13. COST ESTIMATES

Basis of the Estimates

All unit costs in the estimates are representative of contractor bid prices at first quarter of 2002 pricing levels. Unit rates in the estimates include contractor indirect costs, mark-up and profit.

BART General Conditions: A five per cent allowance of construction costs has been utilized to cover the following types of items:

1. Differing site conditions
2. Partnering
3. Dispute resolution
4. Operating system access delays
5. Construction safety incentives / disincentives
6. Engineer's office, vehicles and services
7. Operation and maintenance instructions and personnel training

City Imposed Conditions: A 10 per cent allowance of construction costs has been included in the estimate to cover costs for traffic and MUNI re-routing and restoration costs, and street and limited neighborhood upgrades after construction.

Contingencies: A 25 per cent contingency allowance is included in the estimate. This contingency covers design, scope, construction estimating and pricing contingency up to project completion.

'Soft Costs': The following line item costs have been included as percentages of the total construction costs:

1.	Pre-project / Environmental studies	3 per cent
2.	Preliminary Engineering	4 per cent
3.	Agency administration	5 per cent
4.	Community outreach	1 per cent
5.	Professional services (Engineering, Project Management, & Construction Management	30 per cent
6.	Pre-operating expenses (Start-up and Testing)	2 per cent

Construction Cost Summary

	Alternative 'A' On-Line Station *Basic*	Alternative 'A' *with Pocket Track*	Alternative 'B' Off-Line Station
Construction Elements	$227,183,000	$247,346,000	$235,768.000
Mobilization @ 10%	22,718,000	24,735,000	23,577,000
BART General Conditions @ 5%	11,359,000	12,367,000	11,788,000
City Imposed Conditions @ 10%	22,718,000	24,735,000	23,577,000
Subtotal Construction Cost:	**$261,261,000**	**$309,183,000**	**$271,133,000**
Contingencies @ 25%	65,315,000	77,296,000	67,783,000
Administration, Engineering and Operations ('Soft Costs')	117,567,000	139,132,000	122,010,000
TOTAL Project Facilities Construction:	**$444,143,000**	**$525,611,000**	**$460,926,000**

See Appendix 'J' for itemized cost listing and the full assumptions utilized for these estimates.

Exclusions

The following costs are not included in the estimate:

1. Right-of-way and other property acquisition, easements and encroachments
2. Community mitigation costs
3. Escalation beyond first quarter of 2002
4. Schedule impact
5. Environmental mitigation and hazardous works
6. Project insurance
7. Financing and interest during construction
8. Increase in vehicle fleet size associated with operations through the station
9. Costs of modifying BART central control
10. Costs of substitute transit service during construction
11. Multilingual publicity and information programs during construction

What Are Other Projects Going to Cost?

Selected Bay Area Rail Capital Projects (in millions)

- Caltrain Extension/Transbay Terminal $1,885
- MUNI Central Subway $647
- BART to Warm Springs $634
- χ **BART 30th Street Station $445-525**
- BART Oakland Airport Connector $232

Source: Metropolitan Transportation Commission

14. CONCLUSIONS AND NEXT STEPS

Conclusions

This study concludes with the following findings:

- The three evaluated Alternatives are each basically feasible
- All the Alternatives are very costly projects
- The defining track gradient limitation of one percent (compared to the existing grade of 3.12 percent) is a major influencing factor that drives up the cost for a project of this type
- The Alternative 'A' basic scheme is least costly
- The Alternative 'A' scheme with a Pocket Track Option is most expensive
- Alternative 'B' includes the most important benefits and is only marginally more expensive than the lesser-cost Alternative 'A'
- This would be a very difficult and risky project to construct
- Property and business disruption impacts would be substantial
- Constriction traffic impacts would be significant, but subject to mitigation
- Local access to regional transit via BART at 30th Street would be greatly improved
- Ridership potential has been estimated at 3,700 to 5,000 riders, but new factors could result in more users. Therefore, an updated, more comprehensive and detailed projection is needed.
- Alternative 'B' offers superior operational flexibility and means to recover from delay. It is preferred to the other Alternatives, especially for the critical eastbound pm peak
- Alternative 'A' is not as operationally beneficial as Alternative 'B' but nevertheless appears to be minimally acceptable from the operations standpoint
- A 30th Street Station (with either Alternative) may contribute to limited capacity constraints at 24th and 16th Street Stations in the am peak hour, eastbound direction
- With Alternative 'A' train headways would be increased by up to 49 per cent with corresponding reduction in line capacity

Impacts:

- Construction:
  - Noise
  - Transportation disruptions (MUNI, traffic & BART)
  - Night work
- Long term:
  - Transbay capacity
  - Changes on traffic patterns & volumes
- Risk:
  - Major service disruptions
  - Construction hazards
  - Insurance

- With either of the two Alternatives, there will probably be sufficient am peak hour capacity in the southbound/westbound direction to satisfy demand
- New northbound/eastbound traffic generated at a 30th Street Station would limit the critical pm peak hour eastbound Transbay capacity by FY2020
- Operational benefits of a turnback can be provided, however, such capabilities are being reviewed on a systemwide basis and might be provided elsewhere at lower cost
- Improvements to MUNI transfer and local transit would be minimal because most MUNI lines in the vicinity already interface with BART elsewhere
- The 24-Divisadero MUNI line would benefit the most by having a 30th Street BART connection
- Transit choices and handicapped access would be improved
- The potential for neighborhood beneficial improvements might be substantial, but its description and analysis was outside the scope of this study
- The potential for joint development would be potentially important but its description and analysis was outside the scope of this study

Next Steps

If this project is to proceed, certain steps would need to be undertaken. First of all, this report should be circulated and reviewed by those who have an interest in the project.

A community planning effort may be warranted if the City and County of San Francisco chooses to take (and sponsor) any next steps. A project manager may be selected to lead efforts. Also, there is the possibility to appoint one or more standing committees to oversee the project. These might include a governing board of elected officials, and/or a citizens advisory committee and a technical advisory committee of professional planners, engineers, architects or officials.

Ongoing lines of community-based communication and review would need to be established by the sponsoring agency with BART, MTC, and City departments such as MUNI, City Public Works Department and the Transportation Authority.

What Happens Next?

- Community feedback & acceptance of report
- Possible Community Planning effort
- Involve collaboration of BART & City of San Francisco Agencies (MUNI, DPT, Planning, Transportation Authority)

A further technical development process would need to be defined and pursued. At the same time, a community and policy-making consensus might be encouraged through a process of outreach, involvement and discussion. Additional technical and economic studies would need to be undertaken, possibly including, but not limited to the following:

- Update ridership projections. Improved transit ridership estimates would be critical to evaluating the value of this project, and the presently available ridership projections have not been updated beyond the 1998 rough estimates by the San Francisco County Transportation Authority.

  Those estimates did not have adequate origin/destination data and did not anticipate several very important factors, such as the SFO Airport connection, that have materialized since then. In addition, land use changes since that time and as proposed by the City would have to be assessed to estimate ridership potential with any degree of accuracy.

  The outcome of an effort to fully quantify these factors would be essential in establishing the magnitude of ridership that this station could attract and generate.

- Continued definition and ranking of all the available alternatives.
- More detailed operational evaluations, especially of the more complex modes of use of the off-line station (Alternative 'B') option.
- Focused studies for various engineering elements, especially tunneling and geotechnical aspects.
- Detailing of station configuration and property requirements.
- Preparation of more detailed and accurate capital and operating cost estimates and value engineering studies.
- Possible companion studies to address with specificity, potential neighborhood improvement projects and joint development opportunities, including transit oriented development and 'transit village' sites. The latter would be important as an impetus to increase the benefits to be expected from the project and for 'value capture'.
- More wide-ranging cost/benefit evaluations so as to establish the project as eligible to meet the BART system expansion criteria and also to qualify for outside funding sources.

APPENDICES

A. BART Policy and Criteria for System Expansion

B. City of San Francisco Traffic Data

C. Existing Utility Maps

D. Soils Data

E. BART Staff Listing of Station Criteria

F. On-Line Alternative Using Existing Tunnels

G. Other Alternatives Considered

H. Sample Trackwork Details

I. Description of Advanced Automatic Train-Control (AATC) System

J. Itemized Cost Estimates

APPENDIX A

Bay Area Rapid Transit District

POLICY AND CRITERIA FOR SYSTEM EXPANSION

System Expansion Criteria and Process

Adopted by BART Board - 12.5.02

System Expansion Policy

Introduction

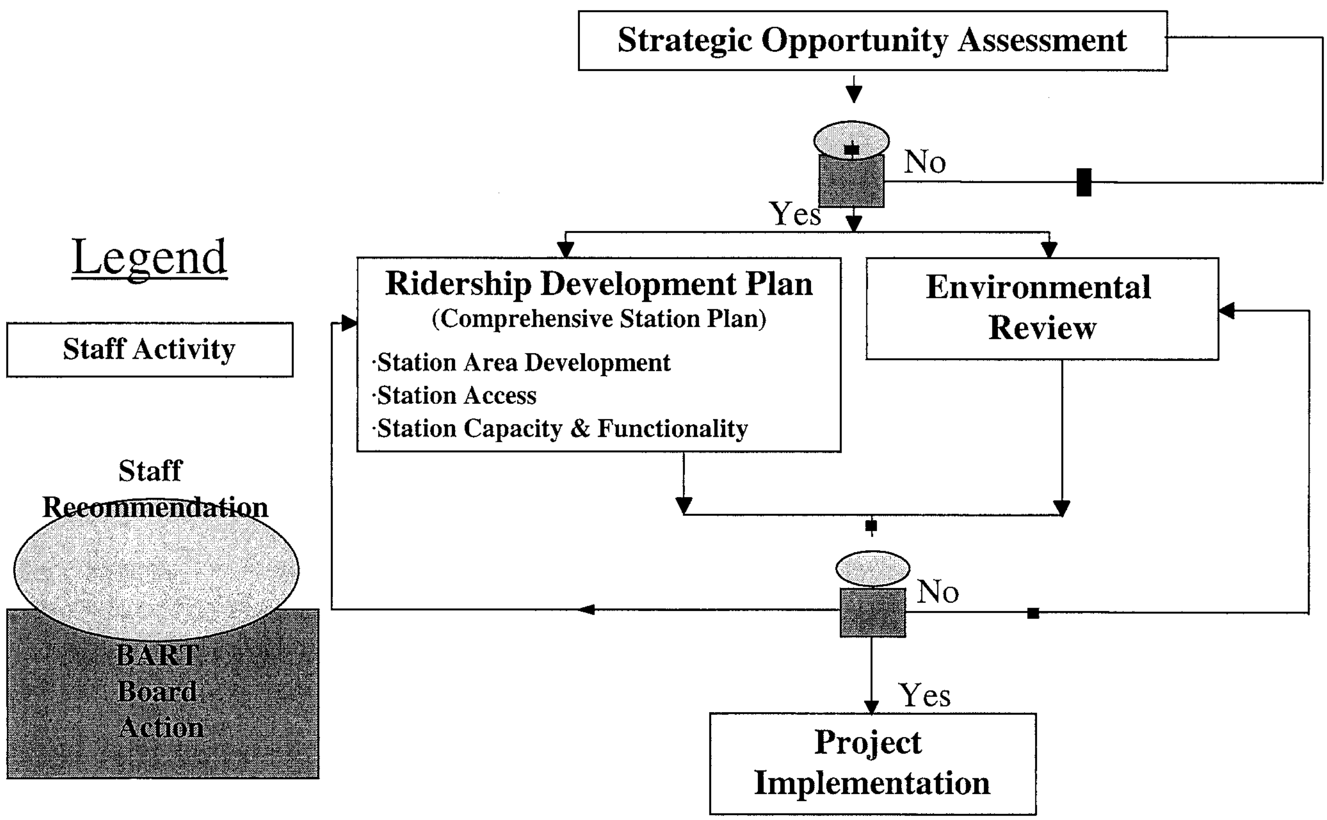
Over forty years ago, residents of the Alameda, Contra Costa and San Francisco Counties supported the creation of the BART District. Since that time, BART has become a critical component of the region's transportation system.

Today the pressures of growth in the Bay Area continue. Accommodating this growth continues to drive further dispersal of jobs and housing. At the same time, BART and other transit systems demand a continued level of reinvestment to maintain service. Finally, financial support for BART and other transportation systems must compete with their infrastructure and social needs. It is imperative that BART, as a steward of public funding for transportation investments, continue to:

·Ensure cost-effective transportation investment decisions;
·Protect the taxpayers' investment in the District's physical infrastructure;
·Ensure the financial health and sustainability of the District; and
·Enhance the Bay Area's environment and quality of life.

It is with these considerations that the BART Board adopts the following Project Advancement Criteria and Process for all System Expansion projects.

Project Advancement Process



Project Advancement Process

Stage 1

- **Strategic Opportunity Assessment**
  - Initial planning assessment of transit expansion opportunities
  - Level of effort commensurate with funding availability for study
  - May include several planning efforts before project recommendation brought forward to the Board
- **Project Advancement**
  - Staff uses study reports to evaluate a project against the criteria and decides whether to recommend a project for advancement to the next stage
  - Board considers staff recommendations and decides whether to advance project recommendation to the next stage for further study

Stage 2

- **Ridership Development Plan**
  - Work in partnership with local jurisdictions to develop a Memorandum of Understanding (MOU) laying out coordinated timelines for transit project Environmental Review and the Ridership Development Plan process
  - Work in partnership with local jurisdictions to achieve transit ridership thresholds by balancing transit-oriented development (TOD) and access goals with community desire; seek commitments from local jurisdictions regarding land use and access plans
- **Environmental Review**
  - CEQA and/or NEPA environmental review process (as applicable).
- **Project Advancement**
  - Ridership Development Plan prepared concurrently with Environmental Review and brought forward to the Board
  - Staff uses both documents to evaluate project with the criteria and decides whether to recommend a project for advancement
  - Board considers staff recommendations and decides whether to advance project to the next stage

Project Advancement Criteria

Transit Supportive Land Use and Access

- Existing Land Use: Residential and/or Employment
- Existing Intermodal Connections
- Land Use Plans and Policies

Ridership Development Plan

- Ridership Threshold
- Station Context

Cost-Effectiveness

- Cost per New Rider: Base Case
- Cost per New Rider: with TOD
- Cost per Transportation System User Benefit

Regional Network Connectivity

- Regional Transportation Gap Closure

System and Financial Capacity

- Core System Improvements
- Capital Finance Plan
- Operating Finance Plan

Partnerships

- Community and Stakeholder Support

Metrics for Staff Recommendations

PROPOSED CRITERIA	PROJECT STATUS	
	Strategic Opportunity Assessment	Environmental Clearance/ Ridership Development Plan
Transit Supportive Land Use and Access		
Existing Land Use: Residential and/or Employment	L/LM/M/MH/H	L/LM/M/MH/H
Existing Intermodal Connections	L/LM/M/MH/H	L/LM/M/MH/H
Land Use Plans and Policies	L/LM/M/MH/H	L/LM/M/MH/H
Ridership Development Plan (Comprehensive Station Plan)		
Ridership Threshold		L/LM/M/MH/H
Station Context		L/M/H
Cost Effectiveness		
Cost per New Rider: Base Case	L/LM/M/MH/H	L/LM/M/MH/H
Cost per New Rider: with TOD	L/LM/M/MH/H	L/LM/M/MH/H
Cost per Transportation System User Benefit		L/LM/M/MH/H
Regional Network Connectivity		
Regional Transportation Gap Closure	L/M/H	L/M/H
System and Financial Capacity		
Core System Improvements	L/LM/M/MH/H	L/LM/M/MH/H
Capital Finance Plan	L/M/H	L/M/H
Operating Finance Plan	L/M/H	L/M/H
Partnerships		
Community and Stakeholder Support	L/LM/M/MH/H	L/LM/M/MH/H

Rating Legend

L: Low LM: Low-Medium M: Medium MH: Medium-High H: High

Transit Supportive Land Use and Access

Existing Land Use: Residential	**Low**	**Low-Medium**	**Medium**	**Medium-High**	**High**
Residential Density (units per *gross* acre)	< 5	5-9	10-14	15-24	> 25
Residential Density (units per *net* acre)	< 15	16-25	26-45	46-75	> 75
Total Units w/i 1/2 mile radius	< 2,500	2,501-5,000	5,001-7,500	7,501-12,500	> 12,500
Estimated Trips at **30%** mode share**	< 1,800	1,801-3,600	3,601-5,400	5,401-9,000	> 9,000

*   Residential units within ½ mile radius of stations

** Estimated trips (two-way) based on 1.2 workers per household.

Examples of Residential Density

within 1/2 mile radius of BART Stations

	Low	**Low-Medium**	**Medium**	**Medium-High**	**High**
Net	North Berkeley BART (10+ du/a)	MetroWalk Richmond BART (20+ du/a)	Strobridge Court Castro Valley BART (41 du/a)	Coggins Square Pleasant Hill BART (58 du/a)	Gaia Building Berkeley BART (250 du/a)

Gross*	Orinda (2 du/a)	Rockridge (9 du/a)	Ashby (11 du/a)	16th Street (22 du/a)	Civic Center (42 du/a)

* Dwelling Units per Gross Acre within 1/2 mile of station (Cervero, 1990)

Transit Supportive Land Use and Access

Existing Land Use: Employment	**Low**	**Low-Medium**	**Medium**	**Medium-High**	**High**
Employment Density (employees per *gross* acre)*	< 10	10-20	21-50	51-100	> 100
Million Sq. Ft. of Commercial Space w/i ½ mile radius	< 1.7	1.7–3.3	3.4-8.3	8.4-16.6	> 16.6
Total Employees w/i 1/2 mile radius	< 5,100	5,100-9,900	9,901-24,900	24,901-49,800	> 49,800
Estimated Trips at **10%** mode share**	< 1,000	1,000-2,000	2,001-5,000	5,001-10,000	> 10,000

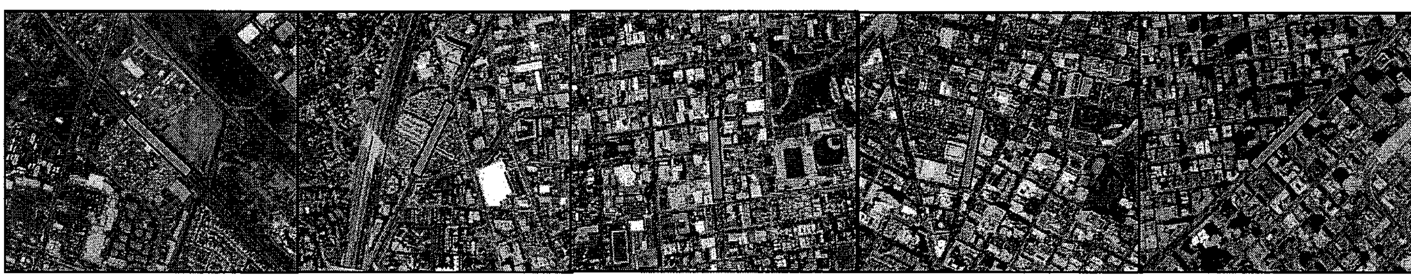
* Employment within 1/2 mile radius of stations

** Estimated trips (two-way) based on 3 employees per 1,000 square feet.

Examples of Employment Density

within 1/2 mile radius of BART Stations

	Low	Low-Medium	Medium	Medium-High	High
Gross*	Union City (2)	Walnut Creek (19)	Berkeley (24)	19th Street (65)	Montgomery (234)



* Employees per Gross Acre within 1/2 mile of station (Cervero, 1990)

Transit Supportive Land Use and Access

Existing Intermodal Connections	Low	Low-Medium	Medium	Medium-High	High
Pedestrian		*Qualitative Assessment*			
Bicycle		*Qualitative Assessment*			
Transit		*Qualitative Assessment*			

Pedestrian
·Comprehensiveness of Pedestrian Network
·Safe Access to Station Sites
·Topography

Bicycle
·Bicycle Network Connectivity
·Existing Bicycle Usage
·Comprehensiveness of Bicycle Network

Transit
·Peak-Hour Transit Routes
·Peak-Hour Routes w/ Headways 15 Minutes or Less
·Evening & Weekend Routes

Transit Supportive Land Use and Access

	Low	Low-Medium	Medium	Medium-High	High
Land Use Plans and Policies		***Qualitative Assessment***			

Growth Management	• Concentration of development around established activity centers and regional transit
Transit Supportive Corridor Policies	• Plans and policies to increase corridor and station area development • Plans and policies to enhance transit-friendly character of station area development • Commitment to inter-jurisdictional consensus on land use
Supportive Zoning Regulations Near Transit Stations	• Zoning that increases development density in transit station areas • Zoning that encourages mixed-use development • Zoning that enhances transit-oriented character of area, and pedestrian access • Zoning that reduces parking and traffic mitigation
Tools to Implement Land Use Policies	• Community outreach in support of land use planning • Regulatory and financial incentives to promote transit support development

Ridership Development Plan

(Comprehensive Station Plan)

Ridership Threshold*	Low	Low-Medium	Medium	Medium-High	High
BART	<5,000	5,000-9,999	10,000-13,999	14,000-20,000	>20,000
Other Rail Technology		***% of BART per mile capital costs***			
Express Bus/Bus Rapid Transit		***% of BART per mile capital costs***			

Includes:

- Station Area Development
- Station Access
- Station Capacity & Functionality

* Thresholds based on corridor-wide station average for daily trips to and from (*entries and exits*) new stations in horizon year with planned transit-oriented development and access improvements

Ridership Development Plan
(Comprehensive Station Plan)

	Low	Medium	High
Station Context	***Qualitative Assessment***		

Low: Station location that would not support transit-oriented development and that would negatively affect the quality of the station experience for patrons (i.e. freeway median)

Medium: Station location with good potential for transit-oriented development and an acceptable station experience for patrons

High: Station location that already has or would greatly facilitate transit-oriented development and would provide a good experience for patrons (i.e. downtown locations)

Cost Effectiveness

	Low	Low-Medium	Medium	Medium-High	High
Cost per *New* Rider - Base Case	>$40.00	$25.01-40.00	$15.01 – 25.00	$10.00 – 15.00	<$10.00

	Low	Low-Medium	Medium	Medium-High	High
Cost per *New* Rider - with TOD	>$40.00	$25.01-40.00	$15.01 – 25.00	$10.00 – 15.00	<$10.00

(Costs in 2002 dollars)

Cost Effectiveness

	Low	**Low-Medium**	**Medium**	**Medium-High**	**High**
Cost/Transportation System User Benefit	TBD	TBD	TBD	TBD	TBD

The cost effectiveness – transportation system user benefits measure is defined as a multimodal measure of perceived travel time for all transportation system users in the forecast year, divided by the recommended cost of the project. The new measure ***de-emphasizes*** *new riders and instead measures the benefits for users changing modes as well as existing transit riders and highway users. The cost effectiveness – transportation system user benefits measure will be phased in over time, becoming effective on September 1, 2001.*

Federal Transit Administration – Frequently Asked Questions on New Starts Final Rule

Regional Network Connectivity

	Low	Medium	High
Regional Transportation Gap Closure	***Qualitative Assessment***		

Assess the interconnected relationship of the transit expansion project and the existing transportation network, identifying opportunities for major gap closures (i.e., airport, inter-city rail, commuter rail, light rail).

System and Financial Capacity

	Low	Medium	High
Core System Improvements	*Qualitative Assessment*		

<u>Enhances (at best) or minimizes demands on core system:</u>

- **Yard/Support Facilities**
- **Redundancy/Recovery Capabilities**
- **Station and Line Haul Capacity**

System and Financial Capacity

	Low	Medium	High
Capital Finance Plan*	***Qualitative Assessment***		

* Capital Finance Plan rating based on:

1) A fully-funded project;
2) The stability, reliability and availability of proposed funding sources; and
3) Funding sources <u>not</u> competing with those that can be used for BART System Renovation and Core System Capacity needs (i.e. RTP/CMAQ or RIP).
4) For projects outside the District - funding sources <u>not</u> competing with those that can be used for District extensions.
5) For projects outside the District - core system improvements are funded in the Capital Financial Plan for the project.
6) For project inside the District - core system improvements are funded in a parallel financial plan.

System and Financial Capacity

	Low	Medium	High
Operating Finance Plan*	***Qualitative Assessment***		

* Operating Finance Plan rating based on:

1) Estimated farebox recovery (Low: <30%; Medium: 30-50%; and High: >50%);

2) The stability, reliability and availability of proposed operating subsidy.

3) For projects outside the District - funding sources that do not draw on, or risk the use of, District operating revenues.

Partnerships

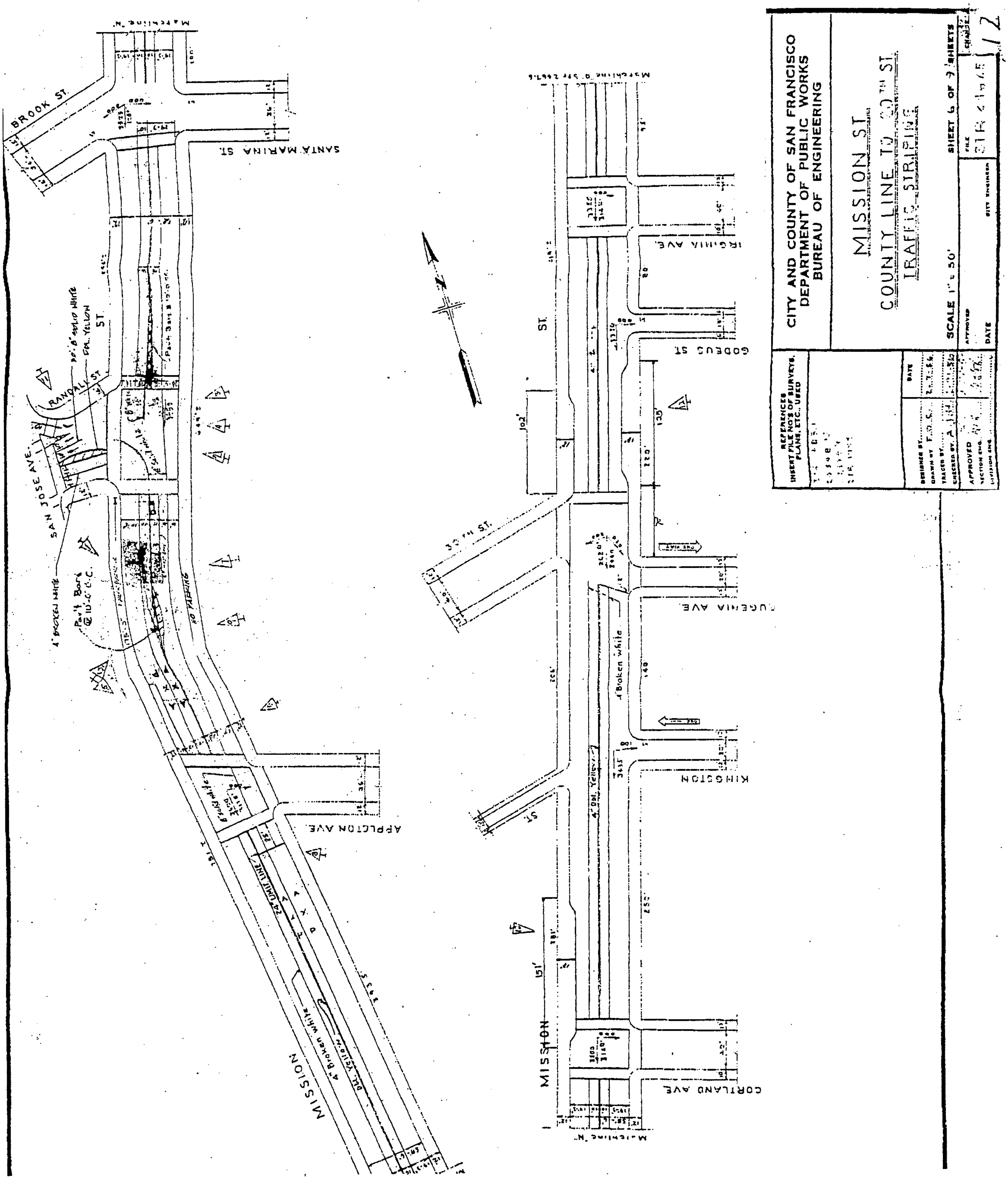
	Low	Low-Medium	Medium	Medium-High	High
Community and Stakeholder Support	***Qualitative Assessment***				

Community Support	•	**Degree of Support**
Stakeholder Support	•	**Degree of Support**

APPENDIX B

CITY OF SAN FRANCISCO TRAFFIC DATA

04/01/02 MON 09:20 FAX 415 554 2352 DPT TRAFFIC ENGINEERING 002



Mission St. South of Cesar Chavez St.
Monday, February 26, 2001
North Bound

HOUR OF DAY	QUARTER HOUR 1st	2nd	3rd	4th	HOUR TOTAL	EACH * REPRESENTS 35 VEHICLES A DASH MEANS HOUR VOLUME < 18
12 AM	33	34	40	28	135	****
1 AM	22	23	15	43	103	***
2 AM	33	22	16	7	78	**
3 AM	15	18	14	13	60	**
4 AM	20	13	19	16	68	**
5 AM	23	33	53	50	159	*****
6 AM	57	71	88	113	329	*********
7 AM	124	179	235	256	794	***********************
8 AM	247	248	236	179	910	**************************
9 AM	168	147	138	123	576	****************
10 AM	154	125	119	125	523	***************
11 AM	119	143	134	152	548	****************
12 PM	145	166	153	169	633	******************
1 PM	163	130	154	163	610	*****************
2 PM	187	168	135	149	639	******************
3 PM	175	148	178	182	683	********************
4 PM	161	176	166	171	674	*******************
5 PM	189	164	166	173	692	********************
6 PM	153	153	128	162	596	*****************
7 PM	123	141	135	127	526	***************
8 PM	117	111	104	113	445	*************
9 PM	97	85	95	95	372	***********
10 PM	75	80	69	66	290	********
11 PM	60	70	47	48	225	******

TOTAL VOLUME IS 10,668 VEHICLES.

PEAK HOURS:
MORNING PEAK HOUR VOLUME OF 987 BEGINS AT 7:45 AM (9 %)
EVENING PEAK HOUR VOLUME OF 702 BEGINS AT 4:15 PM (7 %)

DATA COLLECTION BEGAN AT 3 pm ON SUNDAY,FEBRUARY 26, 1928.

WEATHER: Clear
BY J.D.C. FOR G.D.
COUNTER # 3
COUNT # 01070

Mission St. North of Cesar Chavez St.
Monday, February 26, 2001
South Bound

HOUR OF DAY	---- QUARTER HOUR 1st	2nd	3rd	---- 4th	HOUR TOTAL	EACH * REPRESENTS 25 VEHICLES A DASH MEANS HOUR VOLUME < 13
12 AM	42	40	42	39	163	*******
1 AM	29	30	27	36	122	*****
2 AM	25	20	23	10	78	***
3 AM	11	8	15	17	51	**
4 AM	5	14	15	13	47	**
5 AM	22	17	29	30	98	****
6 AM	31	46	57	61	195	********
7 AM	52	69	81	72	274	***********
8 AM	84	93	111	101	389	****************
9 AM	97	80	80	91	348	**************
10 AM	107	90	101	113	411	****************
11 AM	91	117	114	83	405	****************
12 PM	121	142	134	117	514	*********************
1 PM	143	141	139	111	534	*********************
2 PM	127	132	141	106	506	********************
3 PM	132	146	139	150	567	***********************
4 PM	123	153	148	158	582	***********************
5 PM	147	186	174	163	670	***************************
6 PM	166	150	133	117	566	***********************
7 PM	113	105	99	105	422	*****************
8 PM	95	81	73	96	345	**************
9 PM	104	91	55	59	309	************
10 PM	73	64	60	54	251	**********
11 PM	40	48	42	43	173	*******

TOTAL VOLUME IS 8,020 VEHICLES.

PEAK HOURS:
MORNING PEAK HOUR VOLUME OF 435 BEGINS AT 10:45 AM (5 %)
EVENING PEAK HOUR VOLUME OF 689 BEGINS AT 5:15 PM (9 %)

DATA COLLECTION BEGAN AT 2 pm ON SUNDAY,FEBRUARY 26, 1928.

WEATHER: clear
BY J.D.C. FOR G.D.
COUNTER # 1
COUNT # 01071

3. TURNING MOVEMENT COUNT DATA

3.1 Data Collected

The turning movement counts were carried out in order to determine both through movements and turning movements at various intersections within the Study Area. This information is required in order to:

- establish the functional classification of the street;
- assess the suitability of appropriate traffic calming measures; and
- evaluate the project effects and impacts.

The counts were undertaken at locations where the working group expressed concerns about pedestrian safety, cut-through traffic and localized congestion. The surveys were conducted during the months of March, April and May 2001 between 7:00 AM and 9:00 AM (the morning peak period), and 4:00 PM and 6:00 PM (the evening peak period).

3.2 Data Collection Results

The results of the intersection survey counts for the peak hour periods are illustrated geographically on Figures 3.1 and 3.2; while, the volumes along the main roads within the Study Area are summarized in Table 3.1.

Table 3.1: Summary of Peak Hour Volumes

Street	Between		AM Peak Hour (Two-way)	PM Peak Hour (Two-way)
Winfield St	Esmeralda Ave	Coso Ave	24	39
Godues St	Mission St	Coleridge ST	31	60
Leslie St	Mission St	Park St	31	27
Powers Ave	Mission St	Coleridge ST	37	24
Park Street	Mission St	Leslie St	38	71
Eugenia Ave	Mission St	Coleridge ST	40	128
Prospect Ave	Lundy's Ln	Coso Ave	46	104
Highland Ave	Mission St	Patton St	50	72
Ellsworth St	Powhattan Ave	Bernal Heights Blvd	58	101
Kingston St	Mission St	Coleridge ST	59	31
Coleridge St	Fair Ave	Powers Ave	71	70
Elsie St	Esmeralda Ave	Coso Ave	91	123
Fair Ave	Mission St	Coleridge ST	92	114
Bocana St	Holly Park Cir	Cortland Ave	98	81
Santa Marina	Mission St	Gladys St	98	99
Andover St	Cortland Ave	Eugenia Ave	99	109
Ellsworth St	Crescent Ace	Alemany Blvd	96	150
Folsom St	Cortland Ave	Eugenia Ave	105	63
Coso Ave	Winfield St	Elsie St	106	136
Bocana St	Cortland Ave	Eugenia Ave	121	119
Coso Ave	Prospect Ave	Winfield St	122	152
Coso Ave	Coleridge ST	Prospect Ave	132	156
Appleton Ave	Mission St	Gladys St	134	116
Folsom St	Jarboe Ave	Cortland Ave	137	84
Putnam St	Alemany Blvd	Tompkins Ave	151	148

Street	Between		AM Peak Hour (Two-way)	PM Peak Hour (Two-way)
Coso Ave	Elsie St	Bonview St	153	203
Richland Ave	Mission St	Leslie St	163	169
Virginia Ave	Mission St	Coleridge St	205	189
Andover St	Elbert St	Cortland Ave	303	166
Murray St	Mission St	Genebern Way	406	313
Justin Drive	Benton Ave	Alemany St	342	338
Crescent Ave	Mission St	Leslie St	407	398
Crescent Ave	Alemany Blvd	Nevada St	566	527
Cortland Ave	Gates St	Folsom St	636	642
Cortland Ave	Peraalta Ave	Bayshore Blvd	662	684
Cortland Ave	Mission St	Coleridge St	669	690
Cortland Ave	Bonview St	Bocana St	674	674
Cortland Ave	Folsom St	Bank St	678	645
Cortland Ave	Bocana St	Bennington St	703	674
Cortland Ave	Wool St	Andover St	728	688
Cortland Ave	Andover St	Moultrie St	778	821

A summary of the main findings of the survey data is provided below:

- during both the morning and evening peak periods Cortland Avenue was the busiest street within the Study Area. The busiest section of this street was between Andover Street and Moultrie Street with 778 vehicles in am peak and 821 vehicles in the pm peak.
- analysis of the directional distribution during the am peak hour along Cortland Avenue shows that between Andover Street and Bayshore Boulevard 60% of the traffic was eastbound; while, between Andover Street and Mission Street 55% of the traffic was traveling westbound. During the pm peak the following directional patterns were displayed, 51% of traffic between Andover Street and Bayshore Boulevard was westbound increasing to 60% between Andover Street and Mission Street.
- the busiest intersection within the Study Area, during both peak periods, was Cortland Avenue and Andover Street the total number of vehicles making manoeuvres was 942 and 842, for the am and pm peak hours, respectively.
- turning movement counts were undertaken at all the streets within the Study Area that intersect with Mission Street. The purpose of these counts was to identify the level of cut-through traffic that uses the local streets instead of the two main collector streets (i.e.: Cortland and Crescent Avenue). Interpretation of the intersection count data shows that the only local streets within in excess of 200 vehicles per hour were Murray Street and Virginia Avenue.

3.3 Conclusions

Excessive traffic volume in residential areas is associated with queuing, aggressive driving and cut-through traffic. During the outreach effort the community had expressed concerns about traffic levels on several streets within the Study Area. However, the results of the traffic survey demonstrate that volumes are generally light. The only streets where the level of traffic seems inappropriate for their respective function were:

- the intersection with Murray Street and Mission Street;

5. ACCIDENT DATA OBTAINED

5.1 Data Collected

The DPT provided a detailed collision database for the Bernal Heights area. The database contains collision information from 1995 to 1999.

5.2 Data Collection Results

The collision data was processed and separated into three categories; Pedestrian Collisions, Injury Collisions, and Total Collisions.

5.2.1 Pedestrian Collisions

Pedestrian Collisions are collisions that involve a pedestrian and one or more vehicles. The ten intersections with the most pedestrian collisions are summarized in Table 5.1 and are discussed below.

Table 5.1: Pedestrian Collisions (1995 – 1999)

Rank	Location	Number of Pedestrian Collisions
1	Cortland Ave and Mission St	8
2	Eugenia Ave and Mission St	5
3	Virginia Ave and Mission St	4
3	Richland Ave and Mission St	4
5	Cortland Ave and Ellsworth St	3
5	Godeus St and Mission St	3
5	Murray St and Mission St	3
5	Crescent Ave and Alemany Blvd	3
9	Cortland Ave and Bradford St	2
9	Cortland Ave and Andover St	2

The intersections along Mission Street comprised 60% of the top 10 pedestrian collision locations and intersections along Cortland Avenue comprised 30%. Alemany Boulevard was only sited once in the top ten.

5.2.2 Injury Collisions

Injury collisions are collisions that result in an injury to either a vehicle occupant and/or a bystander. The top 10 intersections with the most injury collisions are summarized in Table 5.2.

Table 5.2: Injury Collisions (1995 – 1999)

Rank	Locations	Number of Injuries
1	Crescent Ave and Alemany Blvd	58
2	Fair Ave and Mission St	35
3	Eugenia Ave and Mission St	30
4	Cortland Ave and Mission St	26
5	Ellsworth St and Alemany Blvd	23
6	Murray St and Mission St	16
7	Justin Dr and Alemany Blvd	15

Rank	Locations	Number of Injuries
8	Richland Ave and Mission St	13
9	Virginia Ave and Mission St	12
10	Highland Ave and Mission St	12

Analysis of the data shows that the intersection of Crescent Avenue and Alemany Boulevard is ranked number one in the top 10 injury collision list. The intersections along Mission Street comprised 70% of the top 10 injury collision list.

5.2.3 Total Collisions

Figures 5.1 and 5.2 show the total collisions over the 4-year period at each intersection in the Study Area; while, the 10 intersections with most reported collisions are summarized in Table 5.3.

Table 5.3: Total Collisions (1995-1999)

Rank	Locations	Number of Collisions
1	Crescent Ave and Alemany Blvd	54
2	Fair Ave and Mission St	28
3	Ellsworth St and Alemany Blvd	27
3	Eugenia Ave and Mission St	27
5	Cortland Ave and Mission St	23
6	Virginia Ave and Mission St	17
7	Murray St and Mission St	15
8	Folsom St and Alemany Blvd	12
9	Richland Ave and Mission St	11
9	Highland Ave and Mission St	11

Interpretation of the survey results show that the intersection of Crescent Avenue and Alemany Boulevard had the most collisions in the Study Area between 1995-1999. The intersections along Alemany Boulevard comprised 30% of the top 10 and intersections along Mission Street comprised 70% of the top 10.

5.3 Conclusions

Interrogation of the DPT accident database showed that the intersections along Alemany Boulevard and Mission Street accounted for over 50% of all accidents in the Study Area. There were also a high number of recorded pedestrian accidents along Cortland Avenue – this issue will need to be addressed during the development of the traffic calming plan.

This accident trend illustrates that the highest numbers of accidents generally occurred at locations with relatively high traffic volumes and pedestrian movements. This pattern is normal, as a greater number of conflicts occur at locations with higher volumes of both traffic and pedestrians.

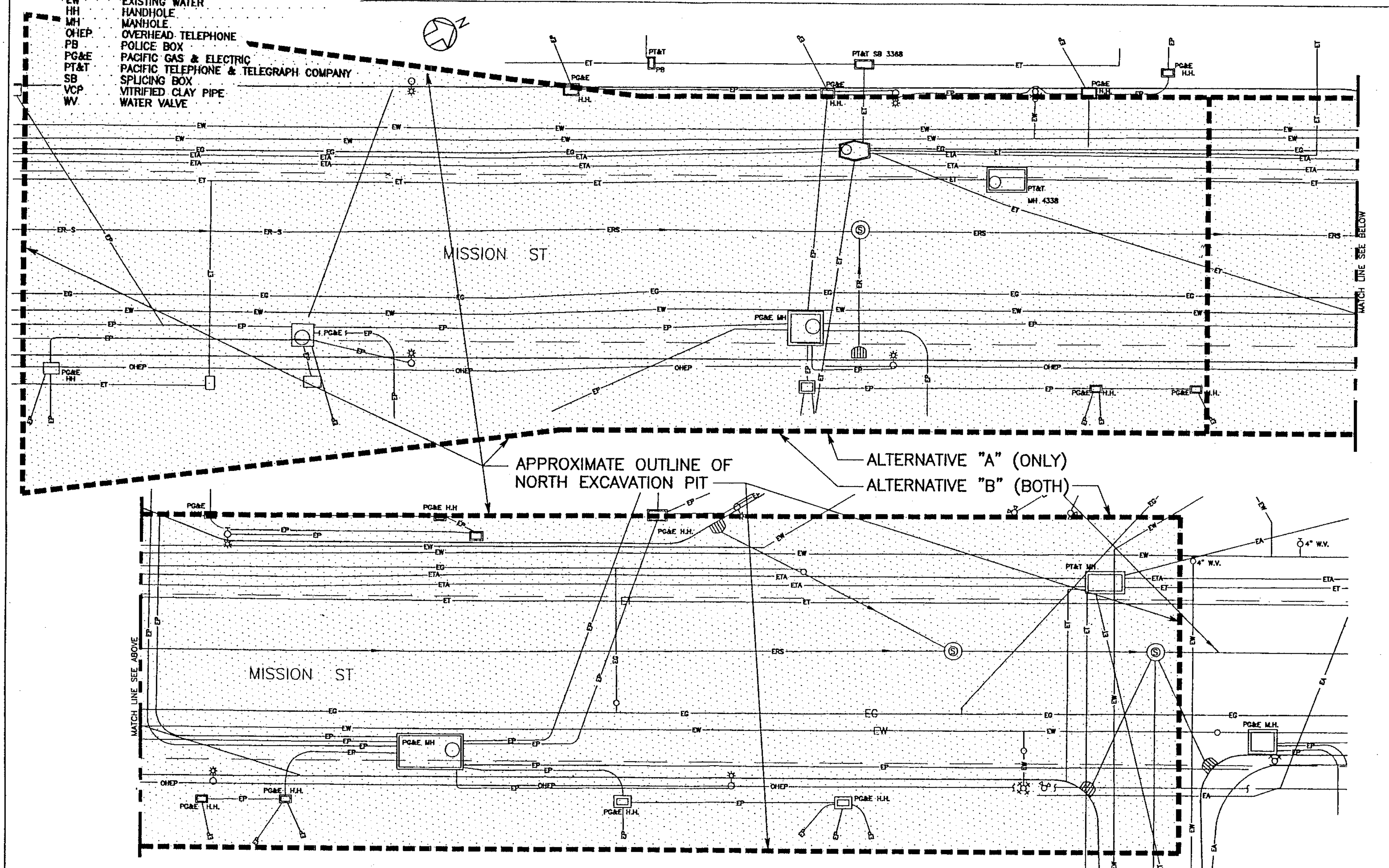
The one exception to this trend is Patton Street, which has relatively low flows of traffic and pedestrian. However, over the four-year period investigated there have been 5 recorded accidents, between Highland Avenue and Appleton Avenue. All the 5 accidents were vehicle oriented; therefore no pedestrians or bicyclists were injured. Further analysis of the database shows the reasons for this anomaly:

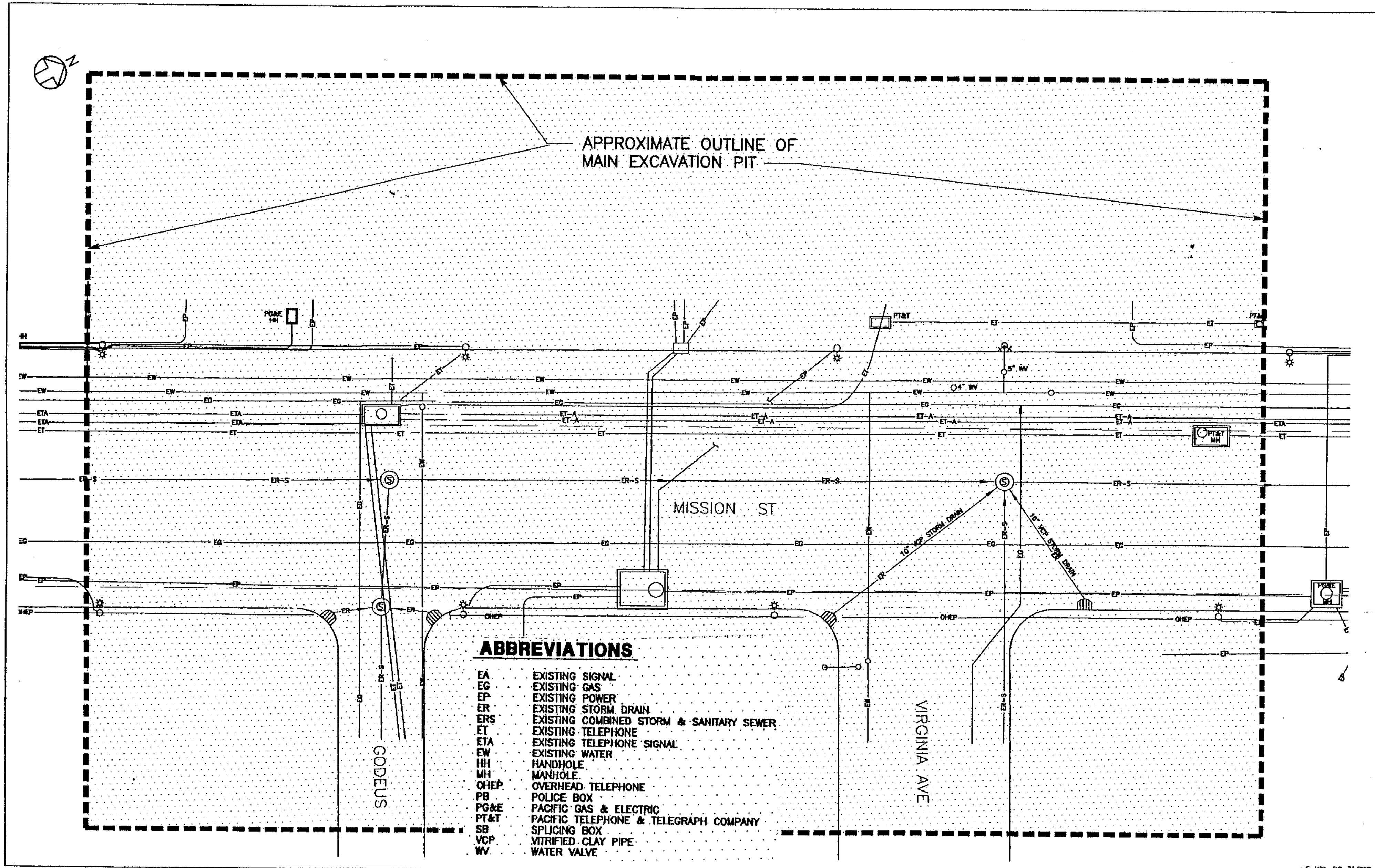
APPENDIX C

EXISTING UTILITY MAPS

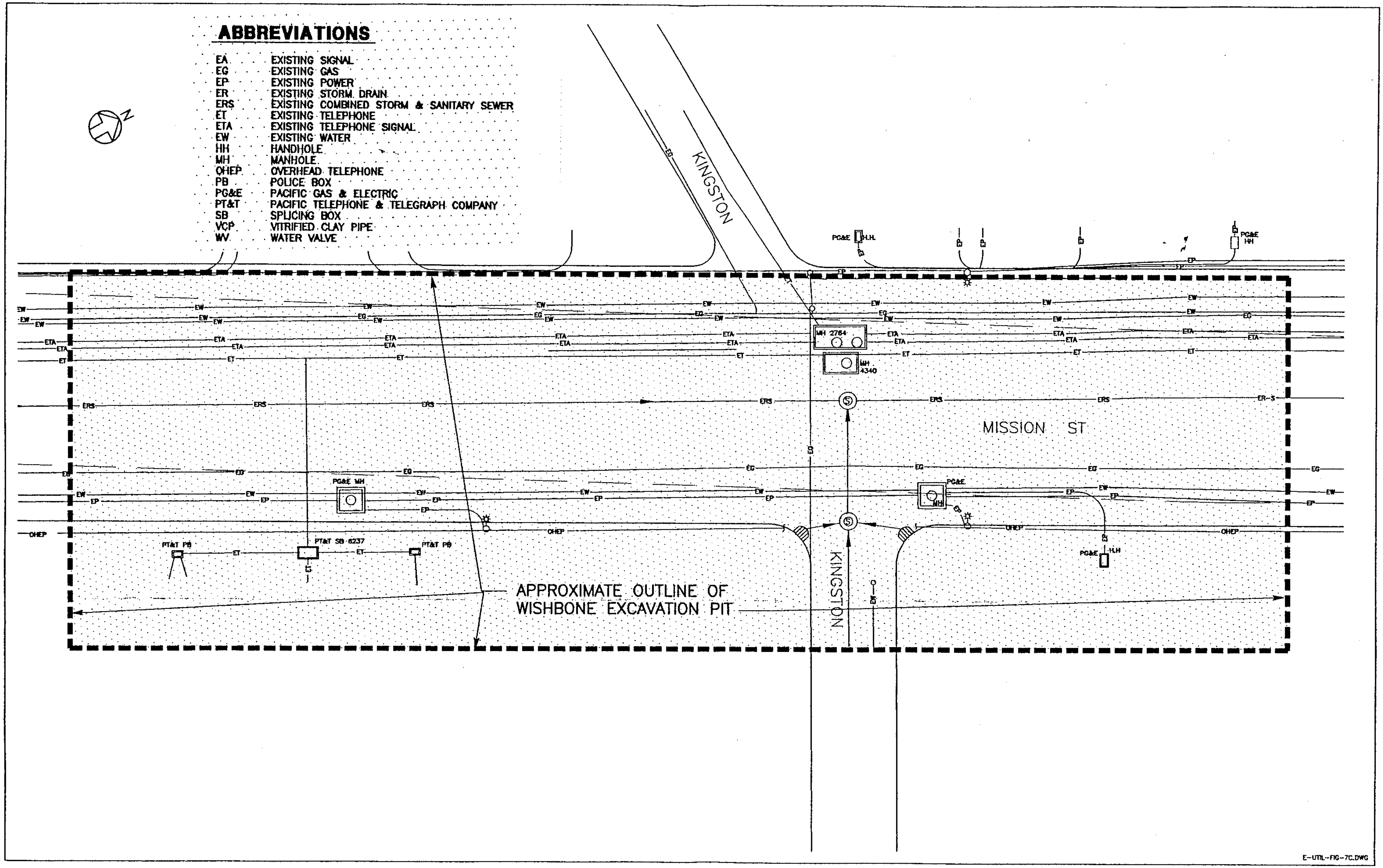
ABBREVIATIONS

EA	EXISTING SIGNAL
EG	EXISTING GAS
EP	EXISTING POWER
ER	EXISTING STORM DRAIN
ERS	EXISTING COMBINED STORM & SANITARY SEWER
ET	EXISTING TELEPHONE
ETA	EXISTING TELEPHONE SIGNAL
EW	EXISTING WATER
HH	HANDHOLE
MH	MANHOLE
OHEP	OVERHEAD TELEPHONE
PB	POLICE BOX
PG&E	PACIFIC GAS & ELECTRIC
PT&T	PACIFIC TELEPHONE & TELEGRAPH COMPANY
SB	SPLICING BOX
VCP	VITRIFIED CLAY PIPE
WV	WATER VALVE



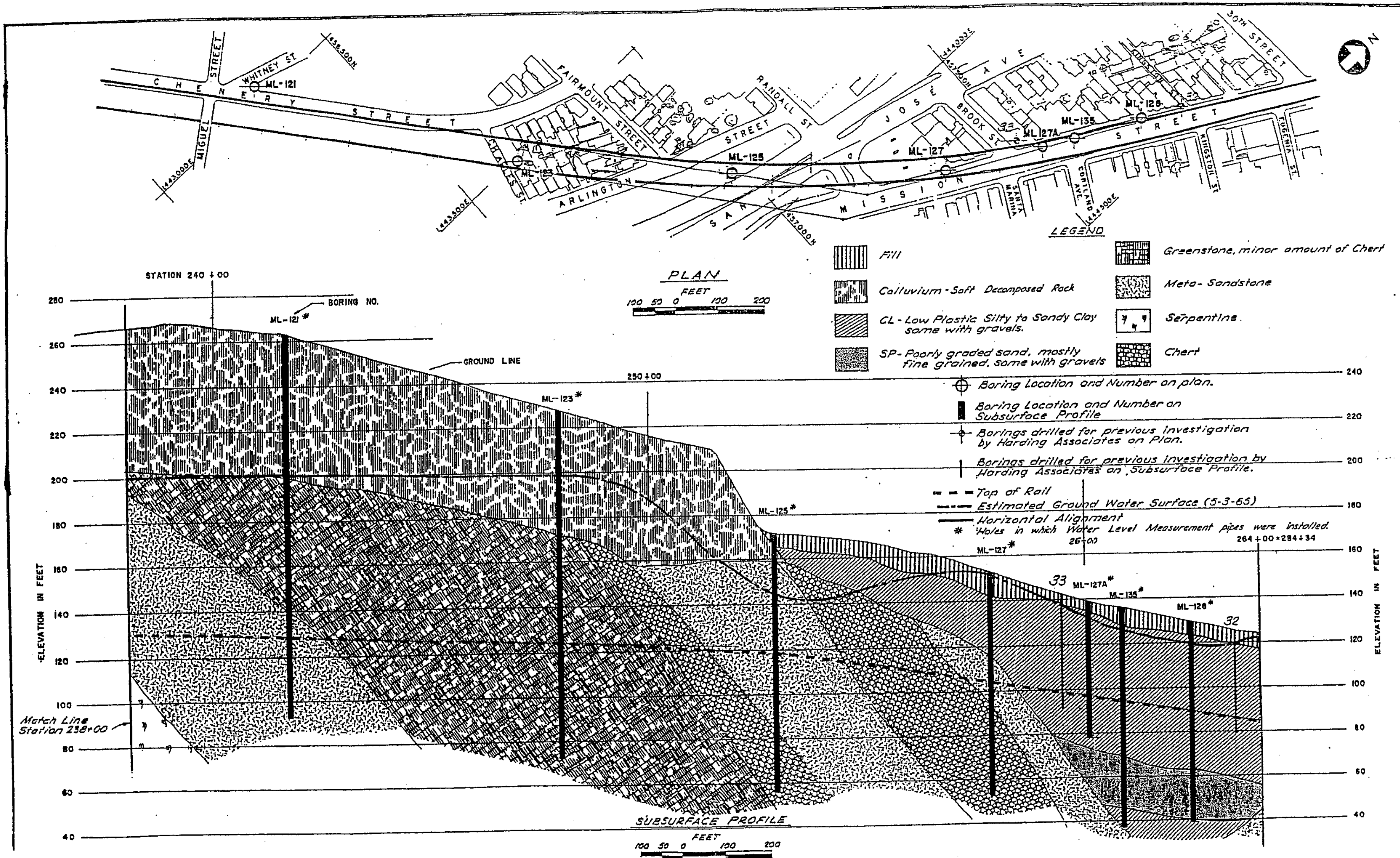


APPROXIMATE OUTLINE OF MAIN EXCAVATION PIT
MISSION ST
GODEUS
VIRGINIA AVE
10" VCP STORM DRAIN
10" VCP STORM DRAIN
PT&T
PT&T MH
PG&E HH
5" WV
4" WV
ABBREVIATIONS
EA EXISTING SIGNAL
EG EXISTING GAS
EP EXISTING POWER
ER EXISTING STORM DRAIN
ERS EXISTING COMBINED STORM & SANITARY SEWER
ET EXISTING TELEPHONE
ETA EXISTING TELEPHONE SIGNAL
EW EXISTING WATER
HH HANDHOLE
MH MANHOLE
OHEP OVERHEAD TELEPHONE
PB POLICE BOX
PG&E PACIFIC GAS & ELECTRIC
PT&T PACIFIC TELEPHONE & TELEGRAPH COMPANY
SB SPLICING BOX
VCP VITRIFIED CLAY PIPE
WV WATER VALVE
E-UTIL-FIG-7A.DWG


ABBREVIATIONS
EA EXISTING SIGNAL
EG EXISTING GAS
EP EXISTING POWER
ER EXISTING STORM DRAIN
ERS EXISTING COMBINED STORM & SANITARY SEWER
ET EXISTING TELEPHONE
ETA EXISTING TELEPHONE SIGNAL
EW EXISTING WATER
HH HANDHOLE
MH MANHOLE
OHEP OVERHEAD TELEPHONE
PB POLICE BOX
PG&E PACIFIC GAS & ELECTRIC
PT&T PACIFIC TELEPHONE & TELEGRAPH COMPANY
SB SPLICING BOX
VCP VITRIFIED CLAY PIPE
WV WATER VALVE
KINGSTON
MISSION ST
KINGSTON
MH 2764
MH 4340
PG&E MH
PG&E H.H.
PG&E HH
PT&T PB
PT&T SB 6237
APPROXIMATE OUTLINE OF
WISHBONE EXCAVATION PIT
E-UTIL-FIG-7C.DWG

APPENDIX D

SOILS DATA



SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT

BECHTEL CORPORATION ENGINEERS SAN FRANCISCO

PARSONS BRINCKERHOFF-TUDOR-BECHTEL GENERAL ENGINEERING CONSULTANTS

Designed by: L. Woolf, C. Spink
Drawn by: C. Sedon
Checked by: R. Glover
In charge: H. Burke

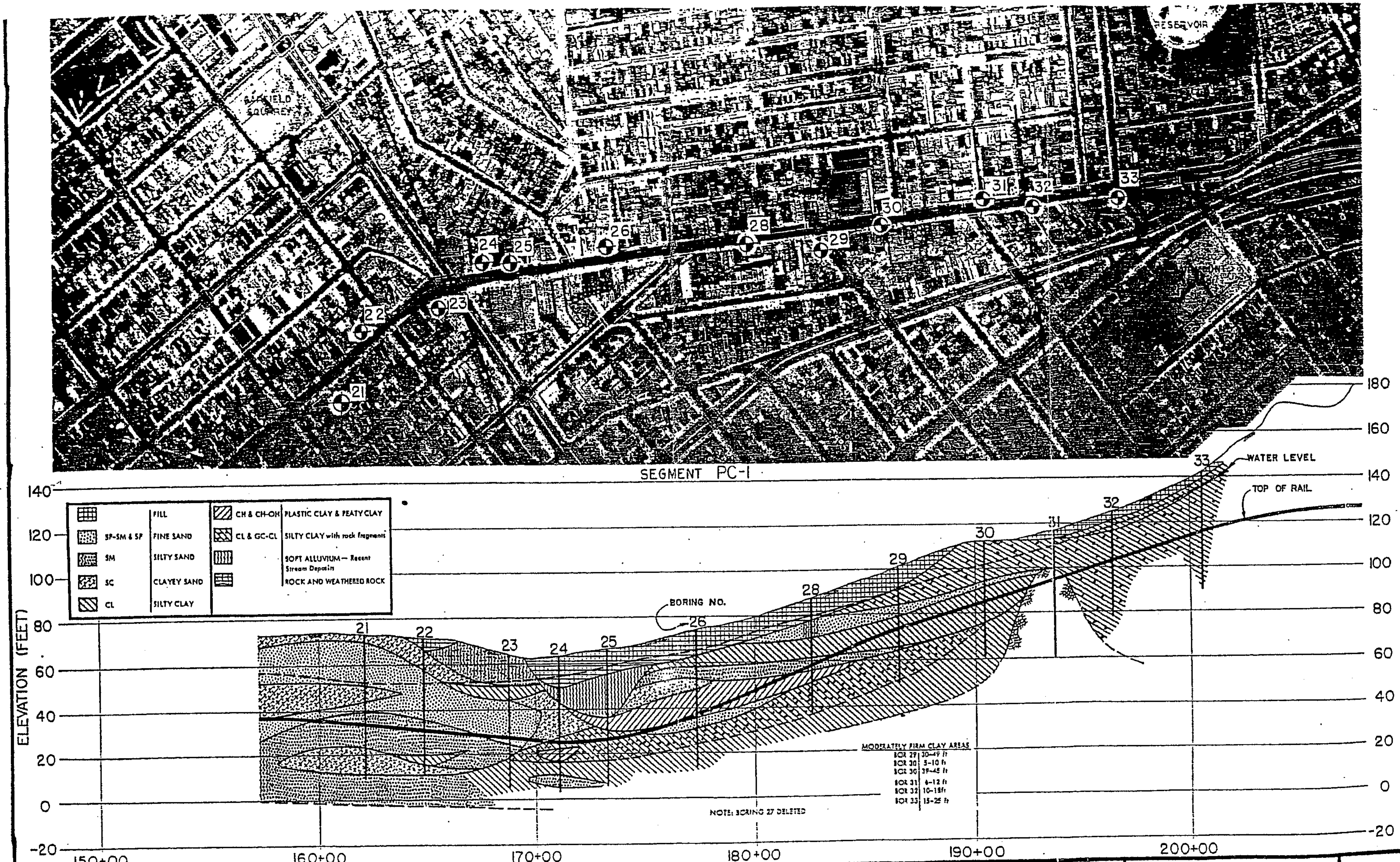
MISSION LINE - PLAN AND SUBSURFACE PROFILE

Station 238+00 to Station 284+34

Scale: As Shown

M 704

Plate 3



REVISIONS:	NOTES:
DRAWN BY: G.W.K. CHECKED BY: ALB APPROVED: [illegible]	

HARDING ASSOCIATES
SOIL MECHANICS ENGINEERS

SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT

BORING LOCATION PLAN AND SUBSURFACE PROFILE

MISSION LINE

ARMY ST. TO RANDALL ST
STA 170+00 TO STA 196+00

SCALE: [illegible]
DATE: 7 MAR 64

APPENDIX E

Bay Area Rapid Transit District

BART STAFF LISTING OF STATION CRITERIA

Proposed In-Fill Station Criteria 30th St

1. Maximum track gradient, 1.5%
2. Because of maximum track gradient requirements and constructability issues, station must be off-line.
3. Provide turnback and double-ended pocket track for operating flexibility.
4. Provide dispatch capability to the South
5. All vertical circulation elements (i.e. stairways, elevators, and escalators) must touch down on platform with gradient that does not exceed 1.5%. Vertical transitions to off-line platforms from the main line may encroach in platform areas beyond the central touch down space reserved for vertical circulation elements. This encroachment shall not exceed 150' from the ends of station.
6. Allow two-way traffic on an off-line center pocket track configuration if station pocket has double wishbone track connections and overlapped interlockings designed to preclude unsafe train movements.
7. In addition to provisions for turnback facilities, consider providing a bad order/ hold track that does not interfere with normal train operations.
8. Maximum track gradient for short vertical track transitions to off-line platforms shall be 4% in the normal uphill direction of train movement and 5-1/2% in the normal downhill direction.
9. Turnouts to off-line station platforms and/or pocket tracks shall be #15 std. And #10 Eq. (36MPH)
10. Station concepts must be constructable under conditions acceptable to BART operations.
11. BART operating moves may include the following:
    a. Train by-pass (skip stop)
    b. Turnback
    c. Off-peak or bad order hold (10 cars)
    d. Single tracking for maintenance
12. Concept shall consider and discuss impacts on BART systemwide operations and extensions planning.

SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT

PROJECT: **30^{TH} AND MISSION STREET STATION, SAN FRANCISCO** Date: 7-20-01
CONTRACT NO. / WORK ORDER NO.: - - - - - - - - - - - - - - - - - **Due Date: 7-20-01**
SUBMITTAL#: **TRANSMITTAL #01** Sheet: 1 of 7
Document: 30^{TH} AND MISSION STREET INFILL STATION STUDY
Reviewer: R.AVERY / M.CHIU /J.GARCIA / H.S.AGROIA **Discipline: ENGINEERING** **Discipline Chief: Colin McDonald**

REF NO.	Potential Operating Constraints/Issues	Comments	Remarks
1	What is the maximum gradient for station platforms? Gradient for an on-line station at 30th Street would be 3.12%.	The desirable gradient through stations is zero. The maximum gradient shall be 1.0% through stations per Design Criteria volume I Civil Section 3.8. **ADAAG** Requirements/Regulations: Refer to two attached files (30thsta8.mlm & 30thsta9.mlm) from Jeff Garcia on the subject. From an ADA standpoint we need to maintain a constant grade along the platform. ADA requires that the platform be level. It defines level as a maximum gradient of 1:50 (2.0%) on a constant plane in any direction. However, to allow for platform drainage, the platform should also have a cross-slope within these requirements. If a std. cross-slope of 1.5% is used, the corresponding maximum allowable longitudinal slope is then 1.322%. We could theoretically maximize the longitudinal gradient and still be within ADA compliance (i.e. 1.0% cross-slope and 1.732% longitudinal slope), however then we'd have to also look at potential vehicle slippage and other issues caused by steeper slope, however minor it may appear. (Most existing BART stations are constructed on a 0.0% slope.) Needless to say, an on-line station with a grade of 3.12% would not be allowed under the ADA.	

SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT

PROJECT: 30TH AND MISSION STREET STATION, SAN FRANCISCO
CONTRACT NO. / WORK ORDER NO.: - - - - - - - - - - - - - - - - -
SUBMITTAL#: TRANSMITTAL #01
Document: 30TH AND MISSION STREET INFILL STATION STUDY
Reviewer: R.AVERY / M.CHIU /J.GARCIA / H.S.AGROIA **Discipline:** ENGINEERING **Discipline Chief:** Colin McDonald

Date: 7-20-01
Due Date: 7-20-01
Sheet: 2 of 7

REF NO.	Potential Operating Constraints/Issues	Comments	Remarks
2	Should the station be developed as an on-line or off-line facility?	I believe that it should be on-line as an off-line stations need turnouts at each end of the station on each track. This will unneccessarily decrease line reliability to meet schedule. An existing on-line station (24th Street @ Mission) is only 0.6 miles from this location.	
3	How would an on-line or off-line station effect train operations and scheduling?	An on-line station will increase run / schedule time by about 1 to 2 minutes which may require adding one or two trainsets (10 to 20 cars) depending on the characteristics of each service route. An off-line station would really only work in this location if it was turnback with a double-ended pocket track. This would help service reliability by enabling BART to run a service ending at 30th Street. Also refer to Rudy Crespo (Transportation).	
4	Should the off-line station be developed as a stub end terminal or through routed?	It should have a double-ended pocket track long enough for a 10 car train with short straight sections on the pocket track beyond the switches.	

PROJECT: **30^{TH} AND MISSION STREET STATION, SAN FRANCISCO** — Date: 7-20-01
CONTRACT NO. / WORK ORDER NO.: - - - - - - - - - - - - - - - - — **Due Date: 7-20-01**
SUBMITTAL#: **TRANSMITTAL #01** — Sheet: 3 of 7
Document: 30^{TH} AND MISSION STREET INFILL STATION STUDY
Reviewer: R.AVERY / M.CHIU /J.GARCIA / H.S.AGROIA **Discipline: ENGINEERING** **Discipline Chief: Colin McDonald**

REF NO.	Potential Operating Constraints/Issues	Comments	Remarks
5	Is this a desirable location for a future turnback facility? What are the related requirements for pocket track length and gradient? Can the pocket track be constructed on a curve?	Not for regular service, but yes for "shoulder" service or rush hours only. Pocket track should ideally be lower than any track it is connected to so that in the event of an accidental brake release it does not run into the mainline tracks. **Schaefer Ranch Rd. Pocket Track** on DPX has horiz. & vert. curves and is at 2% grade per Contract 08YI-110 page nos.24 & 25. **Center Spur (MC)** at north of Daly City Sta. was 570' long on a 1000' radius curve per Contract 1M4072 page 3. Also, refer to Rudy Crespo (Transportation).	
6	Is it possible to utilize a single platform station with two-way running and inbound/ outbound crossovers?	No, absolutely not with the headways we are running. Also, refer to Rudy Crespo (Transportation).	
7	What is the maximum gradient that a turnout can be installed on?	3.76% per Contract 1Z4483 page 485 (1K0061 page 21). This is the max. grade used in the system. Turnouts are not permitted on vertical curves.	
8	What is the maximum gradient for tangent running tracks?	4.0% per Design Criteria volume I Civil Section 3.5.4.1.	
9	What is the maximum gradient allowed into and out of the station for train operation?	This will be an exception to the Design Criteria volume I Civil Section 3.8. The grade should match the station grade 200 ft beyond the limits of platforms.	

SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT

PROJECT: **30TH AND MISSION STREET STATION, SAN FRANCISCO** Date: 7-20-01
CONTRACT NO. / WORK ORDER NO.: - - - - - - - - - - - - - - - - - - **Due Date: 7-20-01**
SUBMITTAL#: **TRANSMITTAL #01** Sheet: 4 of 7
Document: 30TH AND MISSION STREET INFILL STATION STUDY
Reviewer: R.AVERY / M.CHIU /J.GARCIA / H.S.AGROIA **Discipline: ENGINEERING** **Discipline Chief: Colin McDonald**

REF NO.	Potential Operating Constraints/Issues	Comments	Remarks
10	What are the length and gradient change limits for vertical curves?	Length: Refer to Design Criteria volume I Civil section 3.6.2 for information. Rate of Change of Grade: Refer to Design Criteria volume I Civil Section 3.6.3 for information.	
11	Can a portion of the station be constructed on a vertical curve? If so, how much?	It will be very hard to build the track and platform in parallel changing planes. These MUST be accurately done in order to meet ADA requirements for train to platform elevation differences to be within plus or minus 5/8 inch. The north end of 19th Street Oakland Station is on a portion of vertical & horizontal curves for approx one car length, and has restraining rail per Contract 1k0015, drawing nos. CT5 & CT6.	