PROJECT DESCRIPTION AND ENVIRONMENTAL MITIGATION REPORT

PASADENA - LOS ANGELES RAIL TRANSIT PROJECT

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SECTION 1.0 INTRODUCTION

General Description and Purpose

The Pasadena-Los Angeles Rail Transit Project is proposed to be a conventional light rail transit, to be implemented with criteria and specifications identical to that of the Long Beach - Los Angeles Rail Transit Project (Blue Line), and operating between downtown Los Angeles and the eastern area of Pasadena. Major portions of the system will have peak hour typical operating headways of 6 minutes with 3 car trains, while the outer extremities could operate less frequently, or at about 9 minute peak headways.

The alignment, beginning at Union Station, will be basically at-grade, will pass through the Chinatown area, enter the AT&SF Railroad right-of-way at the Los Angeles River near the North Broadway bridge crossing, and will continue in the AT&SF right-of-way through the community of Highland Park and the cities of South Pasadena and Pasadena (see Figure 1-1). The transit guideway will replace the AT&SF facilities; i.e., there will be no shared facilities once in the railroad right-of-way. The alignment is approximately 13.4 miles in length.

The purpose of this report is to describe the system, document the basic assumptions of the work accomplished, identify problem areas, and summarize environmental impact mitigation commitments sufficient to serve as a base document for proceeding to the next phase of project development. Section 18.0, References, provides a list of reference documents that should be utilized in conjunction with this report.

Project Background

The Pasadena-Los Angeles Rail Transit Project was identified as a high priority corridor on the Proposition A map, which was the implementation plan that resulted from the passage of Proposition A, the countywide one-half percent sales tax approved by the voters in November, 1980.

Two route refinement studies were conducted in the corridor beginning in 1985 and being completed in 1988. Five basic alignment alternatives were considered: Lincoln Heights (N. Broadway), Mission Road, Soto Street. N. Main Street, and Highland Park, which would occupy the AT&SF right-of-way. (A number of options were explored in connecting through Chinatown and the Union Station area to the 7th and Flower Metro Rail Station). These initial alternatives ended in the area of the proposed extension of the Long Beach (I-710) Freeway. Additionally, a route refinement study was conducted in the City of Pasadena during this period, and three basic

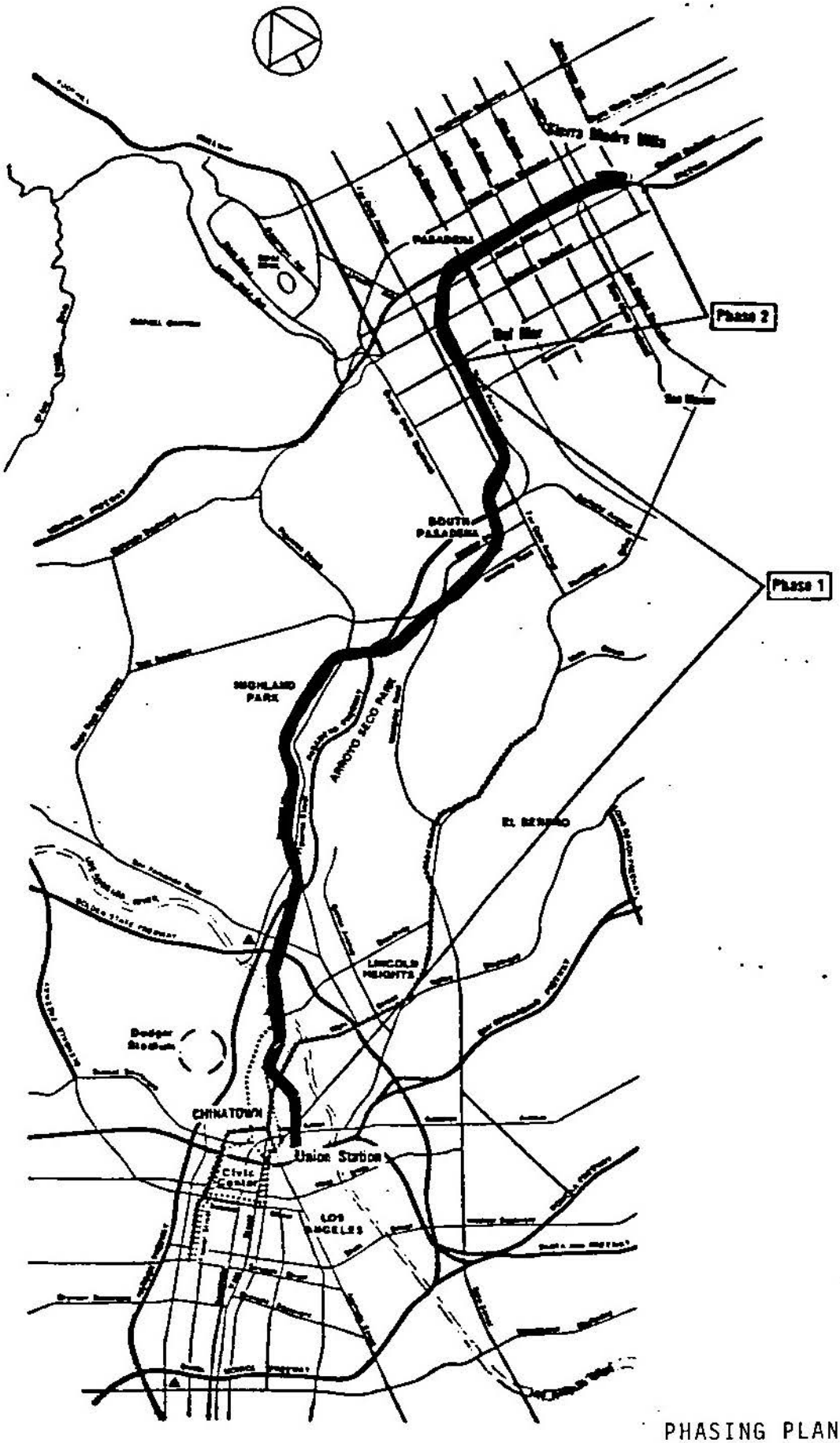
alignment options were evaluated: the Green Street Mall option, Colorado Boulevard, and the AT&SF right-of-way in the median of the Foothill (I-210) Freeway.

In March, 1988, an Environmental Impact Report (EIR) was authorized by LACTC. The alignment alternatives approved for the EIR were the Highland Park (AT&SF right-os-way) and N. Main Street alternatives in the southwest portion of the corridor. The EIR scope was expanded in 1989 to include new alignment options in the Union Station-Chinatown area, and to extend the project along the AT&SF right-of-way in the northeast portion of the corridor beyond the proposed Long Beach Freeway extension through South Pasadena and Pasadena.

The revised Draft Environmental Impact Report was issued in November, 1989, at which time the Commission approved the Highland Park alternative, beginning at-grade at Union Station and ending in the eastern area of Pasadena. Also approved was a one station extension along Flower Street north of the Seventh and Flower Metro Rail Station. The Commission also agreed that additional studies would be developed in the Union Station-Chinatown area in an attempt to locate a station more closely to the center of the Chinatown business district.

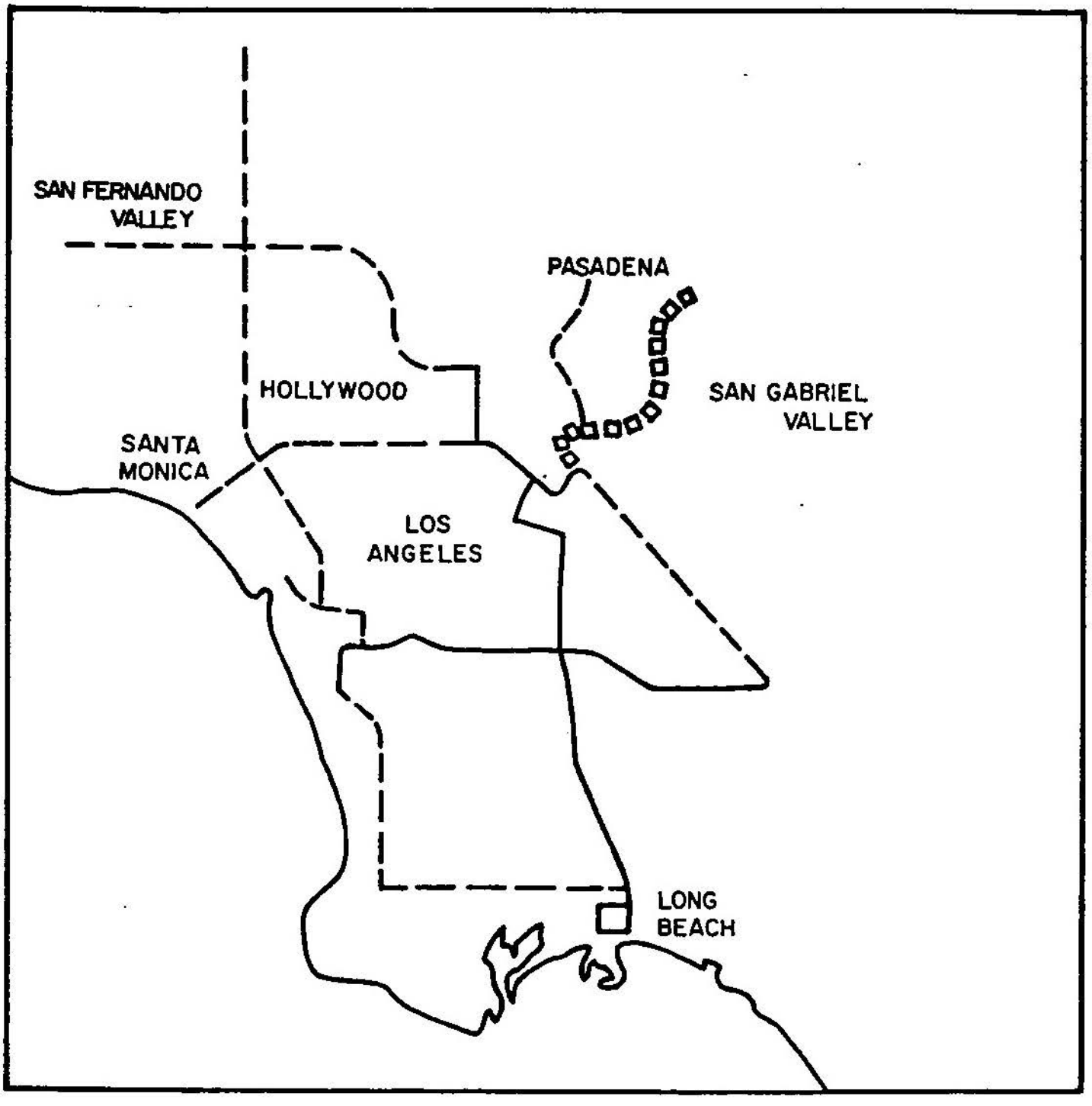
Rail/Rapid Transit Connections

The Pasadena-Los Angeles LRT line will be a part of a regional network that will directly connect to Metro Rail in downtown Los Angeles, thereby indirectly connecting to various lines in the network (see Figure 1-2). Direct connections are also possible to the Glendale-Los Angeles line, to commuter rail operations, and to AMTRAK. Should this line be extended through downtown Los Angeles, it could function as an extension of the Blue Line.



Phasing Plan: Highland Park Alternative
Union Station to Sierra Madre Villa
Pasadena Light Rail Transit Project

PHASING PLAN &
ROUTE MAP
Figure 1-1



LOS ANGELES COUNTY RAIL TRANSIT PLAN FIGURE I-2

SECTION 2.0 ROUTE ALIGNMENT DESCRIPTION

For viewing the plan and profile drawings, typical sections, and station site plans, please refer to the **Pasadena-Los Angeles Rail Transit Project** engineering drawings.

Los Angeles Central Area

The alignment begins at Union Station, where an LRT station, Union LRT Station, is sited at-grade above the Metro Rail station at AMTRAK level. The guideways proceeds at-grade northerly along the Southern Pacific Transportation Company (SPTC) right-of-way to near College Street, and curves northwesterly towards the Southern Pacific freight yard. The Chinatown Station is proposed to be located near Spring Street, easterly of College Street.

The at-grade alignment continues northerly along the western side of the Southern Pacific freight yard, crosses under the North Broadway Bridge, and rises to a bridge structure in order to separate from the SPTC tracks and the LRT yard leads (please see Section 11.0 for a discussion of maintenance facilities) on the south bank of the Los Angeles River, and to cross over the river. At this point, the guideway enters the AT&SF Railroad right-of-way and remains at-grade, except for bridge overcrossings, for the duration.

AT&SF Railroad Right-of-Way

The guideway continues northeasterly, crossing over the Golden State Freeway and Avenue 26th, with the Avenue 26 Station sited between the two crossings. The next crossing is over the Arroyo Seco and the Pasadena Freeway, and the next station is sited just north of the grade crossing at Figueroa, the Marmiom/Figueroa Station. Continuing northeasterly in the railroad right-of-way and parallel to Marmion Way, the alignment curves both east and west as it approaches the intersection of Avenue 50 and Marmion Way. The Avenue 51 Station is located between the Avenue 50 and Avenue 51 grade crossings.

Proceeding at-grade northeasterly through Highland Park in the median of Marmion Way, the Marmion Way/Avenue 57 Station is located between Avenue 57 and Avenue 58. A pocket track is located easterly of the station. Continuing easterly, the alignment crosses over the Pasadena Freeway and the Arroyo Seco and proceeds at-grade into South Pasadena. The two possible station sites in South Pasadena are Mission Station, at Mission Street, and Fair Oaks Station near Oak Lawn Avenue. The alignment crosses over the Pasadena Freeway just southerly of the Fair Oaks Station site, and crosses under Fair Oaks

Avenue just northerly of the site, where it enters Pasadena.

The guideway follows the AT&SF right-of-way at-grade in a northerly direction between Glenarm Street and Walnut Street, entering the median of the Foothill Freeway just beyond Walnut Street. Stations are tentatively located at Glenarm (Glenarm Street Station), at California Boulevard (California Boulevard Station), at De Mar Boulevard (Del Mar Boulevard Station), and north of Holly Street (Memorial Park Station).

The guideway then proceeds easterly in the median of the Foothill Freeway, where it continues of occupy the AT&SF right-of-way. The guideway is proposed at-grade, but is separated from cross streets by virtue of being in the freeway median. Stations, whose access is either from streets above or below, are tentatively located at Los Robles Avenue (Los Robles Avenue Station), at Lake Avenue (Lake Avenue Station), at Hill Avenue (Hill Avenue Station), at Altadena Drive (Altadena Drive Station), and west of Sierra Madre Villa Avenue (Sierra Madre Villa Avenue Station), which is the terminal. Storage tracks are provided beyond the terminal station.

SECTION 3.0 PHYSICAL CONDITIONS

Geology

The terrain varies, from relatively flat in downtown Los Angeles to sloping dissected hills in the northeast area. The elevation varies from about 300 feet above mean sea level to about 640 feet near the northwestern edge of the project area. The highest point in the area is at Mount Washington at 870 feet.

Major physiographic features in the project area include the Elysian Hills and the Repetto Hills. The Repetto Hills are bisected by the Arroyo Seco, which empties into the Los Angeles River near Elysian Park.

The topography in the area gently slopes towards the Los Angeles River, and forms gentle hills to the north. In the vicinity of the River, the topography is nearly flat except near the Elysian Hills. Through the San Rafael Hills, the Arroyo Seco has formed a narrow valley surrounded by moderate hills. The Highland Park alignment follows the Arroyo Seco closely as it provide a fairly level passageway through the hills.

Valleys in the area are underlaid by loosely-to-moderately compacted sand and gravel. Densely compacted sand and gravel, as well as sedimentary rocks, shales, and sandstone also occur.

For more specific geologic information and maps, please refer to **Revised Draft Environmental Impact Report,Pasadena-Los Angeles Light Rail Transit Project,** November, 1989.

Seismic

The project area is located in a seismically active region which consists of a number of active faults including the San Andreas, Newport-Inglewood, San Fernando, Sierra Madre, Whittier, and Raymond Hill faults. The Raymond Hill Fault and the San Rafael Fault cross the Highland Park alignment. Please refer to **Revised Draft Environmental Impact Report, Pasadena-Los Angeles Light Rail Transit Project,** November, 1989, for more details on fault activity in the area, to include an identification map and listing of probable earthquakes. Due to the nature of the geology in the Los Angeles area, seismic protection will be required in the design and construction of the system.

Seismic and Geologic Items Needing Attention

The AT&SF bridge structures to be modified for LRT use have not been verified to have been seismically updated, and the status is presently unknown.

There is an existing steep cut section just beyond the Pasadena Freeway overcrossing northeasterly of Highland Park (civil engineering station 380+00) that presents slide problems for freight and AMTRAK operations. Measures will be required to stabilize this slope.

Land Use and Development

The area in which the project is located is urbanized and diverse. The Los Angeles central business district is located at the southwest end of the project. Leaving downtown, the alignment passes through an industrial district. Single and multiple-family residential, with some commercial and light industrial uses are traversed in the Highland Park community. Residential, with some local commercial uses, are encountered in South Pasadena. As the LRT enters Pasadena, land uses transition to industrial and warehousing interspersed with commercial uses. In the central part of Pasadena, the Old Town District is crossed. This area is a mix of older office and commercial, with considerable restoration underway. The alignment continues eastward to its terminus in the median of the Foothill Freeway, an area of residential, commercial, and industrial uses.

Because of anticipated continued growth in the Los Angeles area combined with the attractiveness of rail transit access to new developments, there should be growth in those areas in closer proximity to stations along the corridor. In Section 10, Stations, proposed developments in the station areas are discussed.

SECTION 4.0 . RIDERSHIP FORECASTS

The Southern California Association of Governments (SCAG) developed ridership forecasts for the year 2010. Thirteen ridership forecasting model runs were prepared in order to address the various alignment alternatives carried into the EIR. For the alignment alternative adopted by the commission, the Union Station-No Subway Option of the Highland Park Alternative extending to East Pasadena, the AM peak line loads are forecast at 5,350 southbound passengers. The daily patronage is forecast at 68,200 trips for the entire 13.4 mile line. For the phase ending at the Del Mar Station in Pasadena, the ridership for this 9.1 mile segment is forecast at 56,600. For more detailed information related to the ridership of the line by phases, please refer to the **Revised Draft Environmental Impact Report**, Section 3.7, and to **Ridership Forecasts for the Pasadena & Coastal Corridors Light Rail Line, Environmental Impact Report Studies**, July, 1988, as amended, by SCAG.

SECTION 5.0 SYSTEM OPERATIONS

Operations

The description of operational characteristics is based on the SCAG ridership forecasts discussed in Section 3 and by the operations plan referenced as **Pasadena Corridor EIR Study, Operating Plans For Alternative Alignments,** prepared by Manuel Padron Associates, September, 1989.

At full operation, the Highland Park Alternative beginning at Union Station would operate during peak hours at six minute headways with 3 car trains. The outlying phase, from Del Mar Station to the terminus, would operate at 9 minute headways with 3 car trains. The total number of vehicles would be 38. The travel time between crossovers should not exceed 4 minutes. Tail tracks at the terminus should provide storage for eight vehicles, and a pocket track south of the Del Mar Station should accommodate six vehicles.

The estimated station-to-station run times and time between crossovers are listed in Table 5-1. The elapsed run time for the full length of the line is projected at approximately 25 minutes.

Because the major portion of the project would be operated in a formally freight and AMTRAK right-of-way, a number of the intersections with freeways and arterial streets are grade-separated, and LRT would occupy these separated structures. Grade crossing that do occur typically are to be gated with LRT preemption. An exception would be the area in Highland Park where transit would operate in the median of Marmion Way, which would be converted to a one-way couplet, and trains would operate in a street running mode, with signals. In the area of the Pasadena central business district where transit is parallel to Arroyo Parkway, preemption with gated crossings are recommended. However, rulings from the California Public Utilites Commission regarding the proximity of station platforms to gated crossings on the Blue Line may require a rethinking of operations in this area. The city blocks are relatively short and the right-of-way narrow, making it difficult to site stations sufficiently away from the crossings to meet PUC rulings.

Passenger Comfort and Contingency Planning

The assumption that have been made regarding the operations of the Pasadena-Los Angeles Line are based on the Blue Line design and performance criteria. The performance of the vehicle is presumed to be similar, and as such accelerates and brakes in a smooth manner. The maximum vehicle loading would

be 145 passengers, with 76 seated and 69 standing during the peak operations. The interior noise level of the vehicle should not exceed 72 dBA.

Contingency planning for operations that are abnormal or in an emergency situation involves single track and close-in operations. Single-track operations may be used when trains must be operated in both directions on one track by utilizing crossovers. For the Pasadena Line, the operating plan assumed that trains would not be delayed as a result of reversing directions of the track, and that full speed (35 mph in mixed traffic and 55 mph in exclusive right-of-way) could be maintained on a single track section, slowing to 25 mph through crossovers. It is acknowledged that these assumptions reflect ideal operations, an crush headways may be difficult to maintain through single track sections.

Close-in operation occurs when a train closes in to provide assistance to a disabled train. The disabled train is pushed to a refuge area. Evacuation plans for such events have been developed for the Blue Line and would apply to the Pasadena Corridor.

Operations Items Needing Attention

Due to residential concerns and track geometry, a crossover as required by the operating plan was not shown on the conceptual drawings between Mission Street Station and Glenarm Street Station.

Due to the narrow right-of-way and the developments immediately adjacent, a pocket track as required by the operating plan was not shown between Glenarm Street Station and Del Mar Boulevard Station.

A review of all crossovers and other special trackwork should be reviewed early in the design in order to assure the most efficient locations are identified.

APPENDIX B12. MODEL RUN #12 -- UNION STATION TO E. PASADENA VIA HIGHLAND PARK
ESTIMATED TIME BETWEEN CROSSOVERS ASSUMING SINGLE TRACK OPERATIONS

20-Sep-89
CROSS-12

STATION / LINE SECTION	MAX. SPEED	DIST. (MILES)	CUMUL. DIST. (MILES)	TRAVEL TIME (MIN.)	DWELL TIME (MIN.)	ELAPSED RUN TIME (MIN.)	TIME BETWEEN CROSSOVERS
UNION STATION			0.00		00:00:00	00:00:00	
	35	0.10		00:00:17			
<<Begin Crossover>>			0.10		00:00:00	00:00:17	Begin X
	25	0.09		00:00:14			
<<End Crossover>>			0.19		00:00:00	00:00:31	End X
	35	0.17		00:00:18			
curve 34+40 to 40+70			0.37		00:00:00	00:00:49	
	45	0.27		00:00:22			
curve 48+60 to 50+70			0.64		00:00:00	00:01:11	
	35	0.08		00:00:14			
COLLEGE/SPRING			0.72		00:00:20	00:01:45	
	25	0.09		00:00:18			00:03:26
curve 55+90 to 58+00			0.82		00:00:00	00:02:03	
	45	0.36		00:00:31			
curves 77+00 to 92+15			1.18		00:00:00	00:02:34	
	55	0.56		00:00:39			
match 106+40bk to 181+00ahd			1.73		00:00:00	00:03:13	
	55	0.20		00:00:16			
<<Begin Crossover>>			1.93		00:00:00	00:03:29	Begin X
	25	0.09		00:00:14			
<<End Crossover>>			2.03		00:00:00	00:03:43	End X
	35	0.09		00:00:15			
AVE. 26/SF ROW			2.12		00:00:20	00:04:18	
	55	0.97		00:01:23			
MARMION WAY/FIGUEROA			3.09		00:00:20	00:06:01	
	45	0.31		00:00:33			
curve 255+00 to 269+00			3.40		00:00:00	00:06:34	00:04:00
	45	0.25		00:00:20			
curve 282+00 to 292+00			3.65		00:00:00	00:06:54	
	45	0.19		00:00:15			
tangent 292+00 to AVE. 51			3.84		00:00:00	00:07:09	
	45	0.06		00:00:06			
<<Begin Crossover>>			3.90		00:00:00	00:07:15	Begin X
	25	0.09		00:00:14			
<<End Crossover>>			3.99		00:00:00	00:07:29	End X
	45	0.34		00:00:36			
MARMION WAY/AVE. 51			4.33		00:00:20	00:08:25	
	45	0.53		00:00:57			00:04:00
MARMION WAY/AVE. 57			4.86		00:00:20	00:09:42	
	55	1.00		00:01:19			
<<Begin Crossover>>			5.86		00:00:00	00:11:01	Begin X
	25	0.09		00:00:14			
<<End Crossover>>			5.96		00:00:00	00:11:15	End X
	45	0.17		00:00:15			
curve 413+00 to 417+00			6.13		00:00:00	00:11:30	
	45	0.76		00:01:01			
curve 443+00 to 453+00			6.88		00:00:00	00:12:31	
	45	0.13		00:00:17			00:03:46
MISSION STREET			7.02		00:00:20	00:13:08	
	45	0.46		00:00:44			
curve 484+00 to 32+00			7.47		00:00:00	00:13:52	
	45	0.49		00:00:41			
<<Begin Crossover>>			7.96		00;00:00	00:14:33	Begin X
	25	0.09		00:00:14			
<<End Crossover>>			8.06		00:00:00	00:14:47	End X
	35	0.09		00:00:14			
GLENARM STREET			8.14		00:00:20	00:15:21	
	55	0.91		00:01:19			
DEL MAR BLVD.			9.05		00:00:20	00:17:00	00:03:20
	45	0.35		00:00:36			
curve 101+50 to 107+00			9.40		00:00:00	00:17:36	
	35	0.03		00:00:03			
<<Begin Crossover>>			9.43		00:00:00	00:17:39	Begin X

TRAVEL TIMES
TABLE 5-1

APPENDIX B12. MODEL RUN #12 -- UNION STATION TO E. PASADENA VIA HIGHLAND PARK 20-Sep-89
ESTIMATED TIME BETWEEN CROSSOVERS ASSUMING SINGLE TRACK OPERATIONS CROSS-12

STATION / LINE SECTION	MAX. SPEED	DIST. (MILES)	CUMUL. DIST. (MILES)	TRAVEL TIME (MIN.)	DWELL TIME (MIN.)	ELAPSED RUN TIME (MIN.)	TIME BETWEEN CROSSOVERS
	25	0.09		00:00:14			
<<End Crossover>>			9.52		00:00:00	00:17:53	End X
	25	0.03		00:00:08			
MEMORIAL PARK			9.55		00:00:20	00:18:21	
	35	0.32		00:00:38			
curve 118+00 to 126+00			9.87		00:00:00	00:18:59	00:03:53
	55	1.38		00:01:42			
HILL AVENUE			11.25		00:00:20	00:21:01	
	35	0.10		00:00:17			
<<Begin Crossover>>			11.35		00:00:00	00:21:18	Begin X
	25	0.09		00:00:14			
<<End Crossover>>			11.44		00:00:00	00:21:32	End X
	55	1.12		00:01:26			
ALTADENA DRIVE			12.56		00:00:20	00:23:18	00:03:09
	55	0.63		00:00:55			
<<Begin Crossover>>			13.19		00:00:00	00:24:13	Begin X
	25	0.09		00:00:14			
<<End Crossover>>			13.29		00:00:00	00:24:27	End X
	35	0.10		00:00:16			
SIERRA MADRE VILLA AVE.			13.39		00:00:20	00:25:03	

NOTES:
1. Length of crossover is 230 feet; length of 3-car train is 270 feet.
2. Maximum speed of train is 25 mph through crossover (230 + 270 feet).
3. Time between crossovers measured from beginning of one crossover to end of following crossover.
4. Time between crossovers < 4:00 minutes to maintain "crush" operations.

Prepared by Manuel Padron & Associates

TRAVEL TIMES
TABLE 5-1

SECTION 6.0 RIGHT-OF-WAY

Right-of-way will need to be acquired in fee, permanent aerial easement, and in easement from the SPTC, AT&SF, and from other private property owners. The majority of the property acquisition will be from the AT&SF Railroad.

The conceptual engineering drawings graphically depict right-of-way needs. Requirements outside the railroad right-of-way are typically cross-hatched; those within the SPTC and AT&SF corridors are indicated by note on the drawings. Large takes, such as a yard requirements, even though in the SPTC right-of-way, are cross-hatched. It should be noted that right-of-way requirements are not defined in detail at the conceptual level, even though large full-takes, such as the AT&SF right-of-way, can be identified. The conceptual drawings make no effort to depict easements that may be required for most utility relocations because that knowledge is not presently available.

Items Needing Attention

The right-of-way needs in the Union Station/Chinatown area are complex and involve proposed commercial developments and joint right-of-way uses. Of particular concern is the complexity of shared right-of-way along the westerly bank of the Los Angeles River. In this area, there are presently SPTC operations, and in addition to the LRT revenue tracks and yard lead tracks, plans are underway for commuter rail, and possibly other light rail operations. The commuter rail plan will require maintenance/storage space, which may be located in the area of the LRT yard facilities. (Please refer to Section 11.0 for additional information). In addition to the above items, a roadway in the area is being considered by a major development.

Traction power substations require sizable plots of land, and all locations should be be reviewed early in design for availability, as developments may be underway.

Station sites and parking areas need further attention for a clearer definition of right-of-way needs. Due to the standard 30 feet width of the AT&SF right-of-way, the placing of station platforms creates adjacent property needs. This is especially true at Marmion/Figueroa Station, Avenue 51 Station, Mission Station, Fair Oaks Station, Glenarm Street Station, California Boulevard Station, and Memorial Park Station.

Because of the narrow AT&SF right-of-way, the guideway between stations may tend to depart from the right-of-way slightly,

especially in areas where stations cause slight realignments, and where there is embankment and retaining structures are required.

SECTION 7.0 RAILROAD RELOCATION AND REMOVAL

The vast majority of the corridor is existing railroad right-of-way. With the exception of the area in the Union Station/Chinatown segment, the needs within railroad right-of-way are linear, and the sharing of right-of-way is not planned.

SOUTHERN PACIFIC TRANSPORTATION COMPANY

The Union LRT Station and the guideway to the north requires the relocation of existing tracks at AMTRAK level, and will occupy existing SPTC track areas leading into Union Station. The storage tracks and leads just north of Union Station (civil engineering stations 25+00 to 35+00) will require removal. Further north, a number of the existing tracks are out of operation and have been or are presently being abandoned as plans for property developments continue. It is assumed that the SPTC freight yard in Chinatown will be phased completely out of operation, to include SPTC service to Capitol Milling Company, and that LRT will not require relocations in the area.

A more complex situation develops in the area near the Los Angeles River. SPTC presently operates on the west bank, and LRT revenue tracks must flyover these tracks and the LRT yard leads must share right-of-way. (There is some discussion that SPTC may operate only on the east bank of the river, which would simplify conditions). It is difficult to be precise at this stage of project development about the specifics of relocations in this area, pending ongoing commuter rail and other LRT rail planning and continued negotiations with the SPTC on sharing or setting aside right-of-way. Access to the Midway storage site, which could be utilized in passenger operations, and to the Taylor Yard site, which requires a long lead track with a relocation of the SPTC onto a new bridge structure over the Los Angeles River, must be sorted out.

UNION PACIFIC RAILROAD

The guideway partially enters abandoned Union Pacific right-of-way in the area of the Pasadena Freeway overcrossing for approximately 1200 feet (civil engineering stations 220+00 to 232+00). Abandoned track still in place requires removal, and the bridge deck over the freeway, shared with AT&SF, requires renovation.

AT&SF RAILROAD

The AT&SF right-of-way is proposed to be occupied by LRT from the entry area at the Los Angeles River crossing, where the existing railroad bridge would be demolished, to the terminal at Sierra Madre Villa Avenue. The right-of-way would not be shared, and it was assumed in the project planning that the AT&SF would salvage their rails, ties, switches, special trackwork, signals and communications equipment, and crossing gates. Accordingly, LRT would occupy cleared right-of-way and there would be no railroad relocations, even though some utility relocations will be required within the railroad right-of-way. Existing bridge structures would remain, and the decks would be modified to accomodate the dual track LRT guideway.

SECTION 8.0 GUIDEWAY AND SPECIAL STRUCTURES

At-Grade Guideway

Most of the proposed route alignment in the corridor will consist of guideway structure which is at-grade. At-grade construction will typically require clearing and grubbing, relocation or protection of conflicting utilities, the preparation of trackbed, the construction of drainage facilities, and the installation of subballast and ballast for securing and supporting the trackwork. At street crossings, staging of the work will be required in order to maintain traffic. Typical at-grade sections are contained in the conceptual engineering drawing set.

Aerial Structures

A new stretch of aerial structure is required at the Los Angeles River crossing. This structure can be considered a bridge structure. The approaches would be constructed on retained fill, and the piers will require a pile or caisson foundation. Other aerial segments are where existing railroad bridges cross over freeways, streets, and the Arroyo Seco. These facilities are proposed to be reconstructed for transit use, even though it is possible that upon further analysis, completely new structures could be required in some locations. It is presently unknown if seismic retrofit has been accomplished by the railroad, although it is suspected that this has not happened.

Subway Structures

The only subway structure certified in the DEIR document to be adopted by the Commission is the one station extension beyond the 7th & Flower Station to the 4th & Flower Station. This stretch is relatively shallow, conventional cut and cover construction. Major utility relocations and suspensions will be required. Timber decking can be accomplished to accommodate traffic during construction. The conceptual engineering drawings depict a typical section in this area.

SECTION 9.0 TRACKWORK

Ballasted Track

Ballasted track will be the typical track section throughout the corridor and the yard. This type of trackwork is assumed to be in accordance with the Blue Line criteria, and would consist of 115 RE rail welded in continuous lengths, concrete ties, and a minimum of 8 inch deep sub-ballast, 12 inch deep ballast, and 7 inch cement treated base. Rail fasteners, rail clips, insulators, and rail seat pads are assumed to be in accordance with Blue Line criteria, which is referenced as **The Long Beach-Los Angeles Rail Transit Project Design and Performance Criteria.**

Direct Fixation Track

Direct fixation methods will be required in the subway segment and on aerial or bridge sections. Direct fixation track consists of poured concrete slab with a second pour overlay upon which rails are fastened with direct fixation fasteners.

Special Trackwork

Special trackwork refers to all track elements required for diverting trains from one track to another, and consists of turnouts, crossovers, and pocket tracks. The special trackwork depicted on the drawings is in accord with the operating plan, except where changes are noted in Section 5.0, and are as schematically shown on the yard plans.

Grade Crossings

Grade crossings are assumed to be constructed in accordance with the Blue Line criteria, and are ballasted track sections with the addition of flangeway guards, electrical isolation of the rails, and surfacing which would consist of timber and asphalt or concrete panels, depending on the intensity of traffic using the crossing.

Track Gauge

Standard track gauge is assumed to be 4 feet, 8 and one-half inches for tangent track and curves with radii equal to or greater than 500 feet. Track gauge will be adjusted in accordance with the Blue Line criteria for tight radii curves. Track gauge for special trackwork is assumed to be in

accordance with the American Railway Engineering Association Portfolio of Trackwork Plans.

SECTION 10.0 STATIONS

For station site plans, please refer to the conceptual engineering drawing set, and for additional discussion of the stations, pleases refer to the **Revised Draft Environmental Impact Report.**

Station Locations

For the Highland Park Alternative, and the extension from the 7th & Flower Station to the 4th & Flower Station, which is the alignment approved by the Commission, Table 10-1 identifies the station name and type, nearest street crossing, and parking facilities.

Platforms

Platforms are planned to accommodate a three car consist, about 270 feet long, with an additional 30 feet of length where fare vending is required on the platform/s. The platforms are to be high level, or 39 inches from the top of rail, to be consistent with the Blue Line criteria. Each station was individually decided on its configuration, i.e., side or center platform. Side platforms were dictated in some areas by the narrow AT&SF right-of-way, which lacked space for track spreading for center platforms. All platforms were sited on tangent track, with a maximum one percent grade allowed.

Handicapped access for at-grade stations is proposed to be by ramp as specified for the Blue Line. Where the platform is accessed from above or below, as is the case in the Foothill Freeway median, elevators are to be provided for the handicapped.

Shelters/Amenities

Stations, unless subway, will not be fully enclosed. Canopies will be provided, as will benches, trash receptacles, fare collection equipment, signage, and security and communications facilities.

Parking, Circulation and Siting

Stations will provide connections to other modes of transportation serving each station area. Depending on the site characteristics of each station, provisions for parking, kiss-ride, and bus access are included. Considerations in

defining these facilities included the availability of real estate for parking facilities, the levels of pedestrian activity, vehicular access to the site, and a review of RTD bus routes, or other public transit operators, serving the area.

Station locations have been sited through the use of ridership forecasts, traffic access, physical characteristics, and proximity to existing and planned activity centers. Emphasis was placed on minimizing property takings, especially residential. Other considerations were compatibility to existing adjacent and planned adjacent land uses, and input from the local community, agencies, and jurisdictions.

It should be noted that station sites have been identified in South Pasadena and Pasadena that exceed a normal spacing of stations for the type of area to be served. In South Pasadena, it is assumed that either the Mission Street Station or the Fair Oaks Station will be dropped, and in Pasadena, one or more stations are in question, to include the California Boulevard Station and the Los Robles Avenue Station. Also, there is the possibility of shifting station sites along the Foothill Freeway.

Station Items Needing Attention

- Mission Station: Possible park land required for northbound platform.

- Glenarm Street Station: Conflict with access to underground parking structure.

- California Boulevard Station: Alignment offset to avoid property take east of the platforms violates horizontal alignment criteria.

- Memorial Park Station: Coordination with Civic Center West development required to insure provisions for station construction. A mixed-use commercial residential project is under design by the Janss Corporation that impacts this station.

- Sierra Madre Villa Station: Location of terminal site undecided.

- All stations adjacent to cross streets requiring gates: The California Public Utilities Commission (PUC) has ruled on the minimum distance between the end of platform and the cross street for Blue Line stations. While the PUC reviews each situation specifically, it can be anticipated that, for safety reasons, station platforms

may have to be set back from intersections further than now shown on the drawings. In the short block areas, especially in Pasadena, this may present problems, as the physical space may not exist. A possible alternative is to use traffic signals rather than gates. Approaching trains would be controlled by the signal. While there are some advantages, train operations would be slower, and signals alone would not assure the tracks are clear of vehicles. For additional discussion, please refer to **Pasadena LRT Routes Traffic Impact Study**, June, 1989, prepared by DKS Associates.

- Commitments to the community/jurisdictions regarding station siting: During the course of station site planning, discussions have been held with agencies and jurisdictions regarding station spacing in South Pasadena and in some areas of Pasadena, where more stations have been sited than is intended to be constructed. Preliminary discussions have been held, and the City of South Pasadena is aware that a station can be sited either at Mission Street or at Fair Oaks, but not both. The City of Pasadena is aware that at least two stations may be eliminated, possibly California Boulevard Station and Los Robles Avenue Station, and that other locations may be reconsidered.

TABLE 10-1

SUMMARY OF STATION CHARACTERISTICS

STATION	LOCATION	PLATFORM TYPE	APPROX. PARK-RIDE SPACES
Union LRT	Union Station	center	0
Chinatown	College/Spring	center	0
Avenue 26	Avenue 26/ Santa Fe RR	side	100
Marmion/Figueroa	Marmion/Figueroa	side	0
Avenue 51	Avenue 51/ Santa Fe RR	side	50
Marmion/Ave. 57	Avenue 57/ Santa Fe RR	side	100
Mission	Mission St./ Santa Fe RR	side	0
Fair Oaks	Oak Lawn/ Santa Fe RR	center	40
Glenarm Street	Glenarm St./ Santa Fe RR	side	200
California Blvd.	California Blvd./ Santa Fe RR	side	0
Del Mar Blvd.	Del Mar Blvd./ Santa Fe RR	side	145
Memorial Park	Holly St./ Santa Fe RR	center	0
Los Robles Avenue	Los Robles Ave./ Freeway	center	0
Lake Avenue	Lake Ave./ Freeway	center	0
Hill Avenue	Hill Ave./ Freeway	center	0
Altadena Drive	Altadena Dr./ Freeway	center	0

Sierra Madre Villa Avenue	Sierra Madre Villa AVE./ Santa Fe RR	center	500-1000

SECTION 11.0 MAINTENANCE AND STORAGE

Facilities were planned in three locations for the purpose of maintenance and/or storage of transit vehicles. The three sites are the Midway Yard, to be utilized in conjunction with the Blue Line major repair facility; the Taylor Yard, to provide maintenance and storage services independent of the Blue Line facility, and temporary storage under the Santa Monica Freeway structure on the Blue Line. Other storage would be provided at the Avenue 57 Station area, at the Del Mar Boulevard Station area, provided that the operations are phased at that location, and at the end of the line beyond Sierra Madre Boulevard Station.

Midway Yard

The Midway site is on SPTC property along the south bank of the Los Angeles River, and was proposesd as a storage and light maintenance facility for alignment scenarios that connected through downtown Los Angeles to the Blue Line, thus allowing heavy repair to be carried out at the Blue Line facility. Because the adopted alternative does not connect through downtown Los Angeles, this site is not a part of the present maintenance and storage plan, but could be utilized for storage for either LRT or commuter rail operations. While the site can accommodate a rather large number of vehicles for storage, about 55, the site is too narrow to develop major repair facilities that could function in a reasonable manner. The site plan is included as Figure 11-1.

Major Yard Sites Considered

For the alignment options beginning at Union Station, several sites were discussed for a major maintenance facility. The more accessible site was the SPTC main railyard in Chinatown, but this site was eliminated because it is up for major commercial redevelopment. Some industrial blocks along the easterly side of N. Spring Street were reviewed, but is was decided that this developed property would be expensive to assemble in an area sufficient for a site, which could require more than a dozen acres. The possibility of following the SPTC tracks non-revenue down Alameda Street to connect to the Blue Line was given some thought, but some of that right-of-way has been built over, and traffic conflicts appeared difficult to resolve. Another thought was to jointly use the Metro Red Line facility, but this was never seriously studied, probably because it appeared physically difficult to connect to the yard, and the problems of utilizing both an overhead contact system and a third rail system within the yard facilities.

Additionally, SCRTD did not appear interested in such a pursuit at that time. The Midway site was further analyzed, but it was concluded to be to narrow , and impractical to widen, sufficient for a major facility.

TAYLOR YARD

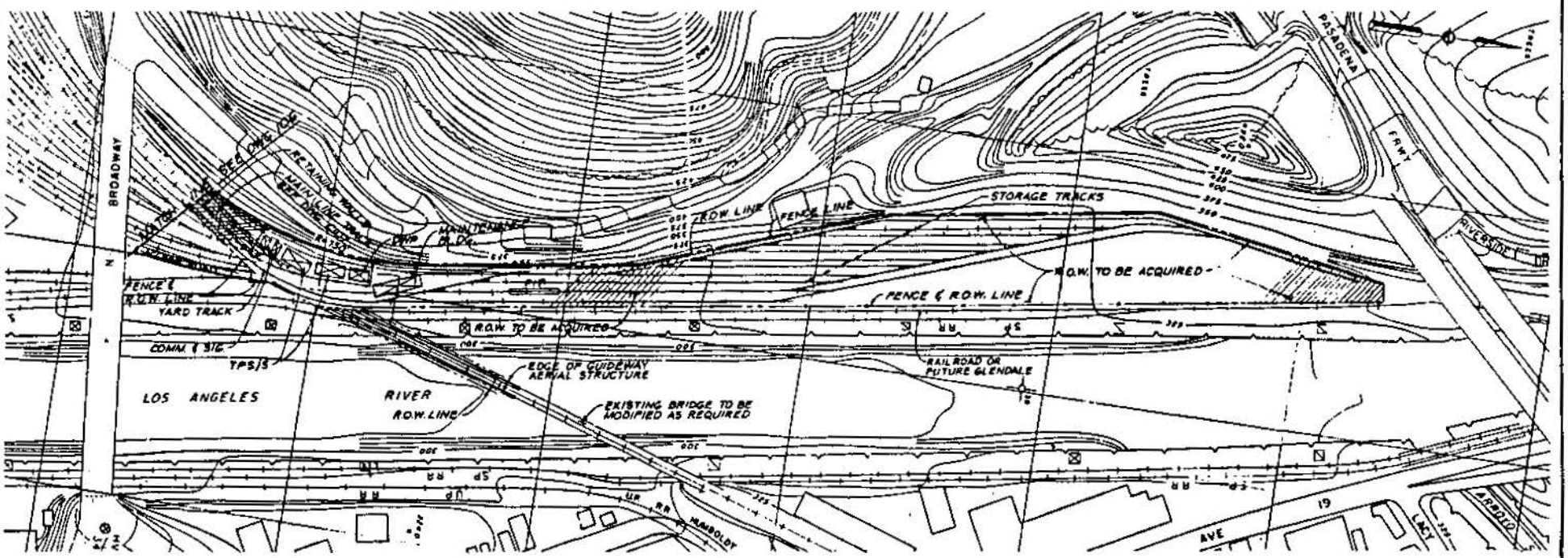
The Taylor Yard, although requiring a long yard lead, and presenting some shared right-of-way problems with SPTC, seemed to provide the best possible answer for a major repair facility. The plan for this facility is included as Figure 11-2. The site is ample for major repair and maintenance-of-way and materials storage, allows for efficient operations, and can be utilized by future LRT operations to Glendale. There is sufficient space for SPTC tracks and possibly commuter rail, as well as Gendale LRT tracks, to traverse the area. The yard will store approximately 50 vehicles as planned, which will handle the 38 vehicles proposed to operate on the Highland Park Alternative from Union Station to the terminus in Pasadena, plus additional vehicles should the Glendale Line depend on this yard.

Taylor Yard Items Needing Attention

There are decisions that need to be made in juxtaposing rail facilities in the area. In addition to LRT facilities, there may be a commuter rail yard site to fit in the area, as well as SPTC maintenance and storage facilities. There is also competition for limited space in aligning tracks under the street and freeway overpass structures, and problems to be solved in crossing the Los Angeles River.

Storage Facilities For The Blue Line

Storage space was planned off Flower Street under the Santa Monica Freeway structure for Blue Line operations purposes. This plan is included as Figure 11-3.



LOS ANGELES COUNTY TRANSPORTATION COMMISSION
PASADENA-LOS ANGELES ROUTE REFINEMENT STUDY

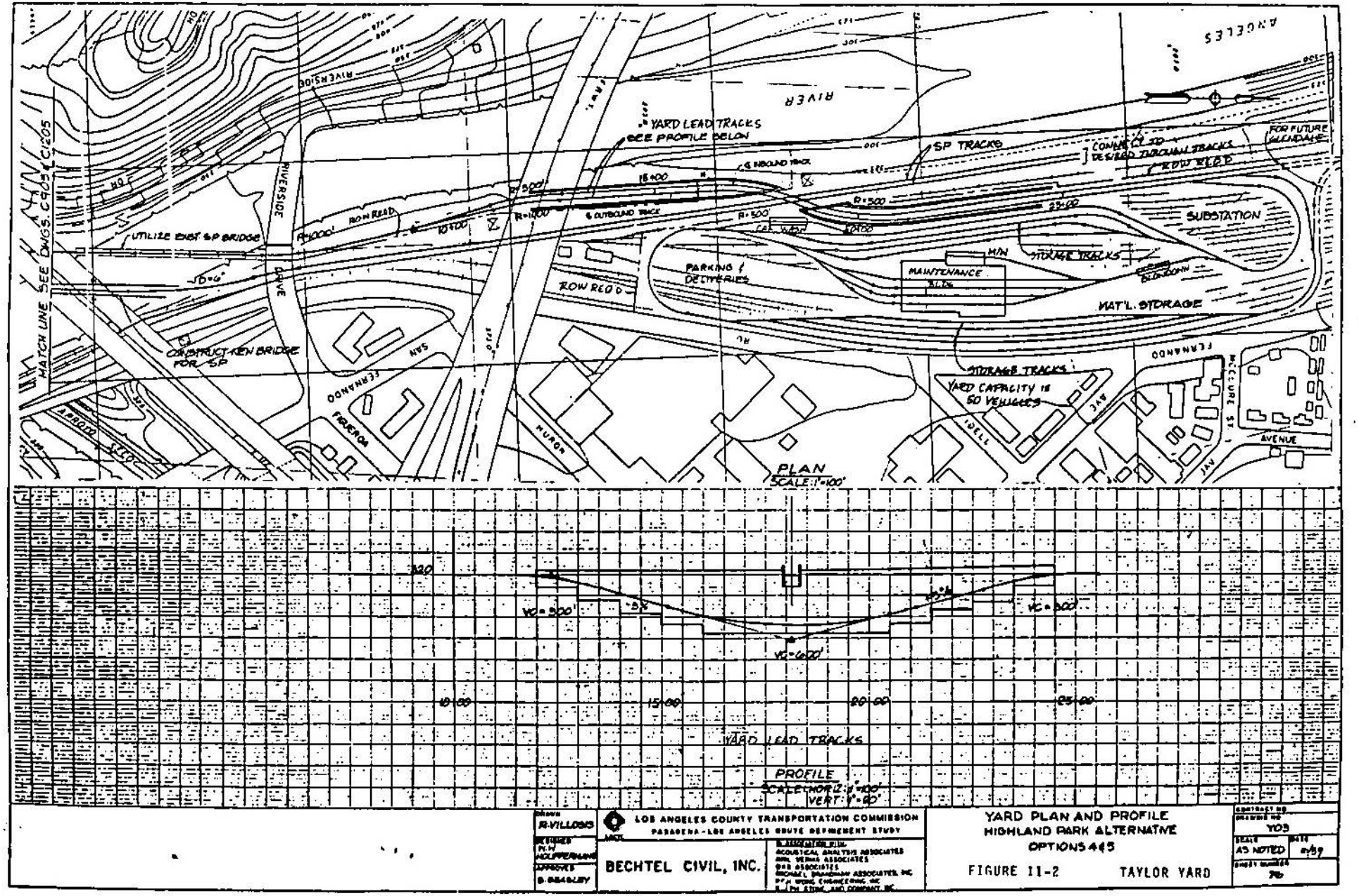
BECHTEL CIVIL, INC.

IN ASSOCIATION WITH:
ANIL VERMA ASSOCIATES
DAMES & MOORE
GEO SERVICES
MICHAEL BRANDMAN ASSOCIATES, INC.
PAUL POMS ENGINEERING, INC.
RALPH STONE AND COMPANY, INC.

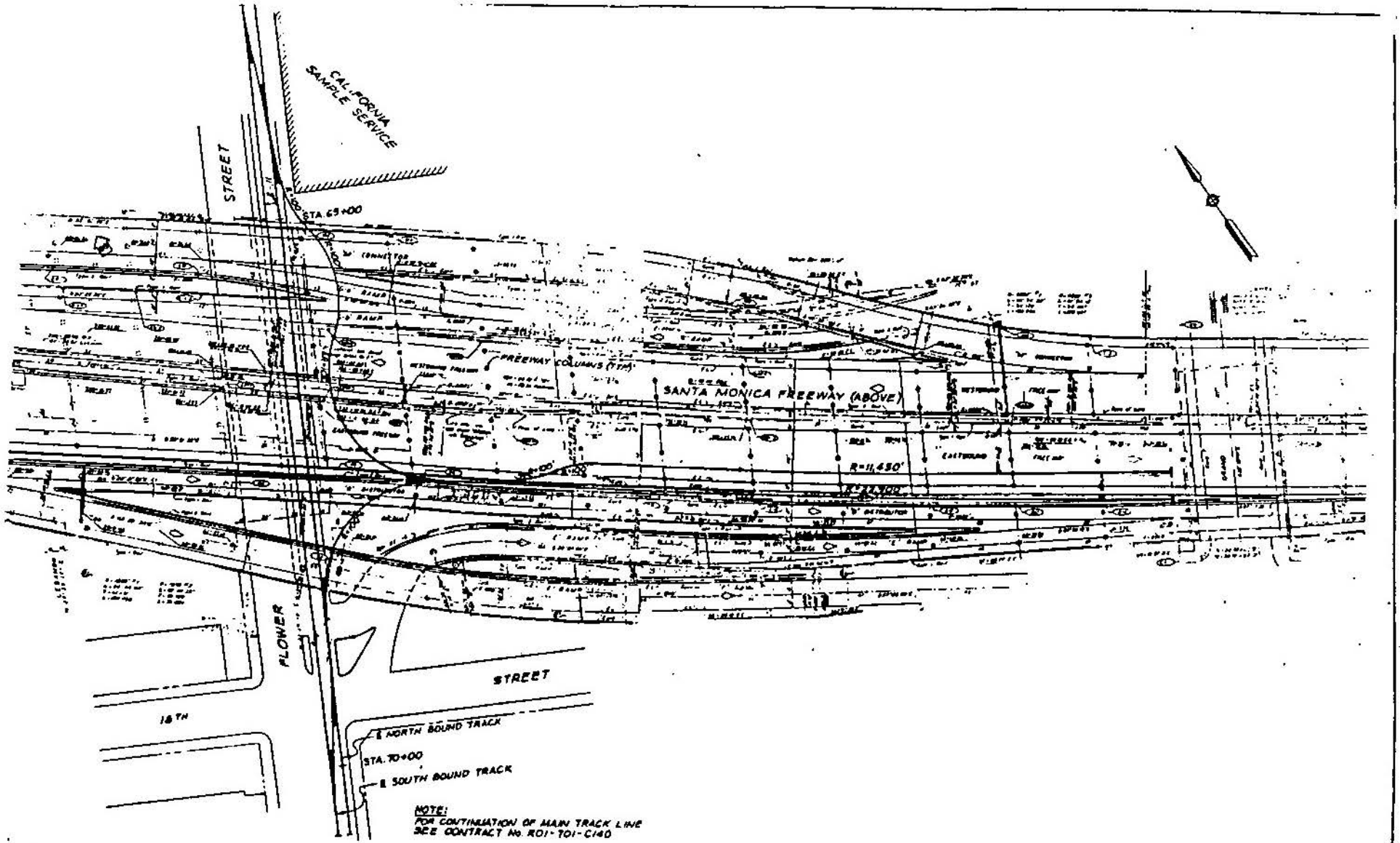
YARD PLAN
HIGHLAND PARK ALTERNATIVE

FIGURE 11-1 MIDWAY YARD

CONTRACT NO. SCY02
SCALE 1" = 100'
DRAWING NUMBER 78



Drawn R. VILLOSIO	LOS ANGELES COUNTY TRANSPORTATION COMMISSION PASADENA-LOS ANGELES ROUTE REFINEMENT STUDY	YARD PLAN AND PROFILE HIGHLAND PARK ALTERNATIVE OPTIONS 4&5	CONTRACT NO.
Reviewed P. H. HOUPPERLAND			DRAWING NO. Y03
Approved D. BRADLEY	BECHTEL CIVIL, INC.	FIGURE II-2 TAYLOR YARD	SCALE AS NOTED DATE 4/89
			SHEET NUMBER 76



LOS ANGELES COUNTY TRANSPORTATION COMMISSION
PASADENA-LOS ANGELES ROUTE REFINEMENT STUDY

BECHTEL CIVIL, INC.

ASSOCIATED FIRMS:
ADAL VENNA ASSOCIATES
SOIL LABORATORIES, INC.
DKE ASSOCIATES
DONALD DIAMOND ASSOCIATES, INC.
FOX AND TOMASEVIC, INC.
RALPH STONE AND COMPANY, INC.

LOS ANGELES CBD APPROACH TEMPORARY STORAGE

SANTA MONICA FREEWAY
FIGURE 11-3

CONTRACT NO. RCY03
SCALE 1"=40'
DATE
SHEET NUMBER 74

SECTION 12.0 CAPITAL COST ESTIMATE

Capital cost estimates were prepared as a part of the route refinement studies of both the southwest and northeast segments of the corridor. For the alternatives carried through the EIR, please refer to **Cost Estimate, Los Angeles-Pasadena Corridor (S.W.)**, January, 1989. For the alternatives carried through the Revised EIR, please refer to **Pasadena-Los Angeles Rail Transit Project Cost Estimate, Revised DEIR,** October, 1989. The former document contains the basis of the estimate, as well as the development of units costs, which were updated and further reviewed for the Revised EIR estimate. Table 12-1 defines the project phasing for the Revised EIR project, and Table 12-2 depicts the cost summary for the Highland Park Alternative. In 1994 dollars, the estimated cost for the Highland Park (Union Station-No Subway) Alternative from Union Station to Sierra Madre Villa is about 925 million dollars.

Items Needing Attention

The preliminary engineering estimate preparation will need to confirm the percentages applied to the construction subtotal are consistent with RCC systemwide estimating procedures. At the time of the Revised EIR estimate preparation, considerable discussion was ongoing concerning the appropriate values.

In addition to the update of quantities and unit costs, the preliminary engineering estimate should also contain updated AT&SF right-of-way costs, which may be actual costs at that time.

DESCRIPTION	HIGHLAND PARK ALTERNATIVE												
	FROM 7TH/FLOWER METRO RAIL TO SIERRA MADRE VILLA								FROM UNION STATION METRO RAIL TO SIERRA MADRE VILLA				
	DOWNTOWN CONNECTIONS PHASE I 7TH AND FLOWER TO RAIL YARD				PHASE 2 RAIL YARD TO MARMION/ FIGUEROA	PHASE 3 MARMION/ FIGUEROA TO AVE. 57	PHASE 4 AVENUE 57 TO DEL MAR	PHASE 5 DEL MAR TO SIERRA MADRE VILLA	PHASE 1 UNION STATION TO DEL MAR				PHASE 2 DEL MAR TO SIERRA MADRE VILLA
	VIA CHINATOWN	VIA 2ND STREET	VIA 2ND STREET - UNION STATION						2ND STREET - UNION STATION		UNION STATION - NO SUBWAY		
			(NW OF SP YARD)	(SE OF SP YARD)					(NW OF SP YARD)	(SE OF SP YARD)	(NW OF SP YARD)	(SE OF SP YARD)	
	OPTION 1	OPTION 2	OPTION 3A	OPTION 3B	OPTIONS 1, 2 AND 3				OPTION 4A	OPTION 4B	OPTION 5A	OPTION 5B	OPTIONS 4 AND 5
FROM STATION	0+00	0+00	0+00	0+00	161+00	260+00	139+00	91+00	79+00	79+00	10+00	10+00	10+00
STATION EQUATION	150+30 BKD = 179+00 AH	113+30 BKD = 50+30 AH	174+20 BKD = 150+30 AH	172+10 BKD = 150+30 AH			203+40 BKD = 10+00 AH	133+40 BKD = 200+00 AH	174+20 BKD = 150+30 AH	172+10 BKD = 150+30 AH	103+00 BKD = 150+30 AH	103+00 BKD = 150+30 AH	151+00 BKD = 200+00 AH
STATION EQUATION		150+30 BKD = 179+00 AH							203+40 BKD = 10+00 AH	203+40 BKD = 10+00 AH	203+40 BKD = 10+00 AH	203+40 BKD = 10+00 AH	
TO STATION	161+00	161+00	161+00	161+00	260+00	350+00	91+00	321+20	91+00	91+00	93+00	91+00	305+20
TOTAL DISTANCE	15,300	17,030	17,470	17,200	9,900	9,900	21,940	23,610	49,210	49,000	49,370	49,200	23,610
COMMENTS	ORIGINAL OPT. ORIGINAL YARD	ORIGINAL OPT. ORIGINAL YARD	NEW OPT. ORIGINAL YARD	NEW OPT. ORIGINAL YARD	ORIGINAL OPT.	ORIGINAL OPT.	ORIGINAL OPT. + NEW PSCS	ORIG. FWY OPT IN PASADENA	NEW DOWNTOWN OPT. + NEW YARD	NEW DOWNTOWN OPT. + NEW YARD	NEW DOWNTOWN OPT. + NEW YARD	NEW DOWNTOWN OPT. + NEW YARD	ORIG. FWY OPT. IN PASADENA
NUMBER OF STATIONS	THREE	FOUR	FIVE	FIVE	TWO	TWO	THREE	FIVE	NINE	NINE	NINE	NINE	FIVE
NUMBER OF VEHICLES	FOURTEEN	FOURTEEN	FOURTEEN	FOURTEEN	SIX	SEVEN	SEVENTEEN (1)(2)(3)	EIGHTEEN (4)	THIRTY-FIVE	THIRTY-FIVE	THIRTY-FIVE	THIRTY-FIVE	SIXTEEN (3)

NOTE

(1) - INCLUDES EITHER MISSION STREET STATION OR WAR MEMORIAL STATION (AT OAK LAWN AVE.) BUT NOT BOTH. TRACTION POWER AND OPERATIONS ANALYSIS TO ASSUME MISSION STREET STATION. DEIR TO INCLUDE BOTH STATIONS.
(2) - DOES NOT INCLUDE CALIFORNIA BLVD. STATION WHICH WILL REMAIN IN THE DEIR BUT NOT IN THE TRACTION POWER AND OPERATIONS ANALYSIS.
(3) - PASADENA AVE./MONTEREY RD. STATION HAS BEEN DELETED FROM THE DEIR
(4) - DOES NOT INCLUDE LOS ROBLES STATION WHICH WILL REMAIN IN THE DEIR BUT NOT IN THE TRACTION POWER AND OPERATIONS ANALYSIS

PROJECT PHASING
TABLE 12-1

CAPITAL COST SUMMARY

ITEM DESCRIPTION	HIGHLAND PARK ALTERNATIVE							PAGE 2
	OPTION 1	OPTION 2	OPTION 3A	OPTION 3B	OPTION 4A	OPTION 4B	OPTION 5A	OPTION 5B
1. Guideways and Structures	$234,073,000	$269,068,500	$263,418,500	$263,322,500	$144,089,000	$143,780,000	$90,803,500	$90,365,500
2. Maintenance Facilities	$7,000,000	$7,000,000	$7,000,000	$7,000,000	$21,000,000	$21,000,000	$21,000,000	$21,000,000
3. Railroad Relocations	$0	$0	$110,000	$100,000	$960,000	$950,000	$980,000	$985,000
4. Utility Relocations	$5,161,600	$6,509,600	$6,433,600	$6,433,600	$3,826,000	$3,826,000	$3,751,600	$3,251,600
5. Vehicles	$111,600,000	$111,600,000	$111,600,000	$111,600,000	$91,800,000	$91,800,000	$91,800,000	$91,800,000
6. Traction Power	$22,975,000	$23,377,900	$23,352,400	$23,316,700	$22,009,400	$21,973,700	$22,070,600	$22,021,300
7. Systemwide Equipment	$38,100,000	$39,095,400	$39,182,400	$39,094,200	$35,864,400	$35,776,200	$36,015,600	$35,893,800
8. Trackwork	$30,261,000	$30,898,200	$31,094,800	$31,061,800	$28,150,800	$28,111,800	$25,780,000	$27,653,000
Construction Contingency @ 20%	$89,834,120	$97,509,920	$96,438,340	$96,385,760	$69,539,920	$69,443,540	$58,440,260	$58,594,040
SUB-TOTL, (ST)	$539,004,720	$585,059,520	$578,630,040	$578,314,560	$417,239,520	$416,661,240	$350,641,560	$351,564,240
9. Testing & Operations Mobilization @ 2.5% of (ST)	$13,475,118	$14,626,488	$14,465,751	$14,457,864	$10,430,988	$10,416,531	$8,766,039	$8,789,106
10. Owner's Insurance @ 6.0% of (ST)	$32,340,283	$35,103,571	$34,717,802	$34,698,874	$25,034,371	$24,999,674	$21,038,494	$21,093,854
SUB-TOTL, Construction (C)	$584,820,121	$634,789,579	$627,813,593	$627,471,298	$452,704,879	$452,077,445	$380,446,093	$381,447,200
11. TO 19. Project Services	$222,111,464	$239,836,402	$239,554,867	$239,444,904	$176,922,442	$176,720,879	$155,261,307	$155,582,913
SUB-TOTL, Services (S)	$222,111,464	$239,836,402	$239,554,867	$239,444,904	$176,922,442	$176,720,879	$155,261,307	$155,582,913
SUB-TOTL, Construct. & Serv. (C+S)	$806,931,585	$874,625,982	$867,368,460	$866,916,202	$629,627,322	$628,798,325	$535,707,400	$537,030,114
21. Real Estate (R)	$136,952,000	$143,641,000	$151,479,000	$151,479,000	$125,964,000	$125,964,000	$132,172,000	$132,172,000
23. Force Account (F) @ 8.0% of (C)	$46,785,610	$50,783,166	$50,225,087	$50,197,704	$36,216,390	$36,166,196	$30,435,687	$30,515,776
24. Project Reserve (PR) @ 20% of (C)	$116,964,024	$126,957,916	$125,562,719	$125,494,260	$90,540,976	$90,415,489	$76,089,219	$76,289,440
25. Special Programs (SP) @ 0.5% of (C)	$2,924,101	$3,173,948	$3,139,068	$3,137,356	$2,263,524	$2,260,387	$1,902,230	$1,907,236
TOTAL 1989 COST	$1,110,557,320	$1,199,182,012	$1,197,774,334	$1,197,224,522	$884,612,212	$883,604,397	$776,306,536	$777,914,566
(C+S) + (R) + (F) + (PR) +(SP)	0.1157							
TOTAL COST / RF	$14,330	$15,014	$15,025	$15,058	$12,317	$12,339	$10,755	$10,821
TOTAL COST / MILE	$75,661,195	$79,274,834	$79,330,764	$79,503,779	$65,034,148	$65,150,555	$56,787,178	$57,134,357
Length (RF):	77500	79870	79720	79510	71820	71610	72180	71890
Length (MILE):	14.6780	15.1269	15.0985	15.0587	13.6023	13.5625	13.6705	13.6155
Escalation 4.5%/yr.@ 4YRS.= 19.25%	$213,802,940	$230,864,842	$230,593,838	$230,487,989	$170,304,305	$170,110,281	$149,453,448	$149,763,023
TOTAL 1994 COST	$1,324,360,260	$1,430,046,854	$1,428,368,172	$1,427,712,511	$1,054,916,517	$1,053,714,678	$925,759,984	$927,677,589

TABLE 12-2

SECTION 13.0 SYSTEMWIDE REQUIREMENTS

All systemwide requirements, to include safety and securi Fire/Life Safety, handicapped provisions, and reliability dependability, are assumed to be in accordance with the E Line criteria.

The primary safety concern is to protect people from potent hazards. All system elements will be designed to be fail-sa to include the areas of operations, the guideway structu the vehicle, and the signaling system.

High levels of perceived as well as actual security will provided. Enforcement will be by the Los Angeles Cou Sheriff. The security plan will include CCTV at each stati two-way communications, alarm systems, well lighted and o stations, and fare inspectors or police randomly riding trains.

Fire prevention and protection will be in accordance w applicable codes and federal guidelines, and will incl alarm systems, panels that identify fire locations, emerge communication facilities, and fire extinguishing syste Building materials will be used to enhance resistance to fi

Handicapped access will be provided in accordance with St codes. Access to stations will be by ramp or elevator, Warn signals will be both audible and visible for the benefit the blind or deaf.

The reliability and dependability of the system will be established by the Blue Line, which has developed high go for on-time service.

SECTION 14.0 LIGHT RAIL VEHICLES

The light rail vehicle requirements, to include size, weight, capacity, performance, propulsion, HVAC, and other features, are assumed to be in accordance with the Blue Line vehicle specifications. A discussion of some of the features of the vehicle are included in Section 3 of the Revised DEIR.

The vehicles would be 11 feet-6 inches in height, 87 feet long, and approximately 8 feet, 9 inches wide. They will be articulated, double ended with four doors on each side, and accessible from high level platforms.

The capacity is for 76 seated passengers, with two seats at each end that can be folded to provide wheelchair space. The maximum capacity of the vehicle would be 238 people, including the operator.

The top speed would be 55 mph, with an acceleration of 3 mph per second.

SECTION 15.0 SIGNALING, COMMUNICATIONS, AND FARE COLLECTION

Signaling

The train protection function is assumed to be the same as the Blue Line, and would be performed by a combination of operating rules and procedures and automatic train protection equipment to detect hazards and to prevent collisions due to conflicting train movements and traffic hazards. Train protection can be manual and governed by operating procedures and traffic signals, and can be accomplished through automatic block signal.

Gates at street crossings would be automatically activated by the train, and are proposed to function similar to the Blue Line operations. With the exception of the segment of alignment in Highland Park between Avenues 51 and 57, gated control at crossings is considered feasible. Between Avenues 51 and 57, the alignment runs in the median of Marmion Way. It is recommended that a conversion is made to a one-way couplet, and traffic signals installed at every intersection between Avenues 51 and 60. LRT would operate in a street running mode.

While the other crossings are assumed to be gated, a review of PUC requirements on the Blue Line may indicate a need to reconsider, especially in the segment in Pasadena parallel to Arroyo Parkway, where the blocks are short and it may be difficult to gain platform setbacks sufficient for gated control.

COMMUNICATIONS

The communications system is assumed to be in conformance with the Blue Line criteria, and include all facilities for data acquisition (SCADA), public address, telephone, CCTV, and mobile radio systems. This system will provide the main communications link between the central control facility and the various field locations.

The central control facility located on the Blue Line near the Imperial Station was assumed to function as a center of system operations for the ultimate light rail network. Should supplementary facilities be necessary, it could be housed in the Taylor Yard shop buildings.

FARE COLLECTION

The fare structure is assumed to be developed systemwide for the self-service, barrier free system envisioned for the Pasadena -Los Angeles Line. Ticket vending machines, including a money changing capability, will be available at stations. Monthly passes would be sold offsite.

SECTION 16.0 TRACTION POWER SYSTEM AND OVERHEAD CONTACT SYSTEM

Traction Power

The traction power will be supplied to the light rail vehicles from the wayside distribution equipment through an overhead contact system. Contact is made through a pantograph collector. Running rails are used as the negative current return.

It is assumed the nominal rated voltage output will be 750 Vdc at 100% load. The spacing and rating of the substations was based on three car trains fully loaded and operating at 6 minute headways. On this basis, 13 sites, including the yard site, were identified on the conceptual drawings and included in the cost estimate. The size and spacing of the substations, and the availability of real estate, should be confirmed during preliminary design. It should be noted that DWP and SCE area requirements may be different for substations. The more conservative, or larger, area was identified in the EIR phase.

Overhead Contact System

An auto-tensioned catenary system, similar to that of the Blue Line mid-corridor, is envisioned for most of the project. A single-wire fixed-termination system can be used in the yard, and in areas where there is visual concern. While no design work was performed in the EIR phase, a cost estimate was prepared that was based on auto-tensioned and single-wire fixed-termination systems.

SECTION 17.0 MITIGATION OF ENVIRONMENTAL IMPACTS

The Revised DEIR lists the mitigation measures for each environmental impact category in Section 4. Below is a summary of the impacts and a list of mitigation measures that must be implemented during the design, construction, and operations of the rail line.

Land Use

Parking overflow near station areas may become a problem. The extent of the problem cannot be identified until the LRT system is in operation. At that time, if a problem arises, it is recommended to initiate special permit parking programs.

Mitigation for sensitive land uses are discussed under specific categories.

Transportation and Circulation

Mitigation measures are needed if LRT impacts causes the street or intersection volume to capacity (V/C) ratio to exceed threshold values or if adverse impacts develop for other rail transit induced reasons. The following measures are recommended:

- Between Avenue 50 and Avenue 57, Marmion Way should be converted to a one-way couplet. Parking should not be allowed, and driveway modifications may be necessary. All intersections should be signalized.

- The Avenue 57/Figueroa intersection is projected to operate at a critical V/C ratio by the year 2010. The problem can be mitigated by peak hour parking prohibition within 300 feet of each side of the intersection, and by restriping the lanes. No street widening would be necessary.

In the City of Pasadena, the following measures are recommended:

- The Arroyo Parkway/Glenarm intersection requires a north to east right-turn only lane on Arroyo Parkway. The purchase of right-of-way is required.

- Add a south to west right-turn only lane on Arroyo Parkway at California Boulevard, requiring the purchase of right-of-way.

- Add a west to north right-turn only lane on California Boulevard at Fair Oaks Avenue, requiring the purchase of right-of-way.

- Add a east to south right-turn only lane on Del Mar Boulevard at Arroyo Parkway by narrowing the sidewalk.

- Add a west to north right-turn only lane on Colorado Boulevard at Fair Oaks Avenue, by restriping Colorado Boulevard.

- Restripe the westbound approach to Hill Avenue at Maple Street to provide an additional west to south left-turn on Maple Street. This requirement would hold only if the Hill Avenue Station is built.

- Restripe the westbound approach to Sierra Madre Villa Avenue at Foothill BOulevard to provide a double left-turn lane. This would require the removal of the existing right-turn only lane on the eastbound approach to the intersection.

- Mitigation of Foothill Freeway (I-210) traffic during construction should limit the inside lane closures to one lane at the time during off-peak hours only, the implementation of ramp metering, possible traffic diversion to Walnut Street or Colorado Boulevard, and possible installation of HOV lanes through the area.

- For interim phasing to the Del Mar Boulevard Station, the mitigation measures listed above at Glenarm Street, Arroyo Parkway, California Boulevard, and Del Mar Boulevard would apply.

Geology and Earth

Seismic mitigation measures for reducing the potential for adverse earthquake impacts include conducting a geotechnical analysis of subsurface conditions, the site specific design and construction of rail facilities to resist shaking, and conformation to applicable seismic codes. During operations, an emergency operation and evacuation plan must be in effect.

Impacts to the earth due to earth moving and grading work must conform to the Los Angeles Municipal Code and the recommendations of the City Engineer and the Department of Building and Public Safety. Recommendations of a qualified geotechnical engineer must be adhered to, and haul routes for disposal and select material must be defined.

Air Quality

The overall air quality impacts are expected to be minor. The following measures are recommended in reducing impacts:

- Control dust during construction with regular watering in accordance with SCAQMD Rule 403.
- Proper maintenance of construction equipment.
- Halting of grading operations during first stage smog alerts.
- Provisions for convenient access to stations.
- Transit improvements, such as bus pockets, to reduce traffic congestion at stations.

Biological Resources

Impacts on plant and animal life can be mitigated by:

- Follow City of Los Angeles Board of Public Works permit process for tree removal, and plant coast live oaks and black walnut trees on slope below the track bed in sufficient quantities to insure replacement of those trees removed during project implementation.
- Replace removed landscaping with new landscaping that is planned and designed to conform with the surrounding environment, and extend the landscaping to the right-of-way limits and in parking/station areas and areas of fixed transit facilities. A maintenance program should be developed.

Noise and Vibration

Groundborne vibration levels generated by the rail system along the Highland Park alignment are not expected to create an impact on sensitive structures because (1) they would be below the acceptable criteria and, (2) the existing railroad activity in the area generates vibration levels above those projected for LRT operations. In the case of any downtown Los Angeles subway construction, vibration can be mitigated by avoiding structure contact with building foundations, and installing elastomer elements if contact is unavoidable.

Noise impacts are to be mitigated where noise sensitive receivers are located near the right-of-way by the placement of acoustically absorbent sound walls at the following

locations:

- Four to six feet high soundwall, with inside facing acoustic panels along the south side of the right-of-way from midway between Avenue 41 and Avenue 42 to Shanley Avenue.

- Six feet high walls on both sides from Shanley Avenue to midway between Avenue 60 and Avenue 61, with inside acoustic panels. This wall height can be reduced if operating speeds do not exceed 35 mph.

- An eight feet wall on the south side and a six feet wall on the north side from the intersection of Marmion Way and Arroyo Drive to Arroyo Verde Road, with inside facing acoustic panels.

- Four feet high walls on both sides from Adelaine Avenue to Orange Grove Place on the north side, and to El Cento on the south side, with inside facing acoustic panels.

- Four feet high walls, with inside facing acoustic panels, on both sides between the Mission Street/Meridian Avenue intersection and the Fremont Avenue/Greveia Street intersection.

- Station noise created from roadway traffic entering and departing the station area is to be mitigated at the Avenue 51 Station and Avenue 57 Station by placing 6 feet high concrete block wall along station property lines that abut residential properties.

- Construction noise involves developing and applying noise specifications that comply with local ordinances, construction planning that explores the quietest methods, the employment of offsite construction activities, and the installation of temporary noise barriers at jobsites.

Light and Glare

Undesirable light and reflection generated by transit facilities are to be mitigated by directional shielding of lights adjacent to residential areas, and the shielding of facilities from adjacent sensitive land uses by landscaping and noises abatement wall, where applicable for noise purposes.

Risk of Upset

RISK OF UPSET

Risk of upset refers to any risk of explosion or the release of hazardous substances in the event of an accident or natural disaster, or the interference of a project on an emergency response of evacuation plan. The risk of upset mitigation measures apply primarily to underground construction, and are listed as follows:

- Detailed geotechnical and hazardous materials investigations are to be conducted during the design phase of the project.

- Underground structures are to be designed to include adequate ventilation and protection, such as membrane surrounds, to reduce methane gas risks. Relief wells may need to be employed to remove methane gas pockets.

- During operations, gas buildup is to be reduced by conventional ventilation systems that include exhaust shafts and air intake shafts, and the employment of a gas sensing system.

Population and Housing

Mitigation measures concerning the removal of existing residential units involves fair and adequate compensation to those displaced.

Public Services

The impacts of the project on local public services such as police, fire, and schools, are to be mitigated as follows:

1) Police and Law Enforcement

- Voice communications between patrons and central control.
- CCTV linked to central control.
- Use of silent alarms by train operators.
- Alarm systems to protect equipment.
- Design of facilities to preclude blind spots.
- Visibility and lighting in parking lots and dark areas.
- Use of vandal resistant materials.
- Protection of guideways with barriers to prevent encroachment of people, thrown objects, or unauthorized vehicles.
- Access to system for emergency services.
- Limit access to substations and other potentially dangerous areas to authorized personnel only.

2) Fire Protection

- Sufficient emergency access during construction and operations.
- Use of smoke detectors and use of fire retardant materials on trains and stations.
- Installation of telephones, communication devices, fire alarm systems, sprinkler systems in substations, automatic fire fighting systems in fire hazard areas, and the availability of hand held fire extinguishers.

3) Schools

For the safety of students, the following safety features are to be observed where applicable during construction and operations:

- Separation of rail right-of-ways by use of curbs, fences, walls, and landscaping.
- Discouragement of trespassing by use of signs and barriers.
- Sufficient measures to isolate pedestrian ways and to prevent off-street intrusion into the right-of-way.
- Secure and sign potential hazards, such as power sources and stations.
- Coordination of construction with local communities to minimize conflicts.
- The use of public information programs to inform students.
- The installation of fences or other barriers adjacent to schools.

Utilities

1) Electrical Consumption

To reduce energy consumption, the following measures are to be incorporated into system design:

- For the transit vehicle, the use of choppers and regenerative braking.
- The coordination of traffic and rail signal systems.
- Where practical, the use of separate electrical meters at major facilities, the integration of stations with adjacent uses, the use of solar power and energy efficient devices, and the consolidation of yard operations.

2) Underground Facilities and Infrastructure

The mitigation of the relocation and support-in-place of utilities involves the evaluation of impacts and the planning of rearrangements through an agreement process that eliminates interference to the maximum extent possible.

Aesthetics

Adverse visual impacts are to be reduced by implementing the following mitigation measures:

- Station design is to be nonintrusive to surrounding areas. Stations will be constructed of low maintenance materials to the extent practical, and landscaping at both stations and along the guideway will enhance the visual aspects.

- An arts program will be implemented.

Recreation

Care will be taken to integrate station design in the recreational areas. Input will be sought from the Parks and Recreation Department of the appropriate jurisdiction.

Cultural Resources

Cultural resources focuses on historic and archaeological resources that may be affected by the construction of the proposed project.

1) Historic Resources

The Arroyo Seco Bridge at Avenue 61 over the Pasadena Freeway and the Arroyo Seco will require modification. This bridge has monument status with the City of Los Angeles Heritage Commission. Modifications to the bridge should be done in a manner consistent with the existing appearance of the bridge, such as using matching side railing on the deck.

2) Archaeological Resources

CEQA guidelines address mitigation measures that must be followed to preserve or salvage artifacts and/or human remains during the construction of a project. The lead agency will make a determination if the resource is significant and must be salvaged. CEQA procedures will apply for salvage operations.

SECTION 18.0 REFERENCES

Bechtel Civil Company, **Pasadena - Los Angeles Rail Transit Project, Engineering Drawings,** November, 1989.

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Manuel Padron Associates, **Pasadena EIR Study, Operating Plans For Alternative Alignments,** September, 1989.

Los Angeles County Transportation Commission, **The Long Beach - Los Angeles Rail Transit Design and Performance Criteria.**

DKS Associates, **Pasadena LRT Routes Traffic Impact Study,** June, 1989.

Bechtel Civil Company, **Cost Estimate, Los Angeles - Pasadena Corridor (S.W.),** January, 1989.

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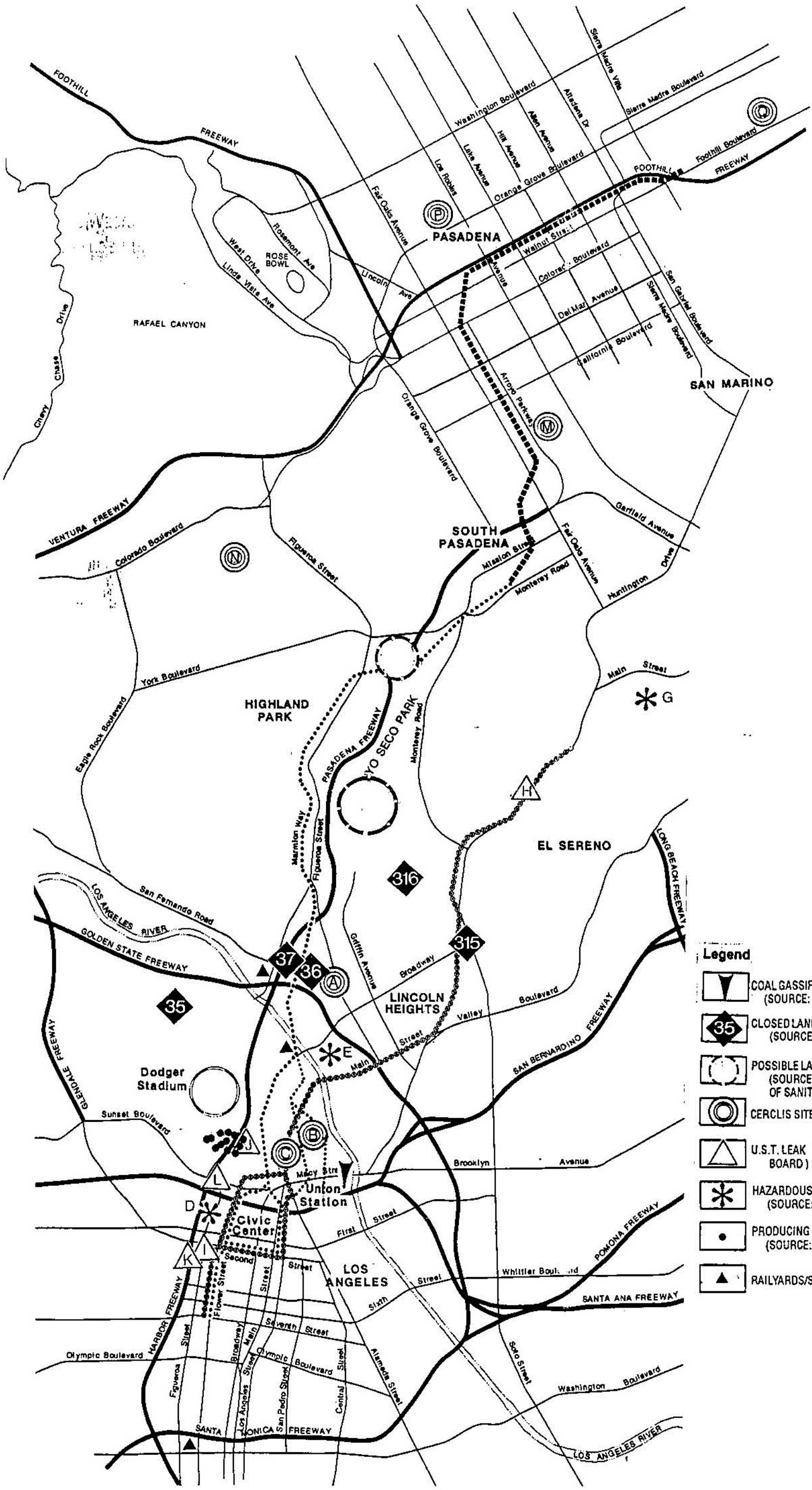

Legend

- COAL GASSIFICATION PLANT CONTAMINATION AREA (SOURCE: RTD METRO RAIL FILES)
- CLOSED LANDFILLS WITH IDENTYING NUMBER (SOURCE: CITY OF LOS ANGELES)
- POSSIBLE LANDFILL AREA (SOURCE: CITY OF LOS ANGELES DEPT. OF SANITATION)
- CERCLIS SITE (SOURCE: EPA)
- U.S.T. LEAK (SOURCE: REGIONAL WATER QUALITY BOARD)
- HAZARDOUS WASTE SUBSTANCE AND SITES LIST (SOURCE: OFFICE OF PLANNING AND RESEARCH)
- PRODUCING OIL WELLS (SOURCE: U.S.G.S. TOPOGRAPHIC QUADRANGLE)
- RAILYARDS/STORAGE

Hazardous Waste Sites

Pasadena-Los Angeles Light Rail Transit Project

NO SCALE

North

Michael Brandman Associates

Exhibit 4-18