
34	**Traffic Signal**												$1,080,000
35		50.02	Beach / Polk	250,000	LS	$1.00	$250,000	0%	$0	20%	$50,000	$300,000	
36		50.02	Beach / Hyde	100,000	LS	$1.00	$100,000	0%	$0	20%	$20,000	$120,000	
37		50.02	Beach / Leavenworth	300,000	LS	$1.00	$300,000	0%	$0	20%	$60,000	$360,000	
38		50.02	Beach / Jones	50,000	LS	$1.00	$50,000	0%	$0	20%	$10,000	$60,000	
39		50.02	Jefferson / Jones	100,000	LS	$1.00	$100,000	0%	$0	20%	$20,000	$120,000	
40		50.02	Jefferson / Leavenworth	100,000	LS	$1.00	$100,000	0%	$0	20%	$20,000	$120,000	
73	**Utilities**												$6,064,511
74		40.02	Water System Improvements	291,200	LS	$1.00	$291,200	32%	$93,184	30%	$87,360	$471,744	
75		40.02	Sanitary & Storm Sewer Improvements	2,132,100	LS	$1.00	$2,132,100	32%	$682,272	30%	$639,630	$3,454,002	
76		40.02	Track Drainage Allowance	7,099	TF	$75.00	$532,425	32%	$170,376	30%	$159,728	$862,529	
77		40.02	AWSS Improvements	787,800	LS	$1.00	$787,800	32%	$252,096	30%	$236,340	$1,276,236	
115	**Trackwork**												$10,461,400
116		10.03	Ri53 in Track Slab (Single)	7,099	TF	$500.00	$3,549,500	32%	$1,135,840	20%	$709,900	$5,395,240	
117		10.09	Allowance for Semi-Exclusive Delineation	4,915	TF	$200.00	$983,000	32%	$314,560	20%	$196,600	$1,494,160	
118		10.12	Turnout/Track Crossing Installation	9	EA	$150,000.00	$1,350,000	32%	$432,000	20%	$270,000	$2,052,000	
119		10.03	Cable Car Crossing Installation	4	EA	$250,000.00	$1,000,000	32%	$320,000	20%	$200,000	$1,520,000	
148	**Stations**												$1,019,692
149		20.01	Standard Stop Platforms	8,617	SF	$50.00	$430,850	32%	$137,872	20%	$86,170	$654,892	
150		20.01	Mini High Stop Platforms	8	EA	$30,000.00	$240,000	32%	$76,800	20%	$48,000	$364,800	
156	**Park & Ride Lots**												$0
157		0.00	0	0	LS	$0.00	$0	32%	$0	20%	$0	$0	
162	**Fare Collection**												$0
163		0.00	0	0	LS	$0.00	$0	32%	$0	20%	$0	$0	
166	**Maintenance Facility**												$0
169		0.00	0	0	LS	$0.00	$0	32%	$0	20%	$0	$0	
170	**Traction Power**												$3,237,144
171		50.04	Traction Power and OCS	7,099	TF	$300.00	$2,129,700	32%	$681,504	20%	$425,940	$3,237,144	
177	**Signal system**												$577,600

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		San Francisco Historic Streetcar Extension											
			San Francisco, CA										
			Order of Magnitude Estimate										
		Sht # 1002	**Option 2**										1st Quarter
			A.3,B.2,C.2,D.2,E.2										2008$
Line NO.	**Base**	**Code**	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Extension**	**E&A %**	**E&A**	**Cont%**	**Unallocated Contingency**	**Detail Total**	**Summary Total**
178		50.01	Train signaling system	380,000	LS	$1.00	$380,000	32%	$121,600	20%	$76,000	$577,600	
180	**Communications**												$121,600
181		50.05	Passenger Information Sign	8	EA	$10,000.00	$80,000	32%	$25,600	20%	$16,000	$121,600	
184	**Vehicles**												$0
185		70.01	Vehicle Allowance	0	LS	$0.00	$0	10%	$0	10%	$0	$0	
188	**Right of Way**												$0
189		60.01	Allowance	0	LS	$1.00	$0	32%	$0	20%	$0	$0	
202									$9,379,211		$7,916,359	$47,818,419	$47,818,419
203													
204													
205													
206	**Professional Services**												
207		80.01	Preliminary Engineering			4%	$1,172,401						
208		80.02	Final Design			6%	$1,758,602						
209		80.03	Project Management for Design and Construction			5%	$1,465,502						
210		80.04	Construction Administration & Management			8%	$2,344,803						
211		80.05	Insurance			2%	$586,201						
212		80.06	Legal; Permits;Review Fees by other agencies, cities, etc.			3%	$879,301						
213		80.07	Surveys, Testing, Investigation, Inspection			3%	$879,301						
214		80.08	Start-up Costs & Agency Force Account Work			1%	$293,100						
215						32%	$9,379,211						
216	**Contingency**												
217		90.01	Unallocated Contingency				$7,916,359						

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San Francisco, California									
Historic Streetcar									
Order of Magnitude Estimate									
Estimate Spread to FTA Descriptions									