



Metro Rail Project
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

SYSTEM SPECIFICATION

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RAPID TRANSIT DISTRICT

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SYSTEM SPECIFICATION



Southern California Rapid Transit District
425 South Main Street
Los Angeles California 90013

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1.0 INTRODUCTION

This system specification defines the requirements for the initial segment of the Southern California Rapid Transit District Metro Rail project. The specification describes the required functions of the rapid transit system, and the physical features of the elements required to perform these functions.

1.1 PROJECT BACKGROUND

In 1974, the SCRTD Board received UMTA funding to evaluate 16 transit corridors in the region. A Rapid Transit Advisory Committee (RTAC), composed of representatives of local and state agencies, guided this effort. Initial analysis identified a Rapid Transit Starter Line Corridor warranting further evaluation. This corridor extended north from Long Beach to downtown Los Angeles, then continuing north through Cahuenga Pass and West into the San Fernando Valley.

Based on results of the study, completed in September 1976, a Regional Transit Development Program (RTDP) was adopted by state and local jurisdictions. An initial segment of a rapid transit system was incorporated as part of the plan. The initial segment was also identified as a project which could be funded by UMTA and a State Proposition Number 5.

In response, SCRTD conducted an indepth Alternatives Analysis/Environmental Impact Study of all bus and rail rapid transit alternatives. Based on the study, the SCRTD Board in October 1979 identified the initial rail segment as an 18.6 mile rapid transit line extending west from downtown along the Wilshire Corridor, north on Fairfax Avenue, through Hollywood and the Cahuenga Pass to North Hollywood in the San Fernando Valley.

In June 1980, UMTA approved this alternative, and authorized and funded the start of the Preliminary Engineering Phase of the Metro Rail Project.

In the Preliminary Engineering phase, major design and engineering issues were defined and resolved; design data for detailed environmental analysis were provided; and reliable cost estimates were produced. During this effort, the precise route alignment, station locations, preliminary station designs, vehicle designs and construction methods were selected. Simultaneous with the preliminary design work, a detailed analysis of the possible environmental impacts of this project on the communities along Metro Rail's downtown-to-North Hollywood route was completed.

Upon completion of the preliminary engineering phase and pending acquisition of necessary capital funding, the final design phase will commence. This will be followed by a 4-to-6-year construction period culminating with system inspection and testing.

The preliminary engineering phase of Metro Rail project is scheduled for completion in mid-1983.

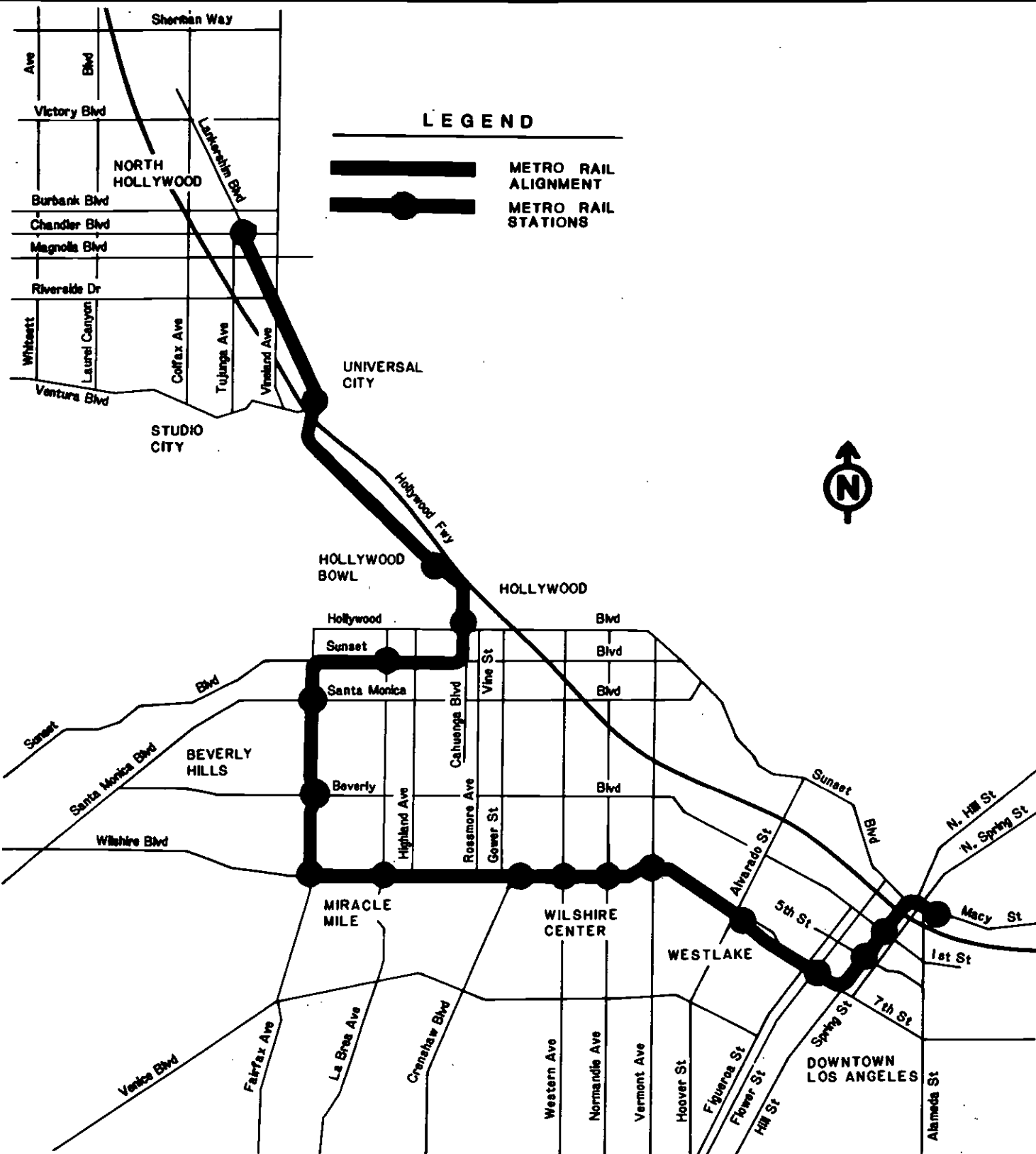
1.2 GENERAL SYSTEM DESCRIPTION

When placed into revenue operation in approximately 1990, the Initial Segment of the Metro Rail Project will form the backbone of SCRTD's integrated bus/rail transit system serving Los Angeles County. Some bus service will be supplemented by the rail line and many bus routes in the core area of the region will be realigned and scheduled to serve as an efficient and economical feeder network for the rail transit line. A map of the system is shown in Figure 1-1.

The system initial segment will be a standard gauge, conventional technology, totally grade separated double-track rapid rail system. The initial segment will be entirely subway, with tunnels 40 to 200 feet underground. The tunnels will be constructed utilizing bored methods. The stations will be constructed utilizing cut-and-cover techniques. The initial segment will consist of 18 stations at the following locations:

Figure 1-1

Map of the RTD Metro Rail System



- Union Station
- Civic Center
- 5th and Hill
- 7th and Flower
- Wilshire and Alvarado
- Wilshire and Vermont
- Wilshire and Normandie
- Wilshire and Western
- Wilshire and Crenshaw
- Wilshire and La Brea
- Wilshire and Fairfax
- Fairfax and Beverly
- Fairfax and Santa Monica
- La Brea and Sunset
- Hollywood and Cahuenga
- Hollywood Bowl
- Universal City
- North Hollywood

The main yard, and shop facility will be located east of the central business district of Los Angeles. The central control facility will be located TBD and will serve as the focal point from which all Metro Rail system operations will be supervised, regulated and controlled.

The passenger vehicle for the Metro Rail system will be a 75 foot long standard gauge, steel wheel vehicle capable of operating at speeds up to 70 mph. The passenger vehicle will have a comfortable capacity of 170 persons.

2.0 SYSTEM GOALS AND OBJECTIVES

The SCRTD was given a mandate to "...solve the transportation problems in the southern California area and to provide the needed comprehensive mass rapid transportation systems." In fulfilling its charter, the SCRTD has enunciated a set of transportation-related goals and objectives. The goals and objectives range from broad statements of ideals and principles to specific plans having the force of law.

To ensure that SCRTD's recommendations would be consistent with the needs of the public, the following goals were identified:

- Conservation of Natural and Cultural Resources - Reduce air pollution and petroleum consumption; reserve open space and retard urbanization of agricultural land.
- Land Use and Urban Form - Guide regional urban development into a more structured form with evenly-spaced, high-density centers linked by high-intensity transportation corridors.
- Conservation of the Urban Environment - Revitalize and develop, as much as possible, existing urban areas rather than urbanize new land.
- Social - Improve mobility of people and enhance access to employment and urban services.
- Transportation - Create a multimodal transportation system integrated with planned land use and furnishing a high level of mobility for all people. Particular emphasis shall be given to public transportation.

The preliminary engineering program used these broad regional transportation goals and objectives as the basis for developing more

specific public goals and objectives that were used for the refinement of the route alignment and station location alternatives and system performance characteristics.

These public goals and objectives, derived through the involvement of the public in the Metro Rail Community Participation Program, are listed below:

- Improve Mobility
 - Provide a necessary improvement in the level of mobility in the Los Angeles CBD-Wilshire-Hollywood-North Hollywood Regional Core Area.
 - Integrate the corridor transit system with the other three elements of RTDP (Regional Transit Development Plan) to provide convenient regional access for all corridor residents.
 - Maintain and improve transportation system safety, dependability, comfort and convenience for both users and nonusers.
 - Reduce travel time and cost.
- Provide Cost Effective Transit
 - Maximize system capital and operational cost-effectiveness in the regional core in terms of passengers and passenger miles, over a foreseeable range of passenger volumes.
 - Minimize capital and operating cost requirements.
 - Minimize the need for public financial support.
- Support Land Development Plans and Maintain an Institutional Framework for Transit Land Use Planning

- Complement regional and local transportation and urban land development goals.
 - Achieve a land use pattern which encourages all components of the regional transit system--bus, Metro Rail, and light rail--to work together, and which allows for cost-effective growth and expansion.
 - Achieve land use patterns at the regional and station area levels to encourage full use of the Metro Rail system during off-peak trips.
 - Ensure that the optimum level of compatible development occurs at (or near) the Metro Rail stations, in a pedestrian environment conducive to attaining increased system ridership and cost-efficient operations.
 - Continue to recognize the importance of community values and community participation in the transit planning process.
- ° Preserve the Environment
 - Complement and support regional energy conservation and air quality goals.
 - Minimize displacement, disruption, disturbance, and noise exposure to residential and employment areas in the Regional Core.
 - Reduce vehicle miles traveled on Regional Core surface streets to the extent possible without arbitrary restraints and delays.
 - Make the most efficient use of existing transportation energy resources and improve the ability of the transportation system to use alternative energy sources in the future.

- ° Implement Joint Development Principles
 - Use joint private/public investments in public transit in order to ensure a stable, continuing source of funding for transit development.
 - Ensure that public and private developments at Metro Rail stations are compatible and are supportive of transport function of the system.
- ° Develop Value Capture Opportunities
 - Use value capture/ benefit sharing mechanisms to enable the public to share in windfalls created by transit investments and to avoid the inequitable distributions of windfalls through speculation.
 - Derive and sustain the highest level of revenues for the Metro Rail project, without interfering with the private marketplace.
 - Achieve an equitable distribution of the liabilities as well as benefits of the transit system development and operation.

3.0 SYSTEM OPERATING REQUIREMENTS

This section describes the overall operating requirements of the system. Included are patronage projections, hours of service, service requirements, the operating environment, security requirements, safety and security requirements, the system assurance approach, requirements for the elderly and handicapped, and the cost-effectiveness approach.

3.1 PATRONAGE LEVELS

The Metro Rail System shall be designed to carry the number of patrons projected to use the Metro Rail system in the year 2000. The patronage projections are based on a 1995 regional trip table extrapolated to the year 2000 by applying SCAG growth policy and demographic data and then using the SCAG/SCI Mode Choice Model developed in 1982.

3.1.1 Daily Station and Link Volumes

By the year 2000, it is projected that 364,400 (one-way) patrons will be riding the Metro Rail system on a typical average weekday.

Figure 3-1 shows the number of riders that will be entering each station on the Metro Rail system on an average weekday by direction of travel. Figure 3-1 also shows the one-way daily link volumes between each station.

3.1.2 Morning Station and Link Volumes.

Figure 3-2 shows the number of riders that will be entering and exiting each station during the morning peak hour by direction of travel. Link volumes for the peak hour are also shown by direction of travel.

In the morning peak hour, 43,900 patrons will use the Metro Rail system. Of these, 26,700 will be traveling inbound and 17,200 will be

traveling outbound. The maximum link inbound will be between Wilshire/ Alvarado and 7th/Flower stations. The maximum link outbound will be between Civic Center and 5th/Hill stations.

3.1.3 Evening Station and Link Volumes

Figure 3-3 shows the number of riders that will be entering and exiting each station during the evening peak hour by direction of travel. Link volume for the peak hour are also shown by direction of travel.

In the evening peak hour, 41,300 patrons will use the Metro Rail system. Of these, 23,450 will be traveling outbound and 17,850 will be traveling inbound. The maximum link outbound will be between 7th/Flower and Wilshire/Alvarado stations. The maximum link inbound will also be between Wilshire/ Alvarado and Seventh/Flower stations.

3.1.4 Mode of Access/Egress

Figure 3-4 shows the mode of access/egress for each station by morning and evening peak hours.

3.1.5 Peak 15-Minute Factor

The System shall be designed to carry 28.2 percent of the ridership within a peak 15-minute period during the peak hour. This factor may be applied to all ridership during either the morning or evening peak hour to obtain the peak 15-minute period characteristic. Peaking within the peak 15-minute periods is assumed to be minimal.

3.2 HOURS OF SERVICE

The Metro Rail system facilities and equipment shall be designed so as to permit operations up to 24 hours a day, seven days per week. For planning purposes, 20 hours operation from 5:30 a.m. to 1:30 a.m. are to be assumed as a typical operating day.

Figure 3-1

DAILY RIDERSHIP VOLUMES

Station	Boardings			One-Way Link Volumes
	Inbound	Outbound	Total	
Union Station		23025	23,025	23,025
Civic Center	2890	17490	20,380	37,625
5th / Hill	7575	36860	44,435	66,910
7th / Flower	5385	26875	32,260	88,400
Wilshire / Alvarado	24245	16990	41,235	81,145
Wilshire / Vermont	25765	10880	36,645	66,260
Wilshire / Normandie	4730	8825	13,555	70,355
Wilshire / Western	19490	5705	25,195	56,570
Wilshire / Crenshaw	7335	5865	13,200	55,100
Wilshire / La Brea	8780	2575	11,355	48,895
Wilshire / Fairfax	12970	6720	19,690	42,645
Fairfax / Beverly	5490	4685	10,175	41,840
Fairfax / Santa Monica	9965	7025	16,990	38,900
Sunset / La Brea	5875	2500	8,375	35,525
Hollywood / Cahuenga	10230	3755	13,985	29,050
Hollywood Bowl	3695	755	4,450	26,110
Universal City	15810	1670	17,480	11,970
North Hollywood	11970		11,970	
TOTAL	182,200	18200	364,400	

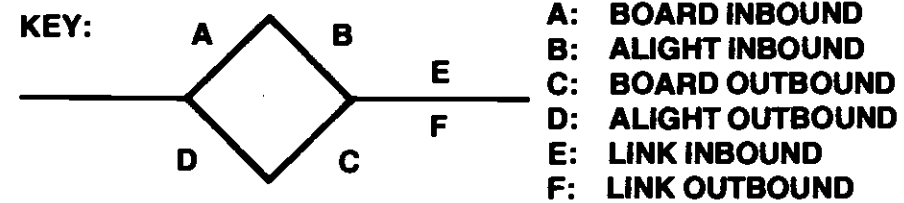
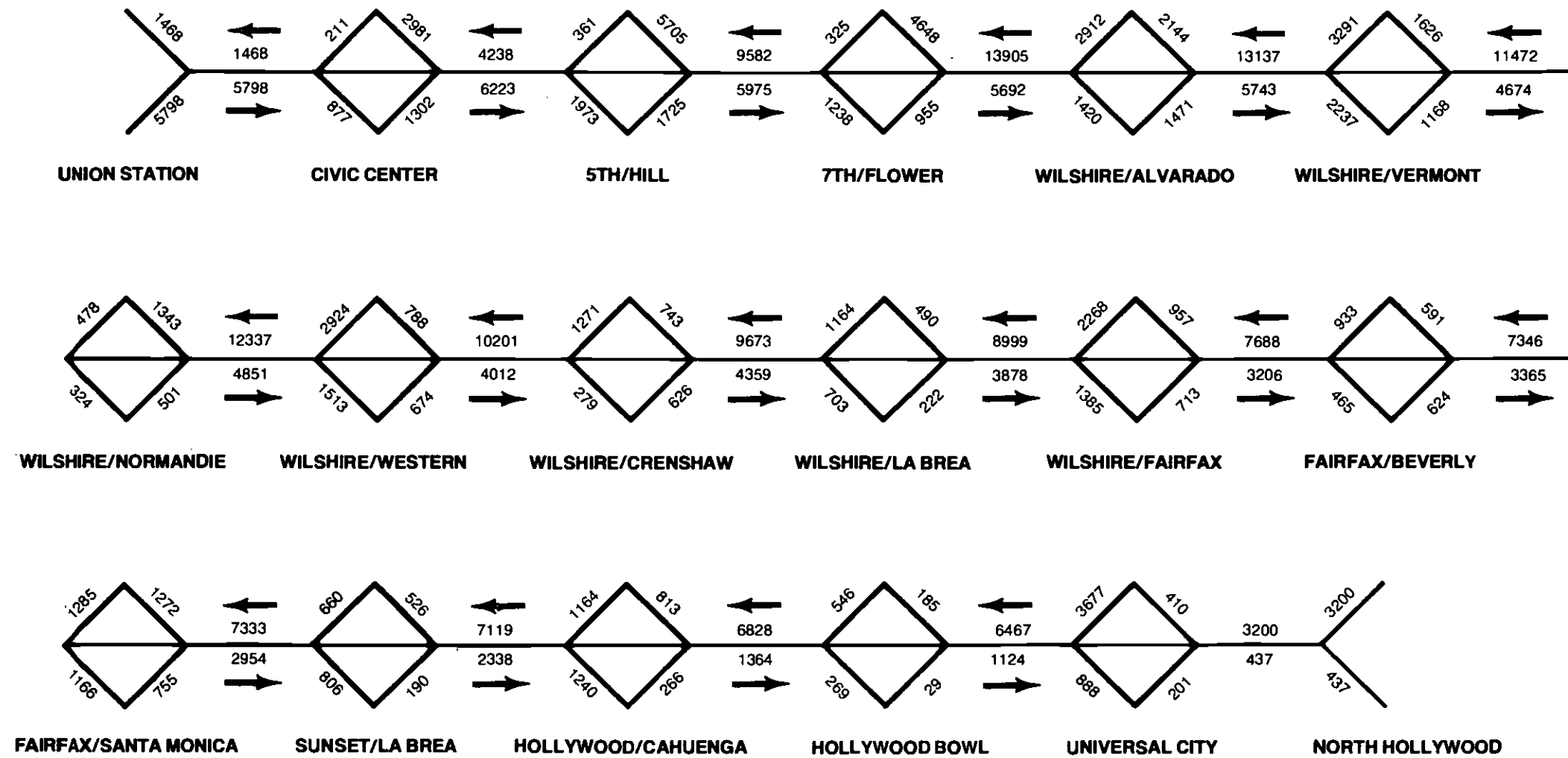


FIGURE 3-2
Morning Peak Hour Ridership
Year 2000 Volumes

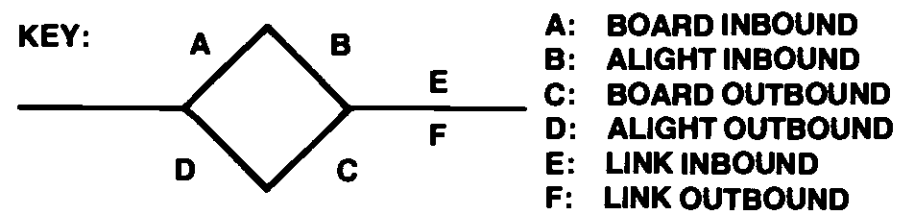
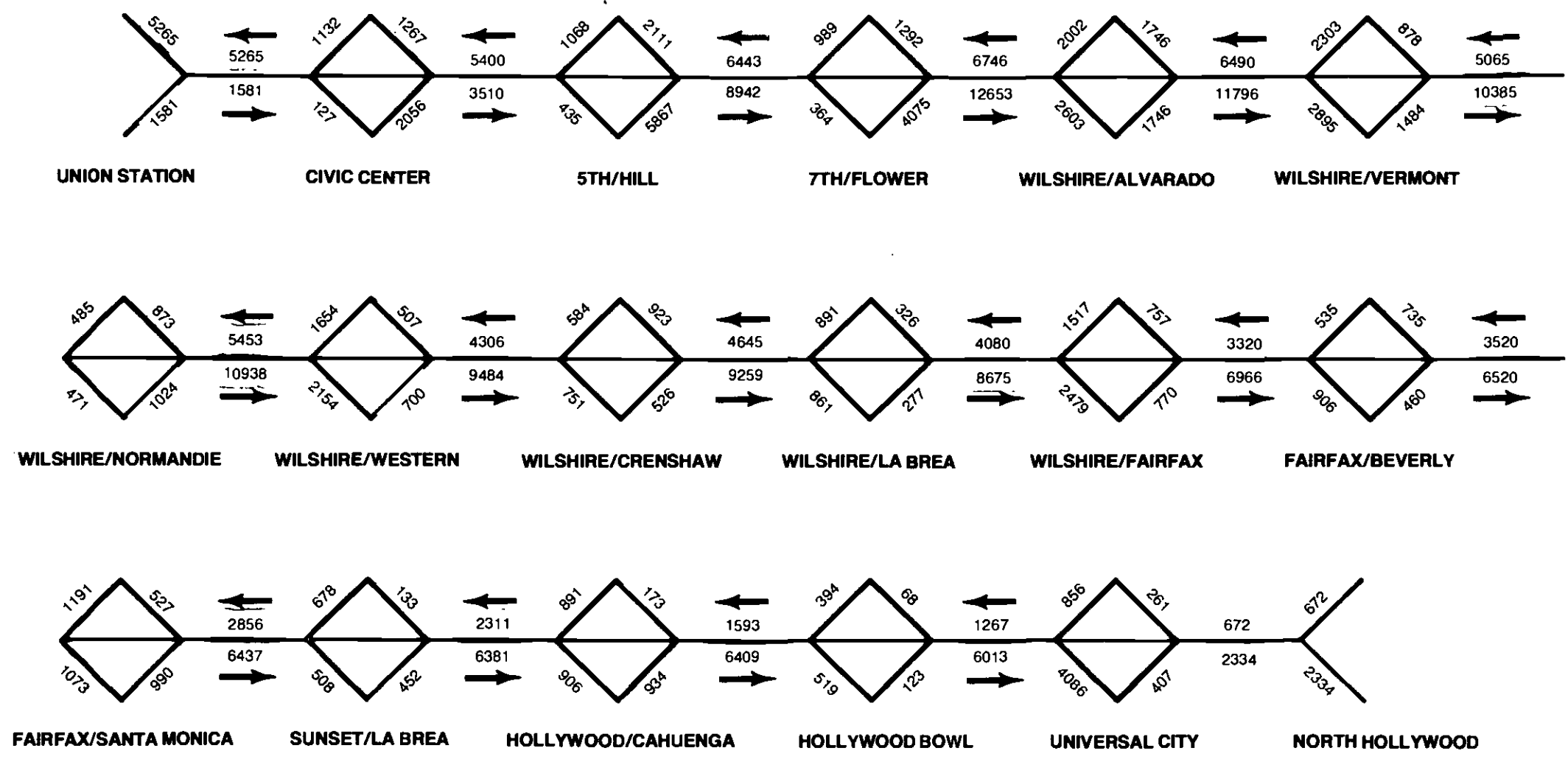


FIGURE 3-3
Evening Peak Hour Ridership
Year 2000 Volumes

Figure 3-4
MODE OF ACCESS/EGRESS
(Year 2000)

	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
<u>Union Station</u>				
Park and Ride	1443	39	176	2029
Kiss and Ride	759	24	51	525
Bus	3067	1085	997	2303
Walk	<u>374</u>	<u>503</u>	<u>369</u>	<u>286</u>
TOTAL	5643	1651	1593	5343

	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
<u>Civic Center</u>				
Park and Ride	0	0	0	0
Kiss and Ride	0	0	0	0
Bus	1187	1444	1112	958
Walk	<u>250</u>	<u>2711</u>	<u>2079</u>	<u>465</u>
TOTAL	1437	4155	3191	1423

	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
<u>5th / Hill</u>				
Park and Ride	0	0	0	0
Kiss and Ride	0	0	0	0
Bus	1559	4372	3339	1493
Walk	<u>661</u>	<u>4375</u>	<u>3603</u>	<u>1120</u>
TOTAL	2220	8747	6942	2613

Figure 3-4 (Continued)
MODE OF ACCESS/EGRESS
(Year 2000)

	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
<u>7th / Flower</u>				
Park and Ride	0	0	0	0
Kiss and Ride	0	0	0	0
Bus	946	4265	3525	1294
Walk	<u>289</u>	<u>2030</u>	<u>1543</u>	<u>403</u>
TOTAL	1235	6295	5068	1697

	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
<u>Wilshire / Alvarado</u>				
Park and Ride	0	0	0	0
Kiss and Ride	829	105	357	874
Bus	1637	1736	1509	1454
Walk	<u>2208</u>	<u>1920</u>	<u>1889</u>	<u>2,089</u>
TOTAL	4674	3761	3755	4417

	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
<u>Wilshire / Vermont</u>				
Park and Ride	0	0	0	0
Kiss and Ride	423	49	165	428
Bus	2532	2152	1839	2096
Walk	<u>1255</u>	<u>2012</u>	<u>1793</u>	<u>1307</u>
TOTAL	4210	4213	3797	3831

Figure 3-4 (Continued)
 MODE OF ACCESS/EGRESS
 (Year 2000)

Wilshire/ Normandie	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Park and Ride	0	0	0	0
Kiss and Ride	346	35	115	331
Bus	357	1052	880	410
Walk	<u>809</u>	<u>623</u>	<u>511</u>	<u>626</u>
TOTAL	1512	1710	1506	1367

Wilshire / Western	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Park and Ride	0	0	0	0
Kiss and Ride	296	36	124	308
Bus	2239	1083	1070	1827
Walk	<u>398</u>	<u>1324</u>	<u>1167</u>	<u>572</u>
TOTAL	2933	2443	2361	2707

Wilshire / Crenshaw	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Park and Ride	0	0	0	0
Kiss and Ride	525	33	97	425
Bus	1077	631	603	903
Walk	<u>427</u>	<u>495</u>	<u>411</u>	<u>370</u>
TOTAL	2029	1159	1111	1698

Figure 3-4 (Continued)
 MODE OF ACCESS/EGRESS
 (Year 2000)

Wilshire/ La Brea	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Park and Ride	0	0	0	0
Kiss and Ride	247	13	38	192
Bus	888	683	621	767
Walk	<u>195</u>	<u>598</u>	<u>504</u>	<u>245</u>
TOTAL	1330	1294	1163	1204

Wilshire / Fairfax	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Park and Ride	577	13	106	1447
Kiss and Ride	349	13	30	248
Bus	1466	1923	1559	1258
Walk	<u>345</u>	<u>728</u>	<u>594</u>	<u>337</u>
TOTAL	2737	2677	2289	3290

Fairfax/ Beverly	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Park and Ride	569	13	38	656
Kiss and Ride	133	4	7	90
Bus	399	760	614	384
Walk	<u>685</u>	<u>364</u>	<u>334</u>	<u>537</u>
TOTAL	1786	1141	993	1667

Figure 3-4 (Continued)
MODE OF ACCESS/EGRESS
(Year 2000)

Wilshire/ Santa Monica	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Park and Ride	0	0	0	0
Kiss and Ride	173	7	18	127
Bus	1392	2287	1788	1225
Walk	<u>248</u>	<u>446</u>	<u>377</u>	<u>261</u>
TOTAL	1813	2740	2183	1613

Sunset/ La Brea	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Park and Ride	0	0	0	0
Kiss and Ride	96	5	16	76
Bus	282	653	500	266
Walk	<u>254</u>	<u>720</u>	<u>612</u>	<u>312</u>
TOTAL	632	1378	1128	654

Hollywood/ Cahuenga	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Park and Ride	0	0	0	0
Kiss and Ride	141	12	38	126
Bus	600	887	685	503
Walk	<u>316</u>	<u>1280</u>	<u>1101</u>	<u>471</u>
TOTAL	1057	2179	1824	1100

Figure 3-4 (Continued)
MODE OF ACCESS/EGRESS
(Year 2000)

Hollywood Bowl	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Park & Ride	0	0	0	0
Kiss & Ride	231	9	22	166
Bus	280	485	346	217
Walk	<u>292</u>	<u>191</u>	<u>151</u>	<u>214</u>
TOTAL	803	685	519	597

Universal City	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Park and Ride	1293	34	140	2412
Kiss and Ride	567	14	22	377
Bus	1731	696	729	1433
Walk	<u>250</u>	<u>520</u>	<u>369</u>	<u>194</u>
TOTAL	3950	1264	1260	4416

North Hollywood	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Park and Ride	1262	30	53	857
Kiss and Ride	188	5	9	127
Bus	1719	561	545	1311
Walk	<u>77</u>	<u>67</u>	<u>58</u>	<u>66</u>
TOTAL	3246	663	665	2361

3.3 SERVICE REQUIREMENTS

Levels of train service will be established prior to the start of revenue operation in accordance with adopted service policy headways and in order to provide sufficient capacity to comfortably accommodate projected demand levels. Train lengths will also be adjusted during the day to accommodate changes in demand levels.

3.3.1 Travel Times

During the peak periods, the travel time from North Hollywood to Union Station will be 34 minutes, with an average dwell time of 30 seconds at each intermediate station. Round trip time will be 74 minutes, with a minimum schedule turnback time of 3 minutes at each terminal. A typical travel time schedule for a peak period train is shown in Figure 3-5.

During the off-peak periods, travel time will be reduced to 31 minutes because of shorter station dwell times (average 20 seconds).

3.3.2 Vehicle Loading Standards

Peak period service levels shall be based on an average 6-car train load of 1020 patrons, with 76 seated and 94 standing in each car. Loading during off peak service periods shall not exceed 76 seated and 14 standing.

3.3.3 Service Levels

For the year 2000, Figure 3-6 shows a service plan for weekday and weekend service. Service during the peak 15-minute periods will be operated at 3-1/2 minute headways. During midday, service will be provided at 7-1/2 minute headways and in the evening, at 15-minute headways. Late evening service for 24-hour operation may be extended to 30 minutes. On weekends and holidays, service will be provided at 10-15 minute headways.

Figure 3-5

ESTIMATED PEAK HOUR TRAVEL TIME BETWEEN STATIONS
(MINUTES)

<u>Station</u>	<u>TRIP TIMES (SEC)</u>	
	<u>Outbound</u>	<u>Inbound</u>
Union Station		
Civic Center	82	82
5th & Hill	55	56
7th & Flower	62	62
Wilshire/Alvarado	98	104
Wilshire/Vermont	89	90
Wilshire/Normandie	66	66
Wilshire/Western	50	50
Wilshire/Crenshaw	67	67
Wilshire/La Brea	106	106
Wilshire/Fairfax	72	72
Fairfax/Beverly	94	98
Fairfax/Santa Monica	93	94
La Brea/Sunset	111	109
Hollywood/Cahuenga	104	103
Hollywood Bowl	86	85
Universal City	165	162
North Hollywood	147	147

Figure 3 - 6
 Service Plan for Weekday and Weekend Service
 (Year 2000)

<u>HOURS OF OPERATION</u>	<u>NUMBER OF TRAIN CARS</u>	<u>TIME BETWEEN TRAINS (MINUTES)</u>
<u>Weekdays</u>		
Early Morning		
5:30 A.M. - 6:00 A.M.	6	15.0
6:00 A.M. - 6:30 A.M.		7.5
Peak Periods		
6:30 A.M. - 9:00 A.M.	6	3.5 - 6.0
3:30 A.M. - 6:30 A.M.		3.5 - 6.0
Mid-day		
9:00 A.M. - 3:30 P.M.	6	7.5
Evening		
6:30 P.M. - 7:30 P.M.	6	7.5
Night		
7:30 P.M. - 1:30 A.M.	4	15.0
<u>Saturday</u>		
Morning		
5:30 A.M. - 7:30 A.M.	4	15.0
Day		
7:30 A.M. - 7:30 P.M.	6	10.0
Evening		
7:30 P.M. - 1:30 A.M.	4	15.0
<u>Sundays and Holidays</u>		
All Day		
5:30 A.M. - 1:30 A.M.	4	15.0

3.3.4 Fleet Requirements

To operate the service plan shown in Figure 3-6, 130 cars (65 dependent pairs) will be required, as follows:

- ° 108 for revenue service
- ° 10 for standby in the event a substitution of equipment is necessary during the peak periods
- ° 12 for maintenance spares, based on a minimum availability of 90 percent.

3.4 OPERATING ENVIRONMENT

3.4.1 Climatic Conditions

The climate of the regions within the Los Angeles metropolitan area significantly differs in temperature, humidity, cloudiness, fog, rain and sunshine. These differences relate to the distance from, and the elevation above, the Pacific Ocean. The elements of the Metro Rail System, therefore, will have significant differences in ambient environment, depending on location along the transit corridor route. Figure 3-7 illustrates the ambient conditions that the system's elements shall operate within.

The ambient conditions stated for tunnels are not design goals for tunnel ventilation equipment systems, but rather, a predication of operating conditions in the tunnels.

3.4.2 Seismic Environment

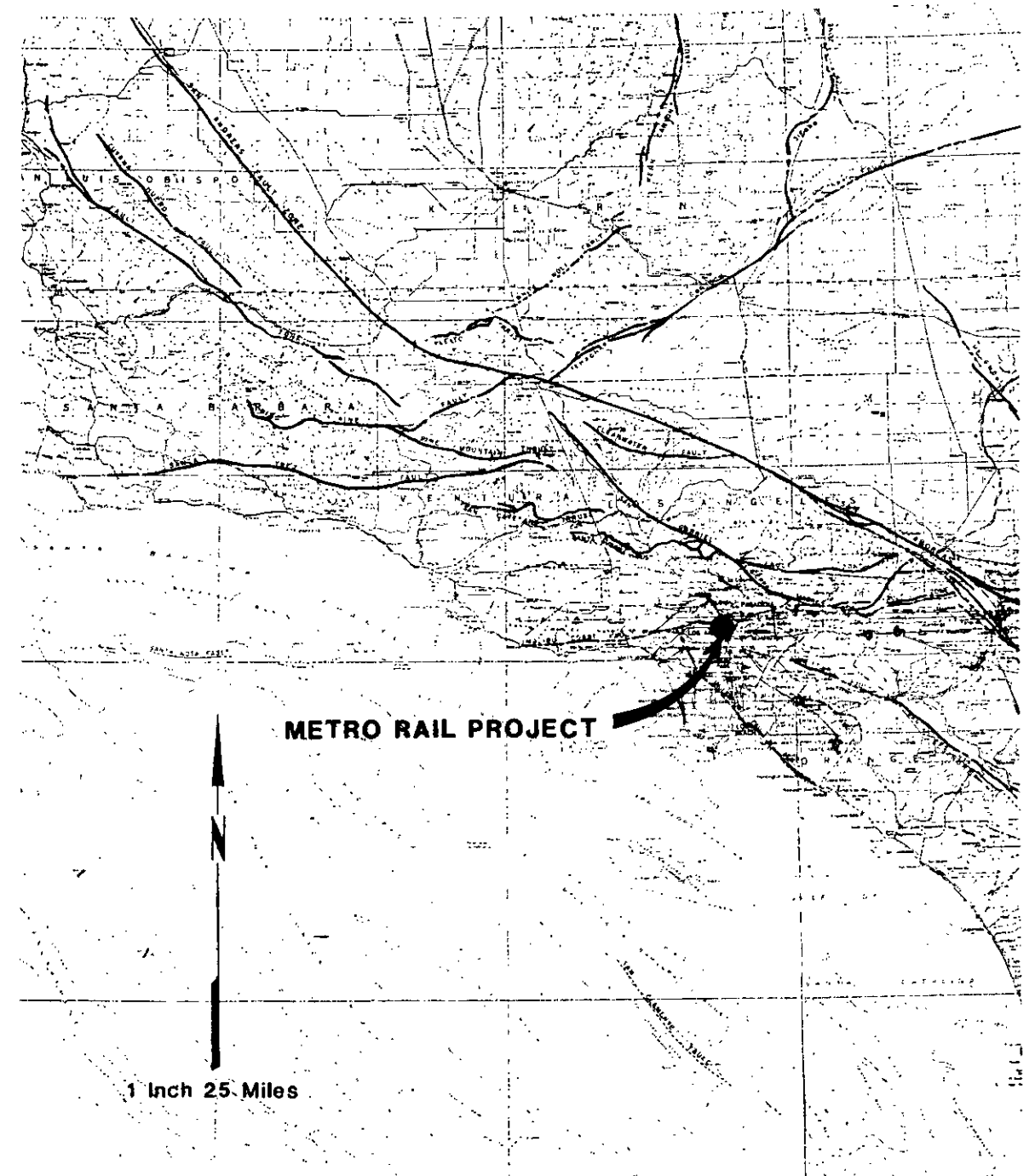
Numerous minor (inconsequential) to structurally significant faults will be crossed by the Metro Rail alignment. The Regional faults considered important to Metro Rail are shown in Figure 3-8. The Hollywood and

Figure 3-7
SYSTEM AMBIENT CONDITIONS

	<u>Los Angeles (Civic Center)</u>	<u>North Hollywood</u>	<u>Metro Rail Tunnel</u>
Temperature Range (°F)	23 - 110	21 - 111	36 - 115
Relative Humidity Range (%) R.H.	40 - 100	31 - 100	40 - 100
Rainfall (max. inches per hour)	4	4	N/A
Wind (steady state gusts, max. miles per hour)	30 - 50	30 - 50	N/A
Hail/Snow	Trace	Trace	N/A
Air Quality			
Particulate (average mg/m ³)	.14	.14	.17
O ₃ (max-PPM)	.29	.35	-
NO _x (max-PPM)	.44	.35	-
SO _x (max-PPM)	.037	.028	-
CO (max-PPM)	19	29	-
Solar Radiation (max-BTUH/ft ²)	275	275	N/A

FIGURE 3-8

POTENTIALLY ACTIVE FAULTS



Santa Monica are the only known faults crossed by the alignment that are considered active or potentially active, that is, significant earthquakes have occurred in historic times, and there is a high probability that earthquakes will occur in the future.

The Metro Rail System shall be designed to special seismic criteria that will preclude the risk of public exposure to significant earthquake hazards.

The earthquake criteria shall be classified in two levels of severity:

- ° Operating Design Earthquake (ODE) Richter Magnitude 5.5 - 6.5
- ° Maximum Design Earthquake (MDE) Richter Magnitude 7.0 - 7.5

The ODE is defined as the earthquake event which has a return period of several hundred years. Such an event can reasonably be expected to occur during the 100-year facility design life. The probability of this level of event is on the order of 40 percent during the facility life.

The MDE is defined as the earthquake event which has a return period of several thousand years. Such an event has a small probability during the facility life. This probability is on the order of five percent or less.

The system shall be designed to operate normally, although performance may be temporarily degraded, with the level of ground shaking at any point on the system caused by an ODE event.

The system shall be designed so that critical functions required to maintain public safety and prevent catastrophic failure continue to function with the MDE level of ground motion at any point on the system.

Design Ground Motion. The design ground motion values shown in Figure 3.10 shall be used for all project locations. The design motion

Figure 3-9
DESIGN EARTHQUAKE PARAMETERS

DESIGN EARTHQUAKE	FOUNDATION CONDITION	DESIGN GROUND MOTION PARAMETERS					
		ACCELERATION (g)		VELOCITY (Ft/Sec)		DISPLACEMENT (Ft)	
		HORIZ.	VERT.	HORIZ.	VERT.	HORIZ.	VERT.
ODE	SOIL	0.30	0.20	1.4	1.0	1.6	1.0
	ROCK	0.30	0.20	0.8	0.6	0.5	0.3
MDE	SOIL	0.60	0.40	3.2	2.1	3.3	2.2
	ROCK	0.60	0.40	1.9	1.3	1.0	0.7

Duration of strong motion:

(accelerations greater than .05g)

ODE = 15-20 Sec

MDE = 25 Sec (Nearby Faults)

= 30+ Sec (San Andreas Fault)

shall be used in analyzing the effect of traveling waves on structures, such as tunnels or foundations, analyzing vibratory response of buried structures, and analyzing the vibratory response of partially buried, above grade and aerial structures. Application of these ground motion values shall be in accordance with the seismic design criteria. The motions of Figure 3-10 may occur coincidentally in 3 orthogonal axes.

Design Spectra. Elastic free field design spectra for use as input in seismic analysis of structural response are given in Figures 3-11 and 3-12 for a horizontal direction. Several curves are provided corresponding to selected levels of structural damping.

For any given value of damping the vertical design spectra shall equal two-thirds the horizontal design spectra for frequencies of engineering interest. Vertical design accelerations and response spectra are to be adjusted for near-fault locations.

Figure 3-10

ODE Horizontal Design Spectra
(2,5, and 10% Critical Damping)

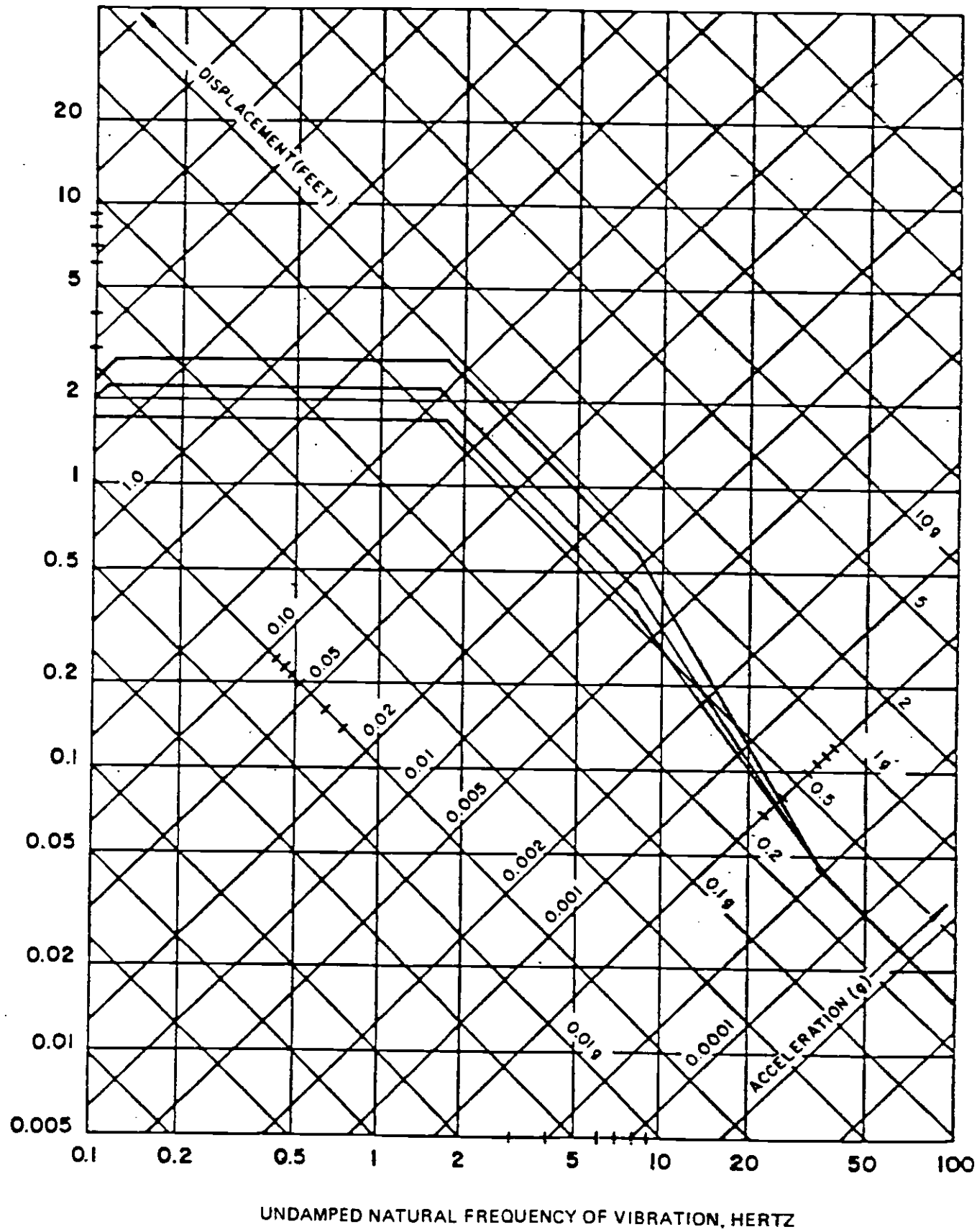
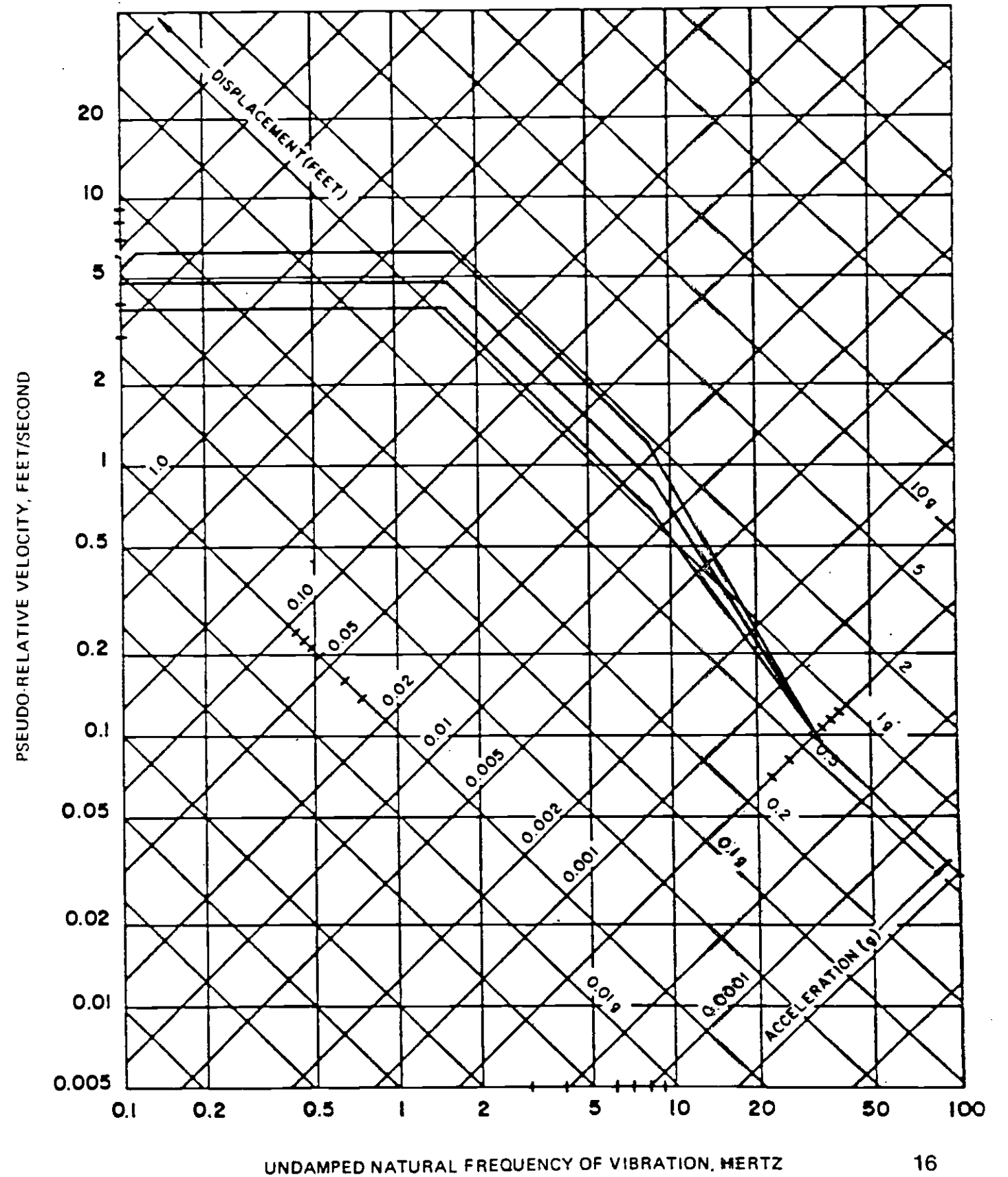


Figure 3-11

MDE Horizontal Design Spectra
2,5, and 10% Critical Damping



3.4.3 Corrosion

The system will be subjected to atmospheric and soils conditions that may cause corrosion of Metro Rail System equipment and facility elements. The system will be exposed to the following conditions:

Atmospheric:

- High Humidity up to 100% RH
- Acid Fog
- Acid Rain
- Sulphur Dioxide
- Ozone

Soils - Conditions

- Acid Soils
- Water
- Methane Gas
- Hydrogen Sulfide Gas

The system shall be designed to minimize the effects of corrosion on the system and area underground utilities and structures by using up-to-date proven corrosion control techniques for the following types of corrosion:

- Oxygen Concentration Cell Corrosion
- Dissimilar Metals (Galvanic)
- Strong Current Corrosion (Electrolytic)
- Stress Corrosion
- Corrosion Fatigue
- Pitting Corrosion
- Uniform Etch Corrosion

3.4.4 Subsurface Gases

Portions of the Metro Rail System tunnel and station sites pass through areas containing subsurface combustible gases, principally Methane (CH₄) and Hydrogen Sulfide (H₂S). Combustible gases will be present

in significant volume and at pressures which present a hazard during construction and subsequently during operations.

The relative likelihood of the presence of gas is shown in Figure 3-12 using the following classifications as adopted from California Administrative Code Title 8 p. 684.18.

Nongassy - Applied to intervals where there is little likelihood of encountering gas during the construction of the tunnel.

Potentially gassy - Applied to intervals where there is a possibility of encountering flammable gas or hydrocarbons.

Gassy - Applied to intervals where it is likely gas will be encountered.

Extrahazardous - Applied to intervals if the Division finds that there is a serious danger to the safety of employees.

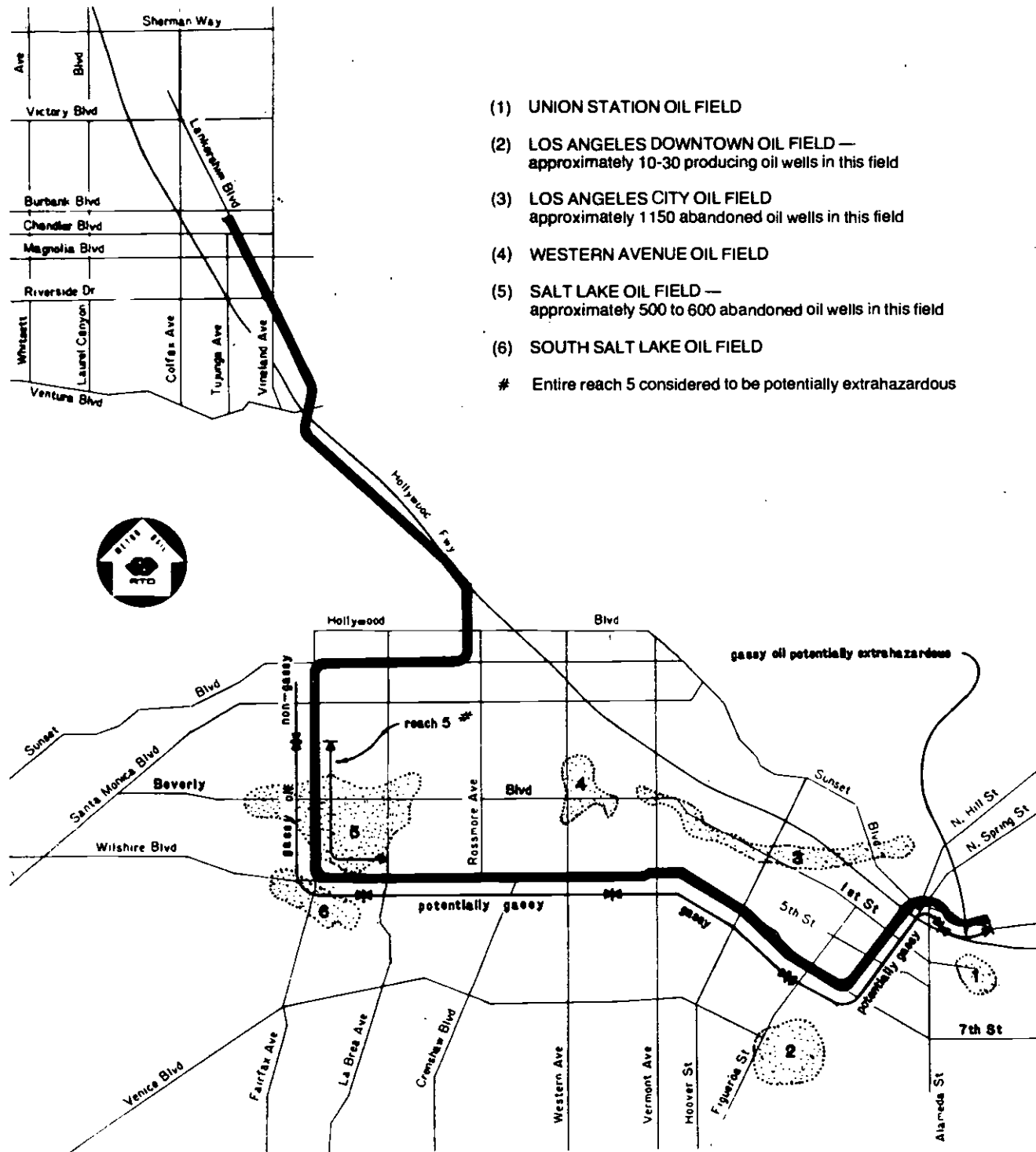
The specific construction or safety measures that will be required to preclude the presence of gas affecting Metro Rail operations shall be determined during construction, based on conditions encountered in the field. Methods shall include sealed tunnel liners, gas detectors and alarm systems, and automatic tunnel ventilators.

3.5 SECURITY

The Metro Rail System design shall ensure that a real and perceived high level of security is provided for patrons and operating personnel. Facility design and operating procedures shall promote a sense of well-being by patrons and personnel, discouraging acts of crime, violence and abuse. Security provisions shall also maintain system integrity by discouraging acts of vandalism, theft and fraud.

FIGURE 3-12

Classification of Gas Likelihood
on the Metro Rail Construction



The Metro Rail System shall be planned and designed to achieve a high level of security through a comprehensive approach that utilizes the following principles.

- Thorough planning and effective management of the security program through a security program plan.
- Definition of major security tasks and their implementation as an integral part of the design and construction process.
- Evaluation of subsystems, system, station and ways and structures for security by analysis, test, review and assessment.
- Timely status indication by formal documentation and other reporting to facilitate implementation of security efforts.
- Compatible security requirements among all of the elements of the Metro Rail System.
 - Central Control will act as the focal point for communication with patrons, with station agents and emergency service personnel being provided when necessary.
 - Nonpublic areas shall be secured to preclude unauthorized entry. Where public access is required through ancillary spaces in emergencies purposes, intrusion into those areas shall be annunciated. Any unauthorized entry areas along those routes are to be secured against inadvertent entry.
 - Station entrances shall be securable and have alarms during nonrevenue hours.

° Surveillance

- Closed circuit television shall be provided to monitor the station areas as defined below:

Platform Edge and Waiting Area
Passenger Safety Zone
Fare Barriers
Ticket Vendors
Rest Room Entrance

- Central Control shall be equipped with video taping capability that can be switched to specific monitors.

° Passenger Vehicles

- Interior and exterior exposed materials shall be vandal resistant and easily cleaned.
- Vehicle windows shall be clear, and impact resistant.
- Vehicle-to-vehicle end visibility is to be provided by windows at each end of the vehicle.
- Each vehicle shall be equipped with an intercom for direct communication between the passenger and the train operator.
- Communication capability between Central Control and the train operator and between Central Control and other on-board patrons shall be provided.
- Vehicles shall be numbered to provide for identification, and equipped with exterior alarm signals.

° Central Control

- All security alarms and annunciations shall be communicated to Central Control.
- Separate transit police radio frequencies shall be designated for the transit police.
- Direct lines shall be provided from Central Control to the headquarters of those municipalities and jurisdictions through which the transit line operates.
- All CCTV installations identified above shall be monitored at Central Control.

° Yard and Shops

- The yard and perimeter shall be illuminated at an intensity consistent with operating security requirements.
- The storage yards shall be enclosed with fencing and controlled access points to prevent unauthorized entry.

3.6 SAFETY

Safety shall be the foremost concern in the design, construction and operation of the Metro Rail System. Passengers, employees and the public shall not be exposed to recognized hazards that have unacceptable levels of severity or frequency of occurrence.

The Metro Rail System shall conform to all appropriate codes and regulations. System safety engineering technology, augmented by those standards and guidelines developed by industry advisory agencies, shall be utilized to ensure that the Metro Rail System achieves a level of safety that equals or betters those levels attained by other rail transit systems operating in the United States and Canada.

The Metro Rail System's fire/life safety levels shall meet or exceed those of other transit systems. These include ensuring that fire/life safety considerations, compatible with system requirements, are incorporated into subsystem designs, and that potential hazards are identified and then eliminated or minimized.

3.6.1 Hazards Control

The Metro Rail System shall achieve an acceptable level of design safety by the processes of eliminating, or controlling hazards which have an effect on life, system loss or cause injury, occupational illness or major system damage.

All single-point hardware and software failures resulting in critical or catastrophic hazards, shall be avoided or eliminated. Those with potential for resulting in marginal hazards shall be controlled to an acceptable level of risk. Measures for the control of hazards shall include redundancy of critical components, judicious use of safety margins and factors, selection of reliable time-proven components and designs, and use of safety and warning devices and special procedures.

Fail-safe principles shall be incorporated into dynamic system elements under all potential operating conditions, including those circumstances where operations continue in the presence of components of subsystem failure.

3.6.2 Facility Safety

Facilities and other structural elements of the Metro Rail System shall be free of design features which pose a danger to the life or safety of patrons, personnel and the general public. Design of these facilities shall incorporate accepted safety margins for all load-bearing members, accounting for the anticipated stresses under which they are to be placed over the life of the system. Obstacles that may prove hazardous to passenger movement under any anticipated circumstances shall be

either avoided or controlled to an acceptable level. Facilities must be designed for safety through provision of adequate movement and queuing capacities. Materials shall not pose a danger to movement nor a health-or life-threatening hazard when exposed to fire, extreme heat, light, electric current or moisture, or when in contact with other building materials.

3.6.3 Occupational Safety

Occupational safety shall be provided by a combination of design and procedures that will control the risk of injury to system personnel during their normal operations, maintenance and repair activities. The requirements of CAL OSHA and applicable local codes shall be met through design and operation of Metro Rail System facility.

3.6.4 Emergency Provisions

The system shall be designed to permit the implementation of special operating procedures for the safe and efficient handling of most foreseeable emergencies.

3.6.4.1 Emergency Evacuation

The system shall be designed to permit the safe, and timely evacuation of patrons and personnel from all fixed structures and facilities.

There shall be sufficient exit lanes to evacuate the occupant load from the station platform in four minutes or less. The station shall also be designed to permit evacuation from the most remote point on the platform to a point of safety in six minutes or less. Exit doors and gates shall be a minimum of 36 inches wide. The capacity per exit lane and per gate shall be 50 persons per minute, (25 ppm if turnstiles are used).

Vehicle evacuation shall be accomplished under direct supervision of system personnel, except under those circumstances when there is an immediate threat to the health, safety or security of passengers or system personnel. The design features, equipment and instructions, shall be made for unsupervised evacuation, however, their use will be discouraged except in extreme emergencies when immediate evacuation is essential.

Emergency egress of patrons from disabled transit vehicles shall be accomplished through tunnel walks and tunnel cross passages to the unaffected bore.

Procedures and facilities shall provide for the supervised safe, timely and orderly evacuation of all passengers, including the elderly and handicapped, from vehicles located anywhere in the system. As a minimum, provisions shall be included to safeguard patrons, system personnel and emergency forces, anywhere on an evacuation or access route, from hazards created by the following:

- Power distribution system
- Moving vehicles
- Potential for falling or tripping.
- Fixed objects or obstacles.

3.6.4.2 Emergency Detection

Fire and smoke detection systems, gas detection, seismic detection alarm systems, and provisions for emergency monitoring and control procedures shall be incorporated as appropriate to minimize the potential for fire losses and associated service disruptions.

3.6.5 Safety Design Requirements

All systems and subsystems shall be designed to be safe to the maximum extent possible. Provisions shall include:

◦ Stations

- Site access points and traffic patterns for vehicles and pedestrians shall be clearly marked.
- Bus and auto lanes that cross, are common, or result in counter-flow or common auto/bus lanes, shall be minimized.
- Automobile stopping zones and taxi stands shall be located so as to minimize patron exposure to traffic. Patrons shall be able to move directly to the station entrance without crossing traffic lanes.
- Where public parking is provided, special spaces shall be provided at the closest point to the station entrance for the handicapped.
- Bus loading and unloading zones shall be located in a manner to permit patrons to move directly to the station entrance without crossing traffic lanes.
- All crosswalks and sidewalks shall be clearly defined, well marked and provided with nonslip surfaces.
- Clear, legible signing and graphics, located to enhance the safety and convenience of patrons, shall be provided stations.
- Right hand traffic shall be maintained where possible.
- Stairs and escalators shall be located so that design features or vistas, which can distract patrons, are avoided.
- The platform edge materials shall be approximately 2 feet wide, nonslip and different in color and texture from the main platform area, and an additional narrow tactile strip for detection by blind patrons.

- The under platform design shall incorporate an area where a person can crouch and not be struck by the collector shoe or other parts of a train.
- The platform design shall be coordinated with the track design and the vehicle static profile to minimize the horizontal and vertical gaps at the vehicle door threshold.
- All walking surfaces within stations shall have nonslip surfaces.
- All passenger or pedestrian walkways over the trackway shall be screened.
- All balustrade tops shall be sloped away from vertical circulation elements and visual openings.
- Railing/guardrails are to extend to the floor and shall comply with the requirements of the Life Safety Code. California Administrative Code, Titles 8 and 24 and fire/life safety criteria.
- Glazing used in railings shall meet the strength requirements of the National Bureau of Standards loadings for unique or unusual materials.
- The third rail shall be located on the opposite side of the track from the station platform.
- Elevators, and escalators shall meet the safety requirements in the elevator/escalator codes, California Administrative Codes, Titles 8 and/or 24 and Title 15.
- Two-way communication shall be provided between the elevator patron and Central Control.
- Elevators shall be sized to accommodate a horizontally positioned stretcher which is carried in emergency vehicles.
- Adequate queueing space shall be provided at the top and bottom of escalators.
- Signing and graphics are to be provided to enable patrons to determine the direction of escalators prior to their arrival at the landing plate.
- There is to be a minimum of one Class A stair connecting all levels in the public area.
- The tread-riser relationship is to meet the requirements of fire/life safety criteria.
- The stairs are to be of a nonslip materials with an eased nosing that is distinct and meets the requirements of fire/life safety criteria.
- Handrails are to be continuous and meet the requirements of fire/life safety criteria.
- Remote operation, from Central Control, shall be provided to permit control of inbound patrons passing through the fare collection array.
- In the event of a power loss, the fare collection array shall permit free exiting.
- Provisions shall be incorporated in the fare collection system to permit access by the handicapped using wheelchairs.
- Visual and audible methods shall be provided to alert patrons of the impending arrival of a train.

- Adequate lighting shall be provided in all station areas. Emergency lighting system shall provide sufficient light for safe exiting of passengers if normal power fails.

- ° Station Communications and Surveillance

- The PA system shall provide Central Control with full station coverage at a level sufficient to be heard over normal train, equipment and public noise.
- The PA system installation shall be designed so that the loss of an amplifier or one loop will not leave any public area without a public address capability.
- Central Control shall be able to communicate with all the stations either singly or as a group.
- Emergency phones, located at each station level in the paid and free station areas, shall be routed to Central Control.
- All emergency phone calls to the Central Control shall generate a priority alarm and shall be recorded and retained.
- Every station shall be provided with at least one emergency phone located within an emergency management panel. The emergency phone shall be used by the public, employees, and emergency personnel. The emergency phone shall be used for the manual fire alarm function, for medical aid and requests for other emergencies.
- Separate radio communication channels shall be provided for:
 - °° Fire service response, command & control
 - °° Train operation
 - °° Maintenance

- °° Transit police
- °° Emergency (redundant base station equipment compatible with local emergency equipment)

- ° Passenger Vehicles

- The door - Automatic Train Protection (ATP) summary logic shall prevent side doors from opening until the train is properly berthed and stopped, and the train from starting until all side doors are closed and locked.
- Door edges shall be designed with appropriate stiffness to prevent fingers from being inserted between fully closed leaves, yet permit the withdrawal of trapped clothing or articles.
- A door control circuit shall be provided to retard the door closing cycle when an obstruction is met.
- A positive door lock device shall be provided to prevent side doors from sliding open unintentionally.
- Audible warning shall sound inside the vehicle when the doors are closing.
- Emergency manual side door controls shall be provided for use by patrons inside the vehicle and for use by emergency teams outside the vehicle.
- End doors shall be provided for emergency use and shall be marked to discourage patrons from moving between vehicles.
- End doors shall be wide enough to facilitate emergency egress by handicapped patrons with assistance.

- Restraining devices shall be provided between adjoining cars of the train to prevent patrons from falling between them. The space between cars shall be kept to a minimum.
- Vehicle emergency lighting with an intensity of 3 foot candles shall be provided for up to one hour.
- The passenger vehicle cab windshield shall be capable of withstanding the impact of a heavy object a maximum speed without the windshield shattering, spalling or being penetrated. It shall be certified to comply with requirements of ANSI 2.26.1, Table 1, Item 3, and Item 1 for windshield.
- Side and end windows shall be made of clear, impact-resistant material capable of resisting a heavy object at high impact velocities without the window shattering, spalling or being penetrated. It shall be certified to comply with requirements of ANSI 2.26.1, Table 1, Item 3, and Item 1.
- Vehicle interior design and construction shall avoid sharp edges and protrusions; in addition to providing protective cushioning where appropriate.
- Windscreens/vanity screens shall be provided at door openings.
- Stanchions shall be provided.
- Handholds shall be provided as part of the lateral seats.
- Within each car, space for wheelchairs shall be identified and located which will not interfere with the other patrons' movements.

- The following conditions shall be detected and displayed in the Vehicle cab.

- °° Automatic Train control

- Overspeed

- ATC equipment failure

- Station stop mode and status

- °° Train Mode

- Emergency cutout or bypass operation:

- ATP

- Doors

- Friction brake

- Operating Mode:

- ATO/MTO

- Door open

- °° Equipment

- Brake failure

- Propulsion failure

- Brake on in propulsion

- Auxiliary failure

- HVAC failure

- An external light is to indicate vehicle operation in the emergency manual mode
- Manual train controller shall be equipped with a deadman capability.
- The manual controller and mode selection switch shall be interlocked to prevent manual operation in the automatic mode.

- The vehicle propulsion and auxiliary equipment shall be capable of being isolated from the power collector from within the vehicle.
- The emergency braking system shall be failsafe.
- A vehicle failure that could result in an unsafe condition shall result in an irrevocable emergency brake applications.
- Auxiliary electrical circuits shall be protected by circuit breaker.
- High voltage circuits are to be clearly marked and separated from control and communication circuits.
- Cars are to be equipped with full-width anti-climbers.
- Cars shall be capable of manual uncoupling from within and outside the car at the cab end.
- Emergency instructions and associated emergency equipment and fire extinguishers shall be placed in each car.
- Exterior lighting shall include vehicle head and tail lights and hostling lights.

° Auxiliary vehicles

- All auxiliary vehicles shall be fully detectable and continuously protected by the ATC system
- Communication shall be provided between Central Control and auxiliary vehicle operator.

° Passenger Vehicle Communication

- Intercommunications shall be provided between a patron and the train operator.
- Communication shall be provided between Central Control and the train operator and to the on-board patrons.

° Automatic Train Control

The ATC system shall always maintain the system in a safe state. The ATC system shall be designed to absolutely ensure that any malfunction affecting safety will cause the system to revert to a state known to be safe. The design shall incorporate into the ATP apparatus all functions of the ATC system which affect safety. The following design criteria shall apply:

- ATP shall be designed to be fail-safe, independent of other ATC functions.
- The equipment shall be designed and constructed so that no single failure or multiple failures from a single cause can cause a train to respond unsafely. Failures which affect train safety shall be self-annunciating or self-detecting. Annunciation of failures which affect safety shall be by fail-safe means, or by stop-ping the train or by imposing a speed limit that is known to be safe. Failures that are not self-detecting shall not cause unsafe conditions. No combination of non-self-detecting failures shall cause an unsafe condition.
- The ATC system shall conform to the safety requirements of American Railway Signaling Principles and Practices of the Association of American Railroads, and to the relevant requirements of the California Public Utilities Commission.

- The ATP shall assure and maintain safe train operation under all conditions. The ATO and the ATS functions shall be entirely subordinate to the ATP function. No subsystem malfunction or component failure shall result in unsafe train operations.
- The ATP function shall provide broken rail detection, train detection, safe train separation, speed limit enforcement, route security through interlockings, traffic direction, prevention of train start-up when doors are open, prevention of vehicle door operation at stations when a train is in motion, and prevention of vehicle rollback.
- Train detection shall be continuous and failsafe so that any detection system failure causes a block occupancy indication.
- Selection of train detection frequency shall preclude frequency interference by cross talk at an unsafe level.
- Block design and safe braking distance shall be based upon the "worst case" train (i.e., adverse track conditions, vehicle loadings and brake performance).
- Train direction and route interlocking through crossovers shall be protected by automatic train protection. Occupancy is to be indicated within the blocks on either sides of crossovers whenever the crossover is occupied.
- The ATP system shall not generate speed limit signals for speeds higher than the safe operating speed.
- Signal malfunction through Central Control shall not be capable of offsetting or overriding the safety of the ATP system.

- The speed limit detectors shall interpret erroneous or absence of commands as more restrictive than intended, and both speed limit and actual speed are to be displayed in the cab to the train operator.

- o Electrification

- Emergency trip switches (ETS) shall be located at:
 - o The platform level (identified by a blue light) at stations
 - o Each tunnel cross passage
 - o The yard
- Emergency power shall provide for operation of:
 - o Automatic Train Control
 - o Public address
 - o Automatic fire suppression systems
 - o Fire sensing and alarming
 - o Security sensing and alarming
 - o CCTV
 - o Emergency lighting
 - o Telephones
 - o Vertical circulation display elements
- The following functions shall be energized by dual substations:
 - o Tunnel fans
 - o Lighting
 - o Emergency Trip Switches (ETS)
 - o Telephones
- Third rails shall be protected by coverboards, and signing and shall be located away from safety walks and station platforms.

- Central Control shall be able to control traction power functions and isolate track sections.
- Shops shall be provided with dual feeders and/or an emergency power source.

° Central Control

- Central Control shall have a capability of communicating with patrons in stations and in vehicles via a public address system.
- The radio communications between Central Control and the trains, and between Central Control and transit personnel shall have a priority/emergency channel. Radio communication from Central Control shall be recorded.
- Central Control shall be able to communicate, via an emergency telephone system, to patrons and SCRTD personnel. The communications shall be recorded and retained.
- The radio and emergency telephone systems shall be independent, to prevent a single failure in one from causing loss of both.
- Incoming and outgoing safety related messages shall be visually displayed and an automatic, hard copy record maintained.
- Central Control shall be equipped to:
 - °° Receive, log, and annunciate fire alarm, trouble alarm and supervisory alarm.
 - °° Receive, record and log emergency telephone messages.

- °° Have direct multi-channel radio communication with operating transit vehicles.
- °° Have access to appropriate fire and emergency organization radio channel.
- °° Have direct line telephone communication with each fire jurisdiction dispatch facility, and police jurisdiction.
- °° Have the capability to use the station public address system to advise and direct patron response to emergencies.
- °° Have the control capability to prepare stations for evacuation.
- °° Have capability for emergency removal of traction power.

- Mimic boards and controls for automatic train control and traction power shall be provided.
- Central Control shall be able to initiate a systemwide fan regime, yet have the capability to select directional fan control.
- Audible alarms are to be provided for fire, intrusion, substation power failure, ventilation fan failure, toxic or combustible gas, and seismic events.

° Yards and Shops

- Maintenance vehicles, including any hi-railers, shall have positive rail shunt capability for detection purposes and be compatible with the train detections system.

- Isolated yard tracks shall not be powered inadvertently by bridging.

o Tunnels

- Continuous safety walks shall be provided throughout the underground system.
- Minimum illumination level at the walkway shall be 1.5 foot-candles.
- Where a double bore tunnel is used, cross passages shall be located at maximum 800 - foot intervals.
- Cross passage doors shall be capable of withstanding an air pressure of 70 pounds per square foot applied on either side of the entire door area.
- The minimum dimensions of the door opening shall be 44 inches wide by 80 inches high. Doors shall be provided at each end and arranged to open into the cross-passages.
- Doors, door frames, and hardware shall have a minimum fire rating of 1-1/2 hours.
- Code-conforming ramps or stairs shall be used between safety walks and the track level, at special trackwork sections.
- An emergency ventilation system shall be provided primarily to control the hazards of smoke, fire and gases by safely dissipating and cooling and directing their path of movement and by supplying fresh air to involved patrons, employees, and fire department personnel.

- Emergency ventilation capability shall provide control for sufficient time to ensure that life safety objectives, property, and operations protection of SCRTD are adequately met. Emergency ventilation systems shall be capable of controlling air quality for not less than TBD minutes in tunnels having unseparated trainways or lacking cross-passages. With trainways in separated tunnels having cross-passages, emergency ventilation shall control fire effects in the tunnel of fire origin for TBD minutes, and in the unaffected tunnel indefinitely. Where separated tunnels are to be designated as an area of refuge, emergency ventilation shall control the effects of fire indefinitely.
- SCRTD and local emergency personnel shall receive periodic emergency training including classroom and simulated emergency drills.
- Ventilation is to be provided to remove smoke, gas and toxic fumes.

3.7 ELDERLY AND HANDICAPPED PROVISIONS

The planning and design of the Metro Rail system facilities and vehicles shall be safe for full accessibility, mobility, and effective use by the elderly and handicapped without loss of operating capability for the general patron. This shall be accomplished through the elimination of architectural and travel barriers to elderly and handicapped, and appropriate considerations for the accommodation of persons with physical disabilities. Physical disabilities include sight impairment, hearing impairment, uncoordination, disabilities due to age, and semi-ambulatory or non-ambulatory disabilities.

The provisions for the elderly and handicapped shall conform in general to the requirements of the following:

- Uniform Building Code (UBC) 1979 edition
- UMTA Final Regulations on Transportation for Elderly and Handicapped persons, 41CFR 18234.
- APTA Guidelines for Design of Rapid Transit Facilities.

3.8 SYSTEM ASSURANCE APPROACH

The reliability, maintainability and quality assurance requirements shall be met through a comprehensive system assurance program that includes:

- Thorough planning and effective management of the systems assurance program through the System Assurance Program Plan.
- Definition of the major reliability, maintainability and quality assurance tasks and their place as an integral part of the design and development process.
- Evaluation of system, subsystems, station and ways and structures reliability, maintainability and quality through analysis, test, review and assessment.
- Timely status indication by formal documentation and other reporting to facilitate implementation of the reliability, maintainability and quality assurance efforts.
- Compatible requirements among all of the elements of the Metro Rail System.

3.8.1 Dependability

It shall be a design objective to optimize dependability by stressing system assurance disciplines in system elements which involve train movement and patron access/egress movement within the station.

System dependability shall be achieved by emphasizing reliability, maintainability and quality assurance requirements during the system engineering phase. These requirements include:

- Proper application of equipment with proven reliability.
- Application of redundancy in critical areas to permit continuation of service in the event of a component failure. A method for continuous or periodic checking of each of the redundant elements will be incorporated.
- Application of maintainability considerations in all subsystem designs to facilitate preventive and corrective maintenance.
- Establishment of appropriate maintenance procedures to maximize the likelihood of operating service without degradation.
- Establishment of "Operate-Around" capability to operate in a degraded mode, in a safe manner.
- Establishment of quality assurance procedures to ensure product delivery from the contractor and sub-tier vendors meet functional and performance requirements.

The Metro Rail System shall be designed to meet a system dependability goal of TBD for completing an average trip within an allowable delay of TBD minutes of the scheduled trip time.

3.8.2 Reliability

Reliability shall be a major consideration of the system and subsystem design of the Metro Rail System. The reliability program shall include the following steps:

- Establishment of reliability data.
- Performance of reliability analysis on those subsystems which have high impact on system dependability.
- Collection and processing of reliability data on these subsystems to verify desired compliance.
- Implementation of a closed loop failure reporting and corrective action system.

3.8.2.1 General Reliability Requirements

All operating subsystems shall be designed to include:

- Application of selected redundancy in those subsystems which have high impact on system dependability and require redundancy to reach the reliability goal with a high margin of safety. A method for continuous or periodic checking of each of the redundant elements will be incorporated.
- Use of components with proven reliability that are compatible with other interfacing components.
- Minimization of operating stresses.
- Minimization of single-point failures which interrupt service.

3.8.2.2 System Element Reliability Goals

Figure 3-14 identifies the reliability goals for system elements required for operation. These numerical goals are established in terms of Mean Time Between Failure (MTBF), Mean Time Between Service Failures (MTBSF), and Mean Cycles Between Failures (MCBF).

3.8.3 Availability

The system shall be designed to have 90% availability.

3.8.4 Maintainability

The maintainability program shall optimize availability by considering factors in the design and procurement of subsystems and components which will minimize their downtime or will permit their repair with limited interruption to service.

3.8.4.1 General Maintainability Requirements

The maintainability program shall include the following steps:

- Establishing maintainability design criteria.
- Performing design trade-off of reliability to maintainability.
- Incorporating and enforcing maintainability requirements in contractor and vendor specifications.
- Performing maintainability analysis.
- Establishing data collection, analysis, corrective action and maintainability status reports.

3.8.4.2 Maintainability Design Requirements

Maintainability will be designed into all operating subsystems. Provisions shall include:

- Rapid identification and isolation of failures and anomalies is to be designed into the subsystems. Consideration shall be given to the inclusion of built-in test features and status displays.

Figure 3-13
RELIABILITY GOALS FOR SYSTEM ELEMENTS

Train Control	TBD
Vehicle	TBD
Communications	TBD
Traction Power	TBD
Fare Collection	TBD
Trackwork/switches	TBD

- ° Rapid access to critical functional components shall be designed into the subsystems.
- ° Means for verification of correct system operation is to be incorporated.
- ° Location of frequently inspected and maintained components and equipment so that the most frequently inspected and maintained items are accessible. This accessibility shall be based on frequency of calibration, failure rates, and need for periodic preventive maintenance.
- ° Major components having test panels or test points shall be located so as to permit easy accessibility and external monitoring of critical functions.
- ° Test points shall be protected against environmental damage and human error.
- ° Need for manual adjustment of shift and drift shall be eliminated where possible.
- ° Utilization shall be made of standard tools; the design shall minimize the use of special tools.
- ° Panels and openings shall be of sufficient quantity, size and placement to permit ready access from normal work areas.
- ° Adjustment controls, fittings, safety valves, and similar items shall be directly accessible through panels and openings.
- ° Access panels in public areas shall use vandal resistant fasteners.
- ° Latches shall not require special tools, shall be minimum in number and self-locking.

- Cable connectors shall be:
 - Spaced far enough apart so that they may be grasped firmly for connecting and disconnecting.
 - Properly labeled and keyed so that they cannot be interchanged or improperly installed.
 - So designed that signal and power leads shall not be adjacent to each other.
- Modular units of a subsystem shall have self-locating connectors to prevent undesirable transposition.
- Coding (color, number) shall be used to identify individual function modules.
- Maximum use of interchangeability of parts and standardization of components shall be used in the design.
- Items that are heavy and difficult to remove shall be located where pit-based under-area maintenance can position lifts. Such items shall not be located over rails.
- External access to lubrication points shall be provided to permit rapid preventive maintenance and reduce possibility of damage.
- Human factors supporting maintainability philosophy shall be followed in the design by:
 - Designing for the minimum level of maintenance skill requirements.
 - Considering comfort and safety when designing for access (e.g., body position, body movements, limits of reach and span, limits of strength in various positions).

- Shielding from environment and from stress generated by the equipment (e.g., heat, vibration, noise, gas, moving parts, etc.).

3.8.5 Failure Management

The Metro Rail System shall be capable of identifying and responding to system disruptions or irregularities. When a failure occurs, and if safety and operational circumstances permit, services shall be maintained on as much of the system as possible but may be degraded. Service stoppage shall be a last resort option.

3.8.5.1 General Requirements

In response to the system disruptions, the system shall:

- Limit the time required to restore to full service.
- Limit the inconvenience to the Metro Rail patrons.

3.8.5.2 Failure Management Design Requirements

The system shall be designed to provide the following failure management features:

- Provisions shall be made for operate-around-failure capabilities. When safety permits, capability for manual operation of vehicles shall be provided.
- A train of any size shall be capable of pushing or pulling an inoperative train of the same size to the next terminal at a reduced performance level. Passengers will normally be unloaded from the inoperative train at the next station.
- Crossovers shall be provided along the Metro Rail System to permit operating trains to by-pass inoperative trains.

- Pocket tracks for temporary storage of inoperative trains (emptied of passengers) shall be provided.
- Means and procedures for communicating service disruptions to patrons shall be incorporated in the failure management processes.

3.8.6 Quality Assurance

A quality assurance program will be implemented to assure that the quality of the end product meets the required standards. The effective elements of the Quality Assurance program shall include, but not limited to:

- Producible and inspectable designs
- Procurement performance specifications
- Procedures for transmission of information and data to subcontractor(s) for compliance to the quality assurance requirements
- Adequate inspection and testing programs to ensure repetitive product conformity to design requirements
- Total program surveillance and verification of physical conformance
- Closed loop reporting and corrective action for quality assurance conformance.

3.8.7 System Performance Verification

[To Be Determined]

3.9 COST-EFFECTIVENESS

Design of the Metro Rail system shall maximize capital and operating cost-effectiveness in terms of passengers carried and passenger miles traveled over the expected range of passenger volumes.

The policy of cost-effectiveness shall be extended through the design and construction phases by implementation of the following:

- Minimization of capital costs consistent with maintaining a high level of ridership. This consideration places emphasis on attracting and maintaining ridership, and hence on providing service with functional utility.
- Assessment of capital and operating cost trade-offs in terms of life cycle costs. This requires that the added costs for capital equipment should have some payback over the life of the system in terms of reduced operating and maintenance costs. Conversely, some increase in annual costs may be appropriate to reduce inordinately high capital expenditures.
- The use of design-and-construct-to-cost techniques. This method sets cost targets for system components and sections; monitors progress against the goal; and, if the expected cost is significantly higher than the target, requires redesign to reduce the cost. It is expected that value engineering techniques will be applied in all phases of the project to ensure the lowest possible system cost.
- Use of proven technology is fundamental to the Metro Rail design. Cost and schedule risks associated with unproven designs shall be avoided.

3.10 COMMUNITY INTERFACE AND ENVIRONMENTAL IMPACT

The Metro Rail system shall be designed to integrate within the local environment fabric by reinforcing the regional core land use plan and the Los Angeles Centers Concept.

All elements of the Metro Rail system shall be designed to provide mitigation of adverse environmental conditions to the extent possible. The Metro Rail design shall include mitigation measures specifically identified by the Environmental Impact Statement. Where options are identified for reducing the adverse impacts of Metro Rail primary consideration shall be given to selecting those designs which offer the most effective solutions.

4.0 SYSTEM INTERFACES

Interface management is a key requirement in the design and development of the Metro Rail system. Interface matrices have been developed to assist in this process and these are given in a separate document. This section summarizes the document to identify the major interfaces between the system elements.

Interface problems can occur when:

- ° System elements or components are designed by different organizations or departments.
- ° System elements or components are procured by separate specifications.
- ° System elements or components intended to function as a single unit are not assembled or constructed properly.

The matrix identifies the interface type, the function and the requirements which describe the interaction between parts of the Metro Rail system.

The purpose of the interface matrix is to assist management staff and the design control board in performing compatibility reviews. These reviews will be performed to assure that design element specifications conform to established objectives, criteria and standards. Also the detailed matrix provides management staff with a checklist for reviews and design requirements, and allows guidance and monitoring of scheduling of activities. The matrix is essential to assuring that associated elements are integrated appropriately, in a timely manner, and it assists in identifying design conflicts.

The Metro Rail System has four major elements:

- ° Ways and Structures
- ° Stations
- ° Yards and Shops
- ° Subsystems
 - Passenger Vehicles
 - Automatic Train control
 - Communications
 - Power
 - Fare collection
 - Auxiliary vehicles
 - Central Control

Each of these are further subdivided into more detailed components. Each of the individual components has interfaces which can be electrical, mechanical, environmental or geometric in nature. Figure 4-1 is a compilation of the possible interface types. The interface types were used to describe the contacts that exist between elements of the Metro Rail system.

The interface matrices are an adjunct to this specification and must be used in the development of the Metro Rail system.

FIGURE 4 - 1
POSSIBLE INTERFACE TYPES

ELECTRICAL

- ° Circuit Types
 - Analog
 - Digital
 - Inductive
 - RF
 - Power
 - Magnetic
 - Audio
 - Video
- ° Interconnection Hardware
 - Wire and cable
 - Connectors
 - Inductive coupling
 - Fibre optics
 - Laser Optics
 - Fuses/circuit breakers
 - Distribution panel
 - Insulators
 - RF transmitters/receivers
 - Telephone switch

GEOMETRIC

- ° Clearance
 - Static
 - Dynamic
- ° Alignment

ENVIRONMENTAL

- ° Acoustic
- ° Climate
 - Temperature
 - Humidity
 - Precipitation
- ° Lighting

MECHANICAL

- ° Contact
 - Rolling
 - Sliding
- ° Mounting/Attachment
- ° Piping
 - Fluid
 - Conduit

5.0 WAYS AND STRUCTURES

This section describes the system specifications pertaining to Ways and Structures. Included are system requirements for Alignment, Structural Codes, Clearance Requirements, Tunnels, Utilities, Drainage, Noise and Vibration and Stray Current Control.

The Ways and Structures specifications were developed from design criteria, passenger comfort and safety standards and accepted engineering practices. The objective of these specifications is to assure that Metro Rail tracks, tunnels and other major structures are designed and constructed in compliance with accepted standards and applicable codes and regulations.

5.1 CIVIL CONSTRAINTS

The horizontal and vertical alignment of the Rail Project shall conform, in general, to the plan and profile drawings contained in Figures 5-1 through 5-21 of this specification, and the requirements specified herein. The alignment shall permit operating speeds that meet the trip times specified in Section 3.3.

5.1.1 Survey Control System

Horizontal controls shall be based on the California Coordinate System, Zone 7, as defined beginning at Section 8801 of the Public Resource Code of California as it existed on January 1, 1982. The accuracy of the horizontal ground control and of supporting ground surveys shall be Second Order, Class I, as defined by the Federal Geodetic Control Committee and published under the title "Classification, Standards of Accuracy and General Specifications of Geodetic Control Stations", authored by the National Geodetic Survey in February, 1974.

Vertical controls for this project shall be based on the National Geodetic Vertical Datum of 1929 as established in Los Angeles County through the 1980 adjustment of the Southern California Cooperative Leveling

Net. The accuracy of the vertical ground control and of supporting vertical ground surveys shall be at least Second Order, Class I, defined by the Federal Geodetic Control Committee and published under the title "Classification, Standards of Accuracy and General Specifications of Geodetic Control Stations", authored by the National Geodetic Survey in February, 1974.

5.1.2 Horizontal Alignment and Superelevation

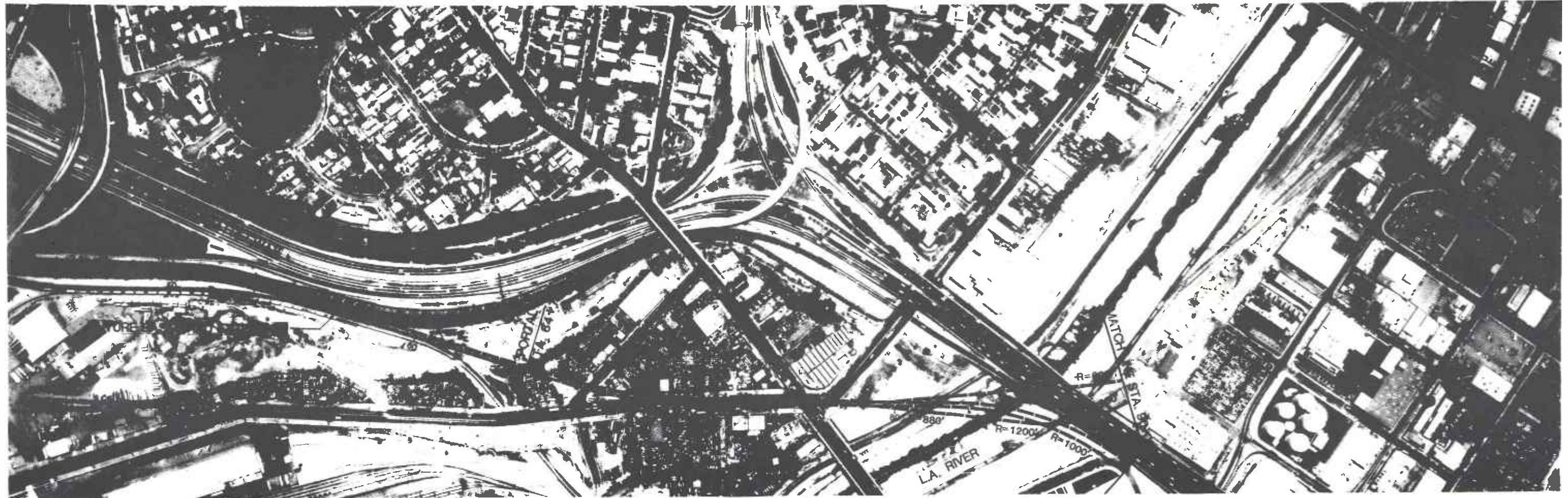
The parameters for the horizontal alignments shall be established in accordance with the recommendations of the Manual for Railway Engineering, published by the American Railway Engineering Association, current August 1, 1981 to July 31, 1982. Riding comfort requirements are based on the AREA Joint Committee Report, "Passenger Ride Comfort on Curved Track", published in Bulletin 516, June, July, 1954.

The horizontal alignment of mainline tracks shall consist of tangents joined to circular curves by spiral transition curves. Spirals shall not be used in yards and service areas.

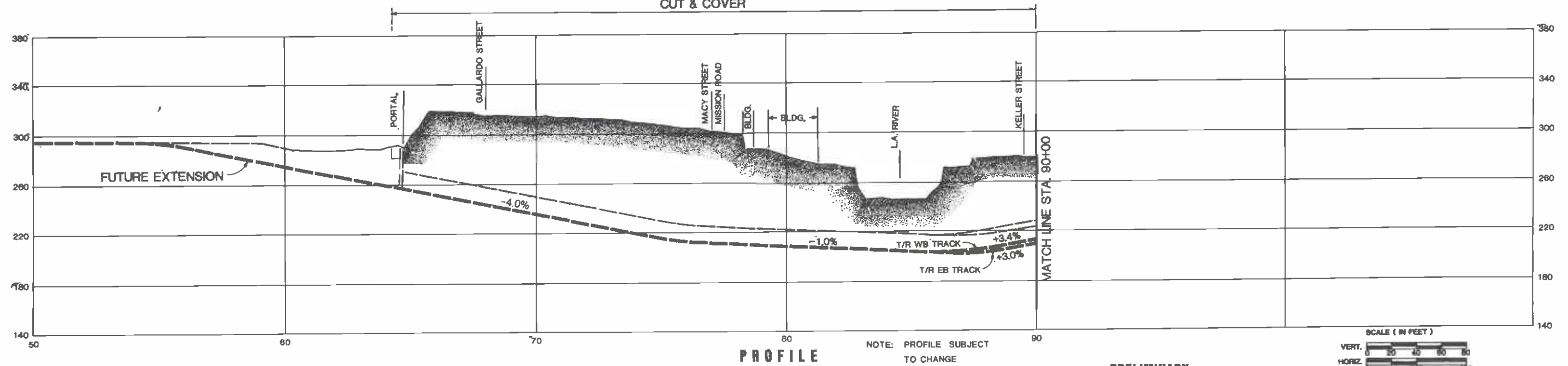
Curvature and superelevation shall be related to design speed, with consideration for the acceleration and deceleration characteristics of the design vehicle. Whenever possible, the geometrics shall accommodate the maximum design speed, of 70 miles per hour, depending on the location of curves, station stop spacings, construction limitations and the performance characteristics of the design vehicle. The minimum design speed, entering or leaving stations, shall be 40 miles per hour.

Each route shall be stationed independently along the centerline of the right hand track. Stationing shall be continuous throughout the length of this track, designated Track "R" and shall be the basic control for locating all other system facilities along the route.

Separate stationing shall be used for the left hand track, designated Track "L", where tracks are neither parallel nor concentric, where



CUT & COVER PLAN



PROFILE

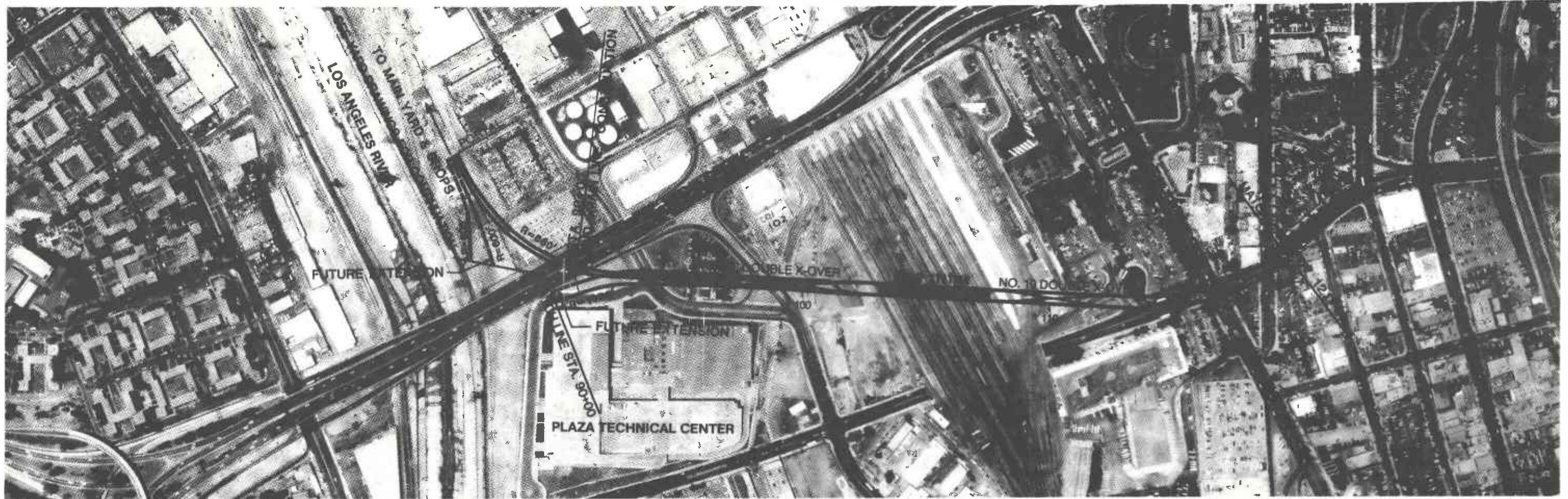
NOTE: PROFILE SUBJECT TO CHANGE



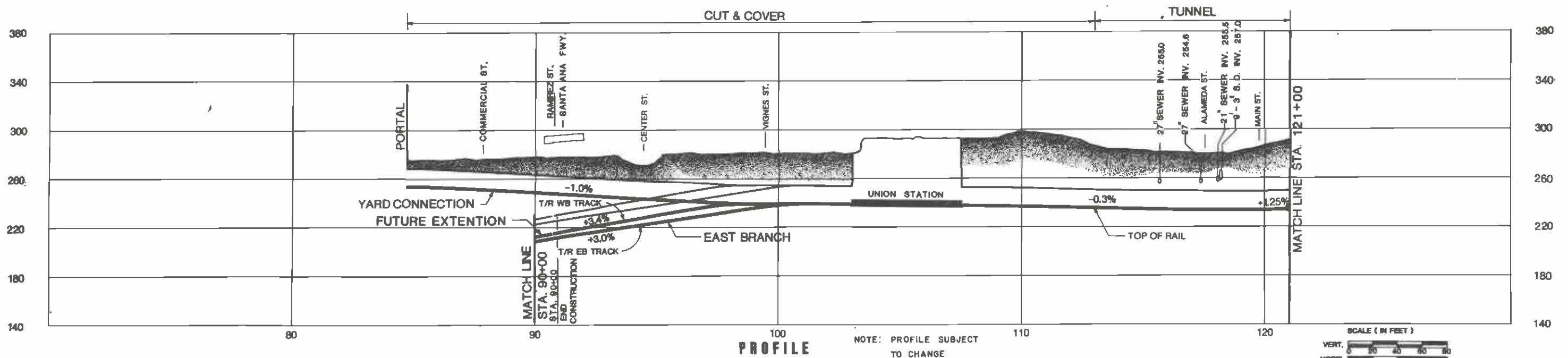
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				DRAWN BY IONESCU MANUEL / CASTILLO / MACIS Date 2/9/83		APPROVAL RECOMMENDED _____ DEPUTY CHIEF ENGINEER Reg. No. _____	APPROVED _____ MANAGER / CHIEF ENGINEER Reg. No. _____		DRAWING NO. AP-18 AAA-C-001		
				CHECKED BY LOGAN Date 2/9/83					SCALE AS SHOWN		
REV. DATE BY APP. DESCRIPTION									SHEET NO. 1 OF 21		

Figure 5 - 1
Alignment Plan and Profile: Station 64 + 70 to 90 + 00



PLAN



PROFILE

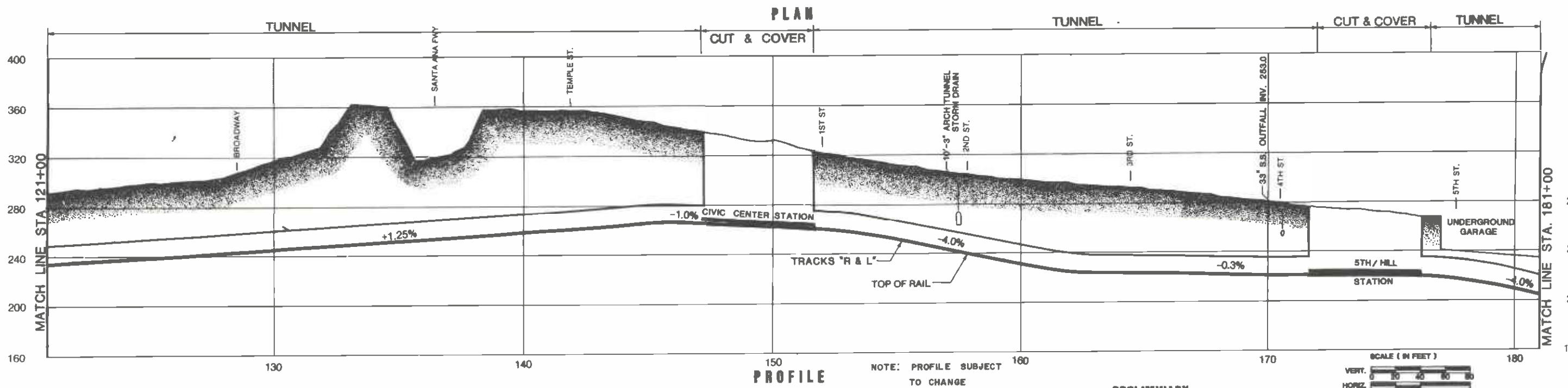
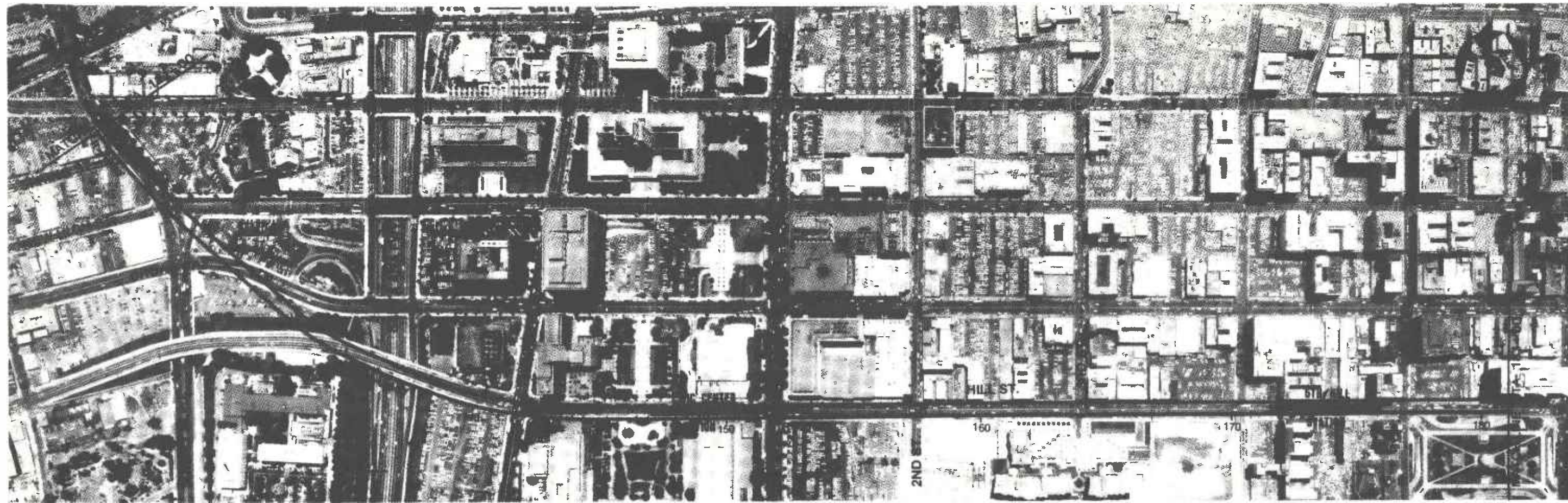
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Figure 5 - 2
Alignment Plan and Profile: Station 90 + 00 to 121 + 00

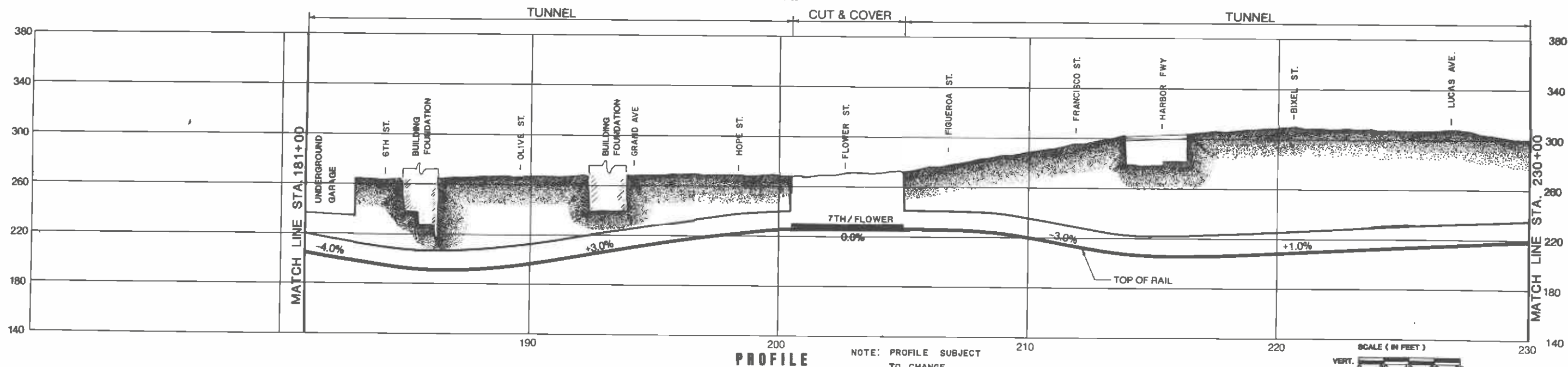


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Figure 5 - 3
 Alignment Plan and Profile: Station 121 + 00 to 181 + 00



PLAN



PROFILE

NOTE: PROFILE SUBJECT TO CHANGE

PRELIMINARY

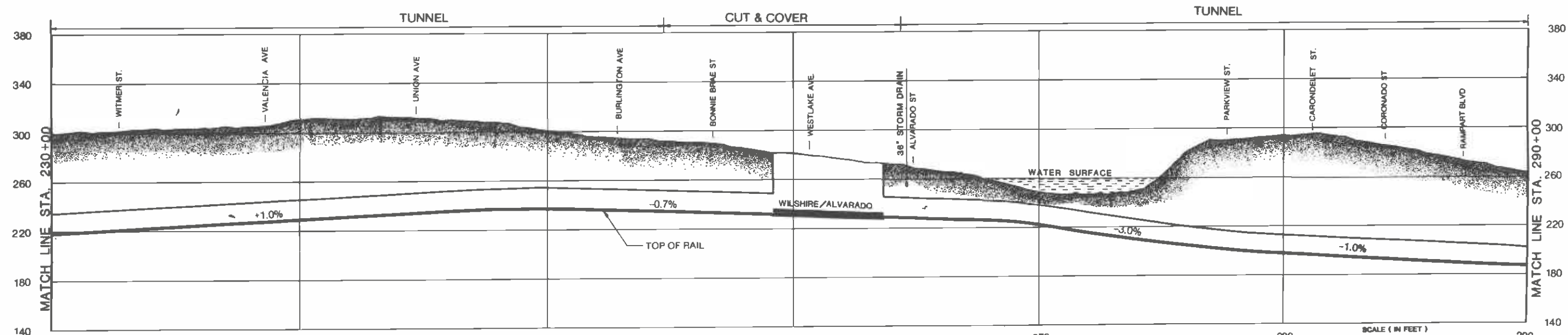


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DRAWN BY IONESCU MANUEL / CASTILLO / MACIS Date 2/9/83			APPROVAL RECOMMENDED _____ DEPUTY CHIEF ENGINEER Reg. No. _____			APPROVED _____ MANAGER / CHIEF ENGINEER Reg. No. _____		ALIGNMENT PLAN AND PROFILE STATION 181+00 TO STATION 230+00
CHECKED BY LOGAN Date 2/9/83		SUBMITTED BY: _____ PROJECT MANAGER Reg. No. _____						SCALE AS SHOWN SHEET NO. 4 OF 21
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1		DMJM	DML	REVISED PROFILE				

Figure 5 - 4
Alignment Plan and Profile: Station 181 + 00 to 230 + 00



PLAN



PROFILE

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1	3/11/83	D.W.L.		REVISED PROFILE

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GARCIA / DHINSA / KARAT

DRAWN BY Date 2/9/83
IONESCU

CHECKED BY Date 2/9/83
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PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT



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DEPUTY CHIEF ENGINEER Reg. No. _____

APPROVED _____ Date _____

MANAGER / CHIEF ENGINEER Reg. No. _____

MILESTONE 10
DEFINITIVE FIXED FACILITIES PLANS

ALIGNMENT PLAN AND PROFILE
STATION 230+00 TO STATION 290+00

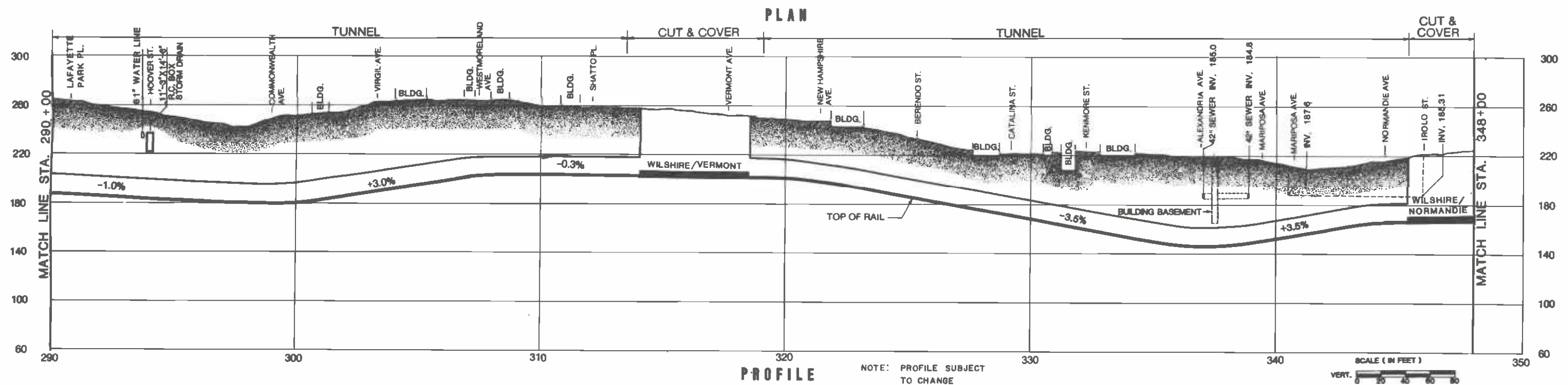
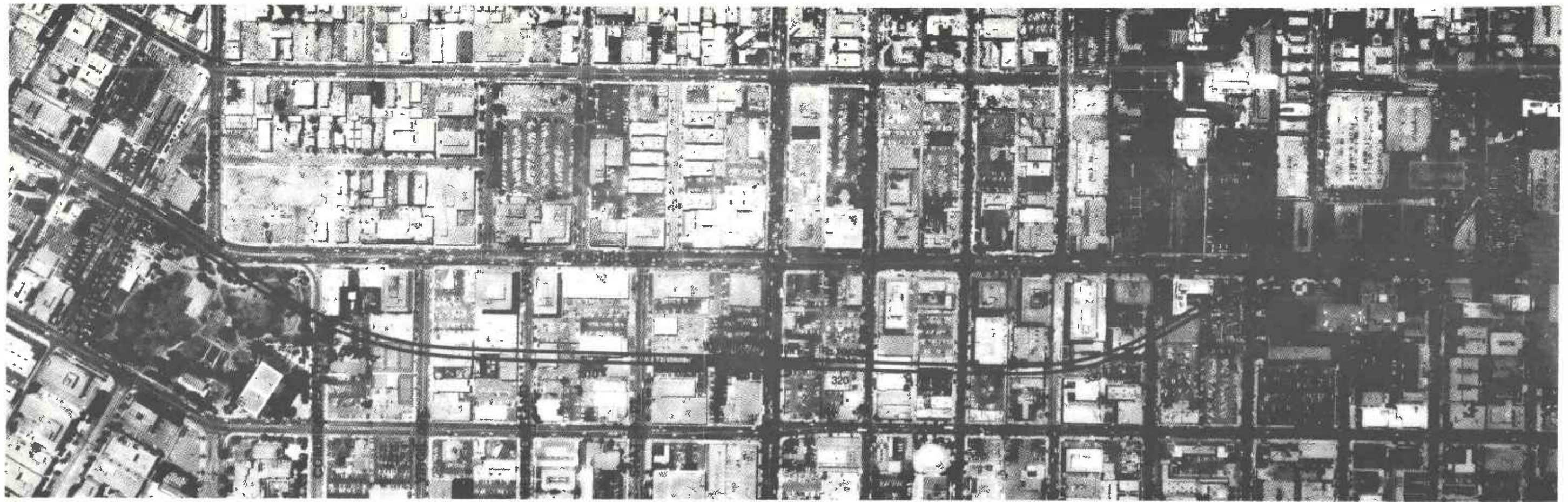
CONTRACT NO. _____

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Figure 5 - 5
Alignment Plan and Profile: Station 230 + 00 to 290 + 00



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1	8/1/83	D.W.L.		REVISED PROFILE

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 DRAWN BY: IONESCU
 Date 2/9/83
 MANUEL / CASTILLO / MACIS
 CHECKED BY: LOGAN
 Date 2/9/83

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 PROJECT MANAGER Reg. No. _____

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METRO RAIL PROJECT
 APPROVAL RECOMMENDED _____ Date _____
 DEPUTY CHIEF ENGINEER Reg. No. _____

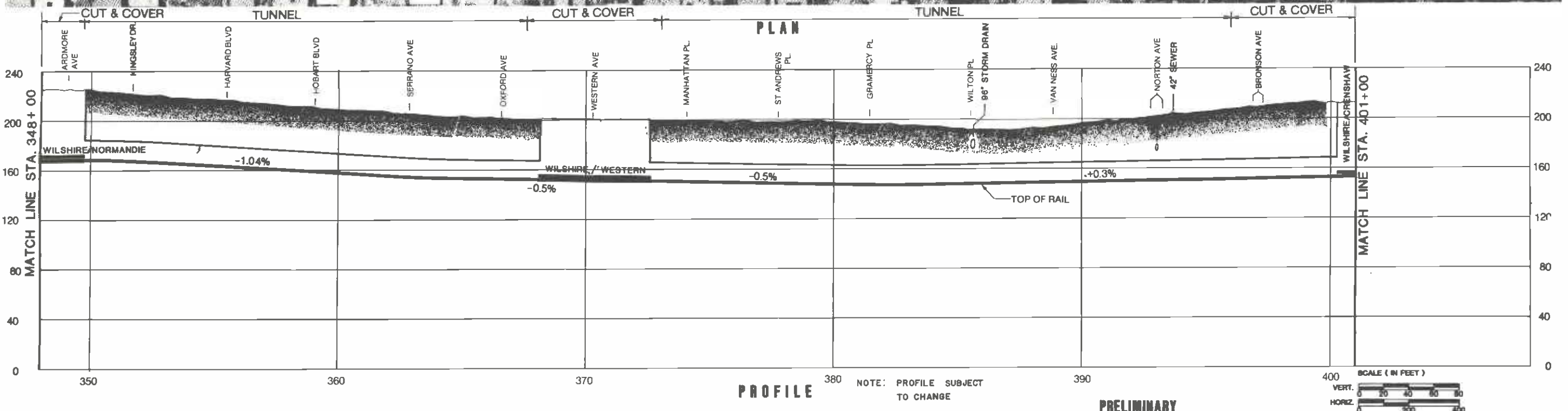
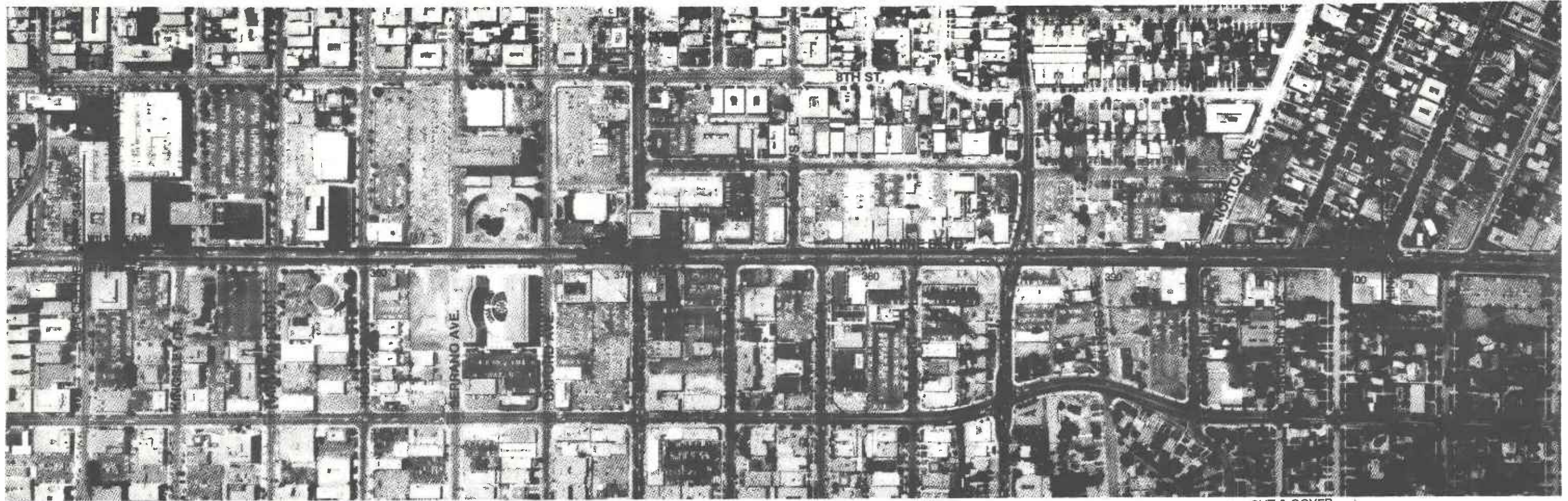
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MILESTONE 10
DEFINITIVE FIXED FACILITIES PLANS
 ALIGNMENT PLAN AND PROFILE
 STATION 290+00 TO STATION 348+00

CONTRACT NO. _____
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Figure 5 - 6
 Alignment Plan and Profile: Station 290 + 00 to 348 + 00

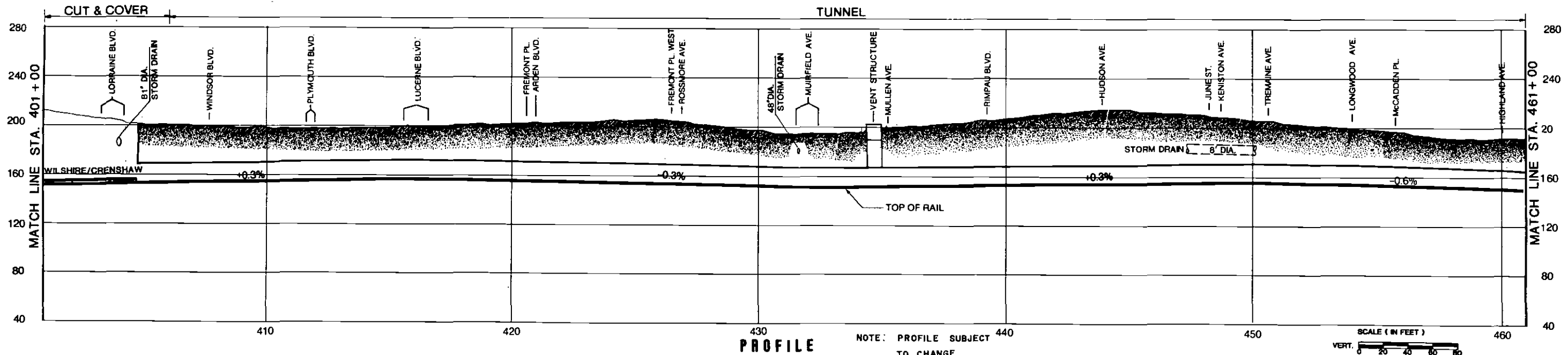


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Figure 5 - 7
 Alignment Plan and Profile: Station 348 + 00 to 401 + 00



PLAN



PROFILE

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2	3/11/83	D.W.L.		ADDED TRACTION POWER SUBSTATION
1	3/2/83	D.W.L.		ADDED OPTIONAL CRENSHAW STATION

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 GARCIA / DHINSA / KARAT

DRAWN BY Date 2/9/83
 IONESCU
 MANUEL / CASTILLO / MACIS

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METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ Date _____
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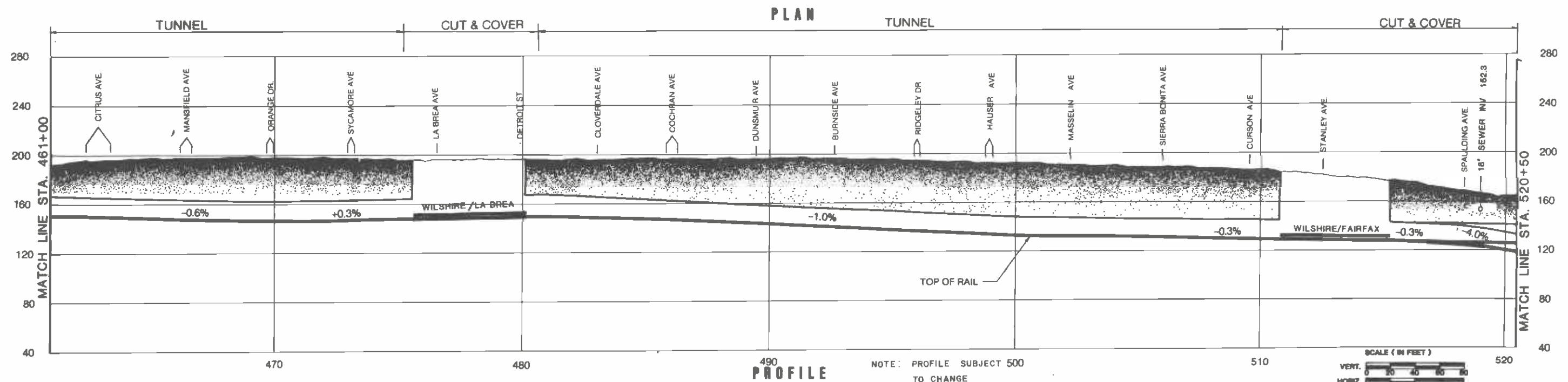
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MILESTONE 10
DEFINITIVE FIXED FACILITIES PLANS

ALIGNMENT PLAN AND PROFILE
 STATION 401+00 TO STATION 461+00

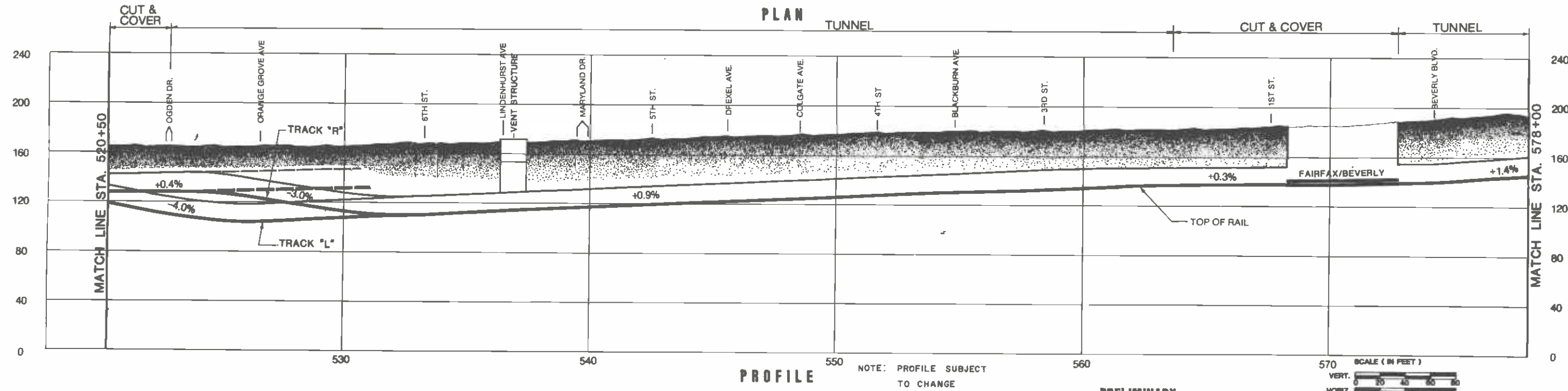
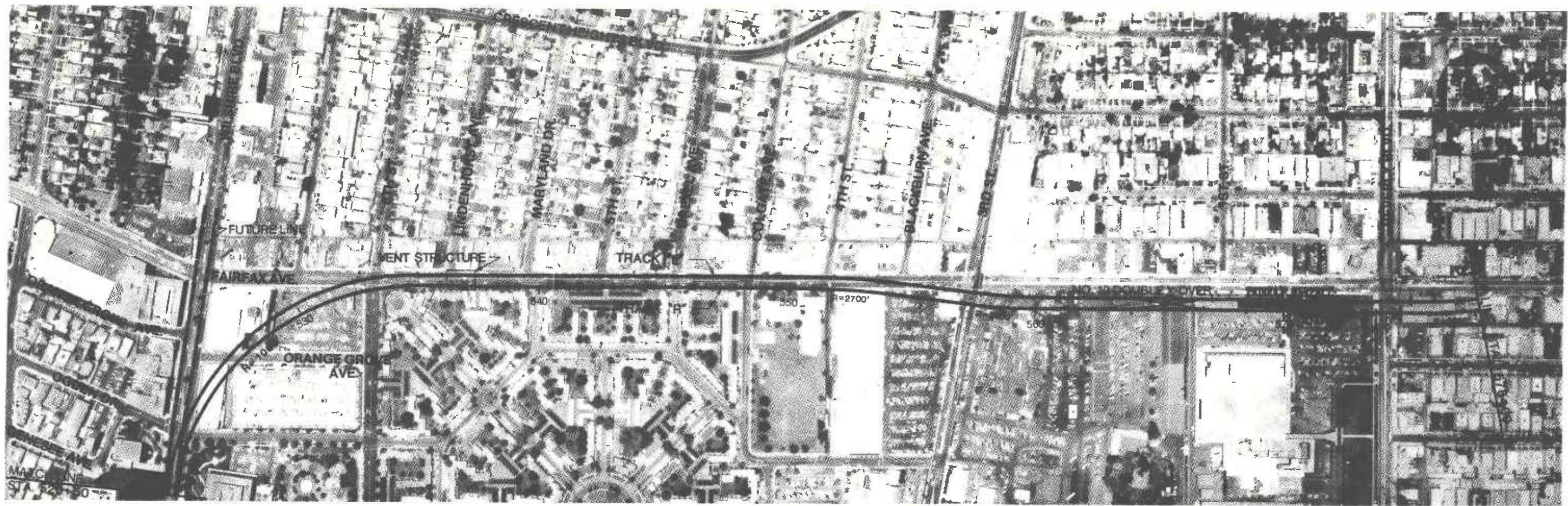
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 SCALE AS SHOWN
 SHEET NO. 8 OF 21

Figure 5 - 8
 Alignment Plan and Profile: Station 401 + 00 to 461 + 00



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Figure 5 - 9
 Alignment Plan and Profile: Station 461 + 00 to 520 + 50 46






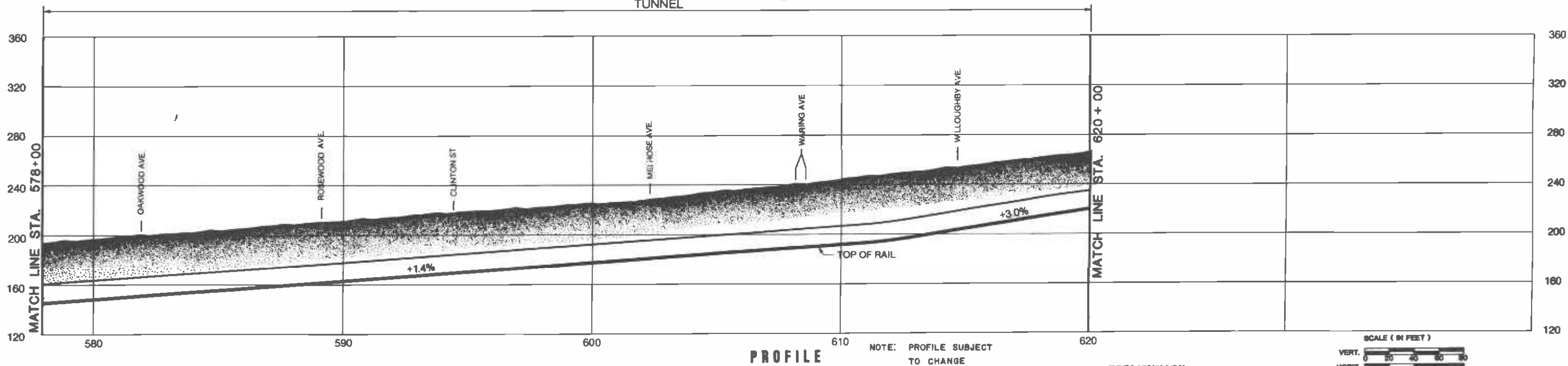
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Figure 5 - 10
 Alignment Plan and Profile: Station 520 + 50 to 579 + 00 47



TUNNEL PLAN



PROFILE

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SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ Date _____
DEPUTY CHIEF ENGINEER Reg. No. _____

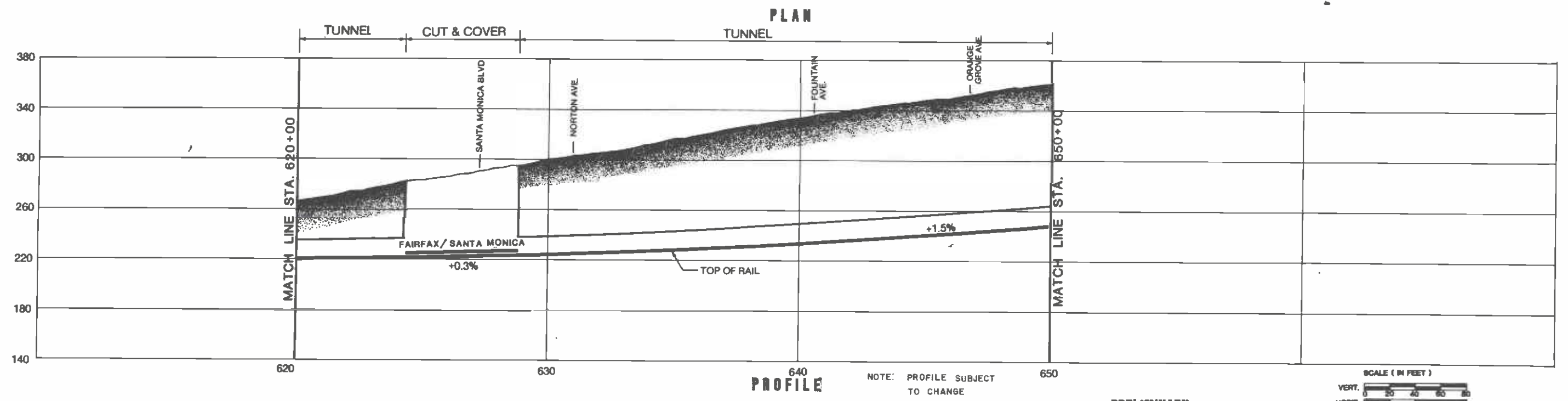
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MILESTONE 10
DEFINITIVE FIXED FACILITIES PLANS

ALIGNMENT PLAN AND PROFILE
STATION 578+00 TO STATION 620+00

CONTRACT NO.
DRAWING NO. AP-18 AAA-C-011
SCALE AS SHOWN
SHEET NO. 11 OF 21

Figure 5 - 11
Alignment Plan and Profile: Station 578 + 00 to 620 + 00



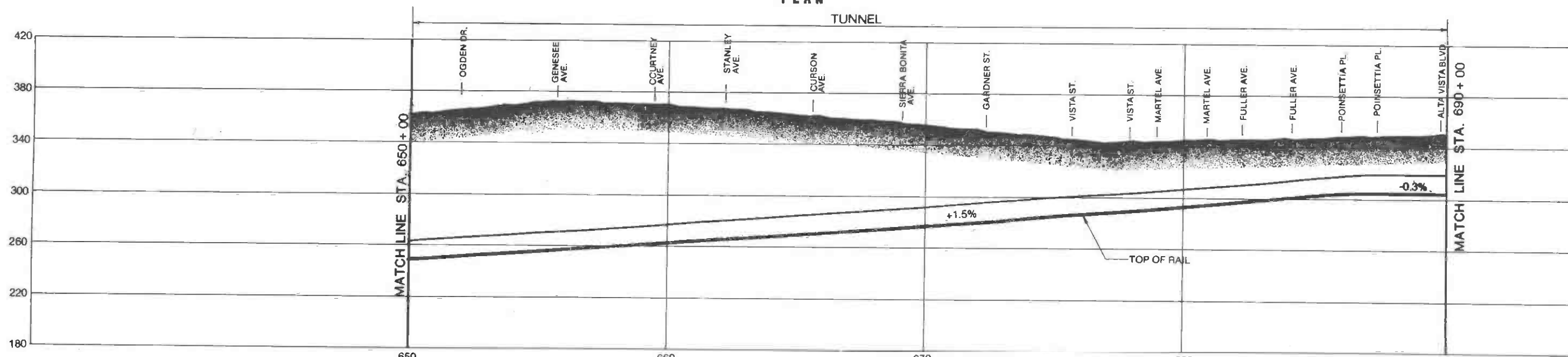
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REV.	DATE	BY	APP.	DESCRIPTION																								

Figure 5 - 12
Alignment Plan and Profile: Station 600 + 00 to 650 + 00 49



PLAN

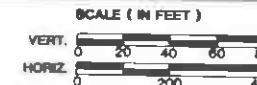
TUNNEL



PROFILE

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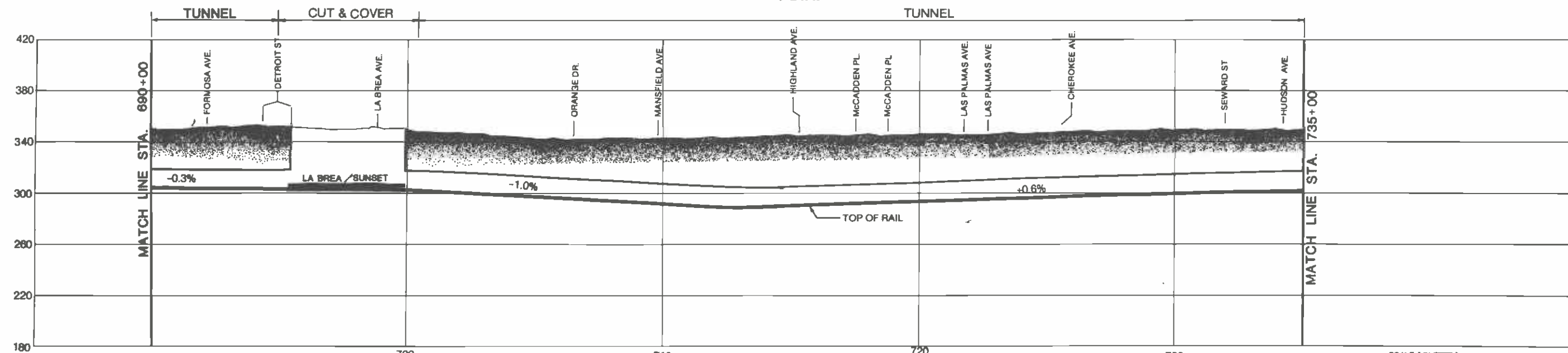
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Figure 5 - 13
Alignment Plan and Profile: Station 650 + 00 to 690 + 00



PLAN



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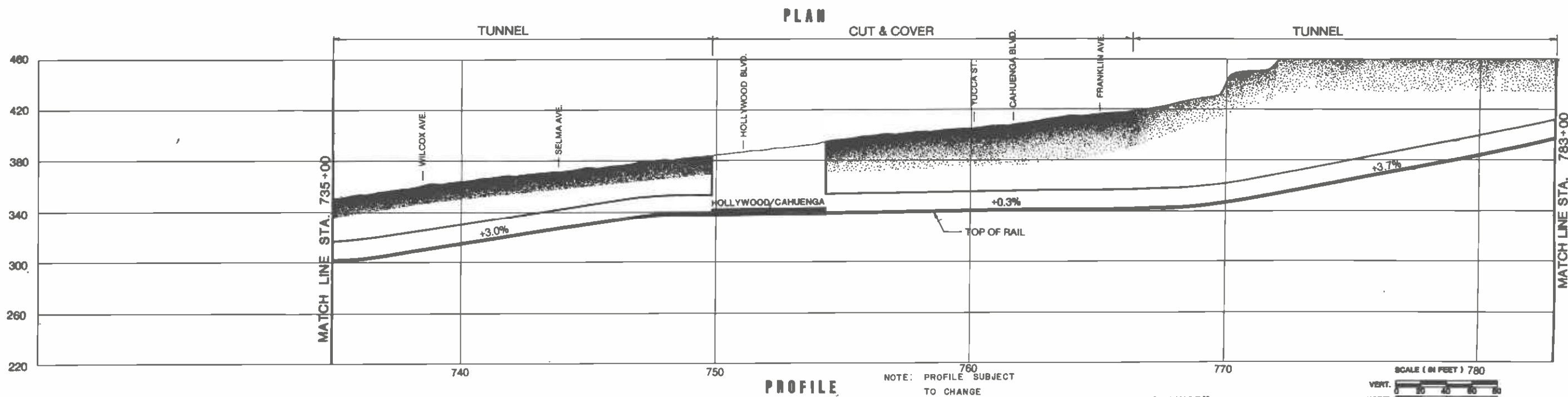
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Figure 5 - 14
Alignment Plan and Profile: Station 690 + 00 to 735 + 00



NOTE: PROFILE SUBJECT TO CHANGE



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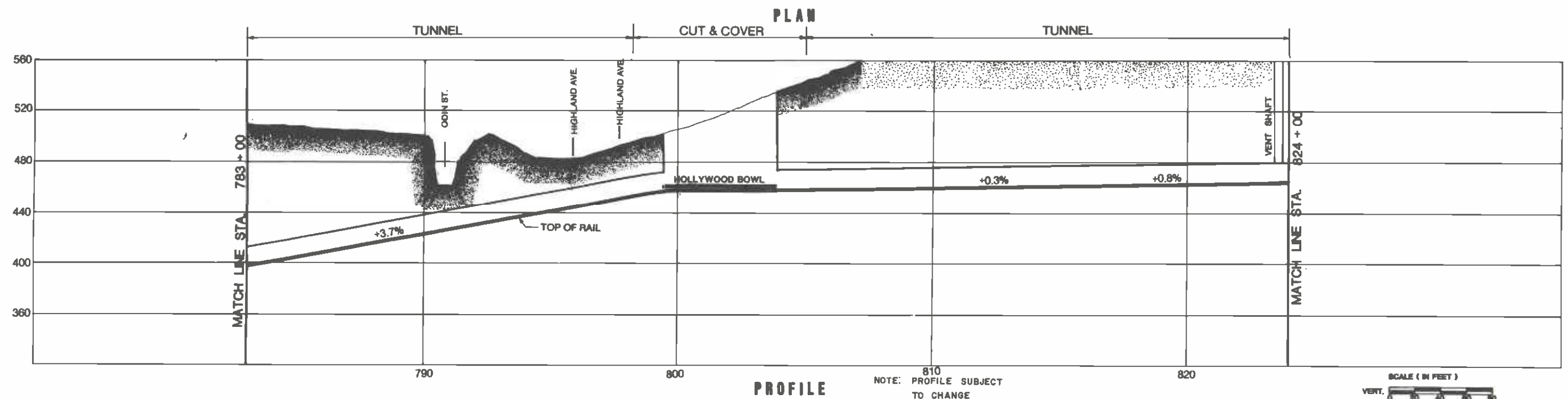
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SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
 APPROVAL RECOMMENDED _____ DATE _____
 DEPUTY CHIEF ENGINEER Reg. No. _____
 APPROVED _____ DATE _____
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MILESTONE 10
DEFINITIVE FIXED FACILITIES PLANS
 ALIGNMENT PLAN AND PROFILE
 STATION 735+00 TO STATION 783+00

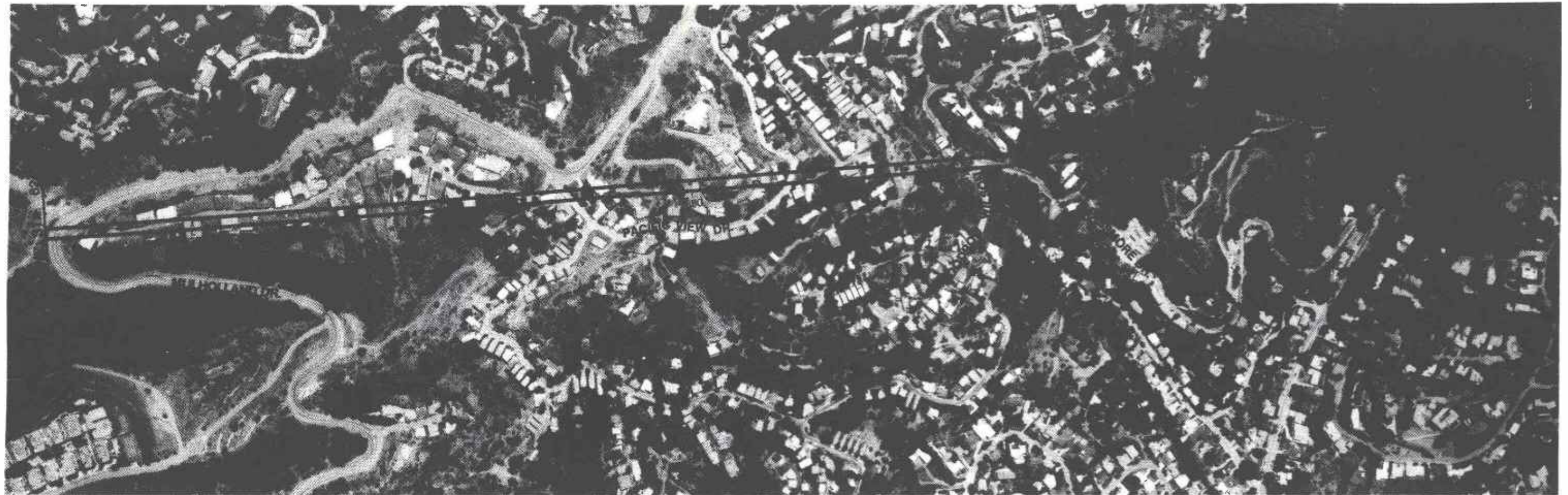
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Figure 5 - 15
 Alignment Plan and Profile: Station 735 + 00 to 783 + 00

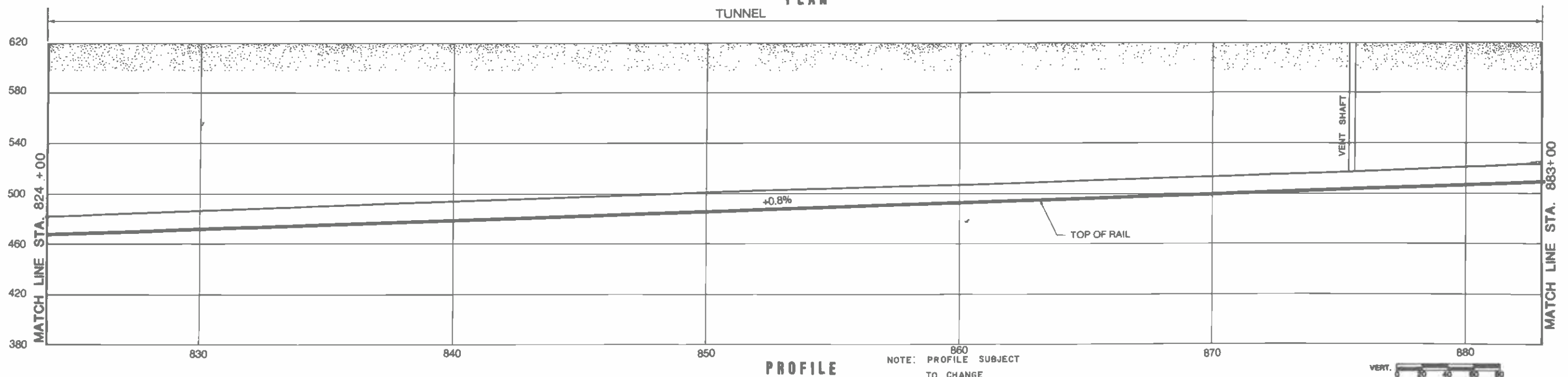


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Figure 5 - 16
 Alignment Plan and Profile: Station 783 + 00 to 824 + 00



PLAN
TUNNEL



PROFILE

NOTE: PROFILE SUBJECT TO CHANGE

PRELIMINARY

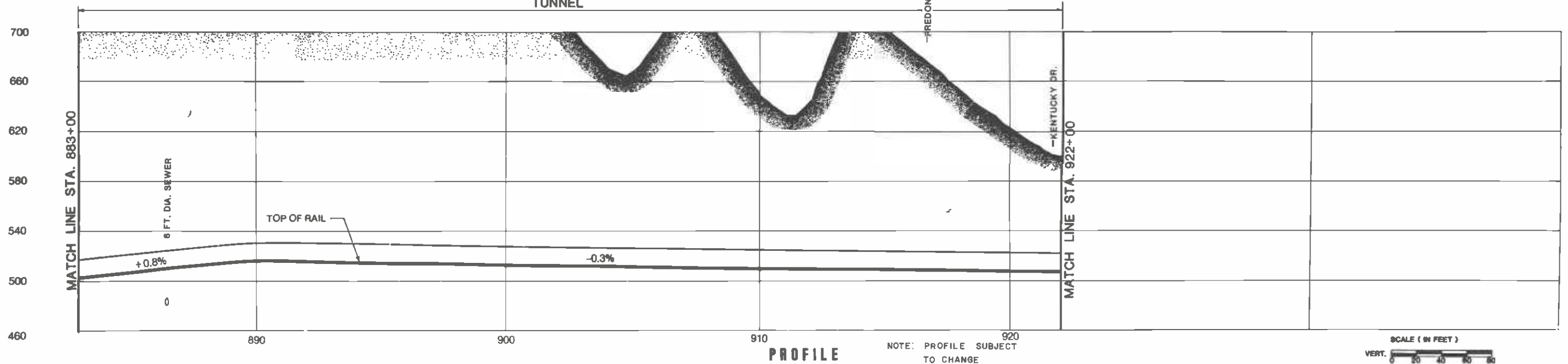


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Figure 5 - 17
Alignment Plan and Profile: Station 824 + 00 to 883 + 00



TUNNEL PLAN



PROFILE

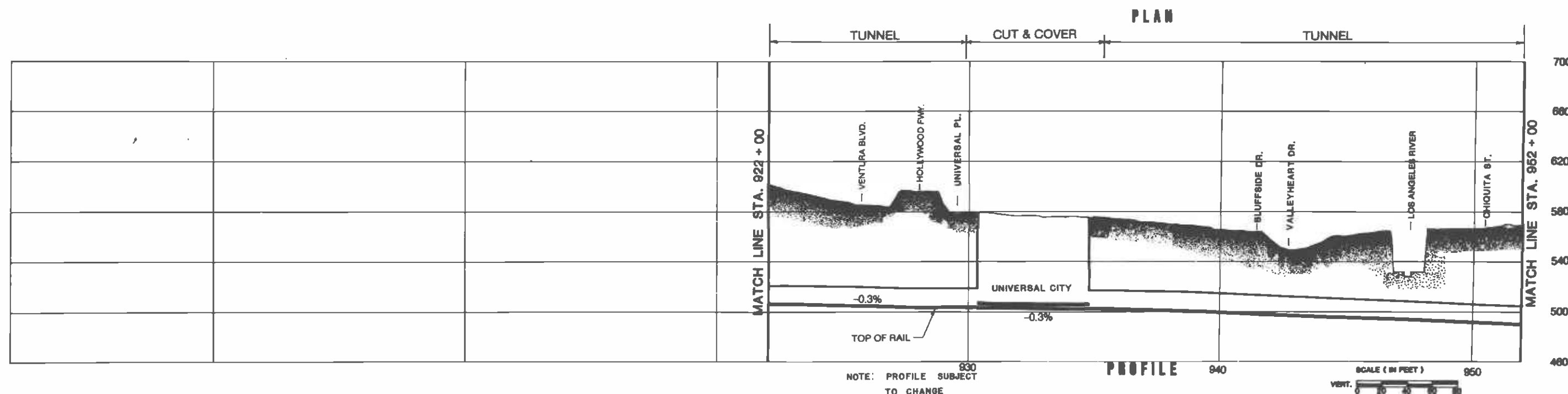
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Figure 5 - 18
Alignment Plan and Profile: Station 883 + to 922 + 00




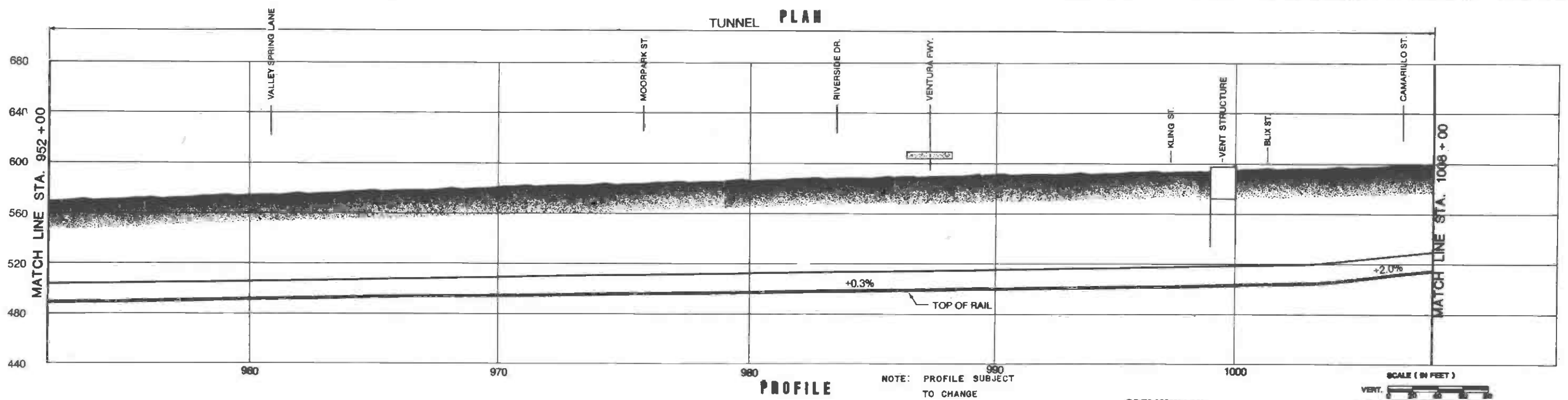
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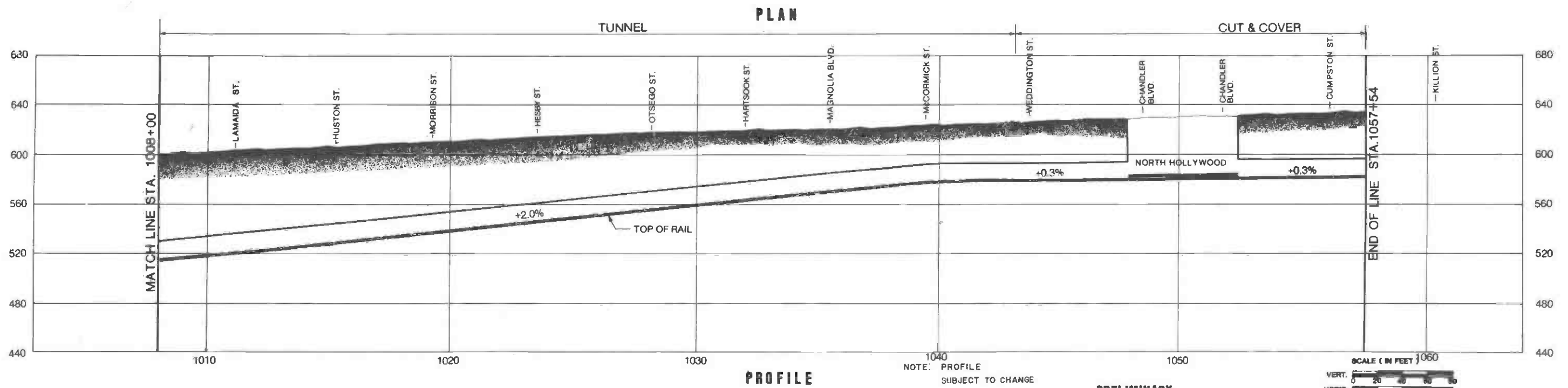
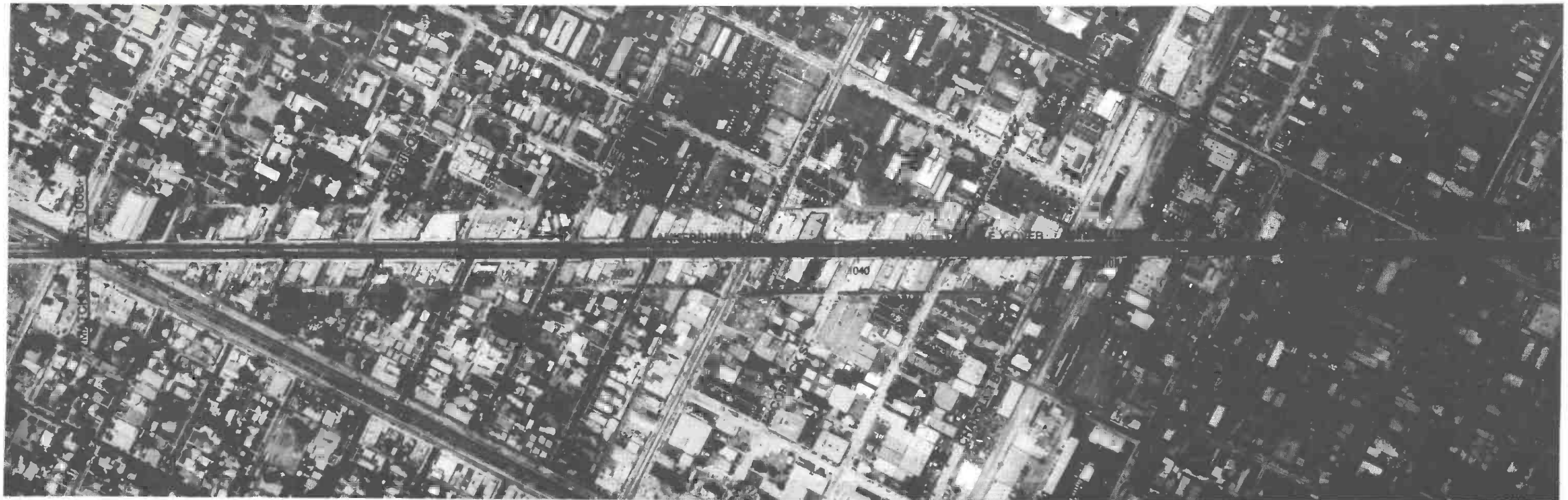
Figure 5 - 19
Alignment Plan and Profile: Station 922 + to 952 + 00



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Figure 5 - 20.
Alignment Plan and Profile: Station 952 + to 1008 + 00

57



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Figure 5 - 21
Alignment Plan and Profile: Station 1008 + 00 to 1061 + 00

widened track centers are required around curves, or where tracks are in separate structures.

5.1.2.1 Track Spacing

Track spacing will vary, depending on the type of construction used for the particular section of line structure.

Minimum center to center dimensions for parallel tracks including yard tracks shall be 14' - 0".

Center to center dimensions for parallel tracks generally will be dependent upon the width of station platform where center platforms are used.

5.1.2.2 Tangent Alignment

The absolute minimum tangent length between curves or spirals shall be 75 feet.

For Station Structures the desired horizontal alignment shall be tangent for a minimum of 600 feet, beginning 75 feet before the station platform and extending 75 feet past the 450 foot length of platform.

5.1.2.3 Curve Alignment

The following shall apply to Circular Curves:

- Circular curves shall be defined by the arc definition of curvature and specified by their radii.
- Or mainline tracks, the desired minimum radius shall be 1,000 feet; the absolute minimum radius shall be 750 feet.
- For secondary tracks, the desired minimum radius shall be 750 feet; the absolute minimum radius shall be 500 feet.

- For yard tracks, the desired minimum radius shall be 350 feet; the absolute minimum radius shall be 250 feet.

The following shall apply to curves or Superelevation

- For horizontal alignments, the allowable speed throughout curved sections shall be determined by passenger comfort as related to superelevation.
- For running track in cut and cover and tunnel construction, the absolute maximum super elevation shall be 4 inches.
- The absolute maximum unbalanced superelevation throughout the system shall be 4-1/2 inches.

The following shall apply to Spiral Transition Curves:

- Spiral transition curves shall be used in mainline tracks to connect tangents to circular curves or to connect compound circular curves.
- No spirals shall be required for curves with radii 10,000 feet or greater.

5.1.3 Vertical Alignment

The profile grade shall represent the elevation of the top of the low rail. In areas of curved alignment where profile is given for one track only, the elevations of the second track shall be adjusted uniformly to accommodate the differences in lengths throughout the curves.

5.1.3.1 Grades

The following shall apply to Line Structures:

- For standard track installation, the maximum desired sustained grade for mainline and for secondary tracks shall be 3.0 percent;

the absolute maximum sustained grade shall be 4.0 percent. For short lengths of track, grades may be increased to, but shall not exceed, 6.0 percent.

- No minimum grade is specified, but adequate drainage shall be provided for all trackage.
- The absolute minimum length of constant profile grade between vertical curves shall be 100 feet.
- Grade adjustments shall be applied to compensate for horizontal curves, where applicable. Where horizontal curves are present, the allowable grade shall be reduced by 229.18 divided by the radius of the horizontal curve.

The following shall apply to Yard and Shop Tracks:

- For yard track, the absolute maximum grade shall be a 1.0 percent; no minimum grade is specified, but adequate drainage shall be provided for all trackage.
- Track located within shop buildings shall be level.

For storage tracks it is desired that the grade of a stub end storage track descend toward the stub end, and, if adjacent to a mainline or secondary track, be curved away from such track at its stub end. If it is necessary to grade the storage track up toward the stub end, the grade shall not exceed 0.20 percent.

The following shall apply to Station Structures:

- No minimum grade is specified at passenger stations provided adequate track drainage can be maintained.
- The absolute maximum allowable grade through passenger stations shall be 1.0%.

- Vertical curves shall not encroach within 75 feet of station platforms.

5.1.3.2 Vertical Curvature

The following shall apply to mainline tracks:

- All changes in grade shall be connected by parabolic vertical curves.
- The absolute minimum length of vertical curve for mainline track shall be determined by the equation $L = AV$ or 100 feet, whichever is greater.

Where: L = Length of vertical curve, feet

A = Algebraic difference in grades connected by the vertical curve, percent

V = Design speed in area, mph

- Reverse vertical curves may be used provided each vertical curve conforms to design criteria requirements.
- Compound and unsymmetrical vertical curves may be used provided each curve conforms to design criteria requirements.

Where possible, combining horizontal and vertical curves shall be avoided. Where the combination of horizontal and vertical curves cannot be avoided the minimum distance between vertical control points and horizontal control points shall be 75 feet.

5.1.4 Facilities Location

Facilities scheduled for the initial 18.6 mile segment are shown on Figure 5-22. This figure locates the facilities of the initial system by coordinates and by stationing along the line. Figure 5-23 shows the location of all facilities schematically and will serve to locate facilities discussed in later sections.

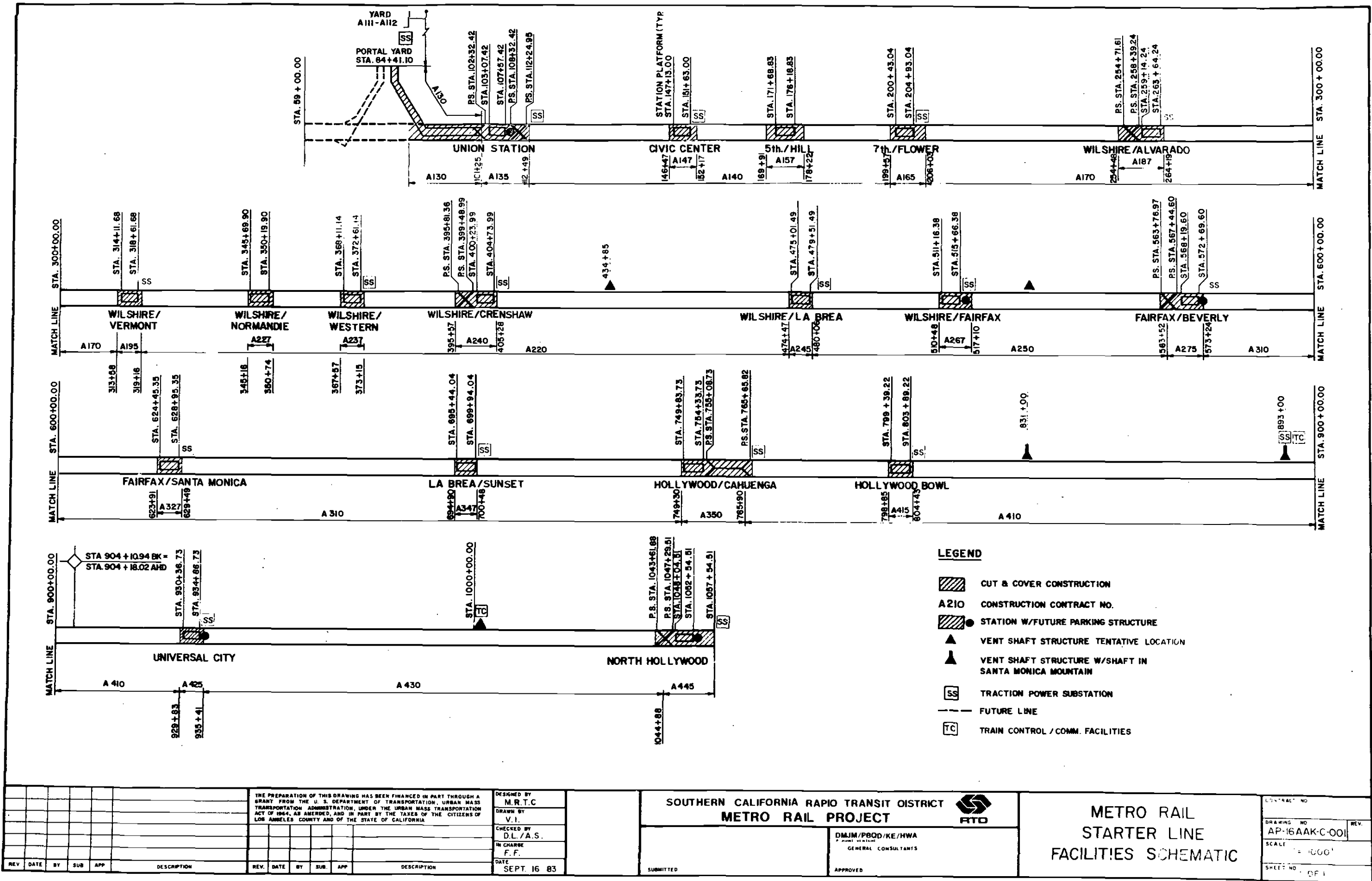










Figure 5-22
System Elements Location by Coordinates

METRO RAIL PROJECT
RECOMMENDED ALIGNMENT STARTER SYSTEM

Legend

-  Alignment
-  Stations
-  Cross over
-  Pocket track
-  Intermediate Traction Power Substation With Vent Shaft
-  Intermediate Vent Shaft
-  Parking
-  Bus Facilities
- 1 Union Station With Central Control Facility and TPS
- 2 Civic Center With TPS
- 3 5th/Hill
- 4 7th/Flower With TPS
- 5 Wilshire / Alvarado With TPS
- 6 Wilshire /Vermont With TPS
- 7 Wilshire / Normandie
- 8 Wilshire / Western With TPS
- 9 Wilshire / Crenshaw With TPS
- 10 Wilshire / La Brea With TPS
- 11 Wilshire / Fairfax With TPS
- 12 Fairfax / Beverly With TPS
- 13 Fairfax / Santa Monica With TPS
- 14 La Brea / Sunset With TPS
- 15 Hollywood / Cahuenga With TPS
- 16 Hollywood Bowl With TPS
- 17 Universal City With TPS
- 18 North Hollywood With TPS

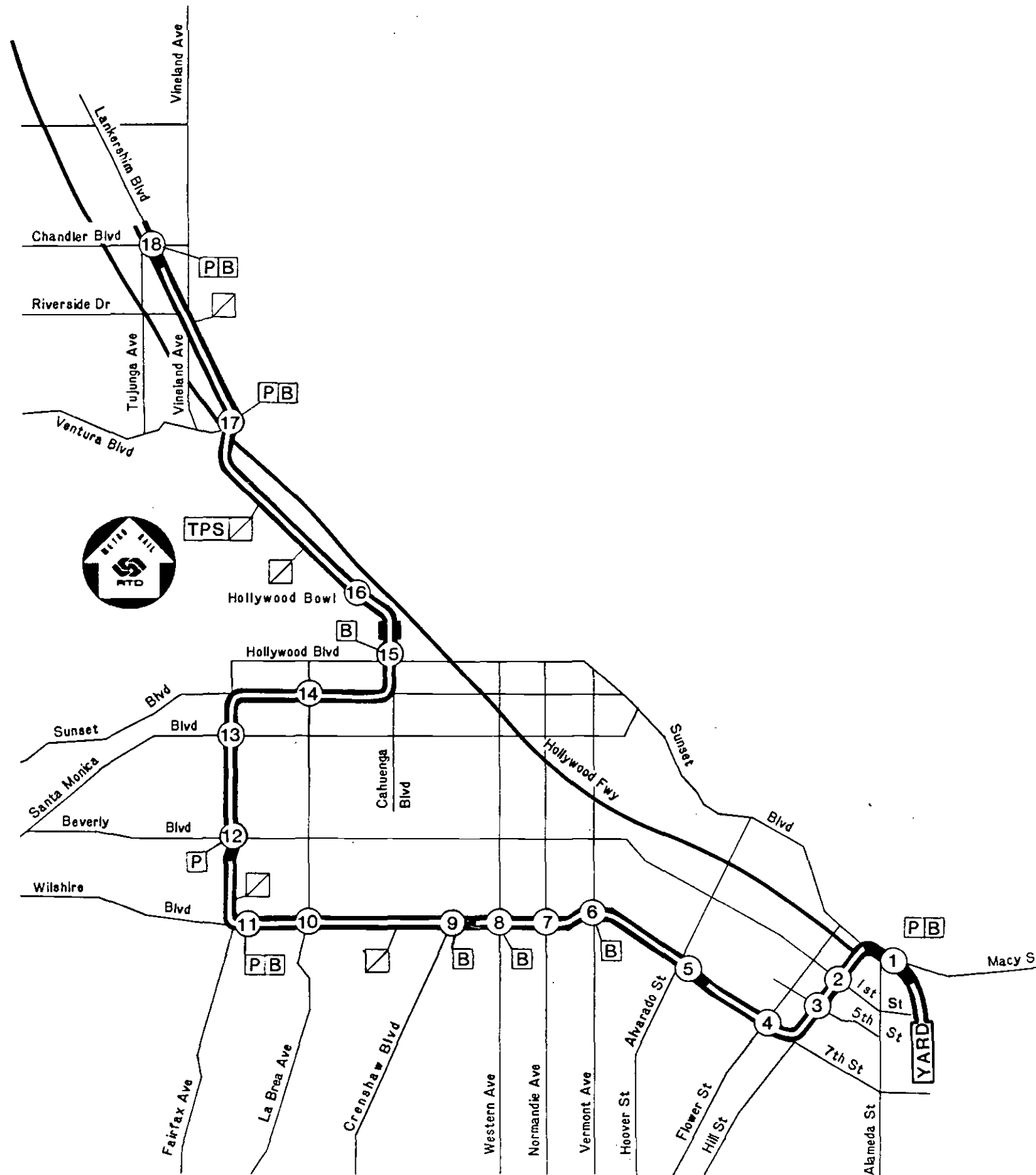


Figure 5-23
Facilities Location

5.2 STRUCTURAL CODES AND STANDARDS

This Section establishes the basic design standards for District owned substructures, including bridges, cut-and-cover structures, tunnels, stations, retaining walls, buildings, construction structures, and miscellaneous structures.

5.2.1 Design Codes, Manuals and Specifications

The structural design shall be governed by all applicable portions of the State of California general laws and regulations and the current editions of the following codes, manuals or specifications, as set forth in this Section:

5.2.1.1 Building Codes

- In the County of Los Angeles buildings shall be in accordance with "The Los Angeles County Building Laws," 1981 Edition, with appropriate amendments to be developed for the construction of rail rapid transit building facilities.
- In the City of Los Angeles buildings shall be in accordance with "The City of Los Angeles Building Code," 1980 Edition, with appropriate amendments to be developed for the construction of rail rapid transit building facilities, except for concrete use ACI 318-77 and for structural steel use AISC Specifications dated 1978.
- In other incorporated areas, not governed by any of the above regulations, buildings shall be in accordance with local municipal law, or, in the absence of such law, shall be in accordance with "The Uniform Building Code" of the International Conference of Building Officials, 1979 Edition, hereinafter referred to as U.B.C., for the construction of rail rapid transit building facilities.

5.2.1.2 Other Codes, Manuals and Specifications

For bridges, District or other, which support railroad loadings, the design requirements of the applicable railroad shall apply. In the absence of such requirements, the current edition of the "Manual for Railway Engineering of the American Railway Engineering Association," hereinafter referred to as the AREA Manual, shall apply.

For bridges, District or other, which support highway loading, the design requirements of the applicable jurisdiction shall apply. In the absence of such requirements, the Twelfth Edition, 1977, of the "Standard Specifications for Highway Bridges" of the American Association of State Highway and Transportation Officials, hereinafter referred to as AASHTO Specifications, shall apply.

For reinforced concrete retaining walls the AREA Manual, shall apply.

For concrete, reinforced concrete, precast concrete and prestressed concrete structures other than bridges subjected to railroad or highway loading, the 1977 edition of the "American Concrete Institute Standard Building Code Requirements for Reinforced Concrete", hereinafter referred to as the ACI-318, shall apply.

For structural steel structures, other than bridges subjected to railroad or highway loading, the 1978 Edition of the "Specifications of the Design, Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction, hereinafter referred to as the AISC Specifications, shall apply.

For timber structures, other than buildings within the jurisdiction of the County of Los Angeles or the City of Los Angeles and bridges subjected to railroad or highway loading, the current edition of the "National Design Specification for Stress-Grade Lumber and its Fastenings", recommended by National Forest Products Association, shall apply.

For cast iron structures, the current edition of "The Gray Iron Castings Handbook" of the Gray Iron Founders' Society, shall apply.

5.2.2 Loads and Forces

All rapid transit structures shall be designed to sustain the maximum dead and live loads to which they may be subjected, including erection loads occurring during construction, and all loads and forces as follows:

- Dead Loads (DL)
- Live Loads (LL)
- Earthquake Forces (EQ)
- Impact or dynamic effect of the live load (I)
- Centrifugal Force (CF)
- Rolling Force (RF)
- Longitudinal Braking and Tractive Force (LF)
- Earth Pressure (E)
- Buoyancy (B)
- Flooding (FL)
- Stream Flow (SF)
- Wind Load on Structure (W)
- Wind Load on Live Load (WL)

- Shrinkage Force (S)
- Thermal Force (T)

The loading criteria to which the structures are designed shall appear on the structural drawings. Loads and forces shall be investigated in combination using either the group loading for Service Load Design or the Load Factor Design as specified in the AASHTO Specifications, or in accordance with the seismic design criteria for structure below grade.

5.3 CLEARANCE REQUIREMENTS

The clearance envelope is defined as the space occupied by the dynamic outline of the design vehicle plus an additional running clearance allowance of 2" around the dynamic outline.

5.3.1 Passenger Vehicle Dynamic Outline

The dynamic outline of the design vehicle is illustrated in Figure 8-6. This outline is based on a composite of state-of-the-art passenger vehicles in service in North America, which meet the general requirements of the Metro Rail system.

5.3.2 Clearances

The design vehicle dynamic outline shall be located within each cross-section configuration so as to satisfy the following criteria:

- A minimum of 2" shall be required between the face of walls and the dynamic outline
- Allowance shall be made for the construction tolerances and, where applicable, for chorded constructions
- A minimum of 2" shall be required between any fixed installation and the design vehicle dynamic outline

- The design vehicle dynamic outline shall not encroach into the service walk space defined by a vertical plane along the edge of the service walk.

5.4 TUNNELS

Twin tunnels will be constructed to connect the various stations along the line. Tunnels for pocket track and crossovers will be constructed using cut-and-cover methods. Bored tunnel shall be circular in section and/or horseshoe in section as determined by field conditions.

5.4.1 Tunnel Types

Two types of tunnel have been identified as being suitable for this project depending on geotechnical conditions.

- Flexible-Earth Tunnel. This type of tunnel will be installed in soft earth or fractured rock. Permanent tunnel support shall be provided by liner rings consisting of a series of liner segments assembled with staggered longitudinal joints.
- Rock Tunnel. This type of tunnel will be installed in the solid rock through the Santa Monica Mountains. Two types of tunnel lining are to be provided depending upon rock quality and anticipated loads. The specific type of lining utilized shall depend upon field conditions. Type I Rock Tunnel lining shall consist of grouted rock bolts and shotcrete. Type II Rock Tunnel lining shall consist of structural steel ribs encased in concrete, reinforced concrete ribs or a combination thereof.

5.4.2 Tunnel Alignment

Horizontal and vertical alignment of the tunnels shall conform with the requirements of Section 5.1.2. (Horizontal Alignment and Super-

elevation), Section 5.1.3 (Vertical Alignment), and Figures 5-1 to 5-21 Alignment Plan and Profile.

5.4.3 Tunnel Size

Tunnels shall be designed to provide the minimum clearances required in Section 5.3 CLEARANCE REQUIREMENTS.

5.4.4 Tunnel Ventilation Shafts

Ventilation shaft walls shall be lined with precast segmental liner rings, reinforced concrete or plain concrete. See Section 5.6 for further details and location of ventilation shafts.

5.4.5 Tunnel Break-Outs

Permanent walls for tunnel break-outs in shafts, cross passages or any other location shall be in reinforced concrete. For tunnels lined with segmented tunnel liners, requirements of specially segmented rings to suit break-out configurations shall be determined. The break-outs shall not cause any excessive deformation or misalignment of the subway structure.

5.4.6 Portals

Tunnel and box section entrance portals shall be designed in a manner to minimize the rate-of-change of pressure on a train passing through the portal.

5.5 TRACKWORK

All system track construction, including special trackwork, shall comply with the American Railway Engineering Association's (AREA) "Manual for Railway Engineering" and the "Portfolio of Trackwork Plans."

5.5.1 Track Structures

Trackwork shall be of two basic types of construction.

- ° Tie and ballast - Tie and ballast structure shall be the primary type used for the trackwork at-grade in the storage yard. It shall consist of crushed rock ballast, to a ballast depth of 12 inches, and cross-ties.
- ° Direct - Fixation Track structure shall be the primary type used for trackwork in subway structures and in stations. It shall consist of a supporting structural slab (subway invert) and a fastening system to hold the running rails directly to the surface of the concrete. Included in this type of track structure are those where cross-ties are placed directly on or in the invert of the subway and resiliently supported trackwork.

Two types of resiliently supported track construction that are considered are the floating track slab and the resiliently supported tie. Depending on noise and vibration criteria, each of these types has certain properties that will meet the reduction requirements. These are shown in Figures 5-24 and 5-25.

5.5.2 Gauge

The system track gauge shall be based on the Standard Track Gauge used in the United States, 4 feet 8-1/2 inches, and shall be measured between the gauge (inner) sides of the heads of the two running rails of the track at a distance 5/8 inch below the top of the rails (T/R). Track gauge shall comply with the following:

- ° Tangent Track - Gauge, 4' -8-1/2".
- ° On Curves with radii greater than 700 feet Gauge, 4' -8-1/2".

Figure 5-24

TYPICAL FLOATING SLAB TRACK SUPPORT SYSTEM

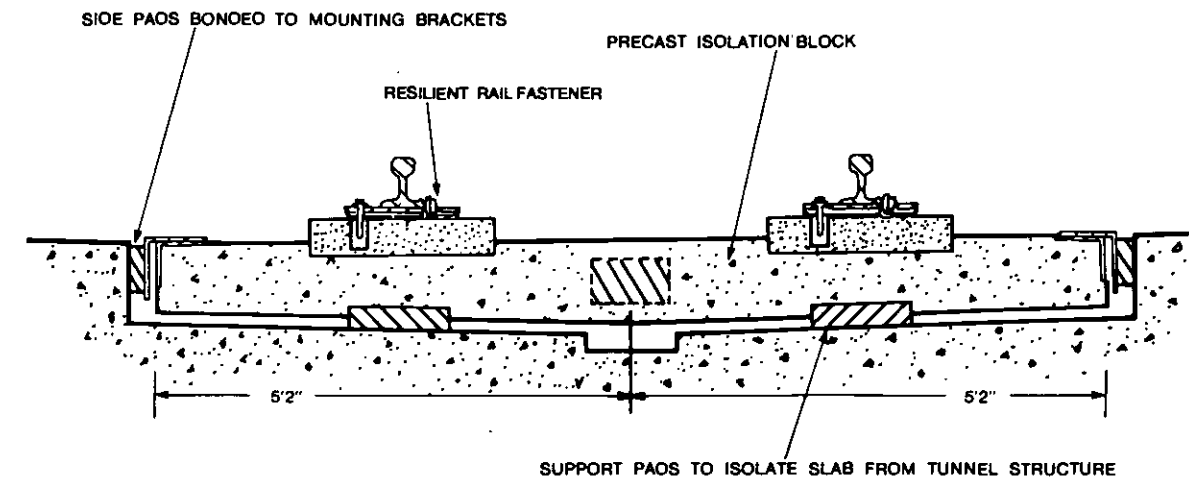
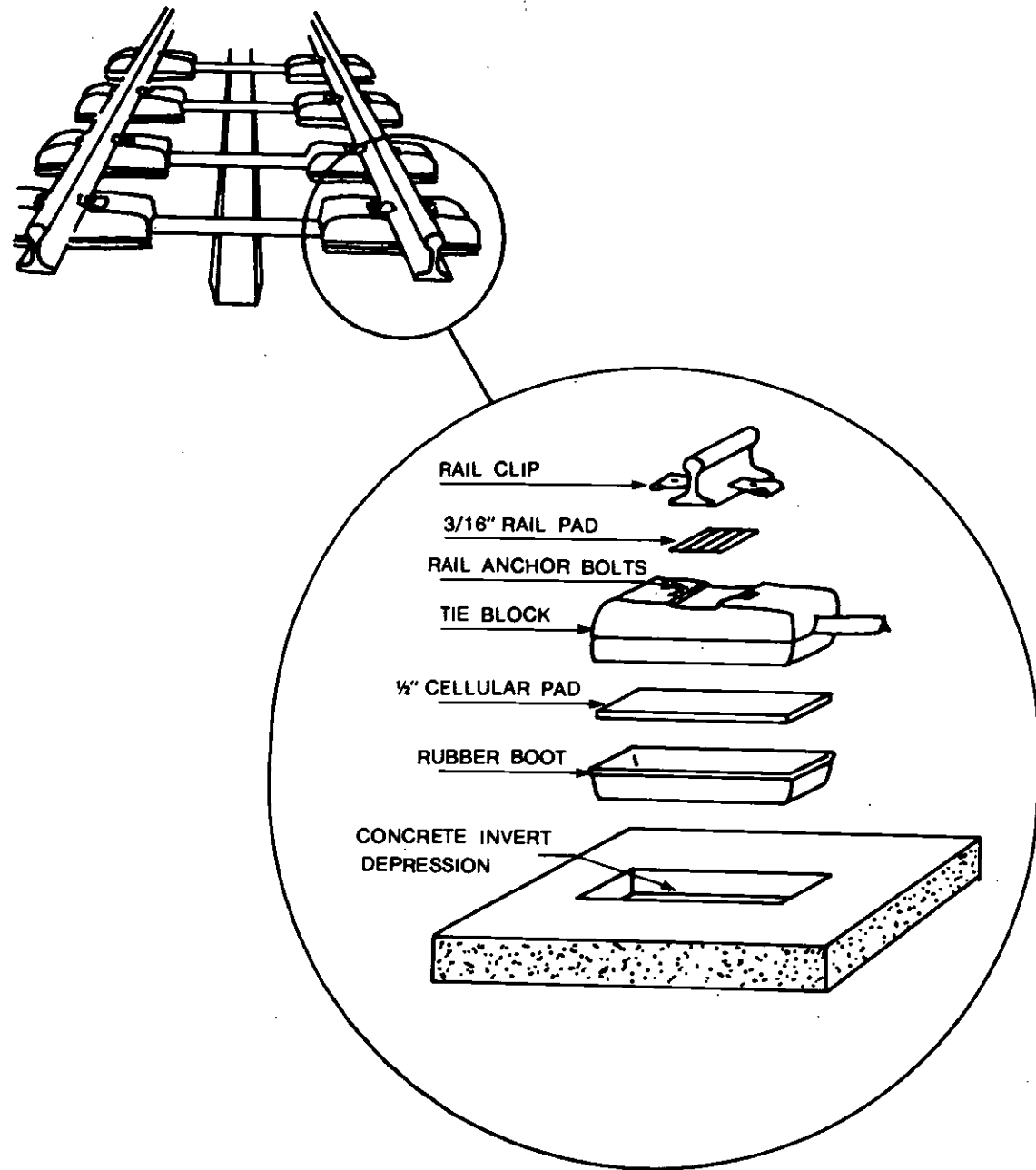


Figure 5-25

TYPICAL RESILIENTLY SUPPORTED RAIL TIES



- On Curves with a radii 700 feet or less, but with radii greater than 500 feet - Gauge, 4' -8 3/4".
- On Curves with radii of 500 feet or less Gauge, 4' -9".

5.5.3 Rail

The standard rail section to be used on the system shall be 115 pound per yard AREA section (115 RE). Rails to be used shall be control cooled, carbon steel or special rail as described below. Only No. 1 rails shall be used in main and transfer tracks. No. 2 and "A" rails may be used in yard and secondary tracks in lieu of No. 1 rails.

Girder Rail will be used in shop buildings and yards where the rail is embedded in pavement. The rail section to be used shall be the AREA Girder Rail Section 128-404.

5.5.4 Continuous Welded Rail

All rail on the system shall be installed as continuous welded rail (CWR) except as follows.

- Rails, less than 300 feet in length, when exposed to the elements.
- Special trackwork where joints are required.
- Buffer rails adjacent to certain joints or special trackwork used to assist in off-setting the rails longitudinal forces.
- Curves where rail handling may be a problem.
- At some structural joints, where it is required that the rail be jointed and/or be provided with expansion joints.

Anchorage for CWR shall be provided by a rail fastening system which deters expansion and contraction of rail ends, and prevents rail creepage.

5.5.5 Rail Joints

The standard rail joint to be used where CWR cannot be installed shall be the six hole, 36-inch long AREA joining bar with AREA recommended rail drillings, bar punching and track bolts.

5.5.6 Standard Trackwork

The following apply to At-Grade Track (Yards Only):

- At-grade track will use either precast concrete cross ties or timber ties.
- Timber switch ties shall be spaced in accordance with the standard drawings which are based on "AREA Portfolio of Trackwork Plans".
- Direct fixation track will use fasteners under each rail. These fasteners shall be placed opposite each other.

5.5.7 Special Trackwork

Special trackwork includes turnouts, double crossovers and pocket track. This special trackwork shall be located only on tangent track with constant profile grade. Double crossovers shall be used only between parallel tracks.

5.5.7.1 Turnouts

All turnouts on the system, with the exception of the storage yard and shop area, shall be No. 10 or longer. No. 6 and 8 turnouts may be used in the yard and shops.

5.5.7.2 Double Crossovers

Double Crossovers are used where operations requires the flexibility of two crossovers. All Double crossovers shall utilize No. 10 turnouts.

5.5.7.3 Pocket Track

A pocket Track is a track between the two main tracks used for storage of defective trains and stand-by trains. Pocket tracks will be constructed utilizing No. 10 turnouts. Pocket Tracks shall be a minimum of 1100 feet in length including turnout length. Pocket tracks will be located as shown in Figure 5-22.

5.5.8 Bumping Post/Sand Boxes

A stopping device shall be provided at the end of each stub ended track. It may a bumping post whose face is mounted 12 feet from the end of track or a sand box (sand track) that will halt the movement of the train by forcing its wheels to plow through the sand.

5.5.9 Guard Rails

Guard rails shall be provided on short radius curves and opposite unguarded frogs.

5.5.10 Grade Crossings

Grade crossings for vehicles shall be limited to yard tracks.

5.6 TUNNEL VENTILATION

Under normal conditions, tunnel ventilation will be provided through shafts (see Figure 5-26) located at the stations along the line, and by intermediate ventilation shafts located between widely spaced stations. The purpose of tunnel ventilation is to provide fresh air and control temperature and relieve the piston effect caused by trains moving in

the tunnel. During emergencies tunnel ventilation shall be achieved using a "push pull" system of operating fans on one side of the emergency in supply, while fans on the other side are operated in exhaust. This produces a longitudinal air movement in the affected tunnel, allowing passengers to be evacuated toward the supply of outside air.

5.6.1 Intermediate Ventilation Shafts

Two types of ventilation shaft are required; one for tunnels with less than 50 feet of cover and a second for tunnels with more than 50 feet of cover.

The first type shall be a three-cell horizontal concrete box joining openings in the top of the tunnels to a vertical shaft which penetrates to the surface. The second type of shaft shall be a twenty-foot diameter shaft connecting the ground surface to the openings in the side of the tunnel.

Ventilation shaft openings shall be a minimum of 300 square feet for each tunnel.

Ventilation shafts must penetrate the surface, preferably in an off-street, off-sidewalk configuration.

5.6.2 Intermediate Ventilation Shaft Locations

Ventilation structures are to be located, (See Figure 5-23), at the traction power substation at Wilshire and Mullen, at Fairfax and 6th Avenue, at two locations in the Santa Monica Mountains and at the traction power substation on Lankershim Blvd. between Kling and Blix streets.

5.6.3 Ventilation Operating Requirements

Normal tunnel ventilation will be provided by the piston effect of the train travelling through the tunnel. The temperature and freshness of

the air in the tunnels shall be controlled and maintained by dampers, controlling the amount of fresh air drawn in.

For emergency conditions the fans shall be capable of blowing or exhausting a minimum of 150,000 cubic feet of air per minute per tunnel per location.

5.7 UTILITIES AND STREETS

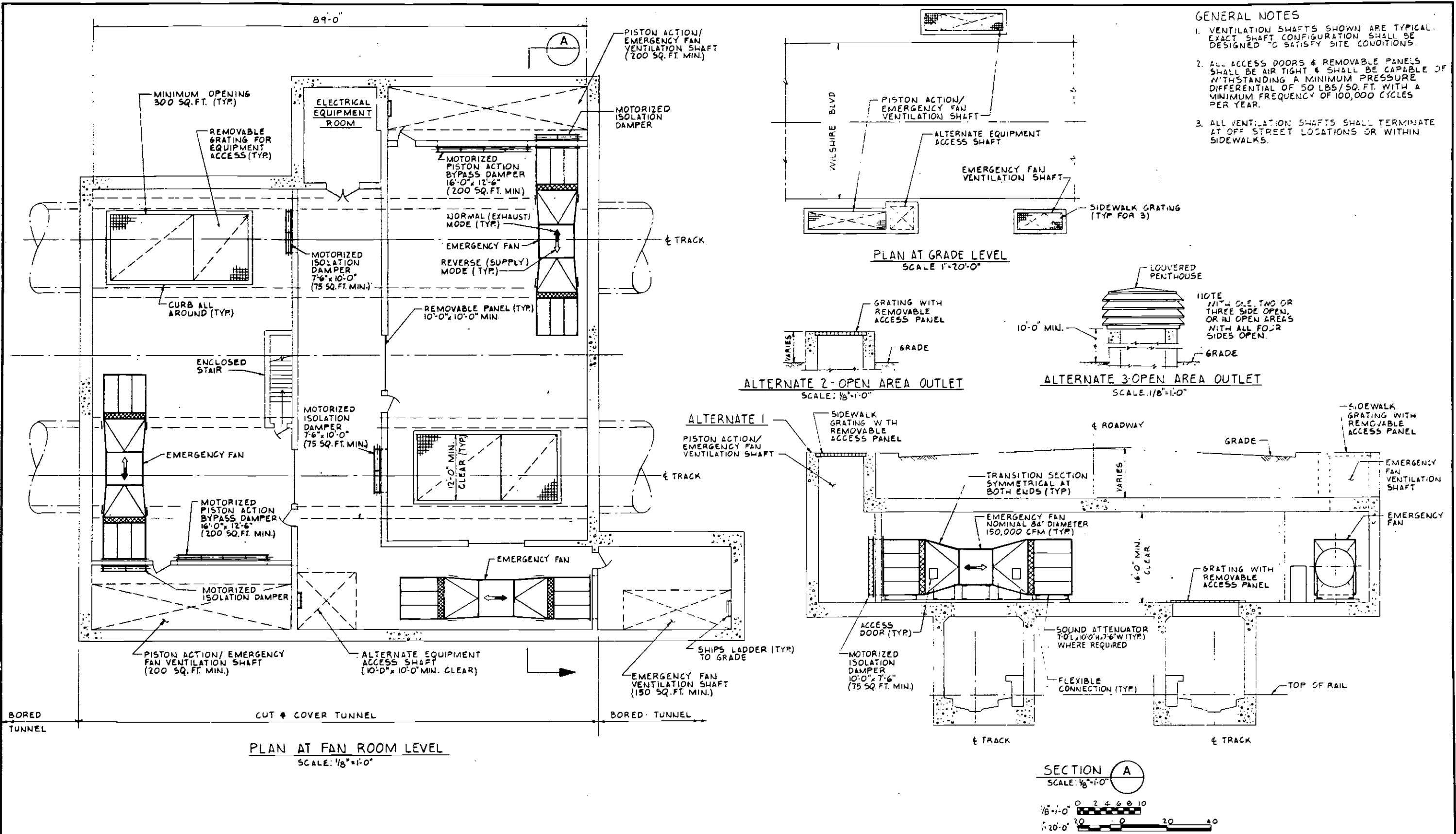
This section describes the maintenance, support, restoration and construction of utilities encountered in the construction of the rail transit system, and the restoration of pavement disturbed by such construction.

5.7.1 Utilities

Utilities include facilities belonging to governmental agencies other than the District, such as Public Utility Corporations and private parties, including service lines to adjoining properties.

Utilities encountered, or that are close enough to be affected by transit construction, may be:

- Supported and maintained complete in place during construction and continue in service following completion of the transit facilities.
- Temporarily relocated and maintained, then, upon completion of transit facilities, restored to service.
- Temporarily relocated and maintained; then, upon completion of the transit facilities, replaced by new utilities.
- Permanently relocated beyond the immediate limits of transit construction.



THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U.S. DEPARTMENT OF TRANSPORTATION, URBAN MASS TRANSPORTATION ADMINISTRATION, UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA.										DESIGNED BY DRAWN BY CHECKED BY IN CHARGE DATE	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 	MECHANICAL DIRECTIVE VENTILATION AND AIR COOLING SYSTEMS EMERGENCY FAN ROOM/VENTILATION SHAFT SHALLOW TUNNEL LOCATION ALTERNATE 1	CONTRACT NO. DRAWING NO. SCALE SHEET NO.
1	4-19-83	KM	ARJ	REVISED TUNNEL CONSTRUCTION UNDER FAN ROOM						DMJM/PBOD/KE/HWA GENERAL CONSULTANTS APPROVED	MD-041 AS SHOWN		
REV.	DATE	BY	SUB	APP	DESCRIPTION	REV.	DATE	BY	SUB	APP	DESCRIPTION		

Figure 5-26
Ventilation and Air Cooling System 70

Utility service to abutting properties shall be maintained and, if temporarily relocated, shall be restored to its prior location upon completion of work.

Replacements for any existing utilities, including government facilities, and pavements shall be designed to provide service equal to that offered by the existing installations.

No improvements to utilities shall be included unless specifically directed by the District.

All maintenance, relocation, restoring, and construction of utilities shall conform to the applicable codes, standards, specifications and practices of the governmental agency or utility company involved.

5.7.2 Street and Traffic Lights

All relocations, temporary or permanent, and restoration of these facilities shall conform to the practices of the agencies involved. Relocation, restoration and other work involving street lights and traffic lights shall meet the codes and standards of the affected City or County and the California Department of Transportation.

5.7.3 Vaults

All remodeling, abandonment, or other work involving private vaults extending from adjoining buildings into public space shall conform to the rules, regulations and practices of the jurisdiction involved.

5.7.4 Oil Pipe Lines, Steam Lines, Etc.

All work involving oil transmission lines, steam lines, and similar types of installations shall be performed by the owner of the installation unless stated otherwise in a Master Agreement.

5.7.5 Street Rights of Way

All pavement restoration in public streets shall conform to the current specifications and practices of the jurisdictions and agencies involved.

All work involving street trees and landscaped areas shall conform to specifications, criteria and practices of the agencies involved. Street trees and landscaped areas shall be preserved wherever practicable. Trees in the construction area which are to remain shall be protected.

If they cannot be maintained during construction, landscape areas shall be restored after construction to the original condition to the extent possible, with street trees to be replaced with the minimum size permitted under applicable Codes and Standards of the locality involved.

All work involving relocation, restoration and temporary installation of street signing shall conform to current standards of local authorities and of the California Department of Transportation.

5.8 DRAINAGE

Transit system drainage criteria shall apply only to the drainage of areas under the authority of the District. Drainage of other areas and connections to other drainage systems shall be designed in accordance with the criteria of the particular jurisdiction involved. Where practical, drainage shall be by gravity flow. Where necessary, pumping stations shall be installed. No sanitary outfall shall be permitted to enter the track drainage system.

5.8.1 Pumping Stations

Pumping stations shall be located at any location where gravity drainage cannot be obtained. Pumping stations shall be automatic with failure alarm indications.

5.8.2 Drainage Volumes

The volumes of water to be handled by each drainage system shall be calculated as follows:

- Surface and Aerial Construction - Drainage of all open areas shall be calculated by means of the formula:

$$Q = CIA$$

where Q = Volume of water in cubic feet per second

C = Coefficient of runoff

I = Intensity of rainfall as derived from approved Los Angeles County intensity charts.

A = Drainage area in acres

- Underground Sections in Earth - Drainage for underground sections in earth shall be designed to exclude groundwater and shall be based on the formula:

$$q = \frac{a}{14} + \frac{L}{500}$$

Where q = Volume of water, in gallons per minute

a = Horizontal projected area of all subway openings in square feet, i.e., station entrances, fan shafts, etc.

L = Linear feet of structure in the drainage system.

- Underground Sections in Rock - Drainage for underground sections in rock shall be designed to collect groundwater in order to relieve hydrostatic pressure, and shall be based on the formula

$$q = \frac{a}{14} + \frac{L}{50}$$

5.8.3 Size of Drains

Sizes of open channels and closed conduits shall be established primarily by the relationship: $Q = av$

Where: Q = Volume of water in cubic feet per second

a = Required area in square feet

v = Velocity as determined by the Manning Formula

5.8.4 Flood Control

Flood protection shall involve station entrances, vent and fan shafts, power substations and any other facilities and openings into the system, such as electric conduits or other pipes.

The design of the transit system shall take into consideration the protection of the system against local flooding resulting from stream overflows and surface flooding. Based on field investigations, consultations with local authorities, studies of any recorded data and analyses of existing and proposed drainage systems, the designer shall submit findings and recommendations to the District for approval while in the preliminary stages of work. Final design shall not be undertaken prior to receipt of such approval.

5.9 NOISE AND VIBRATION

Community acceptance of a rail rapid transit system requires control of airborne noise and vibration from transit train operations, and from transit ancillary areas and facilities such as yard operations, vent and fan shafts of the ventilation system, electrical substations, emergency service buildings, and air conditioning chiller plants. The system should also provide for any required control of ground-borne noise and vibration from the transit vehicle operations.

5.9.1 Airborne Noise from Train Operations

Figure 5-28 shall be used as criteria for single-event maximum noise levels for airborne noise from transit trains for various types of buildings in each of the land use or area categories listed. These criteria are generally applied to nighttime operations because public sensitivity to noise is greater at night than during daytime. The maximum levels are based on the maximum level that will not cause significant intrusion or alteration of the pre-existing noise environment and represent noise levels which are considered acceptable for the type of land use in each area.

Figure 5-28
CRITERIA FOR MAXIMUM AIRBORNE NOISE
FROM METRO RAIL OPERATIONS

Community Area Category	Maximum Single Event Noise Level		
	Single Family Dwellings	Multi- Family Dwellings	Commercial Buildings
I Low Density Residential	70 dBA	75 dBA	80 dBA
II Average Residential	75	75	80
III High Density Residential	75	80	85
IV Commercial	80	80	85
V Industrial/Highway	80	85	85

For some buildings or occupancies maximum noise level limits shall be applied regardless of the community area category. Figure 5-29 lists criteria for maximum airborne noise from train operations near such buildings.

Figure 5-29
CRITERIA FOR MAXIMUM AIRBORNE NOISE FROM METRO
RAIL OPERATIONS NEAR SPECIFIC TYPES OF BUILDINGS

Building or Occupancy Type	Maximum Single Event Noise Level
Amphitheatres	65 dBA
"Quiet" Outdoor Recreation Areas	70 dBA
Concert Halls, Radio and TV Studios	70 dBA
Churches, Theatres, Schools, Hospitals, Museums, Libraries	75 dBA

5.9.2 Ground-Borne Noise from Train Operations

Figure 5-30 shall be used as the criteria for maximum ground-borne noise due to train operations for various types of residential communities.

Figure 5-30
CRITERIA FOR MAXIMUM GROUND BORNE
NOISE FROM METRO RAIL OPERATIONS

Community Area Category	Maximum Single Event Noise Level		
	Single Family Dwellings	Multi- Family Dwellings	Hotel/ Motel Buildings
I Low Density Residential	30 dBA	35 dBA	40 dBA
II Average Residential	35	40	45
III High Density Residential	35	40	45
IV Commercial	40	45	50
V Industrial/Highway	40	45	50

As with airborne noise, there are some types of buildings for which specific design criteria should be applied, regardless of area category. Figure 5-31 presents criteria for acceptable levels of transient ground-borne noise levels in occupied spaces of various types of buildings and occupancies.

Figure 5-31

CRITERIA FOR MAXIMUM GROUND-BORNE NOISE FROM METRO RAIL OPERATIONS NEAR SPECIFIC TYPES OF BUILDINGS

Type of Building or Room	Maximum Single Event Noise Level
Concert Halls and TV Studios	25 dBA
Auditoriums and Music Rooms	30 dBA
Churches and Theatres	35 dBA
Hospital Sleeping Rooms	35-40 dBA
Courtsrooms	35 dBA
Schools and Libraries	40 dBA
University Buildings	35-40 dBA
Offices	35-45 dBA
Commercial Buildings	45-55 dBA

5.9.3 Ground-Borne Vibration from Train Operations

Figure 5-32 shall be used as criteria for maximum ground-borne vibration for various types of residential buildings. The criteria apply to measurements of vertical vibration of floor surfaces within the buildings.

Figure 5-32

CRITERIA FOR MAXIMUM GROUND-BORNE VIBRATION FROM METRO RAIL OPERATIONS

Community Area Category	Maximum Single Event Ground-borne Vibration Velocity Level (dB re 10 ⁻⁶ in/sec)		
	Single Family Dwellings	Multi-Family Dwellings	Hotel/Motel Buildings
I Low Density Residential	70 dBA	70 dBA	70 dBA
II Average Residential	70	70	75
III High Density Residential	70	75	75
IV Commercial	70	75	75
V Industrial/Highway	75	75	75

There are some types of buildings for which specific criteria for ground-borne vibration should be applied, regardless of area category. Figure 5-33 presents acceptable levels of transient ground-borne vibration levels in occupied spaces of various types of buildings and occupancies.

Figure 5-33

CRITERIA FOR MAXIMUM GROUND-BORNE VIBRATION FROM TRAIN OPERATIONS NEAR SPECIFIC TYPES OF BUILDINGS

Type of Building or Room	Maximum Single Event Vibration Velocity Level (dB re 10 ⁻⁶ in/sec)
Concert Halls and TV Studios	65
Auditoriums and Music Rooms	70
Churches and Theatres	70
Hospital Sleeping Rooms	75
Courtsrooms	75
Schools and Libraries	75
University Buildings	75-80
Offices	75-80
Commercial Buildings	75-85

5.9.4 Noise in Stations

Designs for acoustic treatment shall take into account the general architectural characteristics expected of the Metro Rail stations and the expected noise to be radiated by the transit cars and other noise sources. The table below shall be used as criteria for maximum noise level in underground stations.

MAXIMUM NOISE LEVELS IN UNDERGROUND STATIONS

On platform, trains entering and leaving	80 dBA
On platform, trains passing through	85 dBA
On platform, trains stationary	68 dBA
On platform or in mezzanine areas with only station ventilation system & auxiliaries operating	55 dBA
On platforms or other public areas with tunnel ventilation system and/or underplatform exhaust operating at any normal level	55 dBA
On platforms or other public areas with tunnel ventilation system operating in emergency status	70 dBA
In station attendants' booths or offices	50 dBA

5.9.5 Airborne Noise from Transit Ancillary Facilities

The two basic types of airborne noise from ancillary facilities are transient and continuous.

Figure 5-34 below shall be used as the criteria for the transit system ancillary facility noises in each of the community area categories listed.

FIGURE 5-34
DESIGN CRITERIA FOR NOISE
FROM TRANSIT SYSTEM ANCILLARY FACILITIES

Community Area Category	Maximum Noise Level, dBA	
	Transient	Continuous
I Low Density Residential	50	40
II Average Residential	55	45
III High Density Residential	60	50
IV Commercial	65	55
V Industrial/Highway	75	65

5.9.6 Noise In Subway Tunnels

Noise abatement techniques shall be used to reduce the noise of high speed train operations in tunnels to an acceptable level. The maximum interior car noise at maximum tunnel operating speeds shall not exceed 80 dBA.

5.9.7 Vibration Isolation of Subway Structures

Vibration isolation shall be provided at any point where the subway structure is in very close proximity or directly against a building structure or building foundation elements.

The resilient element between the two structures shall consist of intervening soil of at least 2 feet thickness or depth, or shall be an elastomer pad between the subway structure and building. The elastomer pad shall be a 1 or 2 inch thickness closed-cell expanded neoprene, selected to give proper support of hydraulic or structural loads with deflection of the elastomer pad not exceeding 10% to 20% of pad thickness.

5.10 STRAY CURRENT CONTROL

The following criteria have been established for control of stray currents from the operation of the transit system:

- A maximum earth potential gradient at one thousand feet from the transit system of 0.050 volt can be considered as acceptable relative to effects on area utilities.
- Stray current levels no greater than 0.10 ampere per thousand feet of system are required to keep earth potential gradients at 0.050 volt maximum and can, therefore, be considered as a maximum acceptable level for all areas of the transit system.
- Stray current flow on structural components within the tunnel structure (i.e., reinforcing steel and metallic liner) must be kept to absolute minimum levels. The singular most important controlling factor that will minimize stray current corrosion of both utility and tunnel structural components is the level of track-to-earth resistance that can be maintained during in-service operations. Any track resistance level must be uniformly distributed over the length of the system. A level of 1,500 ohms per thousand feet of system (2 rails) will meet the criteria cited above.

6.0 STATIONS

Eighteen stations are planned for the Metro Rail system. All stations are in subway configuration and have several common characteristics, which are described in this section.

Site and design plans are included in this section. The station system element contains several distinct subelements. These include station access provisions, entrances, mezzanines and platforms, mechanical systems, electrical systems, graphics and signing, ancillary spaces and facilities, landscaping and maintenance provisions.

Several of the station subelements interface with other system elements such as vehicles, fare collection equipment, communications, etc. The relationship among these elements is discussed.

6.1 DESIGN PHILOSOPHY

Each station shall be designed in accordance with its individual requirements including line location, patronage, requirements, topographic and geologic configurations, neighborhood character, and surface interface requirements. A basic functional and structural design for each station shall be established to provide significant degree of standardization throughout the Metro Rail system. The design shall be used to establish an identity for the system as a whole, and shall insure that patrons can easily find their way even in a station new to them.

The station must fit harmoniously into the community and relate to permanent existing and proposed new area development.

6.2 GENERAL CHARACTERISTICS

All stations in the initial system shall be constructed in below-ground structures. The station interiors will have 450 foot long center island platforms to provide for unobstructed passenger movements during

normal and emergency operations. Ancillary and mechanical equipment rooms shall be located at both ends of the station at the platform and mezzanine levels. Traction power substations shall be located below grade, within the station, over crossover or pocket tracks immediately adjacent to the stations with the exception of 7th/Flower, Wilshire/Vermont, Wilshire/Western, Wilshire/La Brea, Wilshire/Fairfax and La Brea/Sunset, where they shall be located above or below ground off-street.

Fare collection shall take place at mezzanines centered within or at both ends of the station train room depending on patronage levels. These mezzanines shall provide the transition area between the off-street, plaza-type entries and the platforms and contain fare vending equipment, system maps, telephones, and fare collection gates. All public facilities shall be fully accessible to the handicapped and elderly by elevators serving the platforms from the surface level entries and mezzanines. Stairs and escalators (predominantly for up movements) shall be provided for all vertical transitions within the stations. In addition, emergency evacuation stairs shall be provided at the ends of the platforms to street level.

6.3 STATION CAPACITY

The Station Patronage for each station are outlined in Section 3.0.

The sizing of station elements shall be done on the basis of the Ultimate Station Capacity which shall be 160% of the Station Patronage. Parking capacity shall be based on requirements projected in the Patronage Analysis.

For purposes of design, the Peak Fifteen Minute Patronage (pp15m) shall be 28.2% of the Ultimate Station Volume.

All stations must also meet requirements for emergency evacuation as established in Section 6.16 FIRE AND SAFETY.

6.4 STATION LOCATIONS

The site plans for each of the planned stations, are provided in this section.

Figure 5-22 shows the general location of each of the 18 proposed stations. Figure 6-1 provides symbols and abbreviations used on the site plans.

The plans also indicate potential future entries at selected station locations. Where feasible, the District plans to use knock-out panels as part of station construction to permit future construction of additional entries as a result of subsequent patronage demand and commercial development in the station area. Knockout panels are a type of wall structure which can be removed to permit the relatively inexpensive addition of entrances to a stations. The Civic Center and Fifth/Hill Station plans are representative of such future potential.

6.5 STATION PLANS

Station plans are provided in this section for each of the planned stations. See Figures 6-2 through 6-93.

The spatial relationships are displayed between several of the station subelements including mezzanines, platforms, ancillary spaces, elevators, escalators, fare collection equipment, etc.

6.6 STATION ACCESS AND PARKING

Access to stations can be provided by a variety of means which varies from station to station. While all stations shall have adequate provision for pedestrian access and will be in close proximity to major streets, special access facilities may be developed for stations. These include off street bus facilities, bus pull out lanes, park and ride lots, off-street kiss and ride facilities and bicycle parking.

Table 6-1 identifies the station locations for bus, auto and bicycle facilities.

6.6.1 Bus Facilities

The required bus design capacity for a station shall be determined based on the individual requirements for each station. Loading zones for buses shall be located to provide the most direct and safest inter-modal transfer. Off-street bus facilities shall be constructed at Union Station, Wilshire/ Vermont, Wilshire/Western, Wilshire/Crenshaw, Wilshire/Fairfax, Hollywood/Cahuenga, Universal City and North Hollywood Stations. In addition, bus pull-off lanes shall be constructed at the Civic Center, Wilshire/Alvarado, Wilshire/Vermont, Wilshire/Normandie, Wilshire/ Western, Wilshire/Fairfax, Fairfax/Beverly, Fairfax/Santa Monica, and North Hollywood Stations.

6.6.2 Park-and-Ride Facilities

Park-and-ride facilities to provide surface parking for use only by Metro Rail passengers, shall be constructed at the Union Station, Wilshire/Fairfax, Fairfax/Beverly, Universal City, and North Hollywood Stations. Initially, Park-and-Ride facilities shall be surface parking lots. The construction of parking structures shall be deferred until alternative funding sources have been explored. The following table shows the parking requirements for each station and the number of spaces that would be initially provided on the surface.

PARKING REQUIREMENTS FOR STATION

<u>Park & Ride</u> <u>Station</u>	<u>Requirements</u> (spaces)	<u>Initial Spaces</u> <u>to be Provided</u>
Union Station	2500	300
Wilshire/Fairfax	1000	200
Fairfax/Beverly	1000	250
Universal City	2500	1175
North Hollywood	<u>2500</u>	<u>1180</u>
Total	9500	3105

6.6.3 Kiss-and-Ride Facilities

Off-street kiss-and-ride facilities for autos to drop off or pick up passengers used primarily during the peak hours, shall be provided at Union Station, Wilshire/Alvarado, Wilshire/Vermont, Wilshire/Fairfax, Fairfax/Beverly, Hollywood/Cahuenga, Universal City and North Hollywood Stations. The required design capacity for a station shall be determined based on the individual requirements of each station.

6.6.4 Bicycle Parking Facilities

A number of bicycle lockers or racks will be placed at most stations. If the initially provided bicycle parking spaces are fully utilized, consideration shall be given to providing additional spaces.

6.7 ENTRANCES, MEZZANINES, PLATFORMS

The three major areas of each Metro Rail station are the entrance, mezzanine and platform. Several of the station subelements will be identified as to their location within these three areas.

6.7.1 Station Entrances

Plaza - type entrances and entrances within existing or planned developments shall be utilized wherever possible. These "off-street" entrances shall be planned to relate to business and urban activities in addition to serving their transit function. "On-street" entrances with stairs, escalators and elevators leading directly to/from the sidewalk are considered to be less desirable. Number and location of entrances shall be based on the patronage projections and expected mode of arrival at each station.

The plans reveal the number of entrances per mezzanine and the orientation of the entrances relative to the station interiors.

6.7.2 Mezzanine/Concourse

This component functions as a transition area between the station entrance(s) and the train platform.

The mezzanine size shall be determined by the expected patronage levels and the number and location of entrances. The mezzanine/concourse shall provide space for various functions that include fare collection, directional and information signage, and amenities for the patron's needs such as telephones and maps. The space that a patron enters prior to fare collection is designated a "free" area, with a corresponding space after fare collection designated "paid" area.

6.7.3 Platforms

Metro Rail station platforms shall be approximately 450 feet long to accommodate trains consisting of six 75-foot -long cars and 28 to 32 feet wide. The platform configuration for all stations shall be a "center" type, where a single platform is flanked by the two tracks.

Abbreviations

A.F.C.	AUTOMATIC FARE COLLECTOR	N.	NORTH
APX.	APPROXIMATE	N.T.S.	NOT TO SCALE
@	AT	NO. OF #	NUMBER
ATTOT.	ATTENDANT	O.D.	OUTSIDE DIAMETER
BM.	BEAM	PLAT.	PLATFORM
BET.	BETWEEN	PLUMB.	PLUMBING
B.R.S.	BLAST RELIEF SHAFT	PT.	POINT
B.S.	BOTH SIDES	P.S.F.	POUNDS PER SQUARE FOOT
BOT.	BOTTOM	P.S.I.	POUNDS PER SQUARE INCH
BLOG.	BUILDING	P.A.	PUBLIC ADDRESS
C.B.	CATCH BASIN	R.D.W.	RIGHT-OF-WAY
CLG.	CEILING	RM.	ROOM
C.L. or C	CENTER LINE	SEC.	SECTION
CCTV	CLOSED CIRCUIT TELEVISION	SGNL.	SIGNAL
COL.	COLUMN	S.	SOUTH
CONC.	CONCRETE	S.F.	SQUARE FOOT
COND.	CONDENSER	STD.	STANDARD
CONDT.	CONDUIT	STA.	STATION
CONT.	CONTINUOUS	S.P.	SUMP PUMP
C.D.	CONVENIENCE OUTLET	SWBD.	SWITCHBOARD
DET.	DETAIL	TEL.	TELEPHONE
DIA. or \varnothing	DIAMETER	T.D.C.	TOP OF CONCRETE
DIM.	DIMENSION	T.D.R.	TOP OF RAIL
DN.	DOWN	T.P.S.	TRACTION POWER SUBSTATION
DWG.	DRAWING	TRASF.	TRANSFORMER
E.	EAST	TYP.	TYPICAL
ELECT.	ELECTRICAL	U.P.E.	UNDER PLATFORM EXHAUST
EL.	ELEVATION	UTIL.	UTILITY
ELEV.	ELEVATOR	VENT.	VENTILATION
ENT.	ENTRANCE	VERT.	VERTICAL
ESC.	ESCALATOR	WT.	WEIGHT
EXH.	EXHAUST	W.	WEST
E.F.	EXHAUST FAN	W/	WITH
EXIST.	EXISTING	W.P.	WORKING POINT
EXT.	EXTERIOR		
F.D.C.	FACE OF CONCRETE		
F.D.S.	FACE OF STRUCTURE		
F.O.W.	FACE OF WALL		
FT.	FEET		
FIN.	FINISH		
F.E.	FIRE EXTINGUISHER		
FL.	FLOOR		
F.A.I.	FRESH AIR INTAKE		
GRTG.	GRATING		
HVAC	HEATING, VENTILATING AIR CONDITIONING		
HT.	HEIGHT		
HORZ.	HORIZONTAL		
IN.	INCH		
I.D.	INSIDE DIAMETER		
INT.	INTERIOR		
JT.	JOINT		
K.O.P.	KNOCK OUT PANEL		
LVL.	LEVEL		
LTG.	LIGHTING		
LKR	LOCKER		
MACH.	MACHINE		
MAX.	MAXIMUM		
MECH.	MECHANICAL		
MEZZ.	MEZZANINE		
MIN.	MINIMUM		
MISC.	MISCELLANEOUS		

Symbols


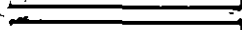
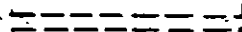

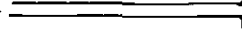
















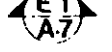









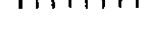
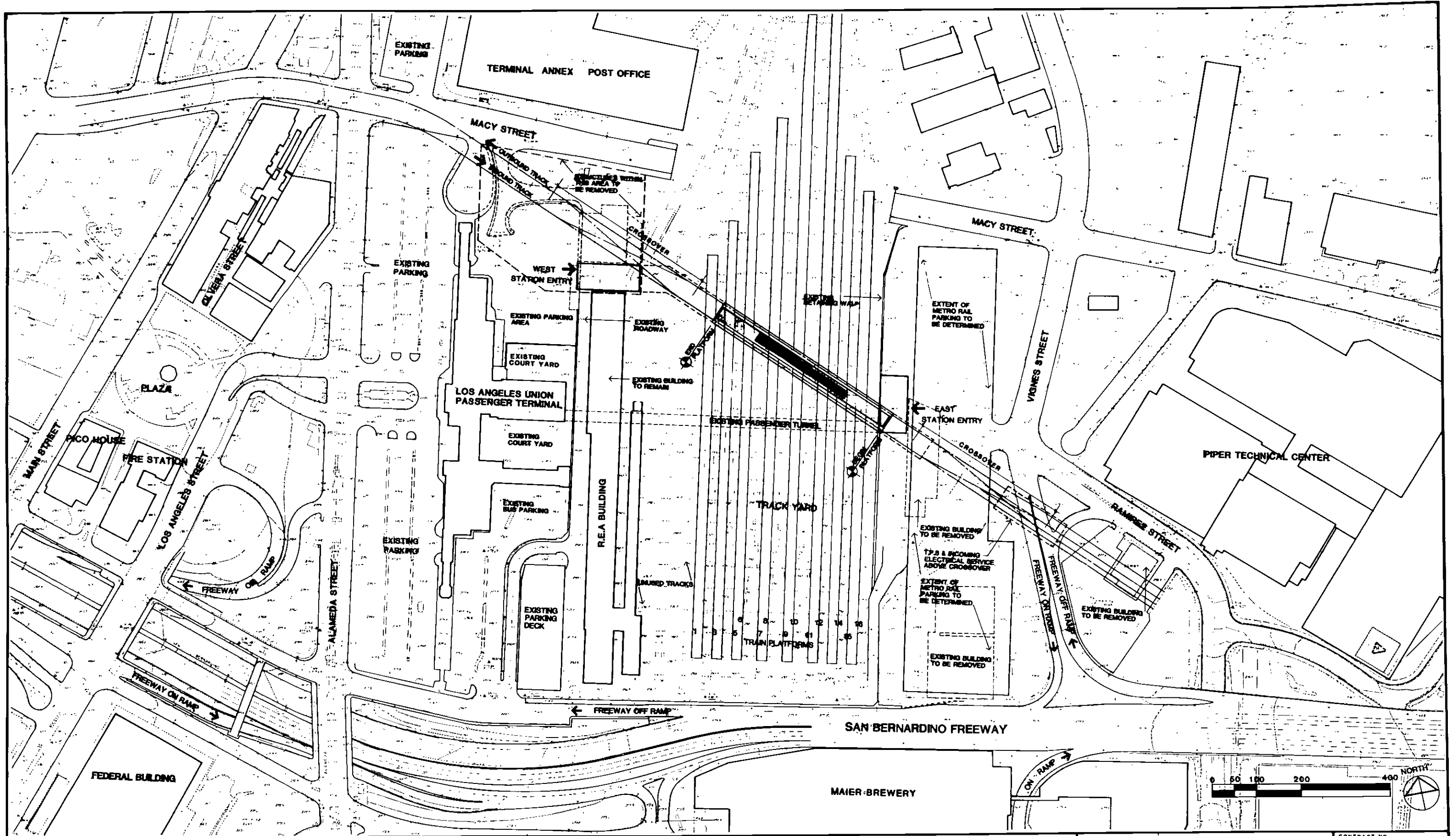
	NEW BUILDING
	EXISTING BUILDING TO REMAIN
	EXISTING BUILDING TO BE REMOVED
	WINDOW WALL
	ARCHITECTURAL FENCE
	STREET ENTRANCE PARAPET, STAIR AND ESCALATOR
	EMERGENCY HATCH AT SIDEWALK
	BUS STOP
	ELEVATOR
	FLUSH GRATING AT SIDEWALK
	GRATING ON TOP OF 10 FT. 'HEADHOUSE'
	PLATFORM EDGES
	FARE GATES AND STATION AGENT'S BOOTH
	FARE VENDORS
	TELEPHONES
	SHAFTS
	EXISTING COLUMN REFERENCE GRID
	NEW COLUMN REFERENCE GRID
	
	SECTION
	DETAIL
	ELEVATION
	LIMIT OF WORK LINE
	PROPERTY LINE
	CENTER LINE OF STREET
	CENTER LINE OF TRACK
	STATIONING LINE
	ELEVATION AT ENTRY
	REVISION
	ROOM TYPE
	EARTH
	BICYCLE PARKING

Figure 6-1.
Plans, Symbols and Abbreviations



DESIGNED BY HWA Date 6-27-83	DRAWN BY M. POINDEXER Date 6-27-83	CHECKED BY J. YEN Date 6-30-83		
REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION J.Y. 7/1/83				
REV	DATE	BY	APP.	DESCRIPTION

HARRY WEESSE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY: *[Signature]*
 PROJECT MANAGER

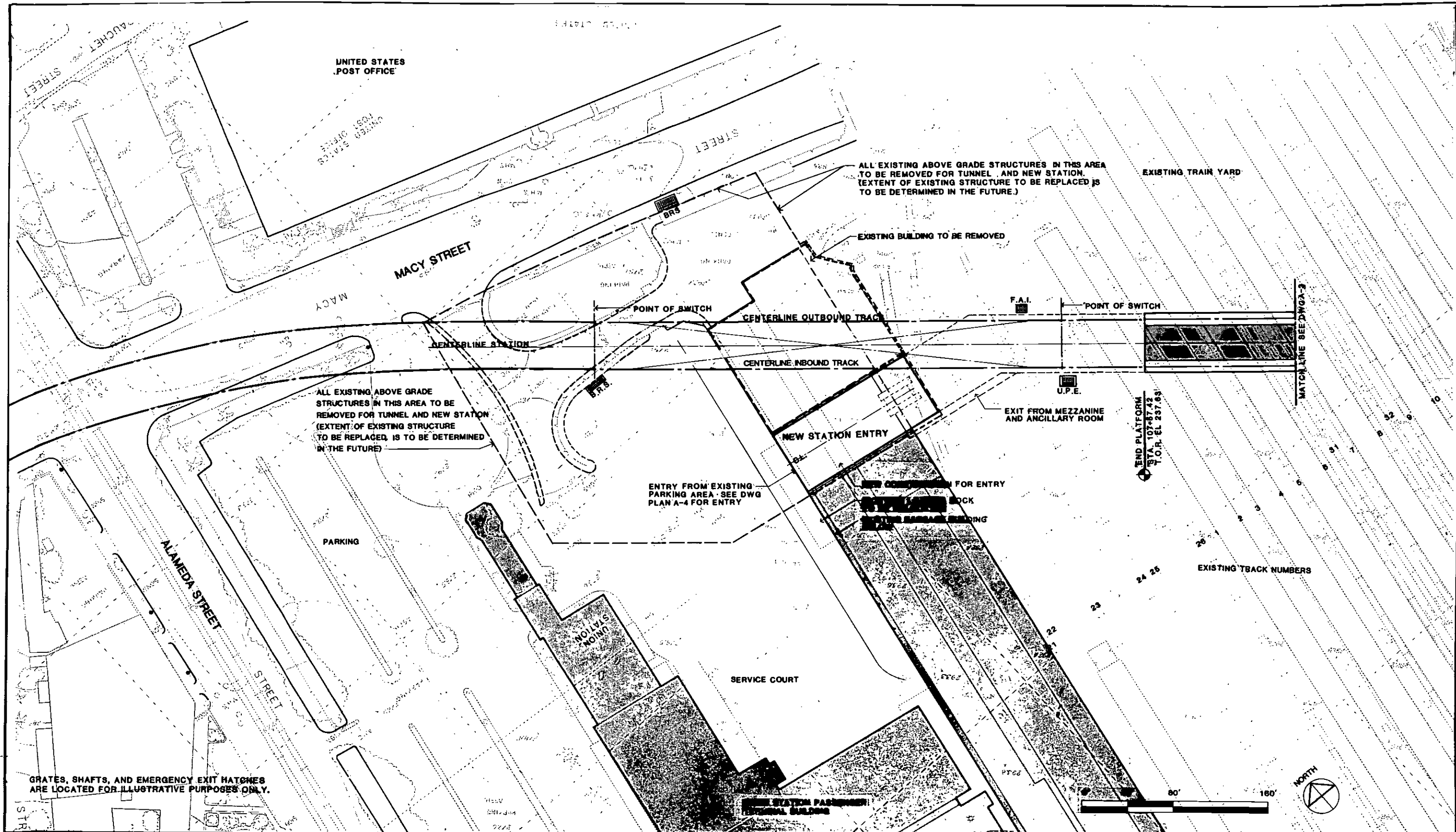
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ Date _____
 APPROVED _____ Date _____
 Reg. No. _____ MANAGER / CHIEF ENGINEER Reg. No. _____

UNION STATION
 SITE PLAN
 PRELIMINARY

CONTRACT NO. A135
 DRAWING NO. A-1
 SCALE 1" = 100'
 SHEET NO. 10 OF 31

Figure 6-2
 Union Station: Site Plan



GRATES, SHAFTS, AND EMERGENCY EXIT MATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.

REV.	DATE	BY	APP.	DESCRIPTION
1	4/20/03	J.Y.	PP	ENTRANCE REVISIONS
2	4/20/03	J.Y.	PP	REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY	Date	4/20/03
HWA		
DRAWN BY	Date	4/20/03
M. HOMER		
CHECKED BY	Date	4/20/03
J. TEN	PIGATI	

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

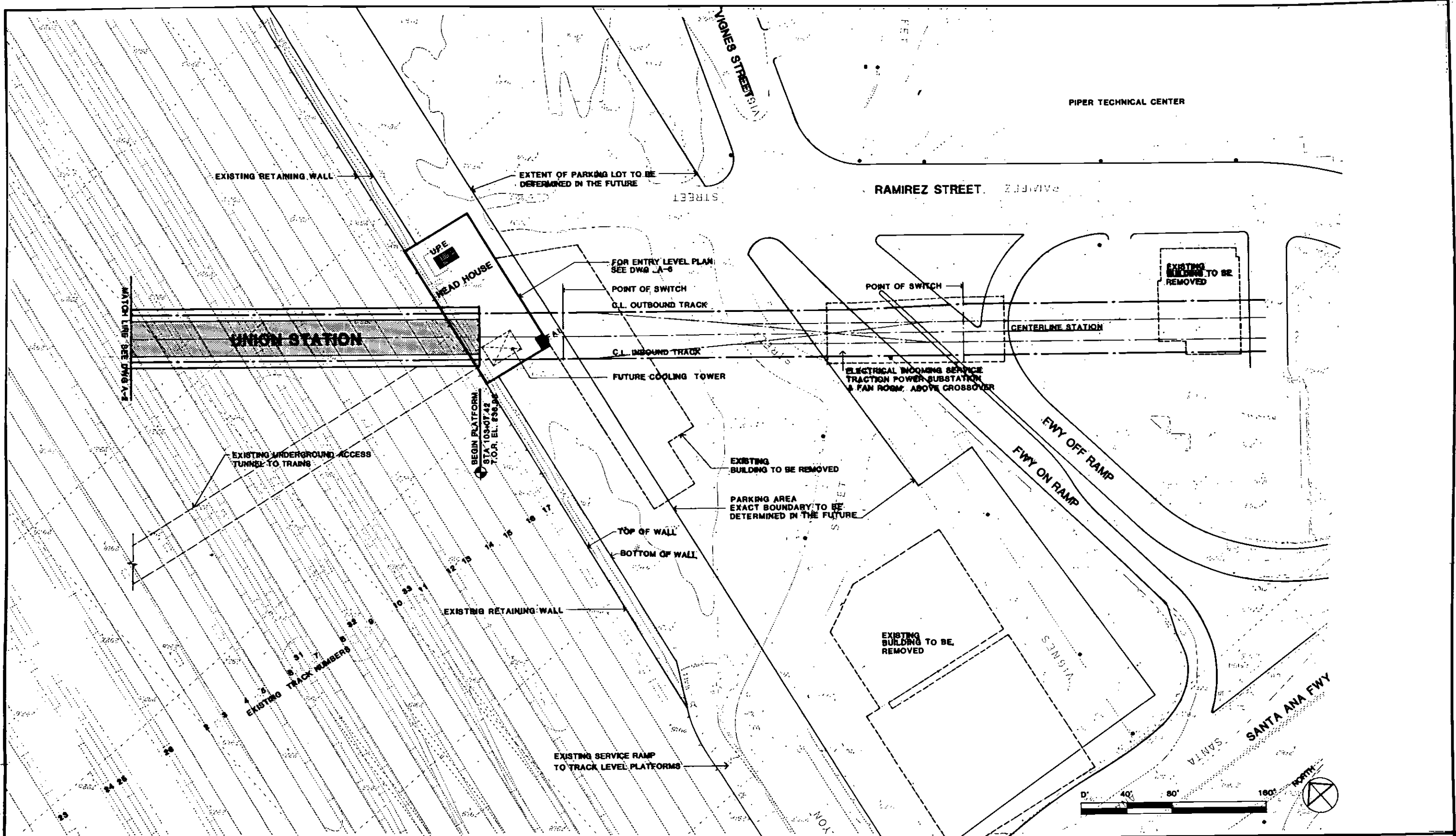
APPROVAL RECOMMENDED _____ Date _____
 Reg. No. _____

APPROVED _____ Date _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

UNION STATION
 SITE PLAN-WEST ENTRANCE
 PRELIMINARY

CONTRACT NO.	A135
DRAWING NO.	A-2
SCALE	1"=40'-0"
SHEET NO.	11 OF 31

Figure 6-3
 Union Station: Site Plan - West Entrance



REV.	DATE	BY	APP.	DESCRIPTION
1	4/19/83	HWA		DESIGNED BY
2	4/19/83	M. HOWER / B. KAPLAN		DRAWN BY
3	4/26/83	J. TEN		CHECKED BY
4				PROVISIONS TO AUXILIARY ROOMS FOR COST REDUCTION

DESIGNED BY Date 4/19/83
 HWA
 DRAWN BY Date 4/19/83
 M. HOWER / B. KAPLAN
 CHECKED BY Date 4/26/83
 J. TEN PLOT 1

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 QIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

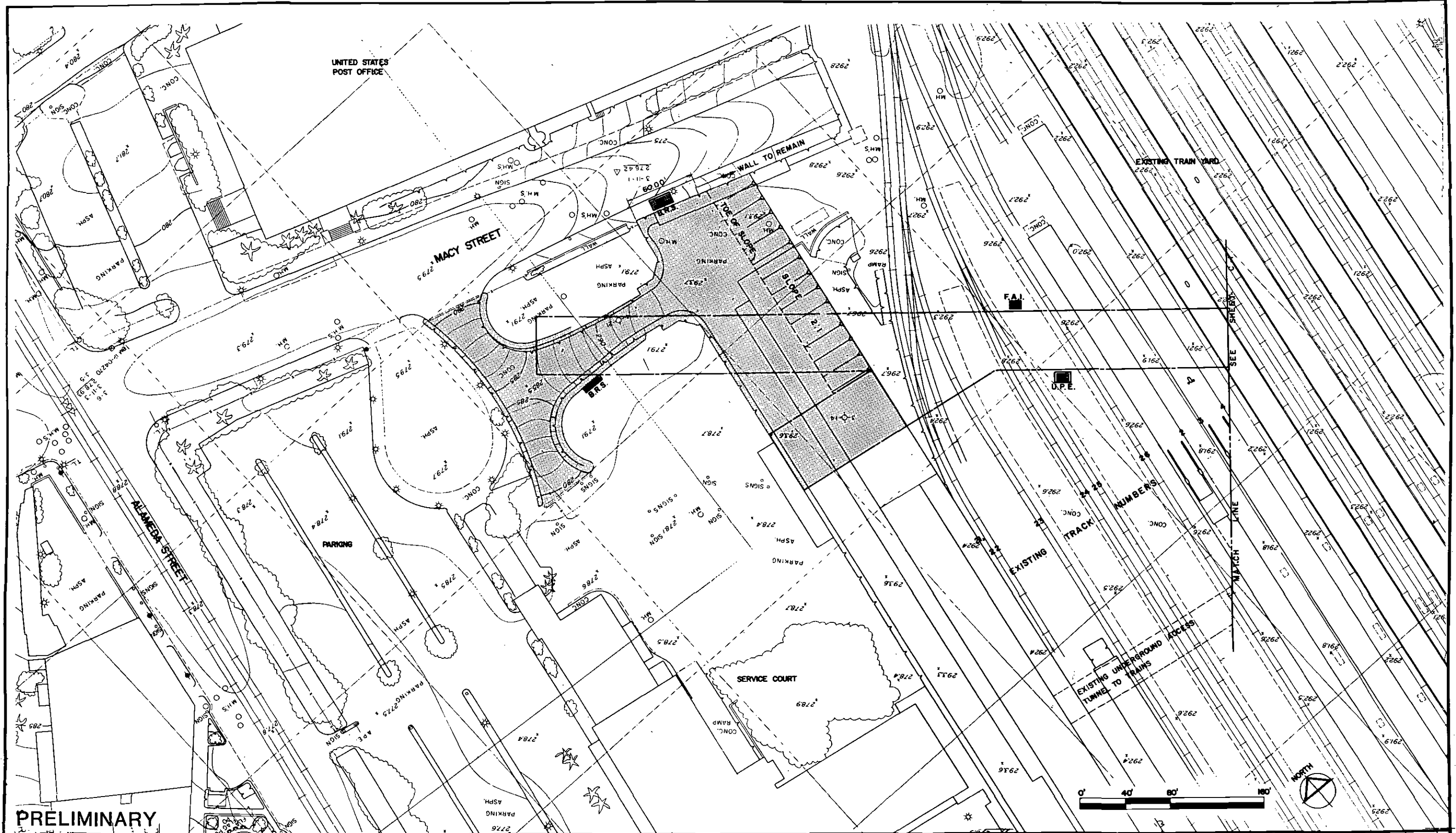
APPROVAL RECOMMENDED _____ Date _____
 Reg. No. _____

APPROVED _____ Date _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

UNION STATION
 SITE PLAN - EAST ENTRANCE
 PRELIMINARY

CONTRACT NO. 1135
 DRAWING NO. A-3
 SCALE 1" = 40'-0"
 SHEET NO. 12 OF 31


Figure 6-4
Union Station: Site Plan - East Entrance



REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY	Date 5/11/83
TAMS	
DRAWN BY	Date 5/13/83
S.A.N / RGL	
CHECKED BY	Date 5/13/83
JLD	

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

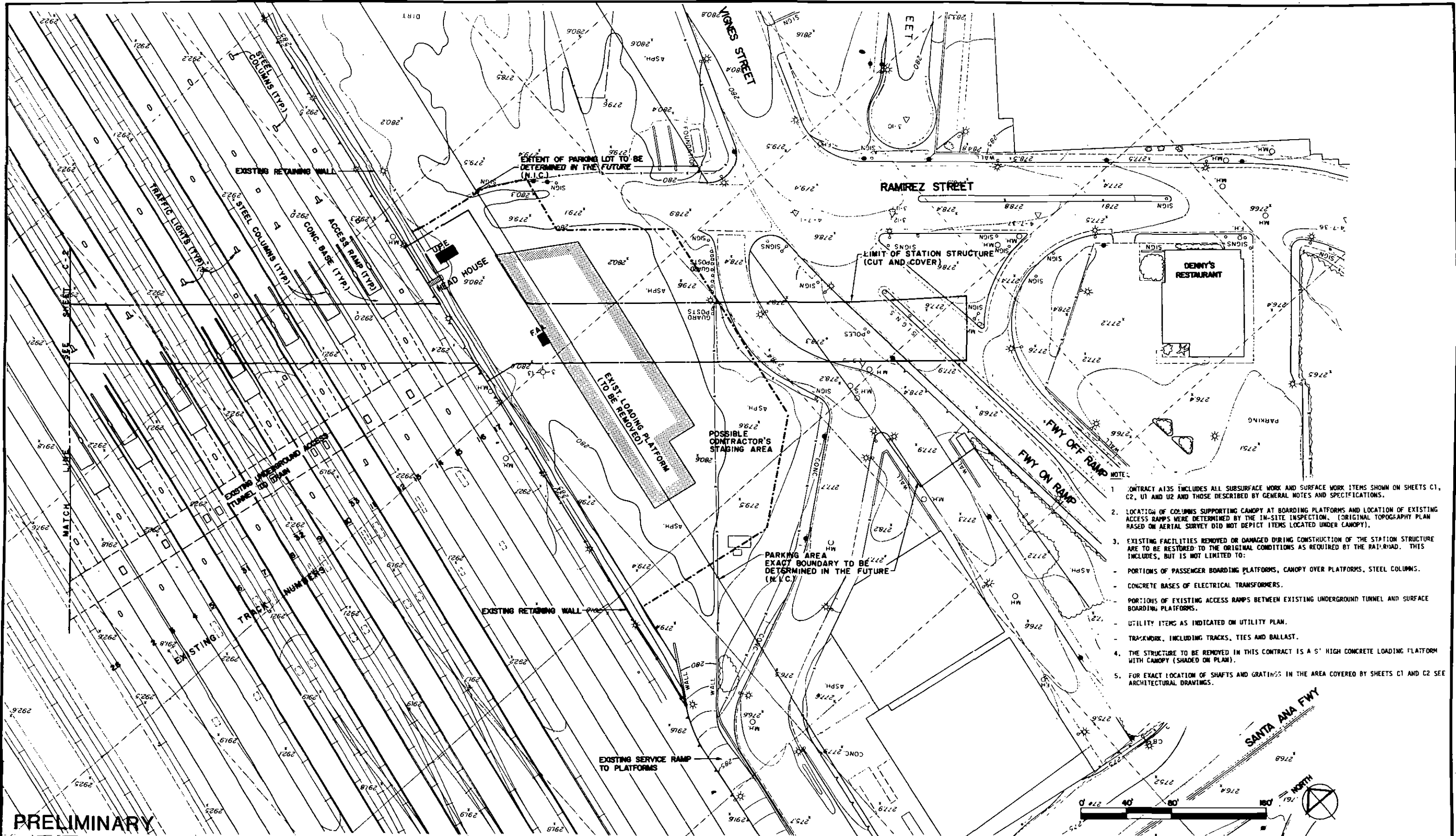


APPROVAL RECOMMENDED	APPROVED	Date
Reg. No. _____	MANAGER / CHIEF ENGINEER	Reg. No. _____

UNION STATION
CIVIL SITE PLAN-WEST ENTRANCE

CONTRACT NO.	A 135
DRAWING NO.	C-2
SCALE	1" = 40' - 0"
SHEET NO.	14 OF 31

Figure 6-5
 Union Station: Civil Site Plan - West Entrance



- NOTE:
1. CONTRACT A135 INCLUDES ALL SUBSURFACE WORK AND SURFACE WORK ITEMS SHOWN ON SHEETS C1, C2, U1 AND U2 AND THOSE DESCRIBED BY GENERAL NOTES AND SPECIFICATIONS.
 2. LOCATION OF COLUMNS SUPPORTING CANOPY AT BOARDING PLATFORMS AND LOCATION OF EXISTING ACCESS RAMPS WERE DETERMINED BY THE IN-SITE INSPECTION. (ORIGINAL TOPOGRAPHY PLAN BASED ON AERIAL SURVEY DID NOT DEPICT ITEMS LOCATED UNDER CANOPY).
 3. EXISTING FACILITIES REMOVED OR DAMAGED DURING CONSTRUCTION OF THE STATION STRUCTURE ARE TO BE RESTORED TO THE ORIGINAL CONDITIONS AS REQUIRED BY THE RAIRIAD. THIS INCLUDES, BUT IS NOT LIMITED TO:
 - PORTIONS OF PASSENGER BOARDING PLATFORMS, CANOPY OVER PLATFORMS, STEEL COLUMNS.
 - CONCRETE BASES OF ELECTRICAL TRANSFORMERS.
 - PORTIONS OF EXISTING ACCESS RAMPS BETWEEN EXISTING UNDERGROUND TUNNEL AND SURFACE BOARDING PLATFORMS.
 - UTILITY ITEMS AS INDICATED ON UTILITY PLAN.
 - TRACKWORK, INCLUDING TRACKS, TIES AND BALLAST.
 4. THE STRUCTURE TO BE REMOVED IN THIS CONTRACT IS A 5' HIGH CONCRETE LOADING PLATFORM WITH CANOPY (SHADED ON PLAN).
 5. FOR EXACT LOCATION OF SHAFTS AND GRATINGS IN THE AREA COVERED BY SHEETS C1 AND C2 SEE ARCHITECTURAL DRAWINGS.

REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY TAMS Date <u>5/12/83</u>
DRAWN BY RGL / S.A.N. Date <u>5/12/83</u>
CHECKED BY JLD Date <u>5/12/83</u>

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

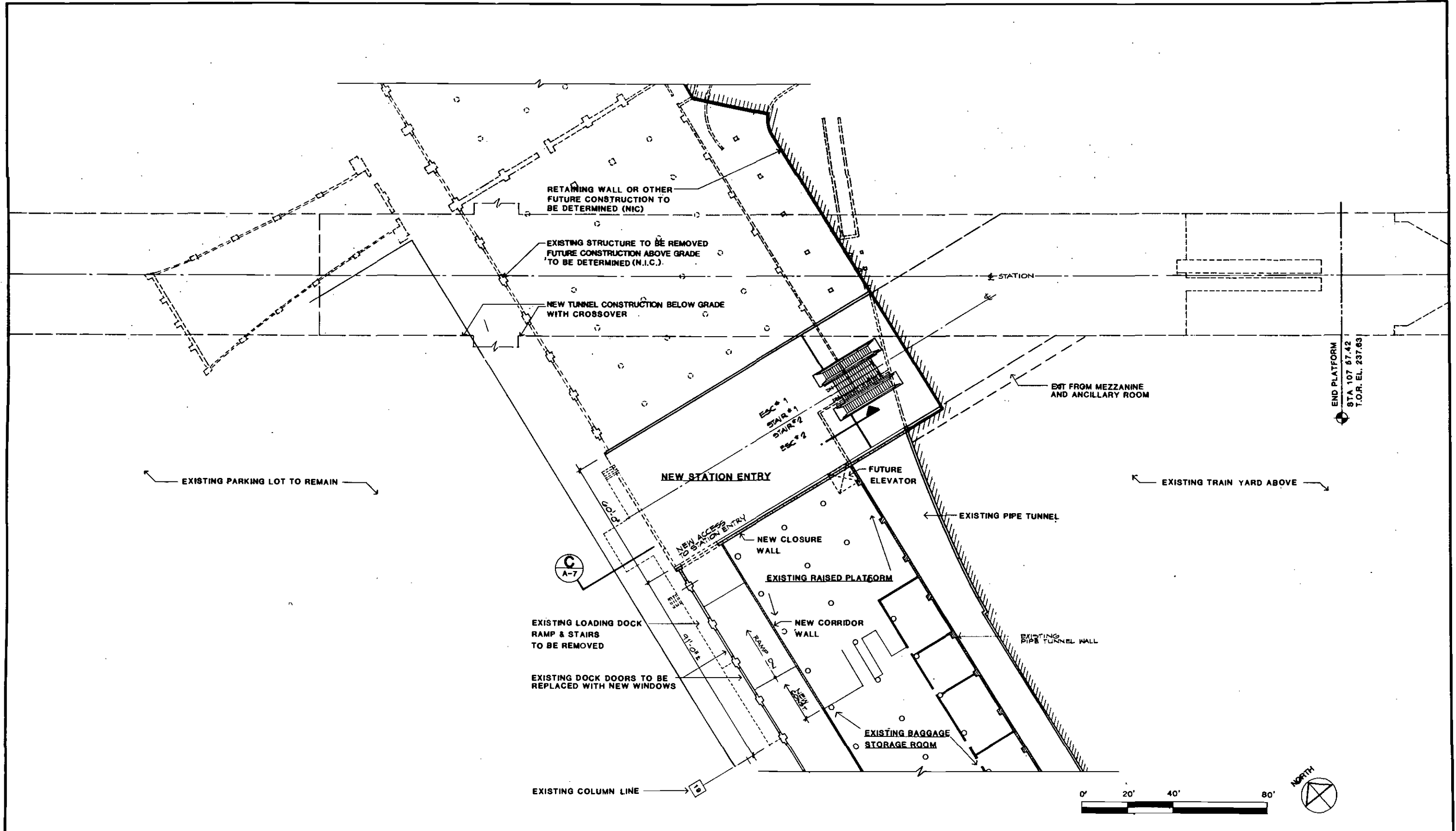
SUBMITTED BY:
[Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT		
METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	DATE
Reg. No. _____	MANAGER / CHIEF ENGINEER	Reg. No. _____

UNION STATION
CIVIL SITE PLAN-EAST ENTRANCE

CONTRACT NO. A135
DRAWING NO. C-1
SCALE 1" = 40' - 0"
SHEET NO. 13 OF 31

Figure 6-6
 Union Station: Civil Site Plan - East Entrance

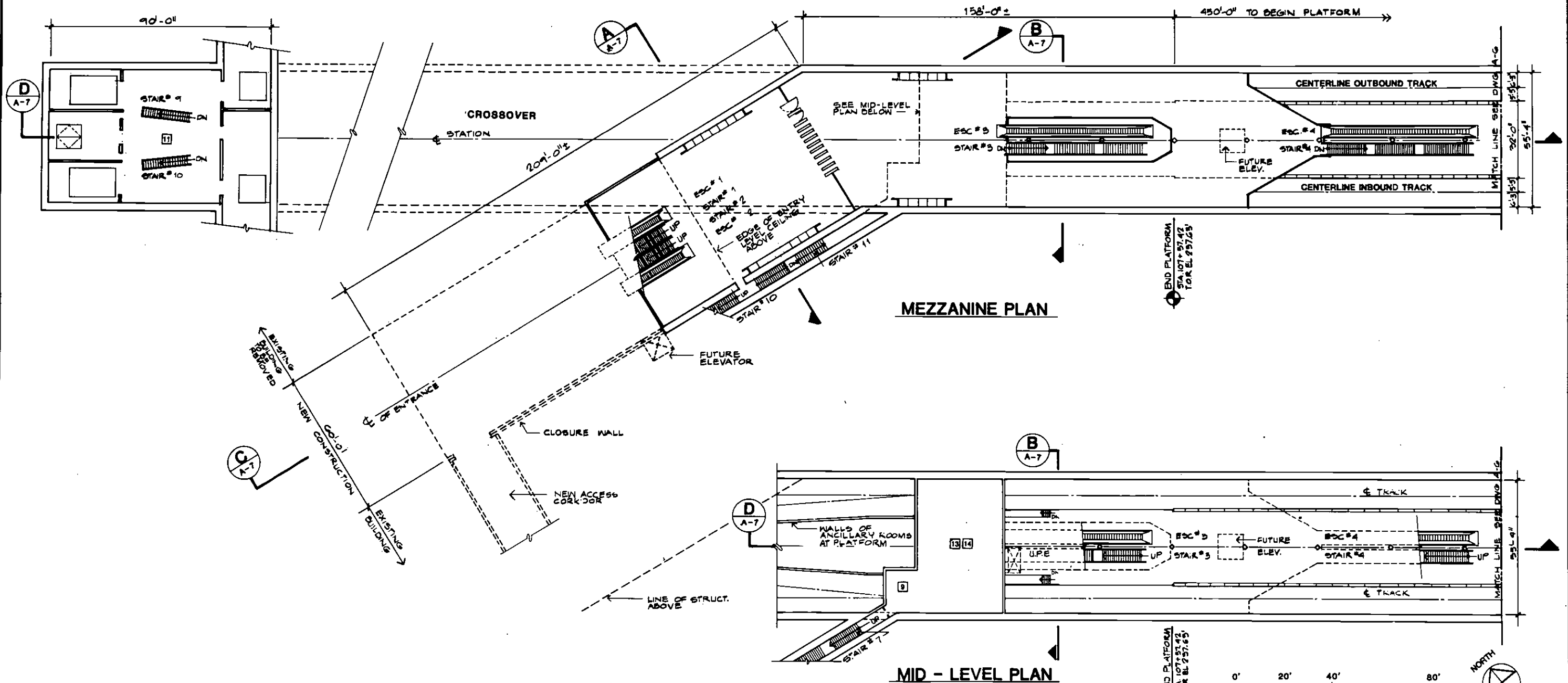


				DESIGNED BY HWA Date: 4/20/03	HARRY WEESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 	UNION STATION STATION ENTRY PLAN WEST ENTRANCE PRELIMINARY	CONTRACT NO. A135
				DRAWN BY M. HOMER Date: 4/20/03				DRAWING NO. A-4
REV. DATE BY APP. DESCRIPTION				CHECKED BY J. YEN Date: 4/20/03 PCAT	APPROVAL RECOMMENDED	APPROVED	SCALE 1"=20'-0"	SHEET NO. 17 OF 31

Figure 6-7
Union Station: Station Entry Plan - West Entrance

SERVICE AND EQUIPMENT ROOMS

- | | | | |
|-----------------------------|----------------------------------|-------------------------|------------------------------|
| 1 Traction Power Substation | 9 Mechanical | 17 Ejector | 25 Telephone Equipment |
| 2 Auxiliary Power | 10 Fan | 18 Sprinkler Valves | 26 Deleted |
| 3 Train Control | 11 Emergency Fan | 19 Sump Pump | 27 Deleted |
| 4 Communications | 12 Chiller | 20 Gap Breaker Station | 28 Trash |
| 5 Batteries | 13 Air Supply Unit | 21 Emergency Equipment | 29 Staff |
| 6 Elevator Equipment | 14 Smoke Exhaust | 22 Custodial | 30 Deleted |
| 7 Deleted | 15 Under Platform Exhaust | 23 Electrical Equipment | 31 Electric Incoming Service |
| 8 Storage | 16 Under Platform Exhaust Plenum | 24 Toilet | |



COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.

REV.	DATE	BY	APP.	DESCRIPTION
5-0-83	M/S	J.Y.		ENTRANCE REVISIONS
5-20-83	J.Y.			REVISIONS TO ANCILLARY ROOMS FOR

DESIGNED BY
HWA
Date 6-7-83

DRAWN BY
M. POINDEXTER
Date 6-7-83

CHECKED BY
J.TEN
Date 6-20-83

HARRY WEESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED
Reg. No. _____

APPROVED
Date _____
MANAGER / CHIEF ENGINEER
Reg. No. _____

UNION STATION
MEZZANINE LEVEL PLAN
WEST ENTRANCE
PRELIMINARY

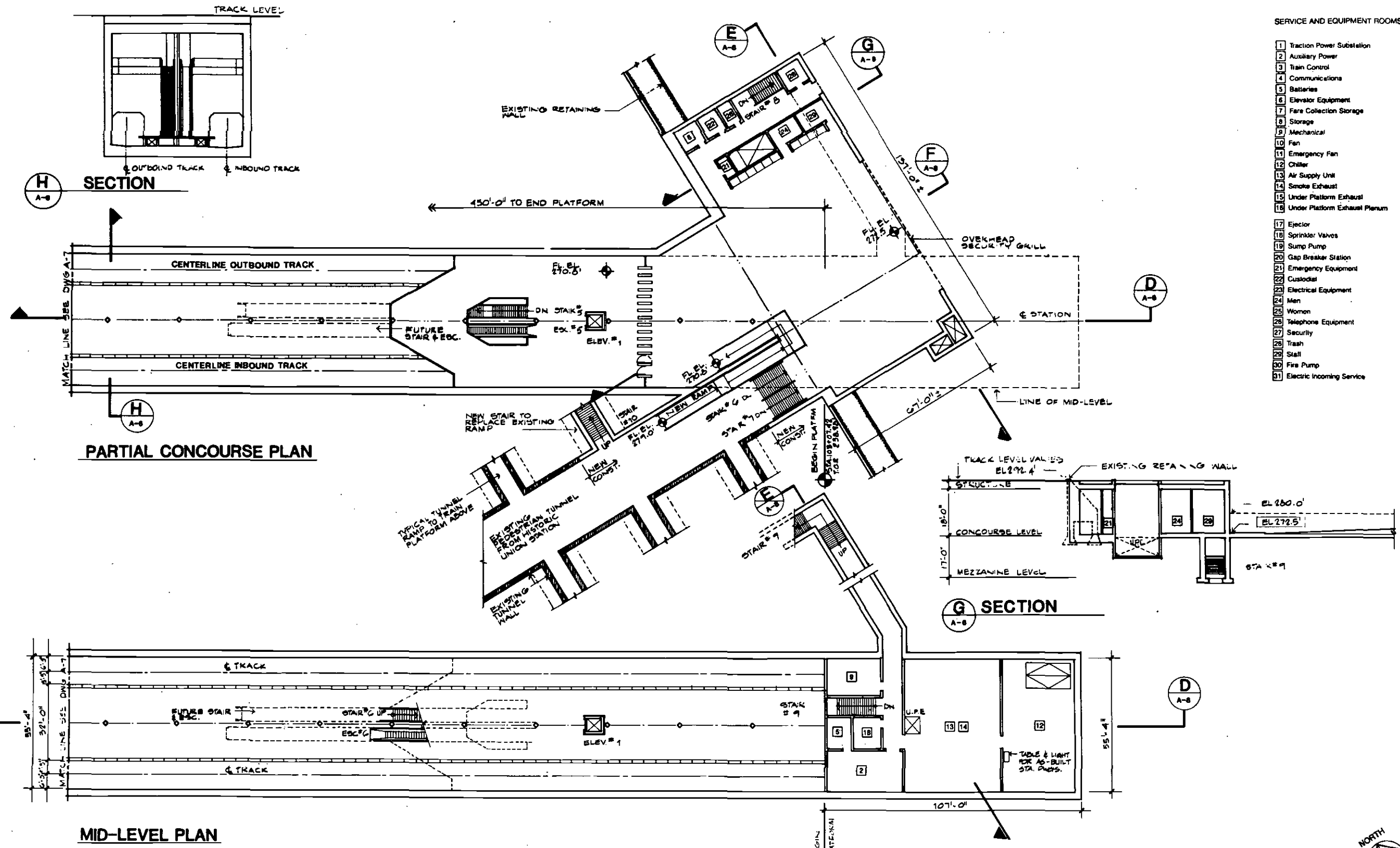
CONTRACT NO.
A135

DRAWING NO.
A-5

SCALE
1"=20'-0"

SHEET NO.
18 OF 31

Figure 6-8
Union Station: Mezzanine Level Plan - West Entrance



SERVICE AND EQUIPMENT ROOMS

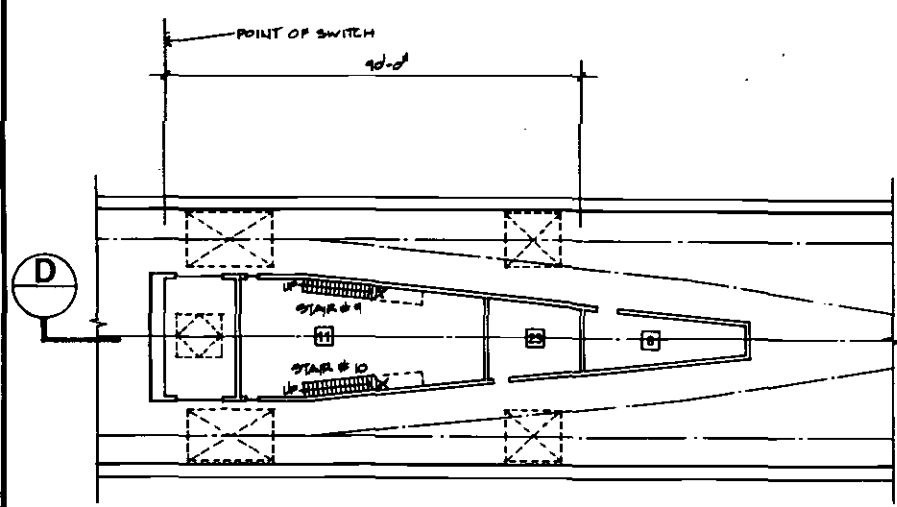
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- 2 Auxiliary Power
- 3 Train Control
- 4 Communications
- 5 Batteries
- 6 Elevator Equipment
- 7 Fare Collection Storage
- 8 Storage
- 9 Mechanical
- 10 Fan
- 11 Emergency Fan
- 12 Chiller
- 13 Air Supply Unit
- 14 Smoke Exhaust
- 15 Under Platform Exhaust
- 16 Under Platform Exhaust Plenum
- 17 Ejector
- 18 Sprinkler Valves
- 19 Sump Pump
- 20 Gap Breaker Station
- 21 Emergency Equipment
- 22 Custodian
- 23 Electrical Equipment
- 24 Men
- 25 Women
- 26 Telephone Equipment
- 27 Security
- 28 Trash
- 29 Stall
- 30 Fire Pump
- 31 Electric Incoming Service

COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.

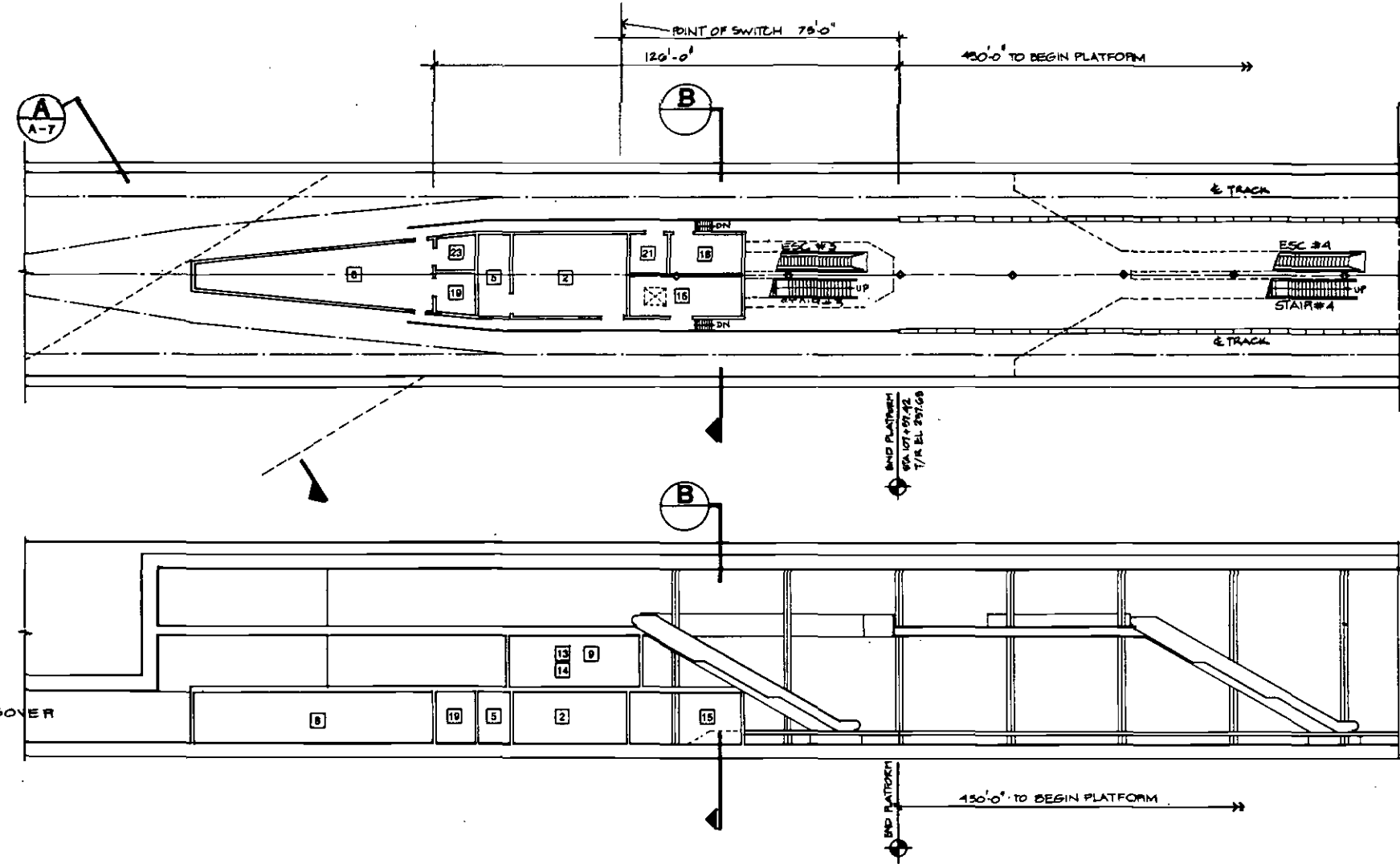


	DESIGNED BY HWA Date 6/10/83	HARRY WEESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 	UNION STATION PLANS / SECTIONS EAST ENTRANCE PRELIMINARY	CONTRACT NO. A 135								
	DRAWN BY A. VERMA. 6/10/83		APPROVAL Recommended _____ Date _____ APPROVED _____ Date _____ MANAGER / CHIEF ENGINEER	DRAWING NO. A-6 SCALE 1"=20'-0" SHEET NO. 19 OF 31									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>REV.</th> <th>DATE</th> <th>BY</th> <th>APP.</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	REV.		DATE	BY	APP.	DESCRIPTION						CHECKED BY J.YEN Date 6/30/83	
REV.	DATE	BY	APP.	DESCRIPTION									

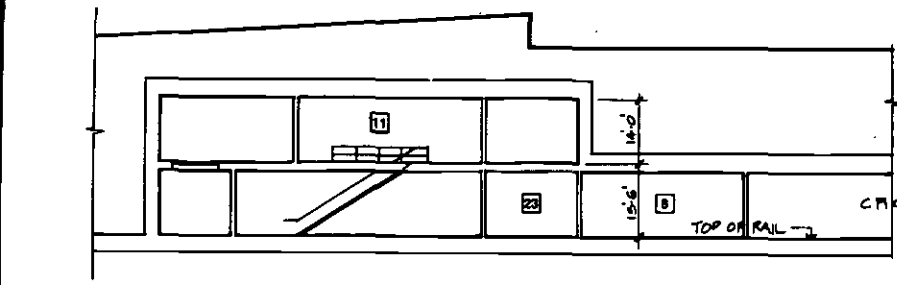
Figure 6-9
Union Station: Plans and Section - East Entrance 88



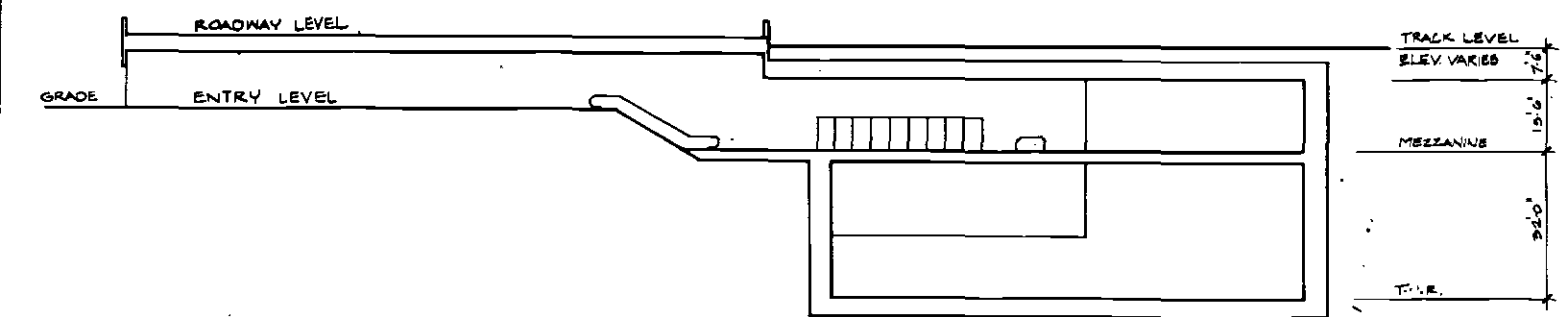
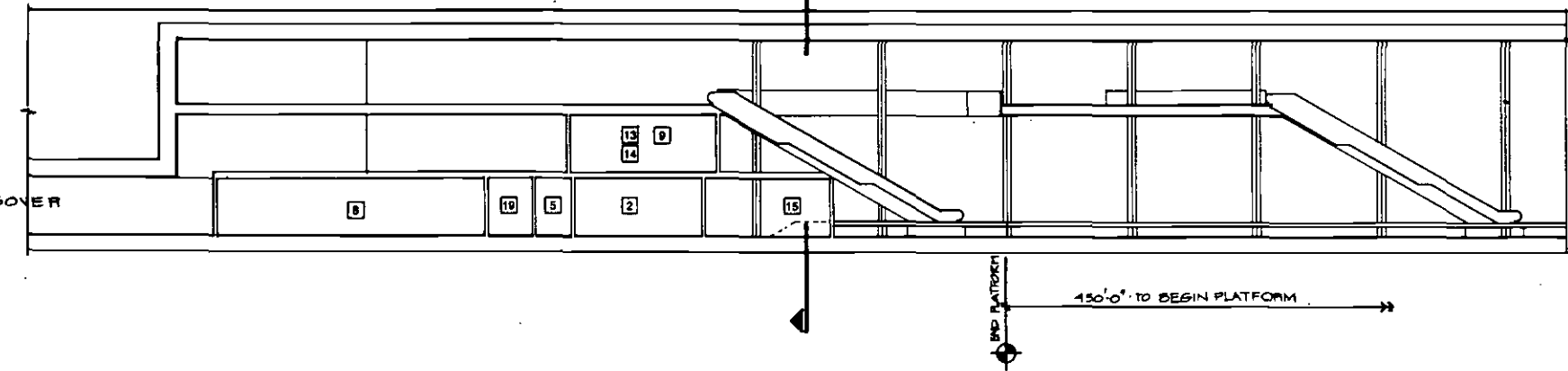
PARTIAL PLATFORM PLAN



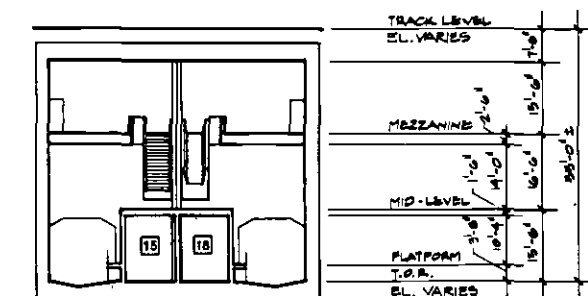
- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Toilet
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff / Security
 - 30 Deleted
 - 31 Electric Incoming Service



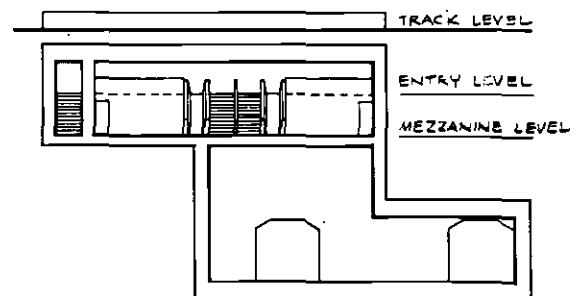
D PARTIAL SECTION



C SECTION

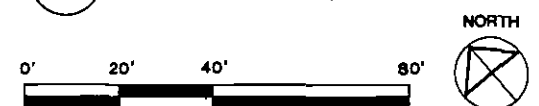


B SECTION



A SECTION

COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.



REV.	DATE	BY	APP.	DESCRIPTION
1	4/20/03	J.Y.	[Signature]	ENTRANCE REVISIONS
2	4/20/03	J.Y.	[Signature]	REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY	HWA	Date	4/20/03
DRAWN BY	ROJ	Date	4/20/03
CHECKED BY	J.YEN	Date	4/20/03
	PIERATTI		

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:
 [Signature]
 PROJECT MANAGER

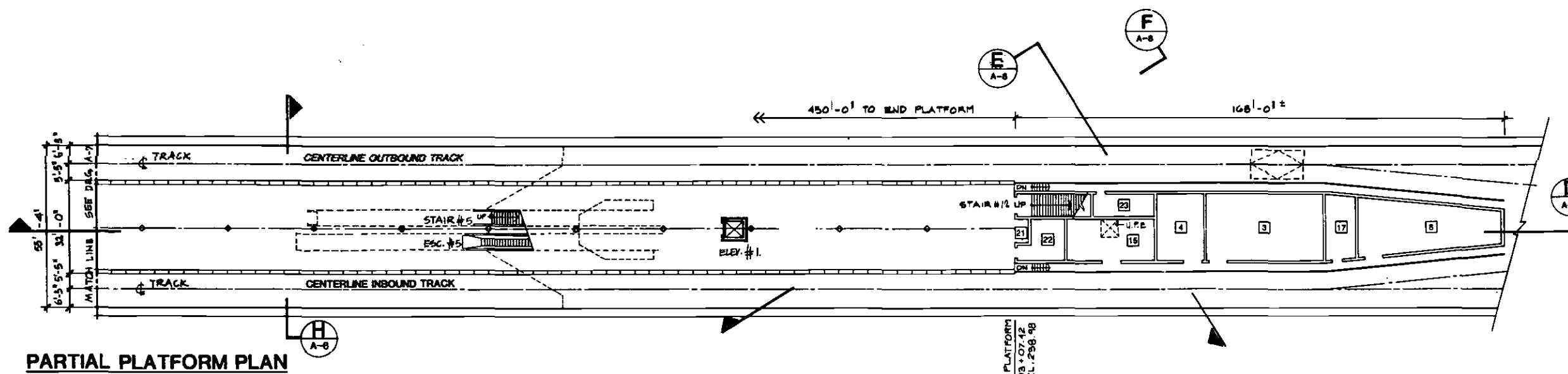
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ Date _____
 Reg. No. _____

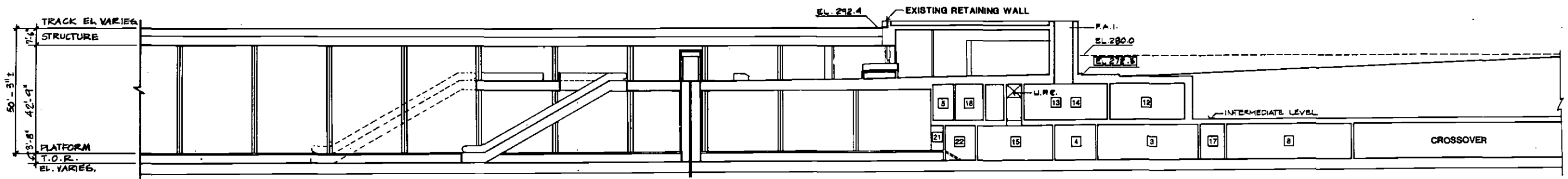
APPROVED _____ Date _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

UNION STATION
PLATFORM LEVEL PLAN
WEST ENTRANCE
PRELIMINARY

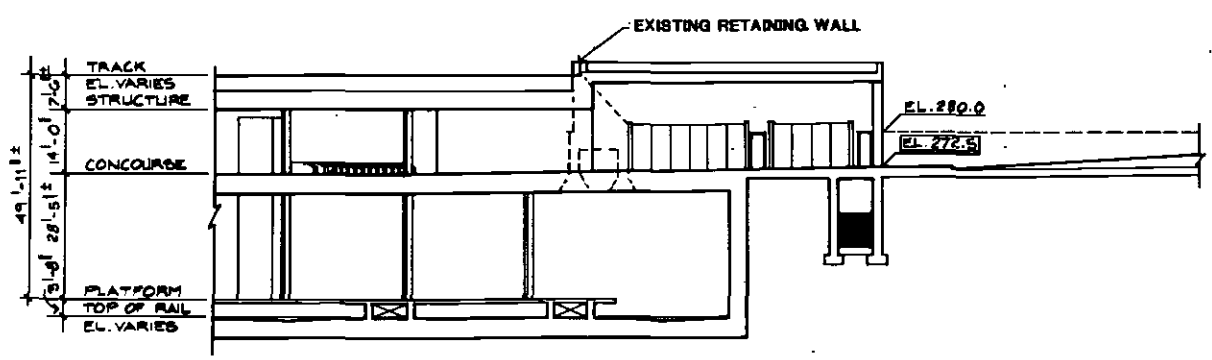
CONTRACT NO.	A135
DRAWING NO.	A-7
SCALE	1"=20'-0"
SHEET NO.	20 OF 31



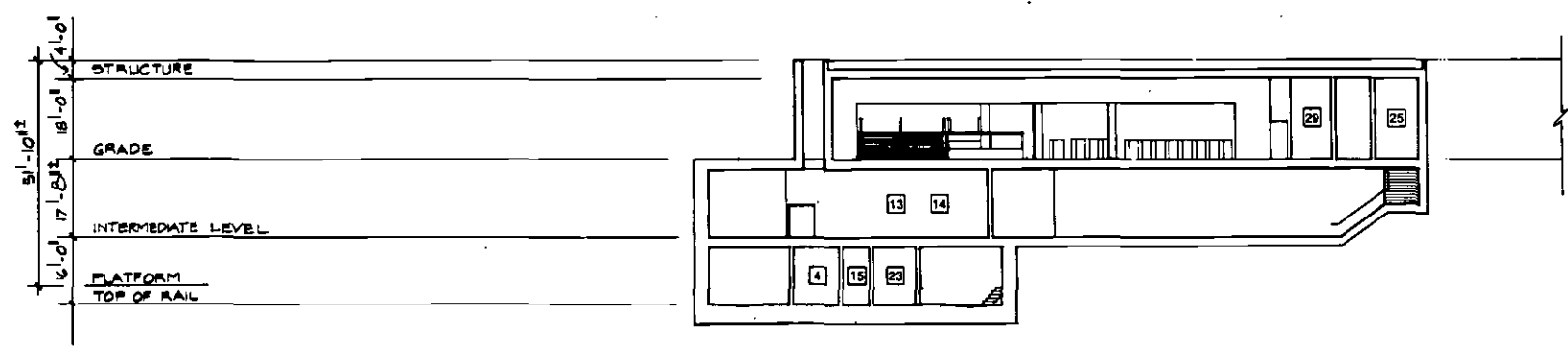
- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Toilet
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff
 - 30 Deleted
 - 31 Electric Incoming Service



D PARTIAL SECTION



F SECTION



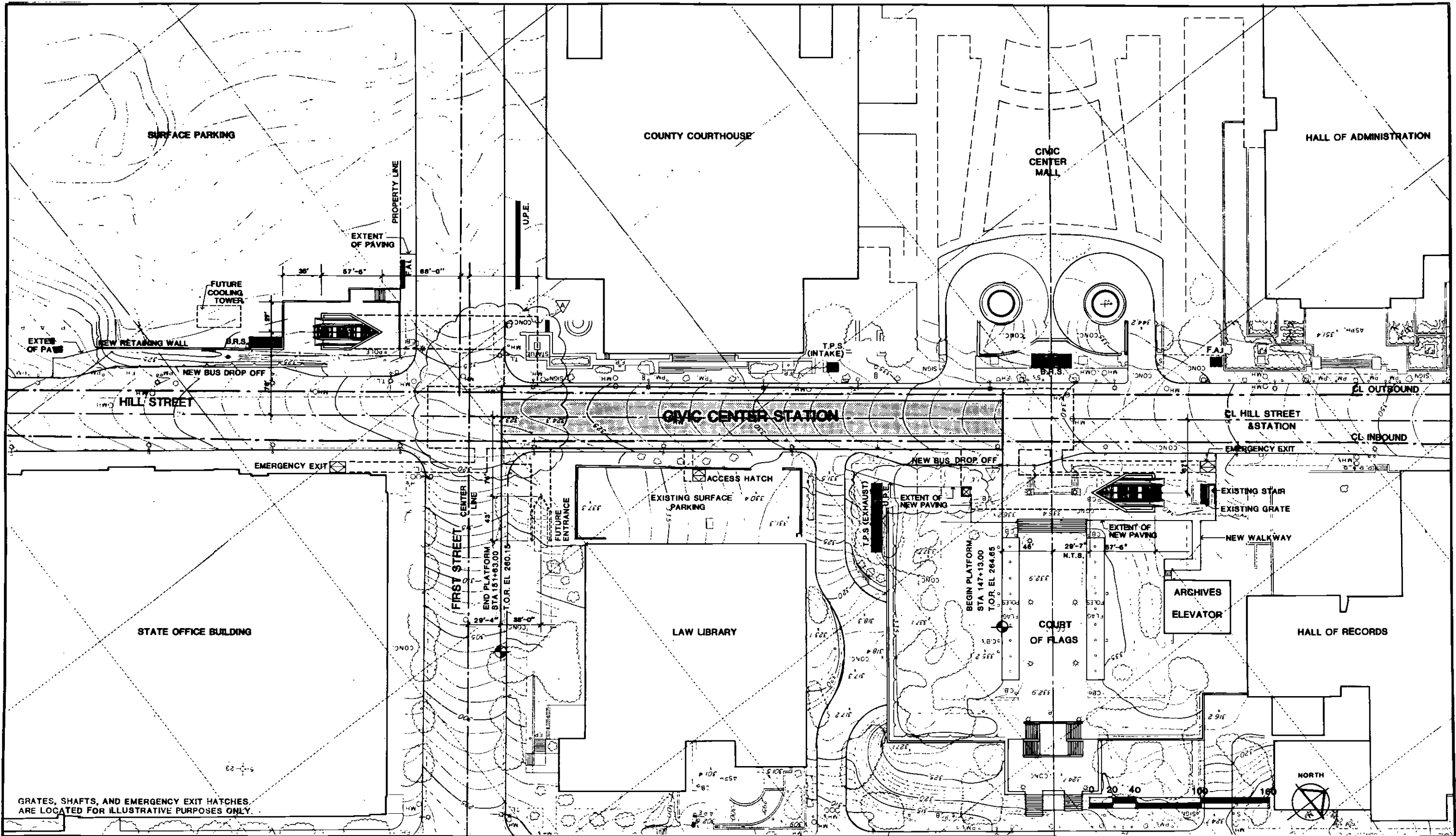
E SECTION



COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.

DESIGNED BY HWA Date 6/10/83		HARRY WEESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 	UNION STATION PLANS / SECTIONS EAST ENTRANCE PRELIMINARY	CONTRACT NO. A 135
DRAWN BY A. VERMA Date 6/10/83					DRAWING NO. A-8
CHECKED BY J. YEN Date 6/20/83					SCALE 1" = 20'-0"
REVISIONS TO AUXILIARY ROOMS FOR COST REDUCTION		SUBMITTED BY: PROJECT MANAGER	APPROVAL RECOMMENDED _____ Reg. No. _____	APPROVED _____ MANAGER / CHIEF ENGINEER Reg. No. _____	SHEET NO. 21 OF 31

Figure 6-11
Union Station: Plans and Sections - East Entrance 90



GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.

REV.	DATE	BY	APP.	DESCRIPTION
1	11/83	MD	JY	REVISIONS AS PER SCRIP COMMENTS.
2	1/84	MD	JY	REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTIONS.

DESIGNED BY HLA	Date 3/10/83
DRAWN BY D. ZAFERES	Date 3/10/83
CHECKED BY J. YEN	Date 3/15/83

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

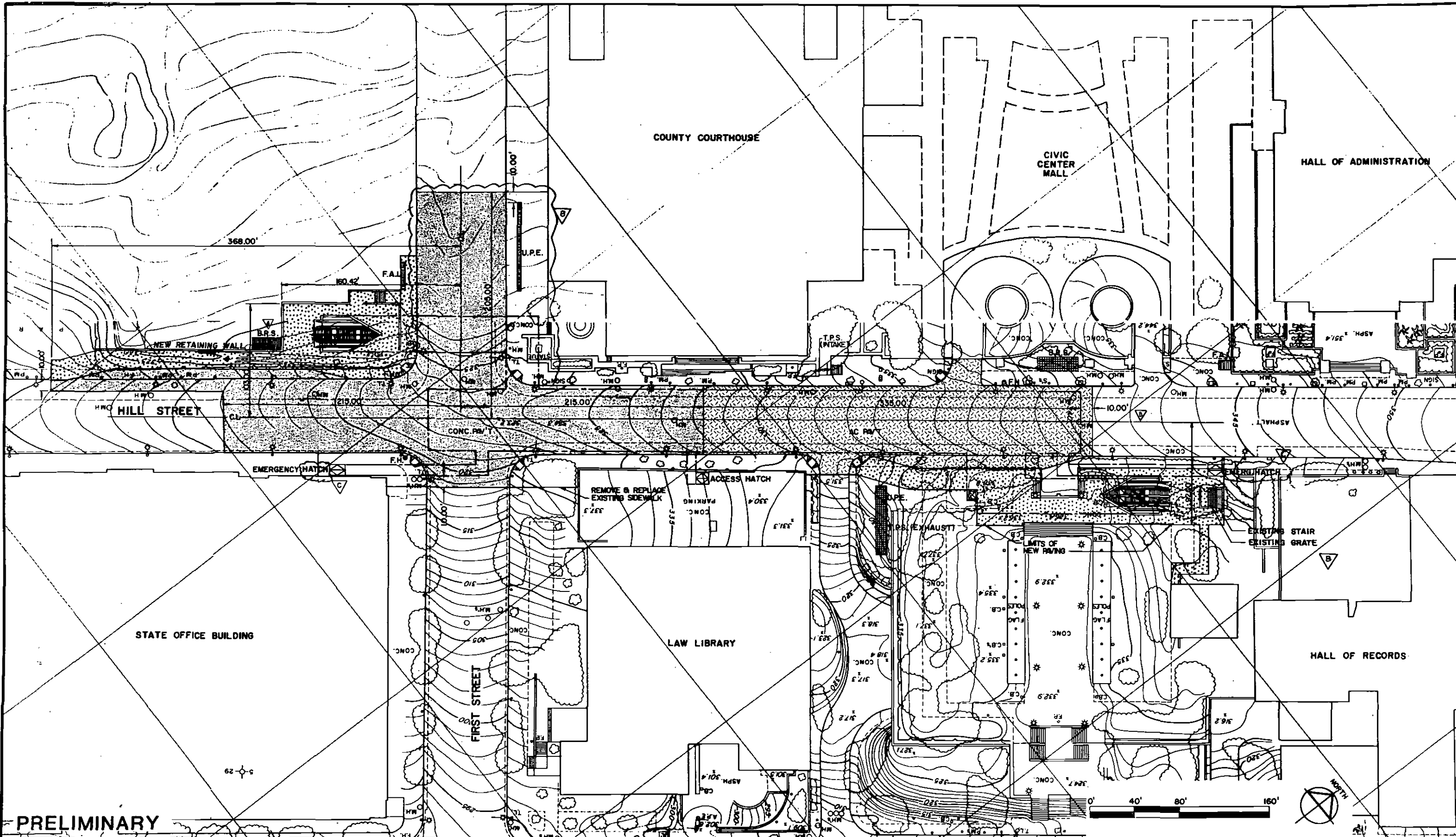
APPROVAL RECOMMENDED _____ Date _____
 Reg. No. _____

APPROVED _____ Date _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

CIVIC CENTER STATION
 SITE PLAN
 PRELIMINARY

CONTRACT NO.	A140
DRAWING NO.	A-9
SCALE	1" = 40'-0"
SHEET NO.	33 OF 60

Figure 6-12
 Civic Center Station: Site Plan 91



PRELIMINARY

REV.	DATE	BY	APP.	DESCRIPTION
7/20/85	JLD			REVISED EXIT TO HATCH
8/18/85	J.L.O.			ADDED SHAFT DESCRIPTION, DIMENSIONS AND EXTENT OF REPAVING
5/1/83	JLD			REVISED GRATING

DESIGNED BY	Date 5/2/85	TAMS
DRAWN BY	Date 5/3/85	S.A.N / RGL
CHECKED BY	Date 5/8/85	JLD

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY: *[Signature]*
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

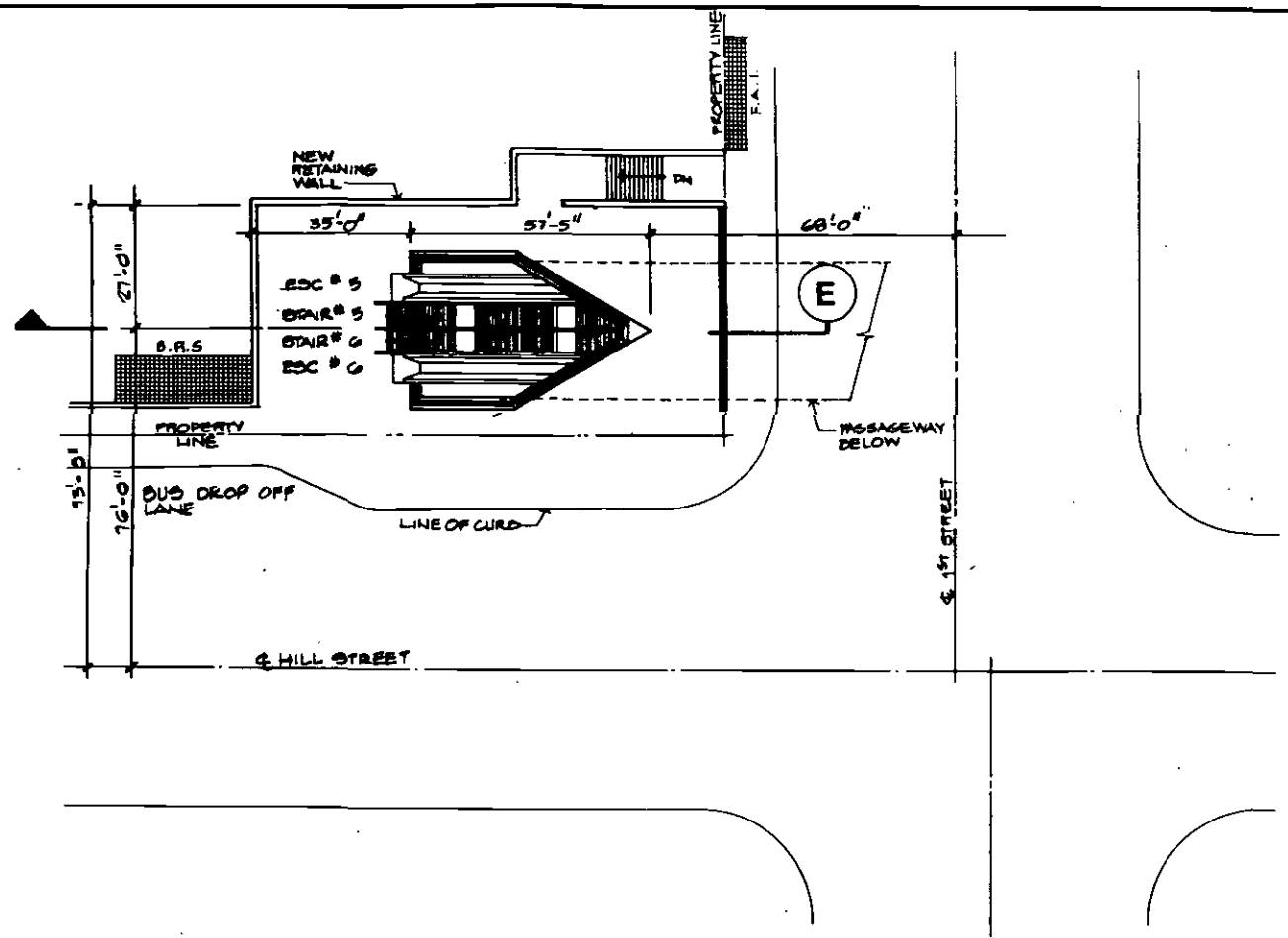
APPROVAL RECOMMENDED: _____
 Reg. No. _____

APPROVED: _____
 Date: _____
 MANAGER / CHIEF ENGINEER
 Reg. No. _____

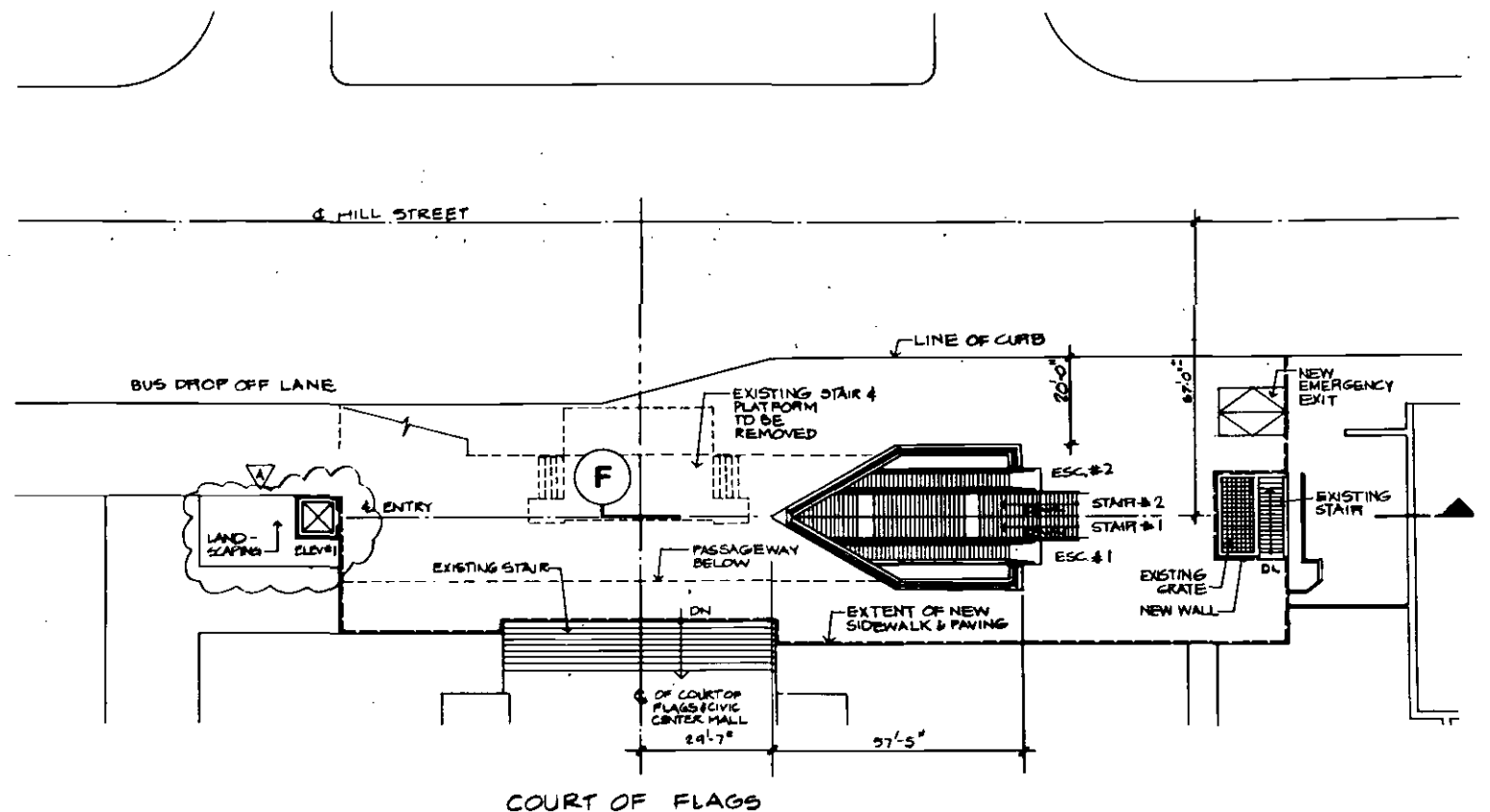
CIVIC CENTER STATION
CIVIL SITE PLAN

CONTRACT NO.	A 140
DRAWING NO.	C-3
SCALE	1" = 40'-0"
SHEET NO.	34 OF 60

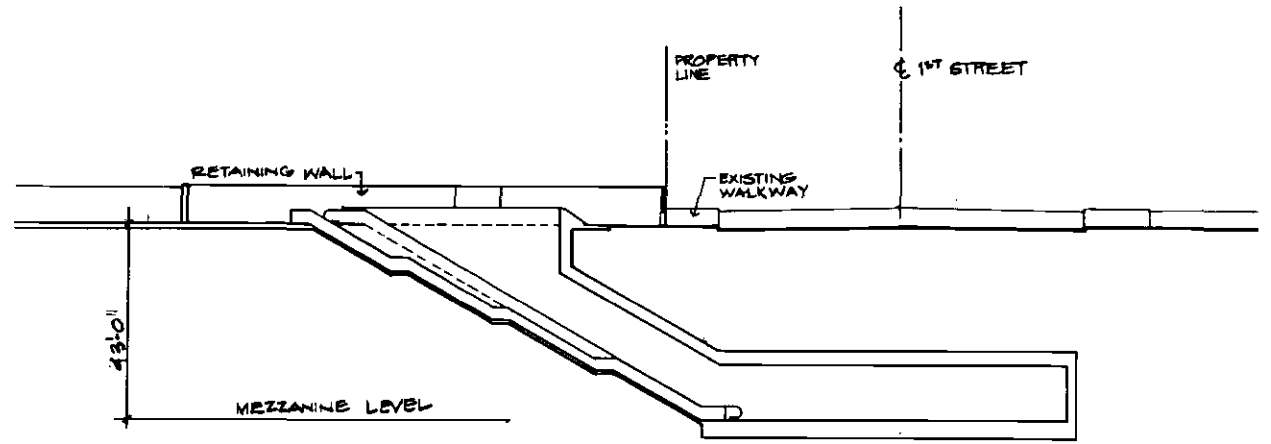
Figure 6-13
 Civic Center Station: Civil Site Plan 92



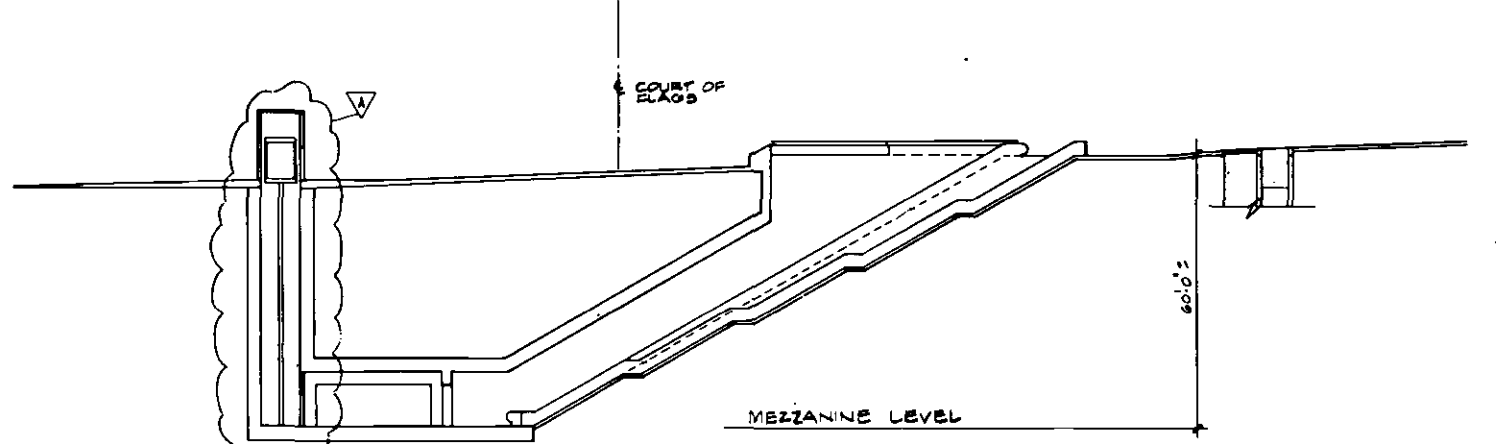
SOUTH ENTRANCE PLAN



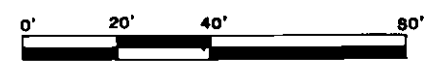
NORTH ENTRANCE PLAN



E SECTION



F SECTION



REV.	DATE	BY	APP.	DESCRIPTION
1	7/1/03	M.		REVISIONS AS PER SERTD COMMENTS.
2	4/24/03			REVISIONS TO AUXILIARY ROOMS FOR COST REDUCTION

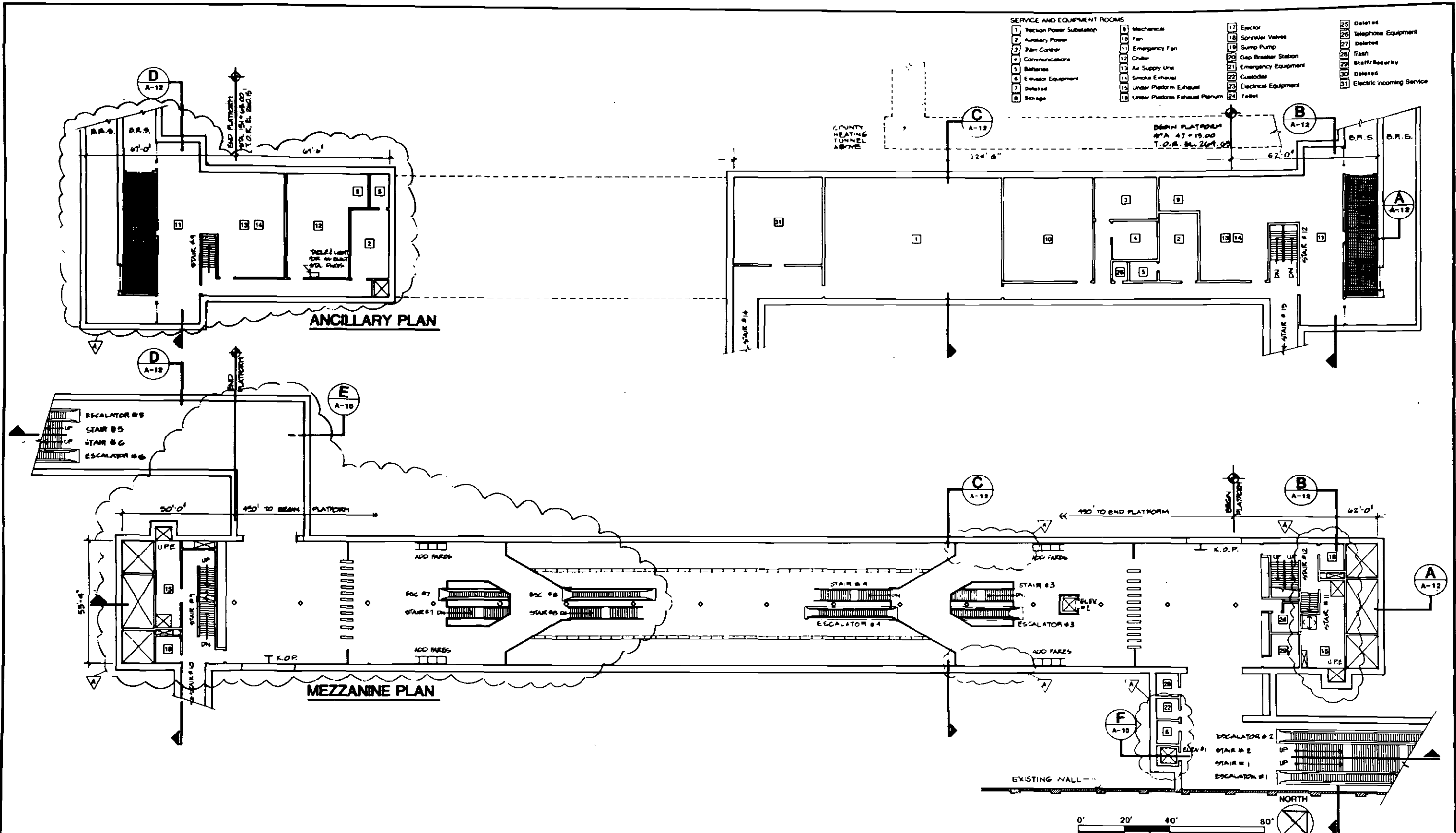
DESIGNED BY HWA	Date 4/22/03
DRAWN BY D. ZAPOROS, HOMER	Date 4/22/03
CHECKED BY J. YEN PIQATI	Date 4/23/03

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY:
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
 APPROVAL RECOMMENDED
 APPROVED
 DATE
 MANAGER / CHIEF ENGINEER

CIVIC CENTER STATION
ENTRANCE LEVEL PLANS
PRELIMINARY

CONTRACT NO. A140
DRAWING NO. A-10
SCALE 1"=20'-0"
SHEET NO. 36 OF 60



REV.	DATE	BY	APP.	DESCRIPTION
1	7/1/99	AL	JY	REVISIONS AS PER SCRD COMMENTS.
2	4/22/00	RP	JY	REVISION TO ANCILLARY PLANS FOR COST REDUCTION.

DESIGNED BY
HWA Date: 12/1/93

DRAWN BY
R&J Date: 4/22/99

CHECKED BY
J. YEN Date: 4/22/99

HARRY WESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____

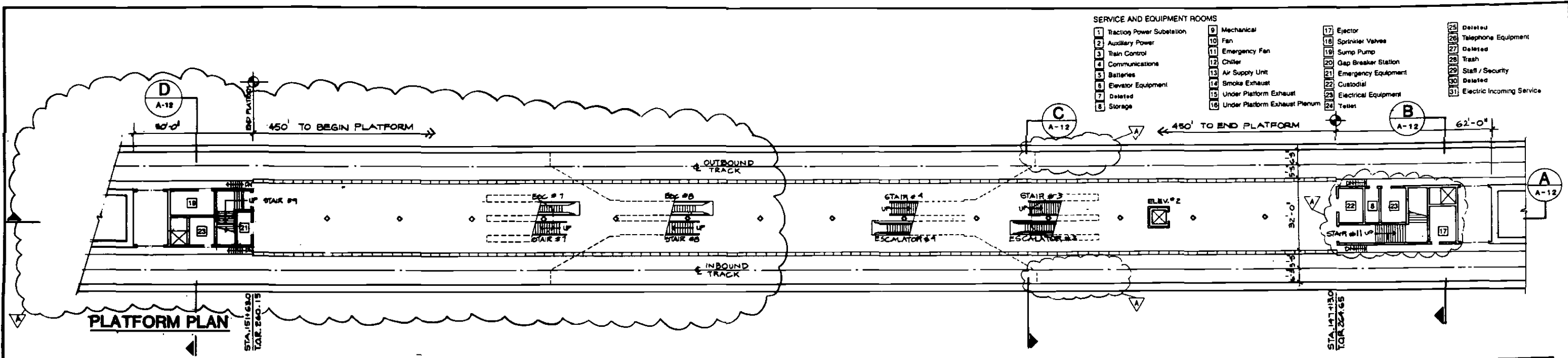
APPROVED _____ Date: _____

MANAGER / CHIEF ENGINEER

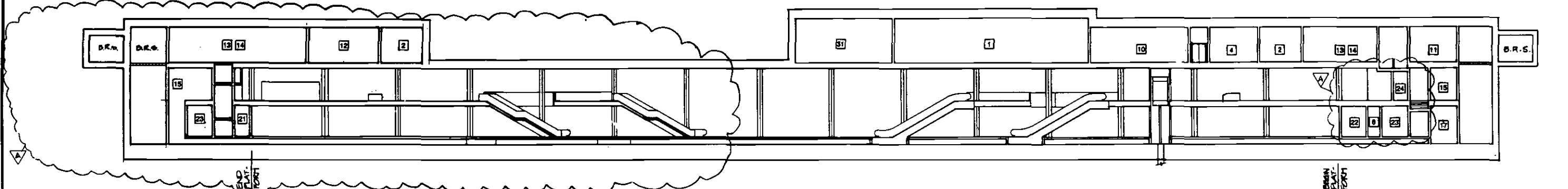
CIVIC CENTER STATION
PLANS
PRELIMINARY

CONTRACT NO. A140
DRAWING NO. A-11
SCALE 1"=20'-0"
SHEET NO. 37 OF 60

Figure 6-15
Civic Center Station: Plans 94



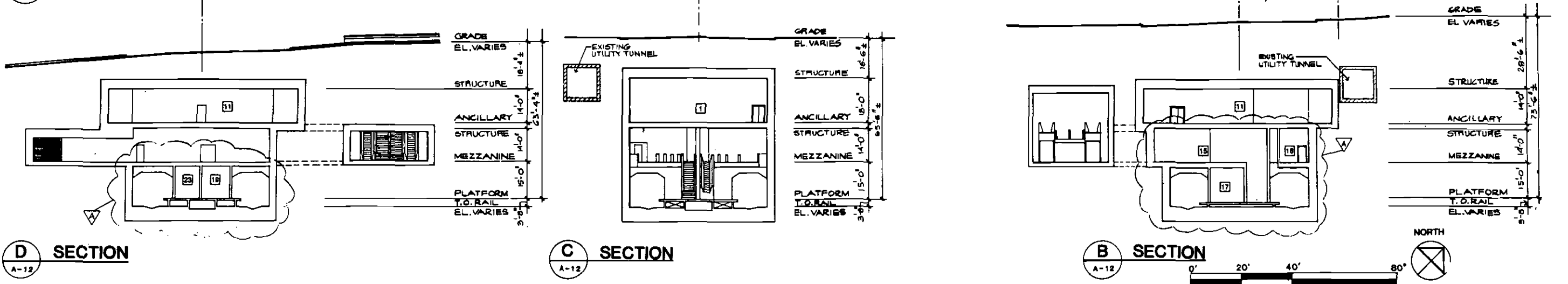
- SERVICE AND EQUIPMENT ROOMS**
- | | | | |
|-----------------------------|----------------------------------|-------------------------|------------------------------|
| 1 Tracking Power Substation | 9 Mechanical | 17 Ejector | 25 Deleted |
| 2 Auxiliary Power | 10 Fan | 18 Sprinkler Valves | 26 Deleted |
| 3 Train Control | 11 Emergency Fan | 19 Sump Pump | 27 Deleted |
| 4 Communications | 12 Chiller | 20 Gap Breaker Station | 28 Trash |
| 5 Batteries | 13 Air Supply Unit | 21 Emergency Equipment | 29 Staff / Security |
| 6 Elevator Equipment | 14 Smoke Exhaust | 22 Custodial | 30 Deleted |
| 7 Deleted | 15 Under Platform Exhaust | 23 Electrical Equipment | 31 Electric Incoming Service |
| 8 Storage | 16 Under Platform Exhaust Plenum | 24 Teller | |



A SECTION
A-12

C SECTION
A-12

B SECTION
A-12



D SECTION
A-12

REV.	DATE	BY	APP.	DESCRIPTION
1	1/1/03	KL	JY	REVISIONS AS PER SCRIPD COMMENTS
2	1/2/03	NY	JY	REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION.

DESIGNED BY HW/A	DATE 4/22/03
DRAWN BY C.Y.	DATE 4/22/03
CHECKED BY J.YEN	DATE 4/22/03

HARRY WESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

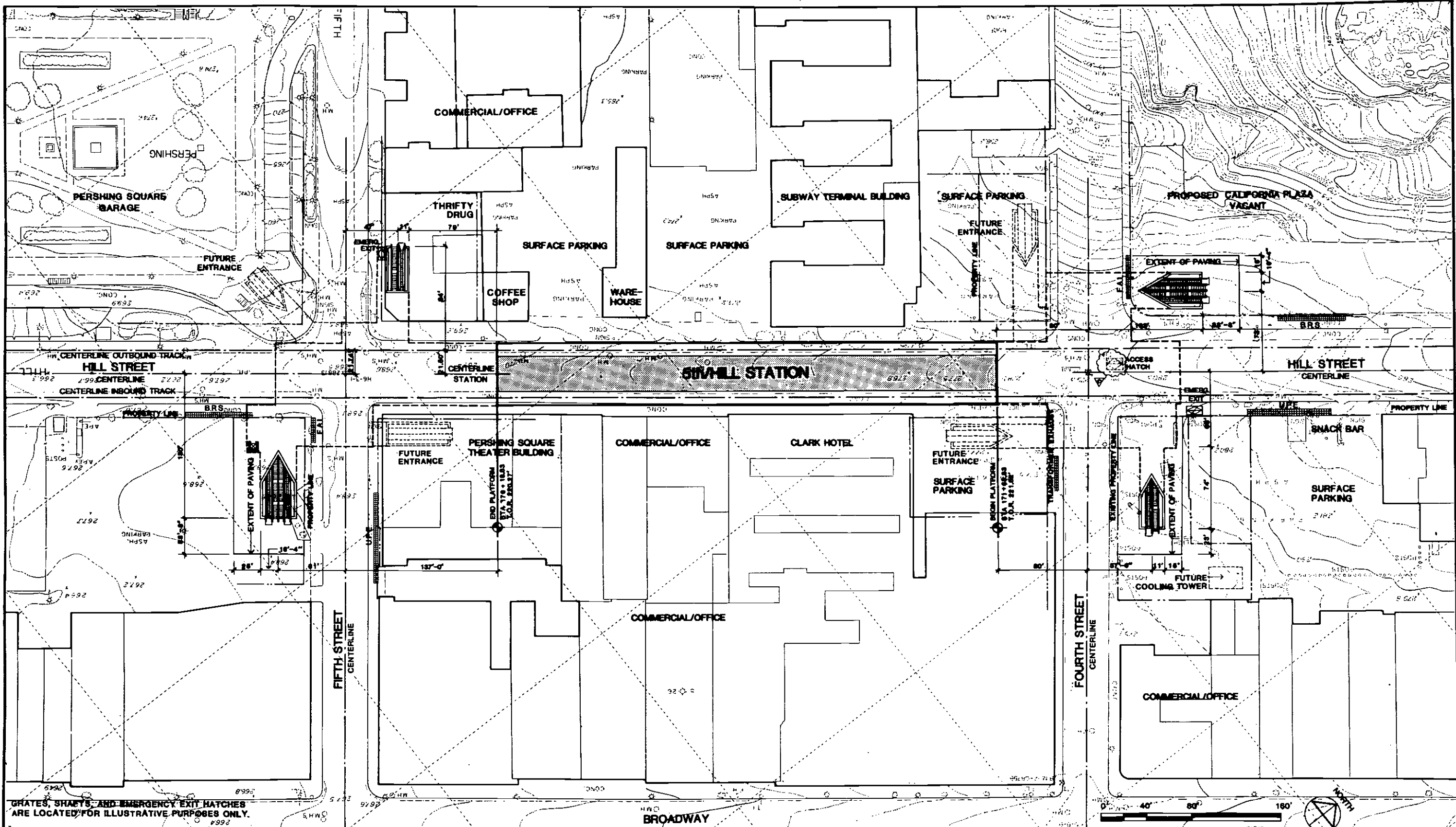
APPROVAL RECOMMENDED: _____ Date: _____
MANAGER / CHIEF ENGINEER

APPROVED: _____ Date: _____
MANAGER / CHIEF ENGINEER

CIVIC CENTER STATION
PLAN & SECTIONS
PRELIMINARY

CONTRACT NO.	A140
DRAWING NO.	A-12
SCALE	1"=20'-0"
SHEET NO.	38 OF 60

Figure 6-16
Civic Center Station: Plans and Sections 95

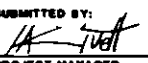


GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.

REV.	DATE	BY	APP.	DESCRIPTION
7/08	KL	JY		REVISIONS AS PER SCDD COMMENTS
8/10		JY		REVISIONS ELEVATOR LOCATION
		RP		REVISIONS TO ANCILLARY ROOMS FOR COST

DESIGNED BY H.W.A.	Date 4/15/09
DRAWN BY K. LIM	Date 4/15/09
CHECKED BY J. YEN	Date 4/16/09
PIGIATI	

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED

 Reg. No. _____

APPROVED

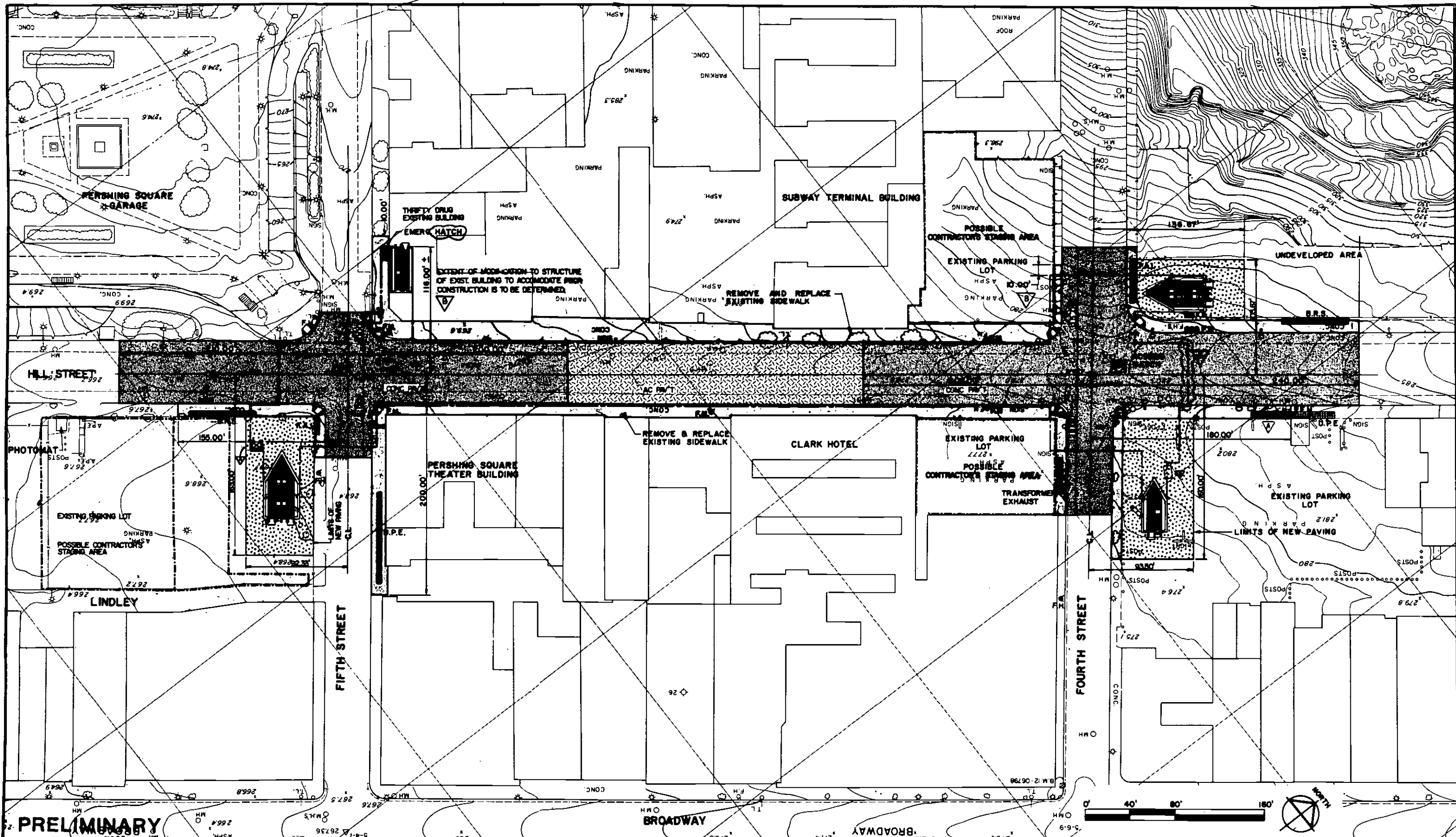
 Date _____
 MANAGER / CHIEF ENGINEER
 Reg. No. _____

5th/HILL STATION
 SITE PLAN

PRELIMINARY

CONTRACT NO.	A140
DRAWING NO.	A-13
SCALE	1"=40'-0"
SHEET NO.	44 OF 60

Figure 6-17
 5th/Hill Station: Site Plan 96



REV.	DATE	BY	APP.	DESCRIPTION
1	7/1/83	JLD		CHANGED EMERG. EXIT TO HATCH, STA. LENGTH
2	7/1/83	JLD		REMOVED PAVEMENT, REFINED DIMENSIONS AND ADDED GRATES - EXIT-ACCESS HATCH.
3	7/1/83	JLD		REVISED ELEVATOR AND GRATING LOCATIONS

DESIGNED BY	Date	7/1/83
TAMS		
DRAWN BY	Date	5/4/83
RGL / S.A.N		
CHECKED BY	Date	5/4/83
JLD		

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIM WONG ASSOCIATES
 General Architectural Consultants: Stations

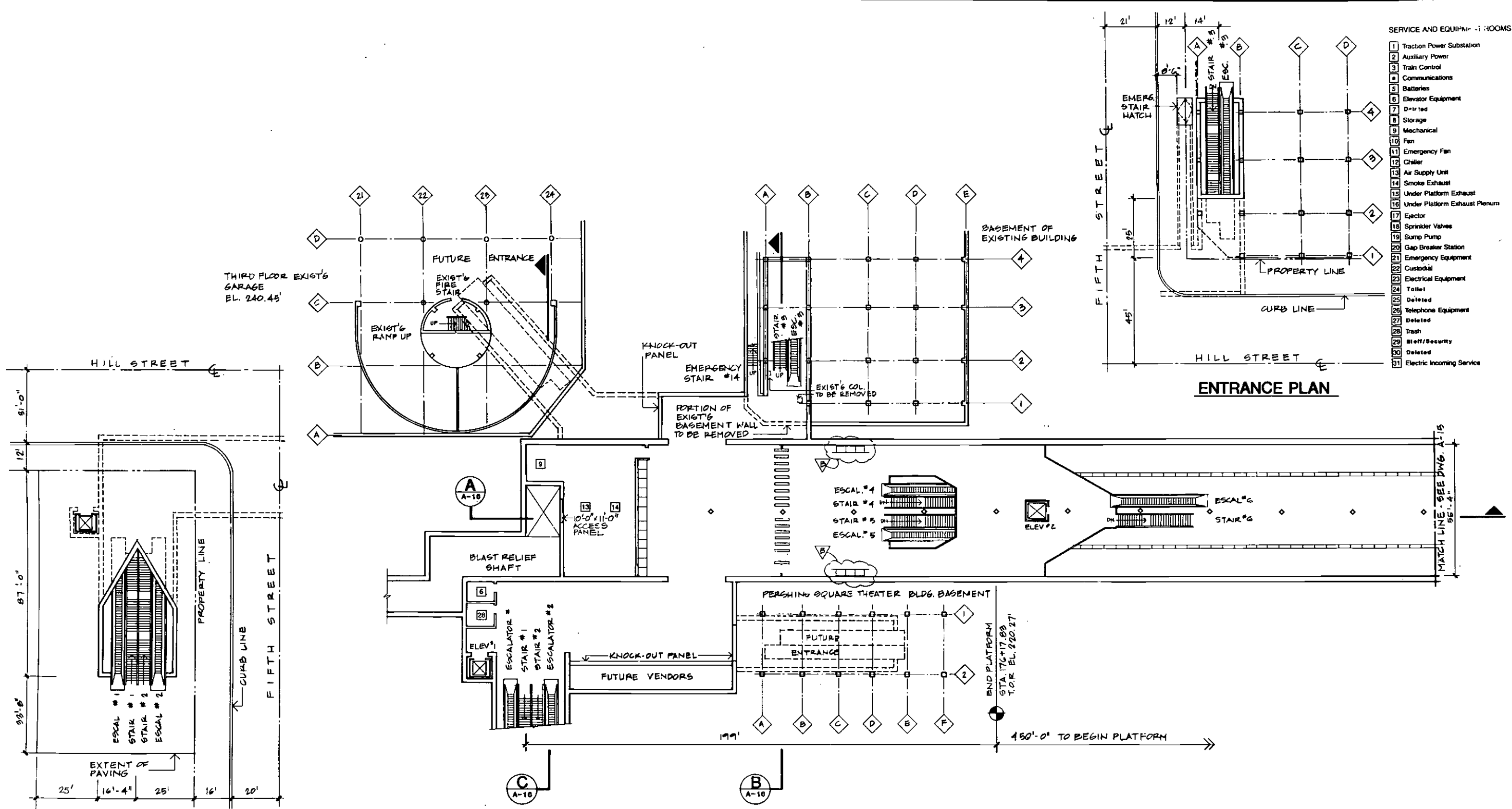
SUBMITTED BY:
[Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT		
METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	Date
_____	_____	_____
Reg. No. _____	MANAGER / CHIEF ENGINEER	Reg. No. _____

5th / HILL STATION
CIVIL SITE PLAN

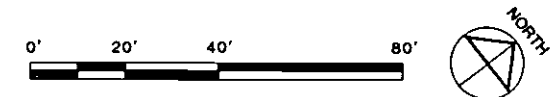
CONTRACT NO.	A140
DRAWING NO.	C-4
SCALE	1" = 40'-0"
SHEET NO.	45 OF 60

Figure 6-18
 5th/Hill Station: Civil Site Plan 97



ENTRANCE PLAN

PARTIAL MEZZANINE PLAN



REV.	DATE	BY	APP.	DESCRIPTION
1	7/15/83	M.D.	J.Y.	REVISIONS AS PER SCRIPD COMMENTS.
2	7/17/83	J.Y.	J.Y.	REVISED ELEVATOR LOCATION
3	11/20/83	RP	RP	REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY	Date 4/15/83
H.W.A.	
DRAWN BY	Date 4/19/83
K.L.M.	
CHECKED BY	Date 6/20/83
J.YEN	PIGATTI

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ Date _____

APPROVED _____ Date _____

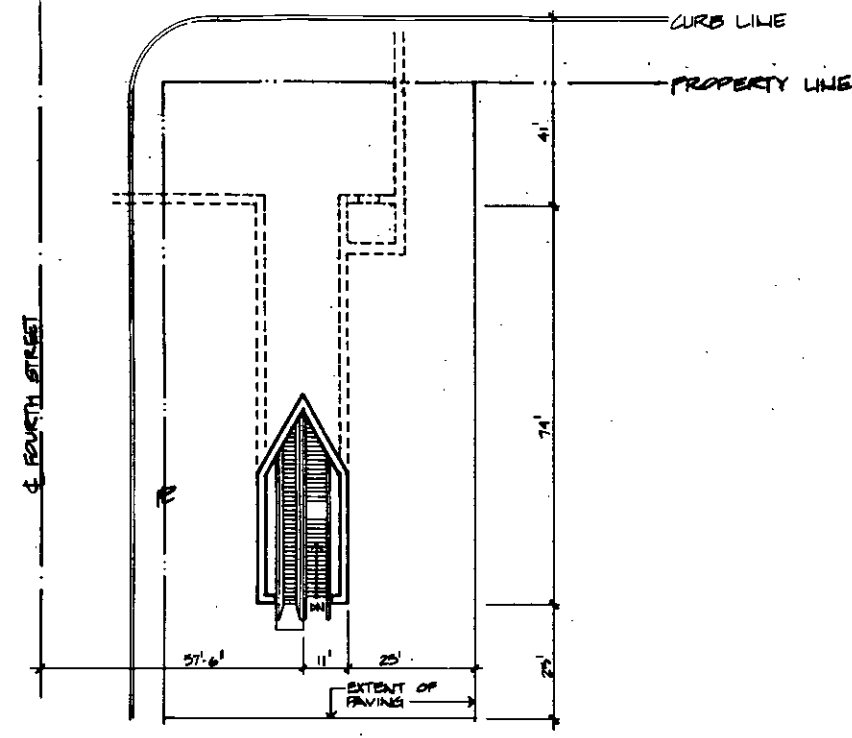
Reg. No. _____ MANAGER / CHIEF ENGINEER Reg. No. _____

5th/HILL STATION
 PLANS

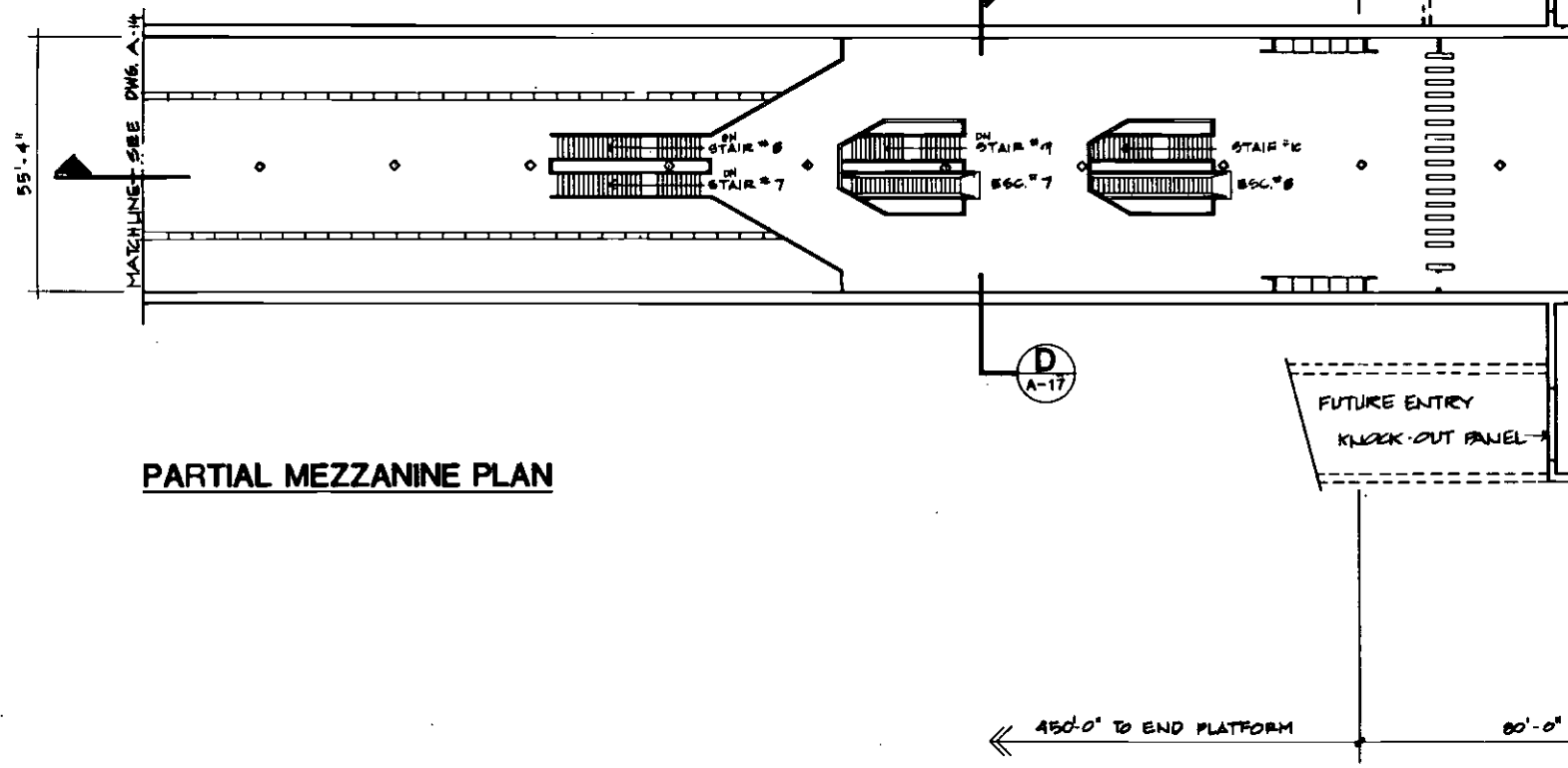
PRELIMINARY

CONTRACT NO.	A140
DRAWING NO.	A-14
SCALE	1" = 20'-0"
SHEET NO.	47 OF 60

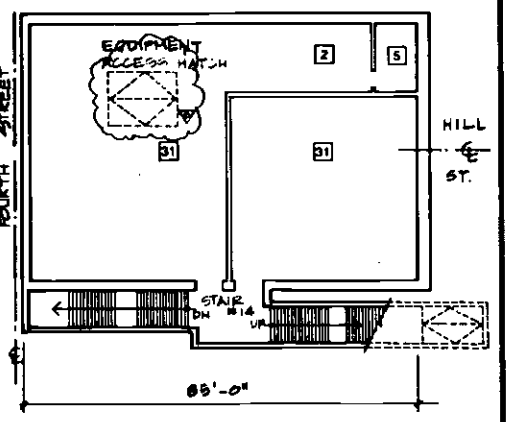
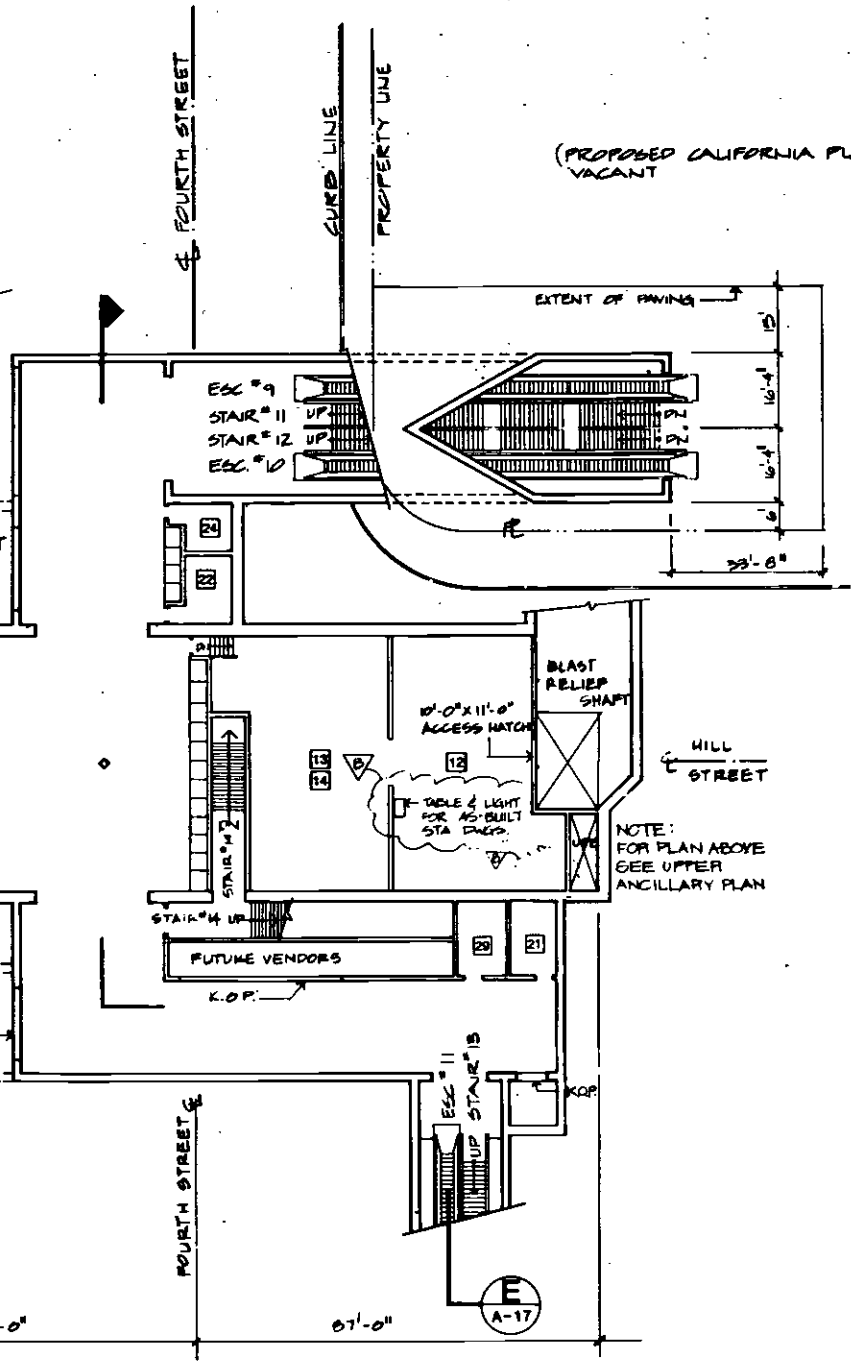
Figure 6-19
 5th/Hill Station: Plans



ENTRANCE PLAN

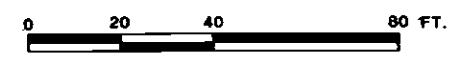


PARTIAL MEZZANINE PLAN



UPPER ANCILLARY PLAN

- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Toilet
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff/Security
 - 30 Deleted
 - 31 Electric Incoming Service



REV.	DATE	BY	APP.	DESCRIPTION
18	7/1/03	J.Y.		REVISIONS AS PER BOARD COMMENTS
17	6/11/03	KL	J.Y.	REVISED ELEVATOR LOCATION
	4/20/03	AP		REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY HWA	Date 4/20/03
DRAWN BY J. WOODSEY	Date 3/20/03
CHECKED BY J. YEN	Date 4/20/03

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

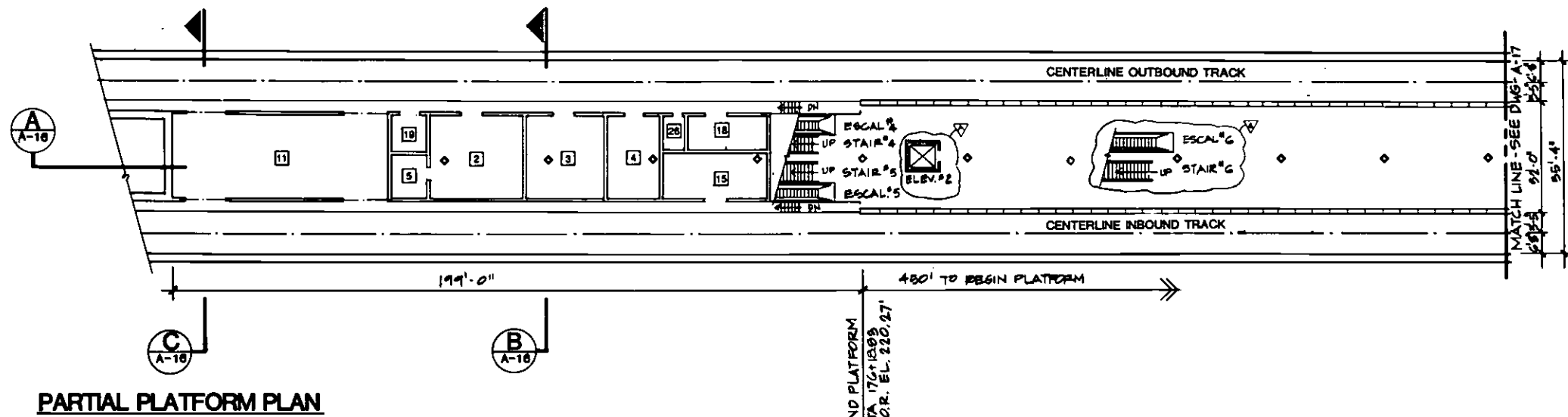
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT		
METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	Date _____
Reg. No. _____	MANAGER / CHIEF ENGINEER	Reg. No. _____

5th/HILL STATION
PLANS

PRELIMINARY

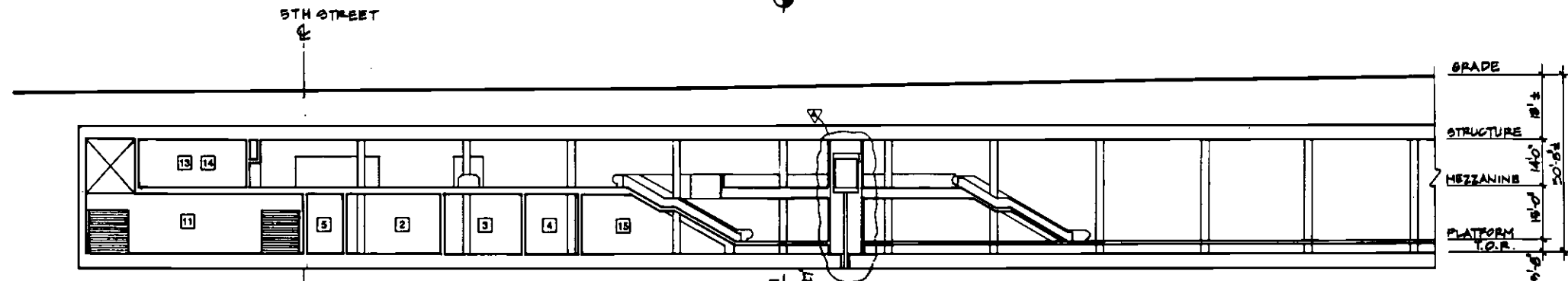
CONTRACT NO. A140
DRAWING NO. 4-15
SCALE 1"=20'-0"
SHEET NO. 48 OF 60

Figure 6-20
5th/Hill Station: Plans

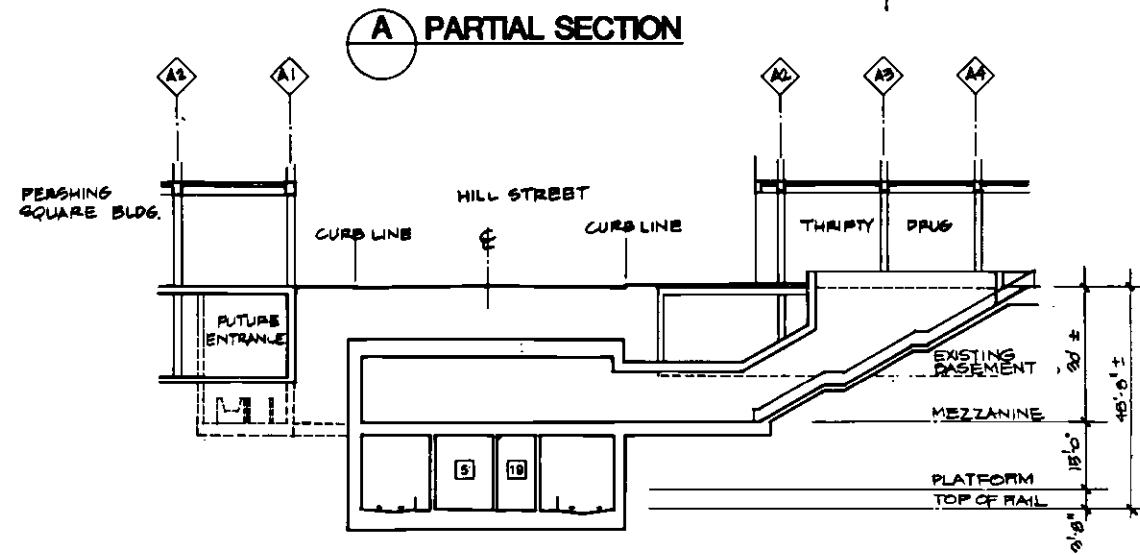


- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Toilet
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff/Security
 - 30 Deleted
 - 31 Electric Incoming Service

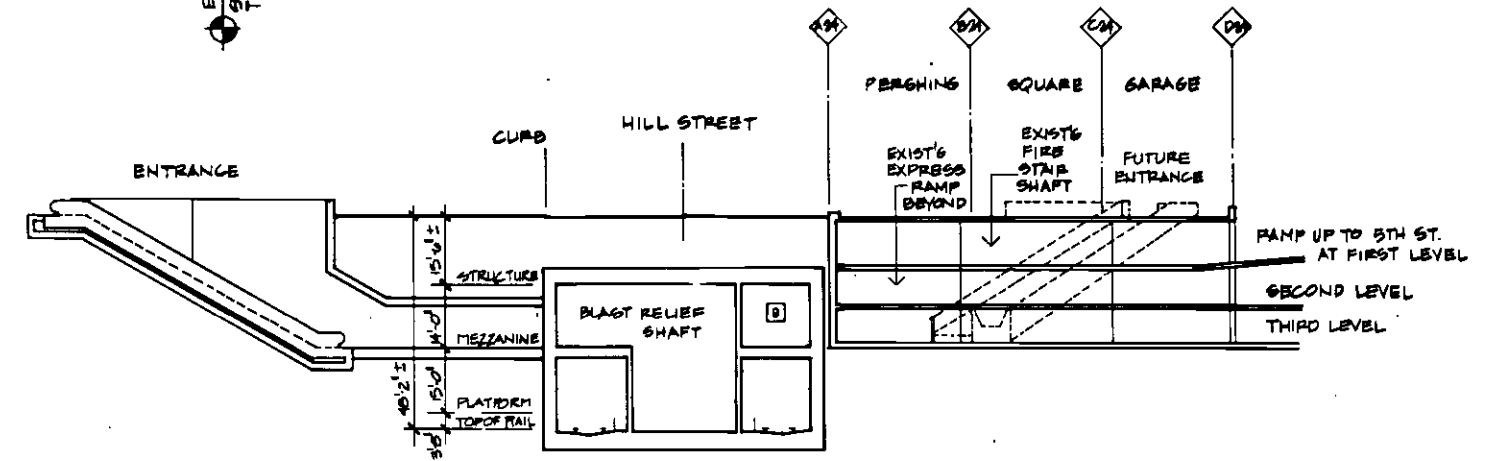
PARTIAL PLATFORM PLAN



A PARTIAL SECTION



B SECTION



C SECTION



REV.	DATE	BY	APP.	DESCRIPTION
1	7/1/05	J.Y.	RP	REVISED ELEVATOR LOCATION.
2	7/1/05	RP	RP	REVISIONS TO AUXILIARY ROOM FOR COST REDUCTION

DESIGNED BY H.W.A.	Date 4/19/05
DRAWN BY K.L.M.	Date 4/19/05
CHECKED BY J.YEN	Date 4/24/05

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED: _____ Date: _____
 Reg. No. _____

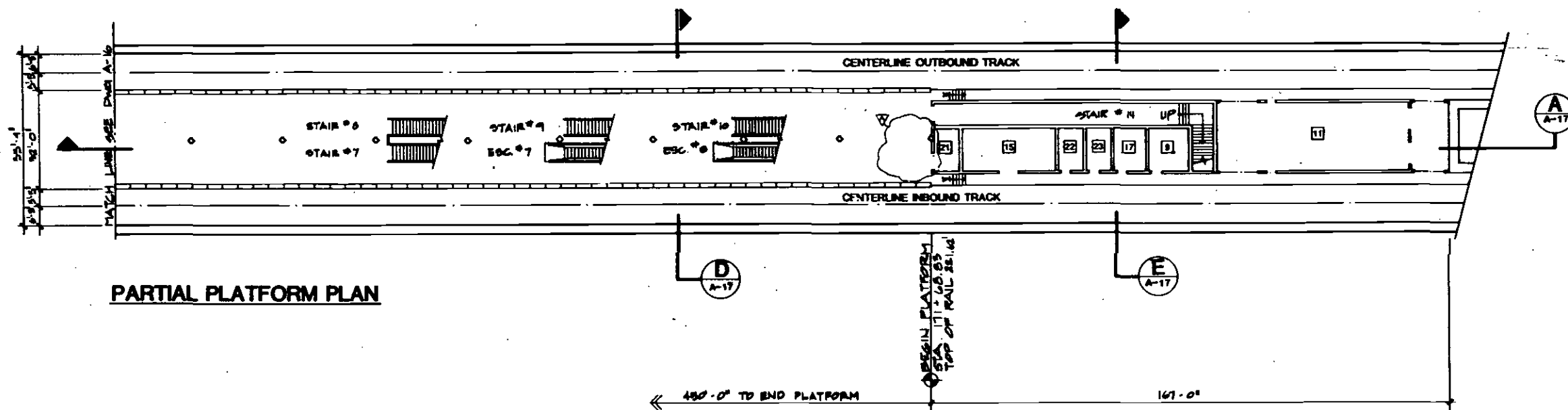
APPROVED: _____ Date: _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

5th/HILL STATION
PLANS AND SECTIONS

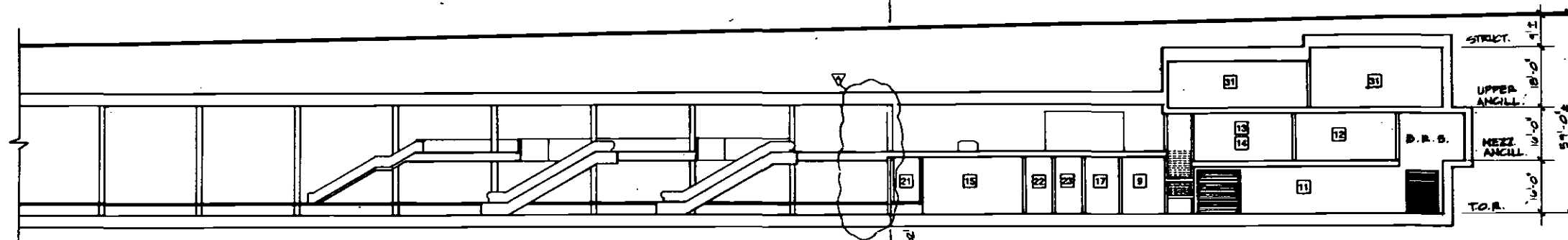
PRELIMINARY

CONTRACT NO.	A140
DRAWING NO.	A-16
SCALE	1" = 20'-0"
SHEET NO.	49 OF 60

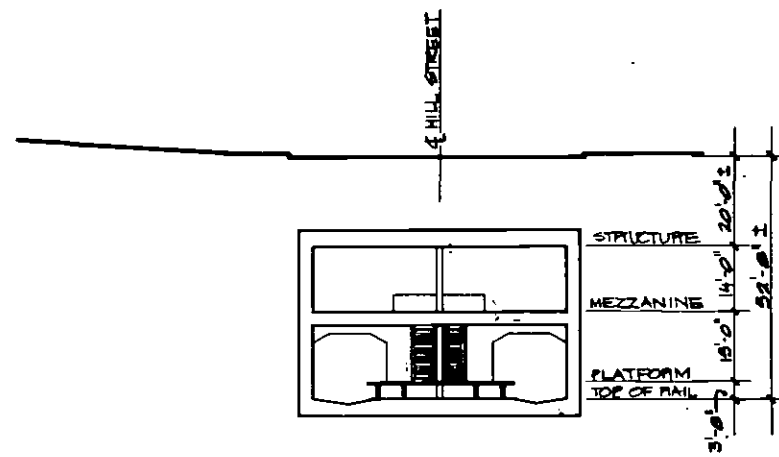
Figure 6-21
5th/Hill Station: Plans and Sections



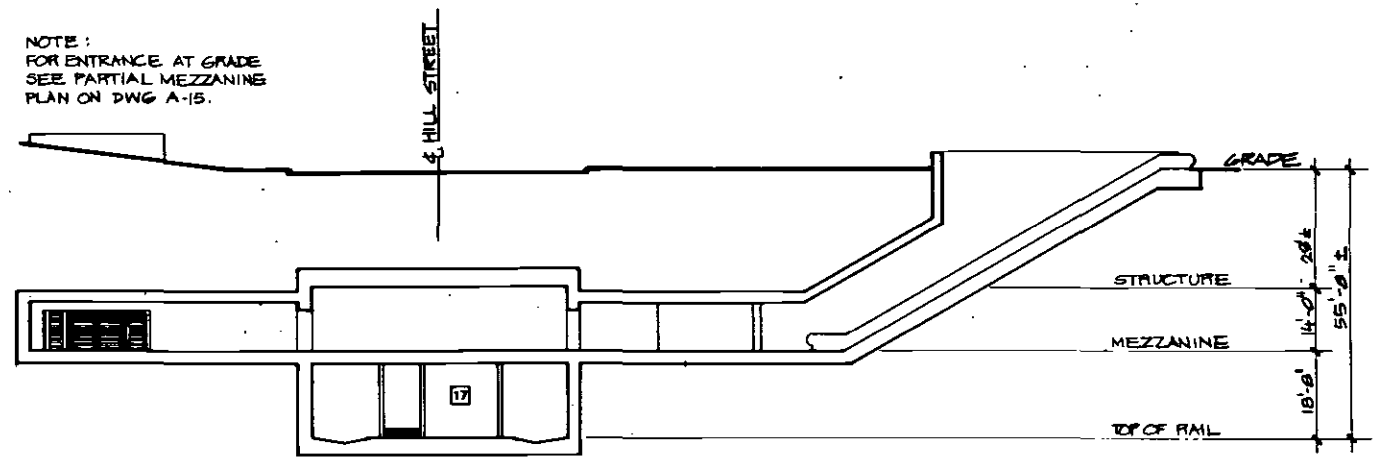
PARTIAL PLATFORM PLAN



A PARTIAL SECTION



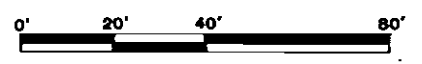
D SECTION



E SECTION

- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Teller
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff/Security
 - 30 Deleted
 - 31 Electric Incoming Service

NOTE:
FOR ENTRANCE AT GRADE
SEE PARTIAL MEZZANINE
PLAN ON DWG A-15.



REV.	DATE	BY	APP.	DESCRIPTION
1	1/1/02	JY	RP	REVISED ELEVATOR LOCATION
2	4/2/02	JY	RP	REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY
HLIA
Date 4/20/03

DRAWN BY
J. WADLEY
Date 4/20/03

CHECKED BY
J. YEN
Date 4/20/03

HARRY WEESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ Date _____
APPROVED _____ Date _____
MANAGER / CHIEF ENGINEER

5th/HILL STATION
PLANS & SECTIONS

PRELIMINARY

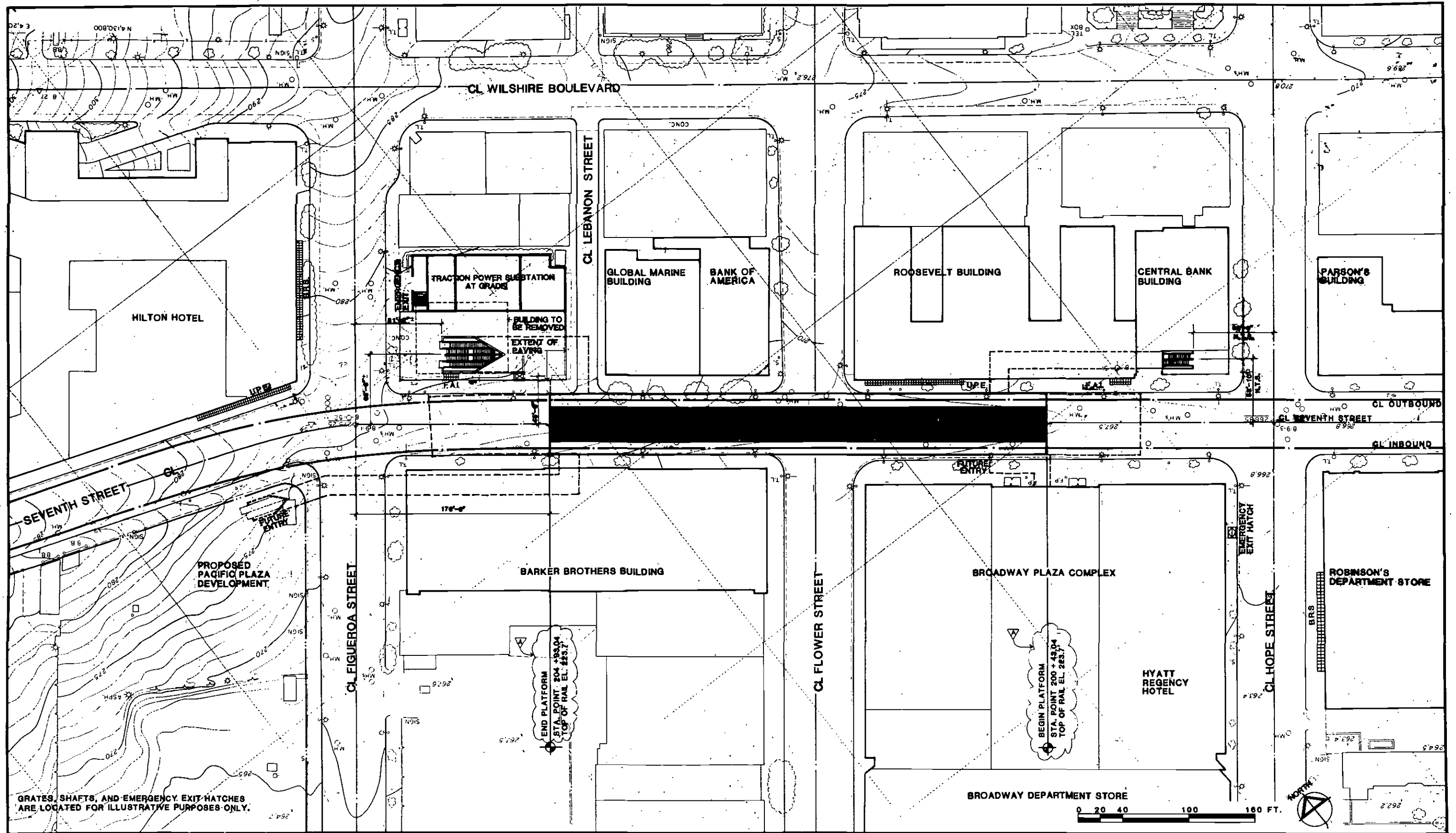
CONTRACT NO.
A140

DRAWING NO.
A-17

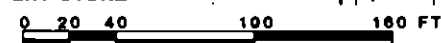
SCALE
1"=20'-0"

SHEET NO.
50 OF 60

Figure 6-22
5th/Hill Station: Plans and Sections



GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.



REV.	DATE	BY	APP.	DESCRIPTION
1	7/16/03	MD	J.Y.	REVISED STATION POINTS
2			J.Y.	REVISIONS TO AUXILIARY ROOMS FOR COST REDUCTION

DESIGNED BY <i>HWA/JW</i>	Date 3/9/03
DRAWN BY <i>WOOLSBY</i>	Date 3/1/03
CHECKED BY <i>J.YEN</i>	Date 3/15/02

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 QIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ Date _____
 Reg. No. _____

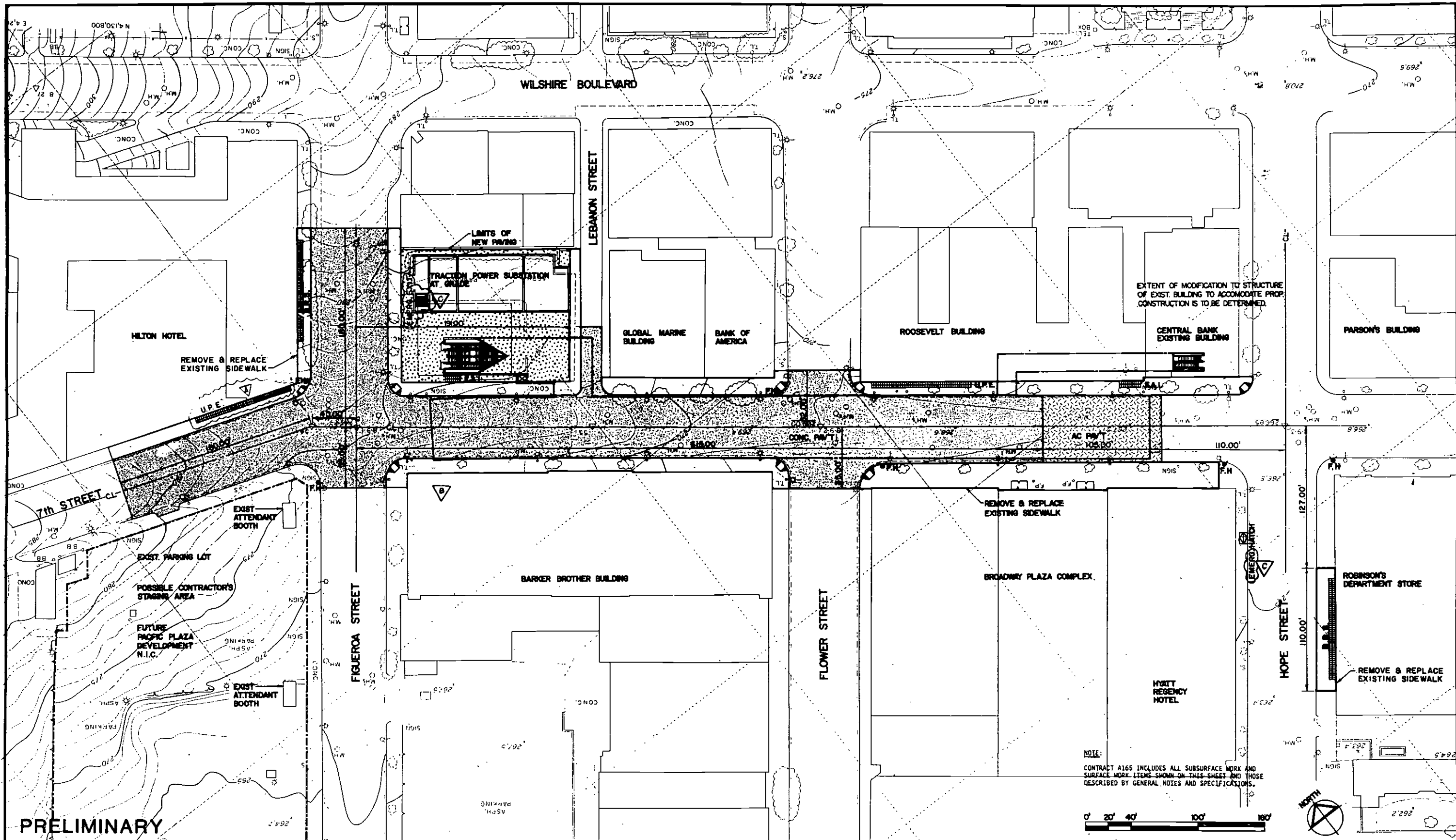
APPROVED _____ Date _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

7TH / FLOWER STATION
 SITE PLAN

PRELIMINARY

CONTRACT NO. A105
DRAWING NO. A-18
SCALE 1" = 40'-0"
SHEET NO. 8 OF 18

Figure 6-23
 7th/Flower Station: Site Plan 102



PRELIMINARY

NOTE:
 CONTRACT A165 INCLUDES ALL SUBSURFACE WORK AND SURFACE WORK ITEMS SHOWN ON THIS SHEET AND THOSE DESCRIBED BY GENERAL NOTES AND SPECIFICATIONS.



REV.	DATE	BY	APP.	DESCRIPTION
1	7/2/03	JLD		ADDED EMERG. EXIT & CHANGED ACCESS MATCH TO INEAC PATCH
2	7/2/03	JLD		REVISED EXTENT OF ASPAVING AND REMOVED U.P.E. GRATING S. OF 7TH ST.
3	7/1/03	JLD		ADDED GRATING

DESIGNED BY	Date 8/2/02
TAMS	
DRAWN BY	Date 8/4/03
RGL / S.A.N.	
CHECKED BY	Date 5/2/03
JLD	

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

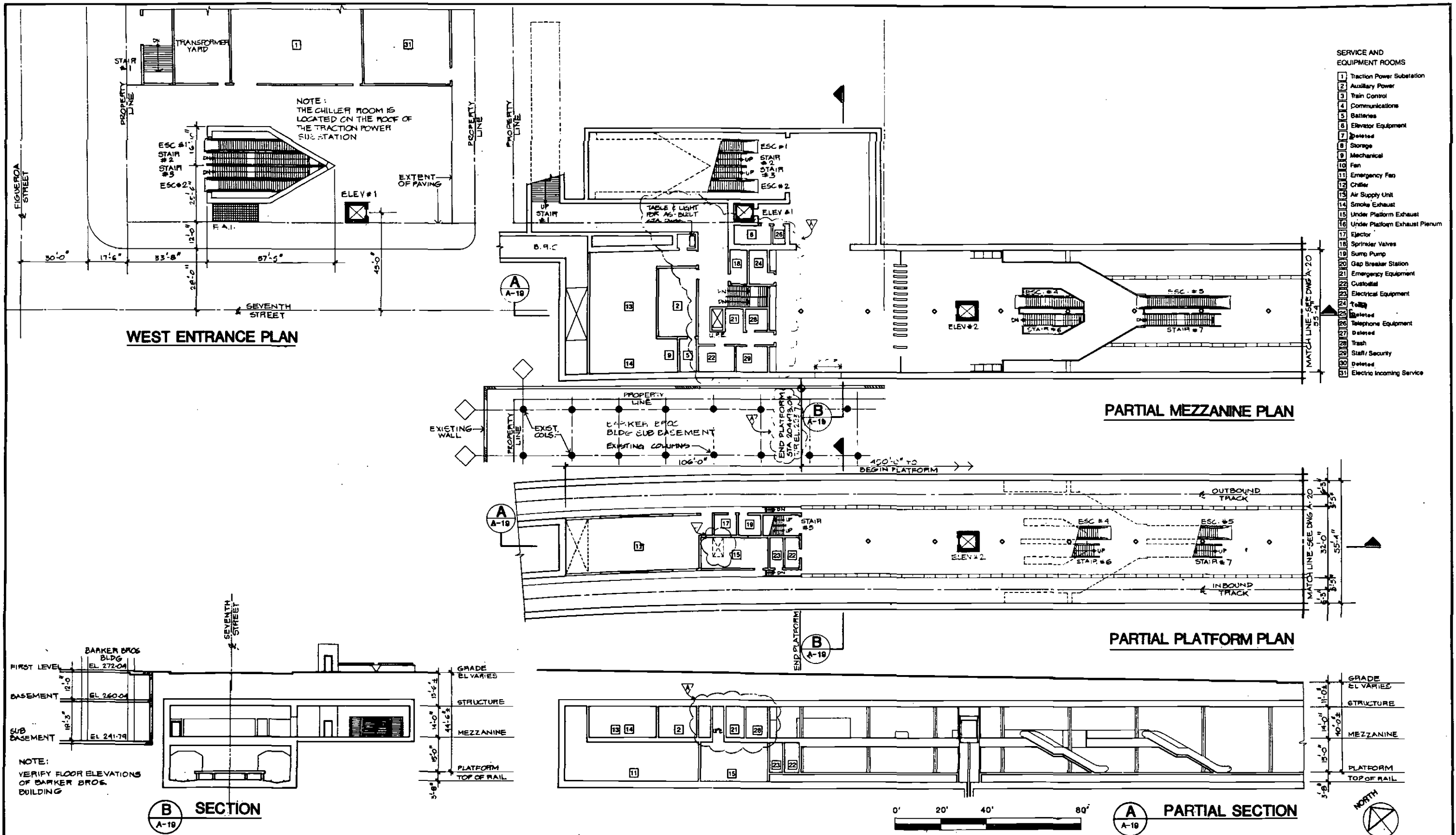
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ Date _____
 APPROVED _____ Date _____
 Reg. No. _____ MANAGER / CHIEF ENGINEER Reg. No. _____

7th / FLOWER STATION
CIVIL SITE PLAN

CONTRACT NO.	A165
DRAWING NO.	C-5
SCALE	1" = 40'-0"
SHEET NO.	9 OF 10

Figure 6-24
 7th/Flower Station: Civil Site Plan 103



REV.	DATE	BY	APP.	DESCRIPTION
7/1/00		JY		REVISIONS AS PER SERVO COMMENTS.
11/20/00		PP		REVISIONS TO AUXILIARY ROOMS FOR COST REDUCTION.

DESIGNED BY	HWA	DATE	4/15/03
DRAWN BY	S. DEBNATH	DATE	4/15/03
CHECKED BY	J. YEN	DATE	4/20/03
	PIGATI		

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

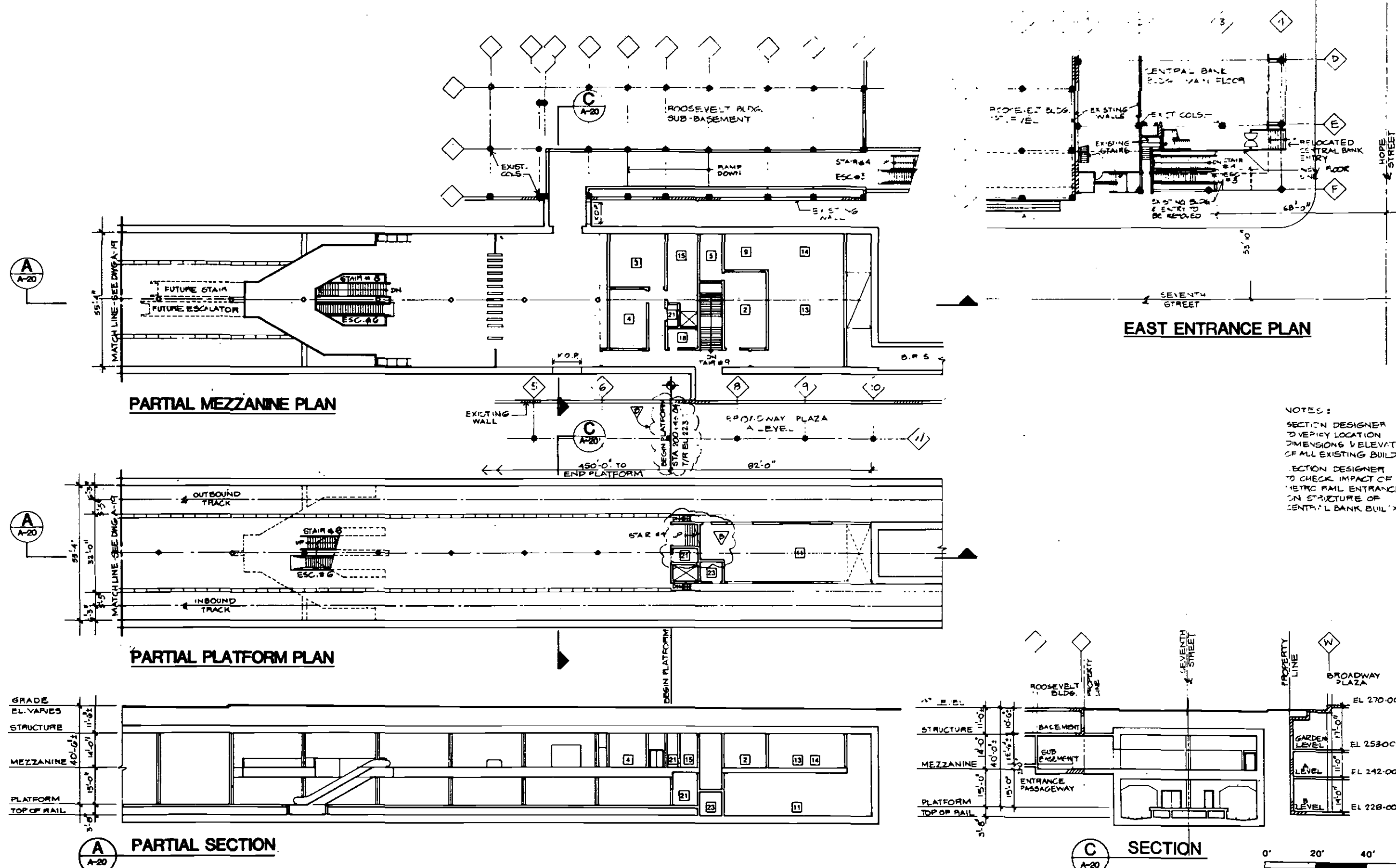
SUBMITTED BY: *[Signature]*
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED: _____ Date: _____
 APPROVED: _____ Date: _____
 MANAGER / CHIEF ENGINEER

7th / FLOWER STATION
 PLANS & SECTIONS
PRELIMINARY

CONTRACT NO.	A 165
DRAWING NO.	A-19
SCALE	1"=20'-0"
SHEET NO.	11 OF 13



- SERVICE AND EQUIPMENT ROOMS
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Yellit
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff/Security
 - 30 Deleted
 - 31 Electric Incoming Service

NOTES:
 SECTION DESIGNER TO VERIFY LOCATION DIMENSIONS & ELEVATIONS OF ALL EXISTING BUILDINGS.
 SECTION DESIGNER TO CHECK IMPACT OF METRO RAIL ENTRANCE ON STRUCTURE OF CENTRAL BANK BUILDING.

REV.	DATE	BY	APP.	DESCRIPTION
1	7/1/03	J.Y.		REVISIONS AS PER SC&TD COMMENTS.
2	5/9/03	J.Y.		REVISIONS TO ACCOMMODATE TWO ADDITIONAL DEVICES IN THE FUTURE REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION.
3	4/20/03	RP		

DESIGNED BY HWA	Date 4/15/03
DRAWN BY S. DEBNATH	Date 4/15/03
CHECKED BY J. YEN	Date 4/20/03
	PKWT

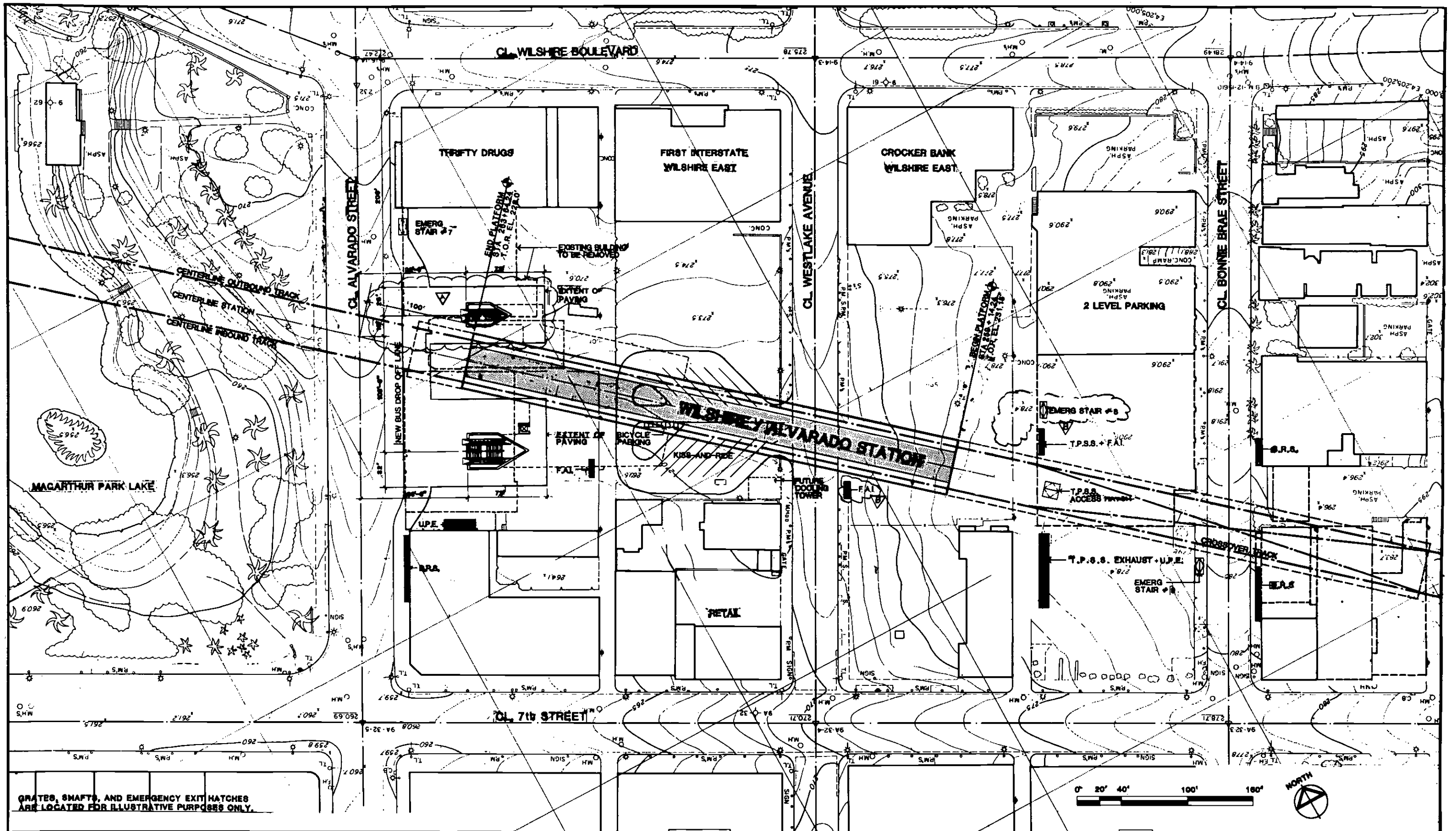
HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT		
METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	Date
Reg. No.	MANAGER / CHIEF ENGINEER	Reg. No.

7th / FLOWER STATION
PLANS & SECTIONS
PRELIMINARY

CONTRACT NO. A 165
DRAWING NO. A-20
SCALE 1"=20'-0"
SHEET NO. 12 OF 18



GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.

REV.	DATE	BY	APP.	DESCRIPTION
1	7/20/88	J.Y.		REVISED LOCATION OF EMERGENCY STAIR #8 & F.A.I. SHAFT
2	8/17/88	J.Y.		SHRINK ACCESS TO NORTH SIDE
3	8/16/88	J.Y.		REVISION TO ANZILLARY ROOMS FOR COST REDUCTION

DESIGNED BY HWA.	DATE 2/11/88
DRAWN BY B.M.	DATE 2/11/88
CHECKED BY J.YEN	DATE 2/11/88

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants Stations

SUBMITTED BY:
[Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

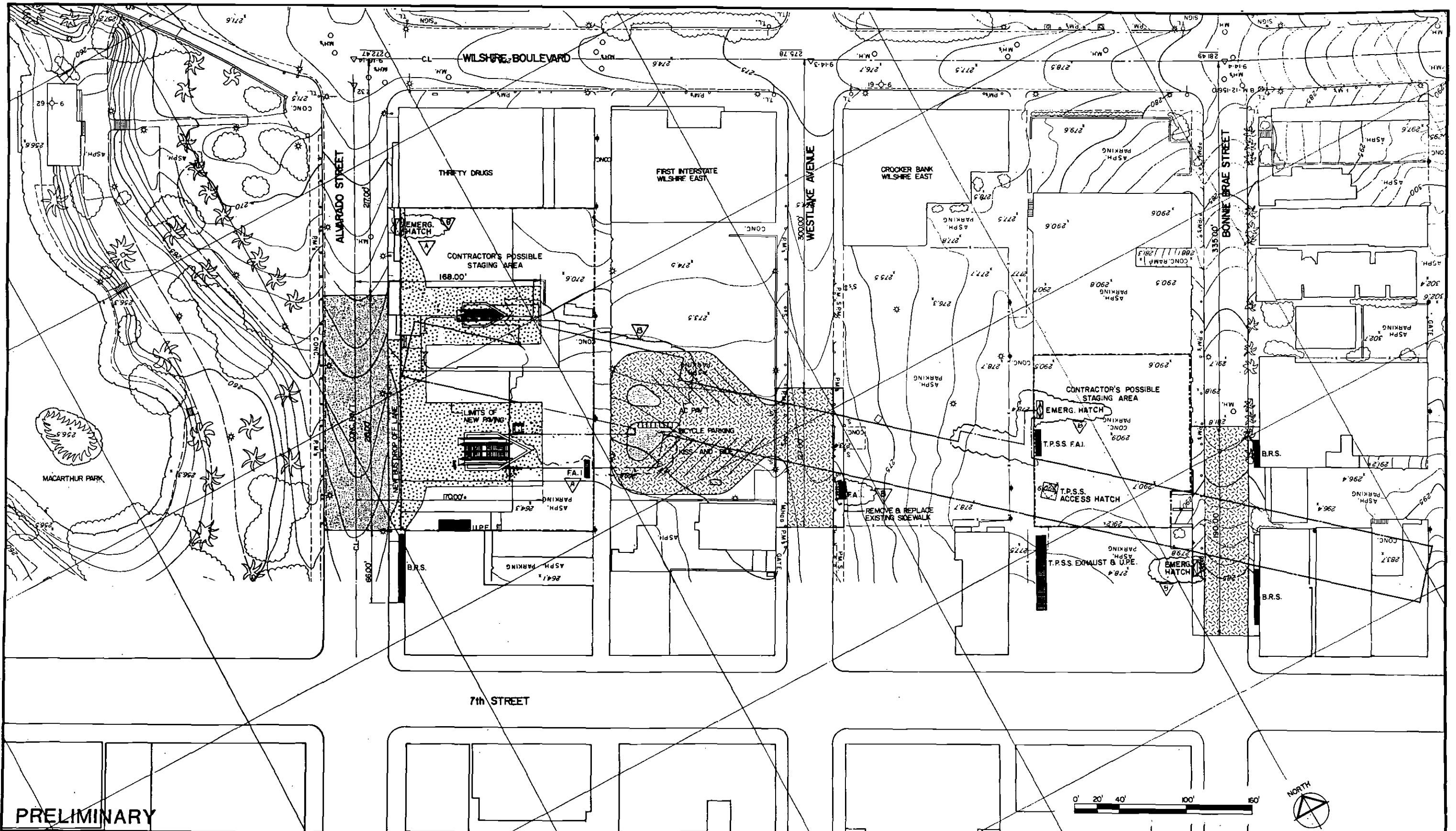
APPROVAL RECOMMENDED _____ DATE _____
 APPROVED _____ DATE _____
 MANAGER / CHIEF ENGINEER

WILSHIRE / ALVARADO STATION
 SITE PLAN

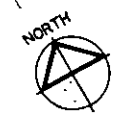
PRELIMINARY

CONTRACT NO. A170
DRAWING NO. A-21
SCALE 1"=40'-0"
SHEET NO. 36 OF 48

Figure 6-27
 Wilshire/Alvarado Station: Site Plan




PRELIMINARY



REV.	DATE	BY	APP.	DESCRIPTION
7/10/83	JLD			RELOCATED EMERG. HATCH & F.A.I. HATCH, REV. FOOTPRINT AND RAIL TO HATCH.
6/10/83	JLD			ADDED NORTH ENTRY & RELOCATED EMERGENCY EXIT & F.A.I.

DESIGNED BY	Date 5/2/83	TAMS
DRAWN BY	Date 5/9/83	S. AN / RGL
CHECKED BY	Date 5/10/83	JLD

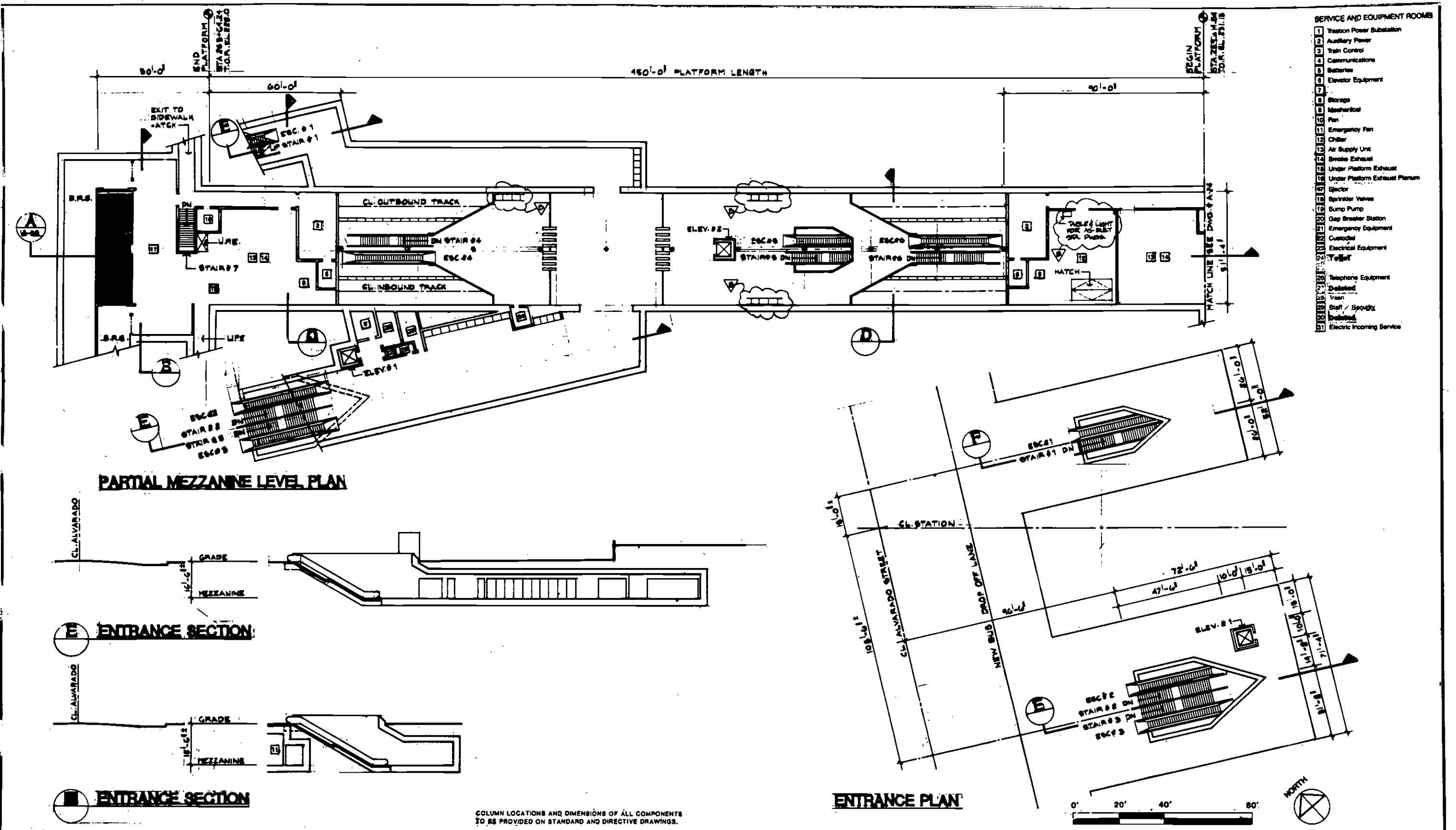
HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY:
[Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

 APPROVAL RECOMMENDED _____ Date _____
 APPROVED _____ Date _____
 Reg. No. _____ MANAGER / CHIEF ENGINEER Reg. No. _____

WILSHIRE / ALVARADO STATION
 CIVIL SITE PLAN

CONTRACT NO.	A170
DRAWING NO.	C-6
SCALE	1" = 40'-0"
SHEET NO.	37

Figure 6-28
 Wilshire/Alvarado Station: Civil Site Plan 107



REV.	DATE	BY	APP.	DESCRIPTION
1	7/1/00	J.Y.		REVISIONS AS PER RECD COMMENTS
2	8/1/00	B.K.	J.Y.	ENTRY ADDED AT NORTH SIDE OF STATION
3	8/1/00	B.K.	J.Y.	REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY	Date	8-17-99
H.W.A.		
DRAWN BY	Date	8-17-99
B.K.		
CHECKED BY	Date	8-21-99
J.YEN		

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants Stations

SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

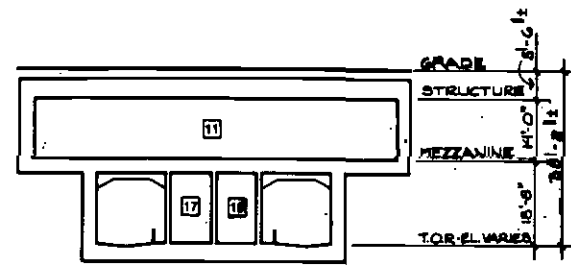
APPROVAL RECOMMENDED: _____ Date: _____
 Reg. No. _____

APPROVED: _____ Date: _____
 Reg. No. _____
 MANAGER / CHIEF ENGINEER

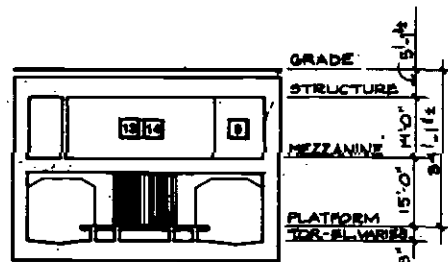
WILSHIRE / ALVARADO STATION
PLANS AND SECTIONS
PRELIMINARY

CONTRACT NO.	A170
DRAWING NO.	A-22
SCALE	1"=20'-0"
SHEET NO.	39 of 48

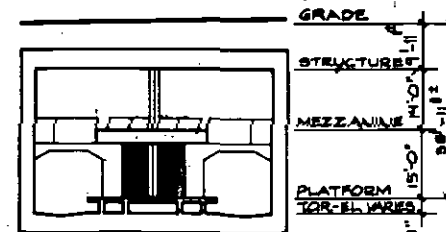
Figure 6-29
 Wilshire/Alvarado Station: Plans and Sections



B TRANSVERSE SECTION



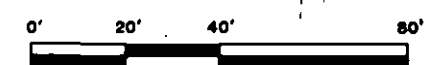
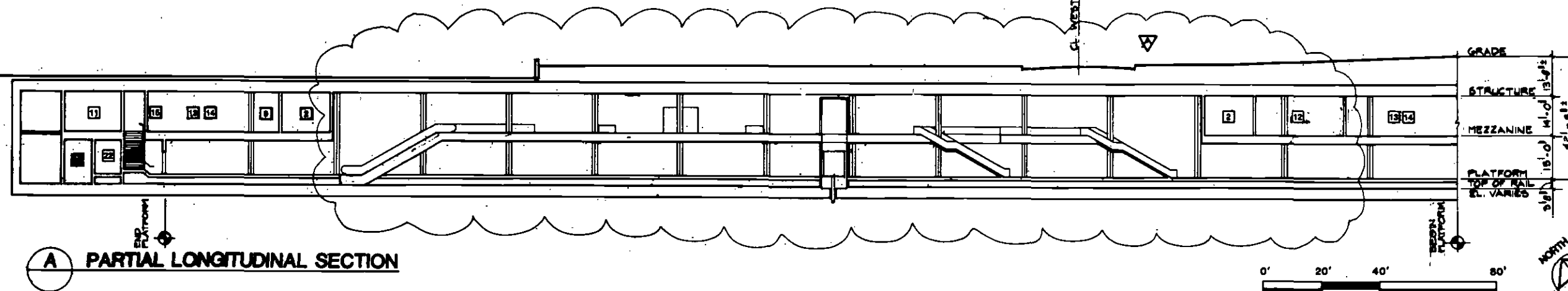
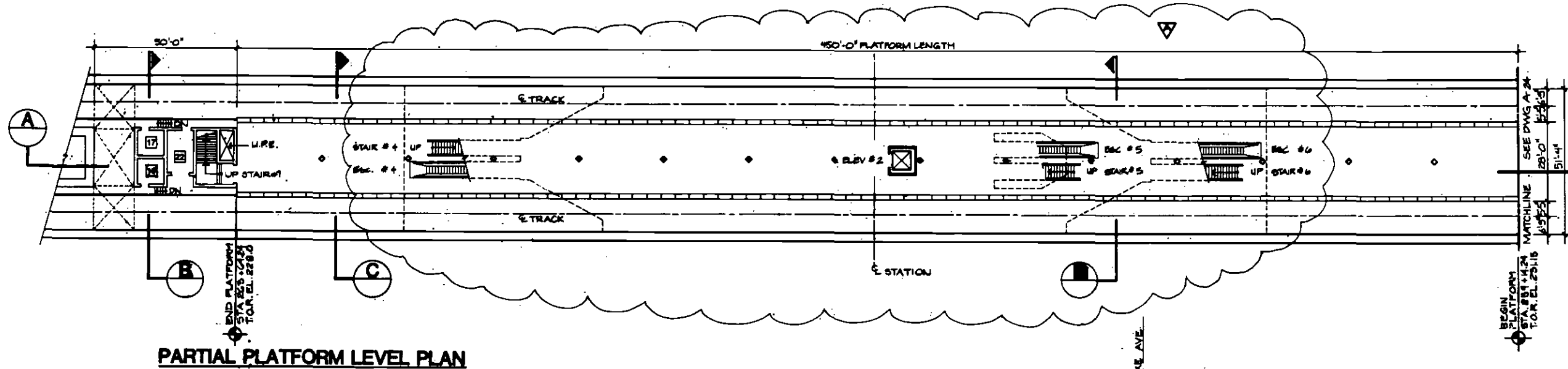
C TRANSVERSE SECTION



D TRANSVERSE SECTION

SERVICE AND EQUIPMENT ROOMS

1	Traction Power Substation	17	Ejector
2	Auxiliary Power	18	Sprinkler Valves
3	Train Control	19	Sump Pump
4	Communications	20	Gap Breaker Station
5	Batteries	21	Emergency Equipment
6	Elevator Equipment	22	Custodial
7	Deleted	23	Electrical Equipment
8	Storage	24	Toilet
9	Mechanical	25	Deleted
10	Fan	26	Telephone Equipment
11	Emergency Fan	27	Deleted
12	Chiller	28	Trash
13	Air Supply Unit	29	Staff/Security
14	Smoke Exhaust	30	Deleted
15	Under Platform Exhaust	31	Electric Incoming Service
16	Under Platform Exhaust Plenum		



REV.	DATE	BY	APP.	DESCRIPTION
1	5/6/83	J.Y.		REVISIONS TO NORTH SIDE OF STATION
2	5/6/83	J.Y.		REVISIONS TO AUXILIARY ROOMS

DESIGNED BY	HWA	DATE	5/6/83
DRAWN BY	B.K.	DATE	5/6/83
CHOKED BY	JYEN	DATE	5/6/83
PROJECT MANAGER	PIGATI		

HARRY WESE & ASSOCIATES
 TIPPETTS-ARBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Station

SUBMITTED BY: *[Signature]*
 PROJECT MANAGER

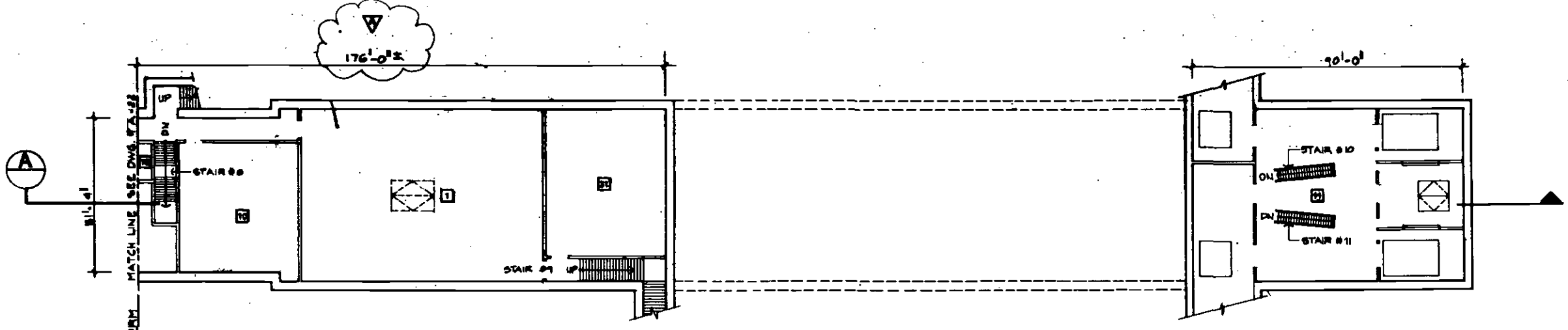
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED: _____
 APPROVED: _____
 Reg. No. _____ MANAGER / CHIEF ENGINEER Reg. No. _____

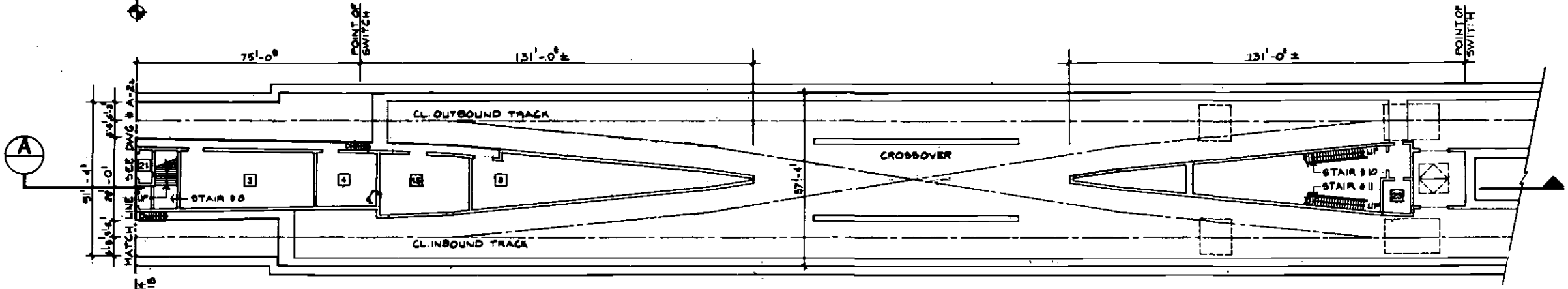
WILSHIRE/ALVARADO STATION
PLANS AND SECTIONS
PRELIMINARY

CONTRACT NO.	A 170
DRAWING NO.	
SCALE	1"=20'-0"
SHEET NO.	40 of 48

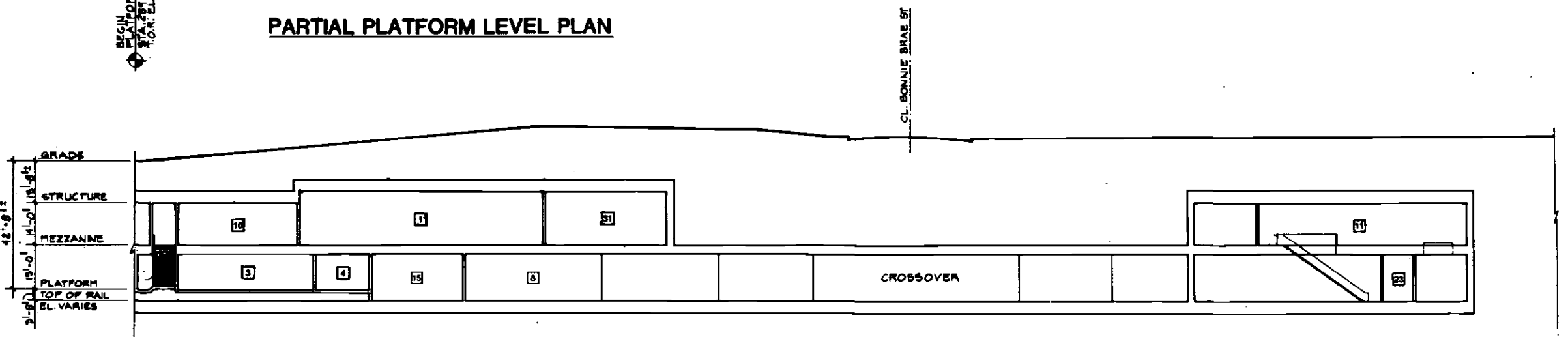
- SERVICE AND EQUIPMENT ROOMS**
- ☐ Traction Power Substation
 - ☐ Auxiliary Power
 - ☐ Train Control
 - ☐ Communications
 - ☐ Restrooms
 - ☐ Elevator Equipment
 - ☐ Storage
 - ☐ Mechanical
 - ☐ Fan
 - ☐ Emergency Fan
 - ☐ Chiller
 - ☐ Air Supply Unit
 - ☐ Brake Exhaust
 - ☐ Under Platform Exhaust
 - ☐ Under Platform Exhaust Plenum
 - ☐ Ejector
 - ☐ Sprinkler Valves
 - ☐ Sump Pump
 - ☐ Gas Breaker Station
 - ☐ Emergency Equipment
 - ☐ Custodial
 - ☐ Electrical Equipment
 - ☐ Telephone Equipment
 - ☐ Trash
 - ☐ Staff / Security
 - ☐ Electric Incoming Service



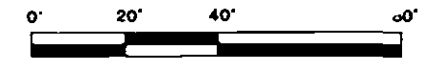
PARTIAL MEZZANINE LEVEL PLAN



PARTIAL PLATFORM LEVEL PLAN



A PARTIAL LONGITUDINAL SECTION



REV.	DATE	BY	APP.	DESCRIPTION
1	5/16/02	J.Y.		ENTRY ADDED AT NORTH SIDE OF STATION
2	5/16/02	J.Y.		REVISIONS TO AUXILIARY ROOMS FOR EASY PRODUCTION

DESIGNED BY	Date
H.W.A.	
DRAWN BY	Date
D.K.	5/16/02
CHECKED BY	Date
J.YEN	5/16/02

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

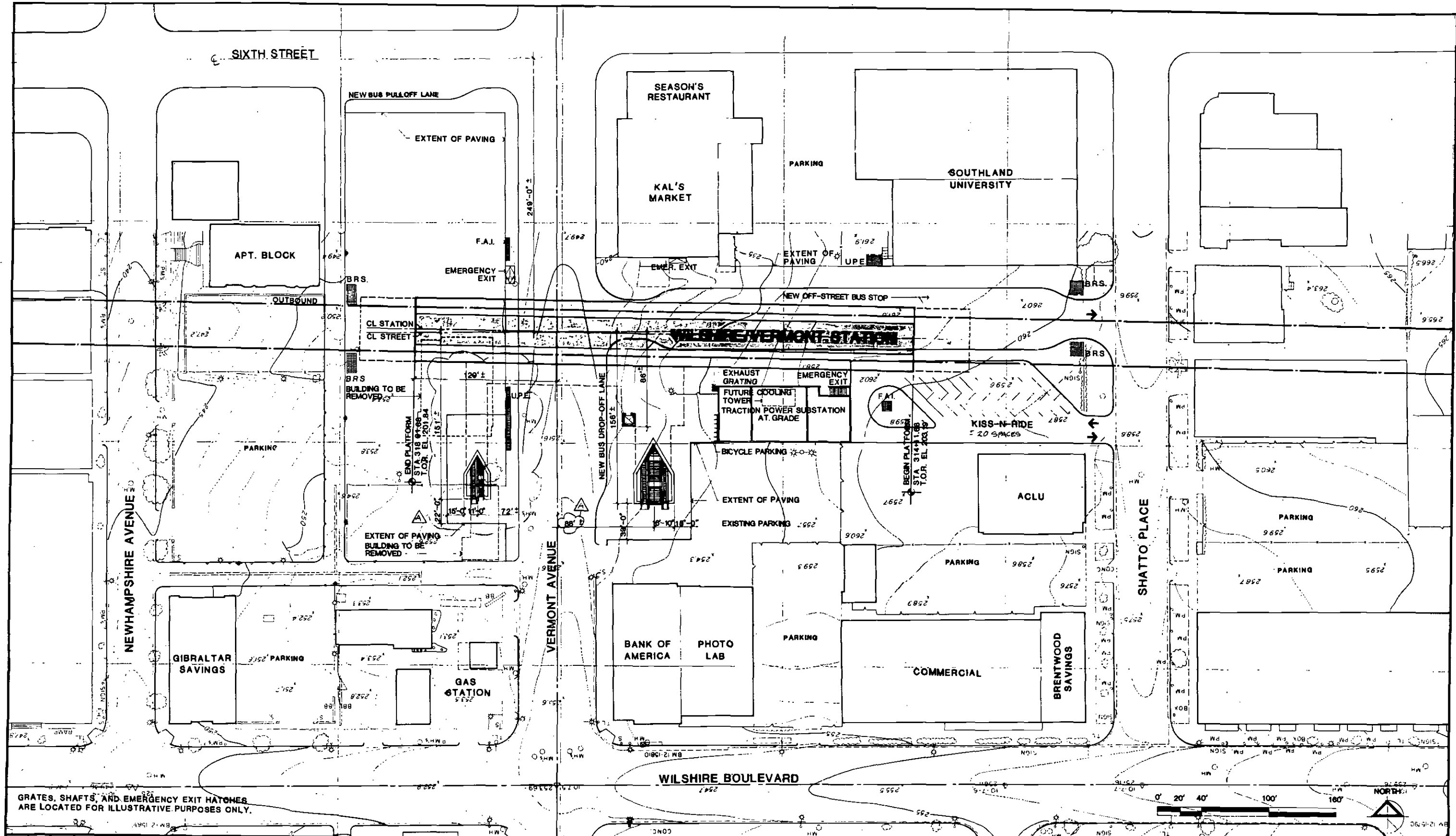
APPROVAL RECOMMENDED: _____ Date: _____
 Reg. No. _____

APPROVED: _____ Date: _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

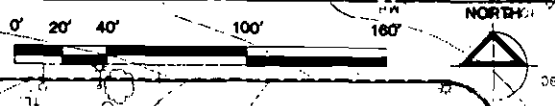
WILSHIRE / ALVARADO STATION
PLANS AND SECTIONS

PRELIMINARY

CONTRACT NO.	A170
DRAWING NO.	A-24
SCALE	1"=20'-0"
SHEET NO.	41 of 48



GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.



REV.	DATE	BY	APP.	DESCRIPTION
5/24/83				ENTRY ADDED ON WEST SIDE OF VERMONT AVE.
9/26/83				REVISIONS TO AUXILIARY ROOMS FOR COST REDUCTION.
5/24/83				PLATFORM MOVE TO THE EAST ENTRY MOVED TO EAST OF VERMONT AVE.

DESIGNED BY
HWA
DATE 5/23/83

DRAWN BY
S. DEBATH
A. SNICK
M. HOWER
DATE 5/26/83

CHECKED BY
J. JEN
DATE 5/24/83

HARRY WESE & ASSOCIATES
TIPPETTS-ABBETT-MCCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
PROJECT MANAGER

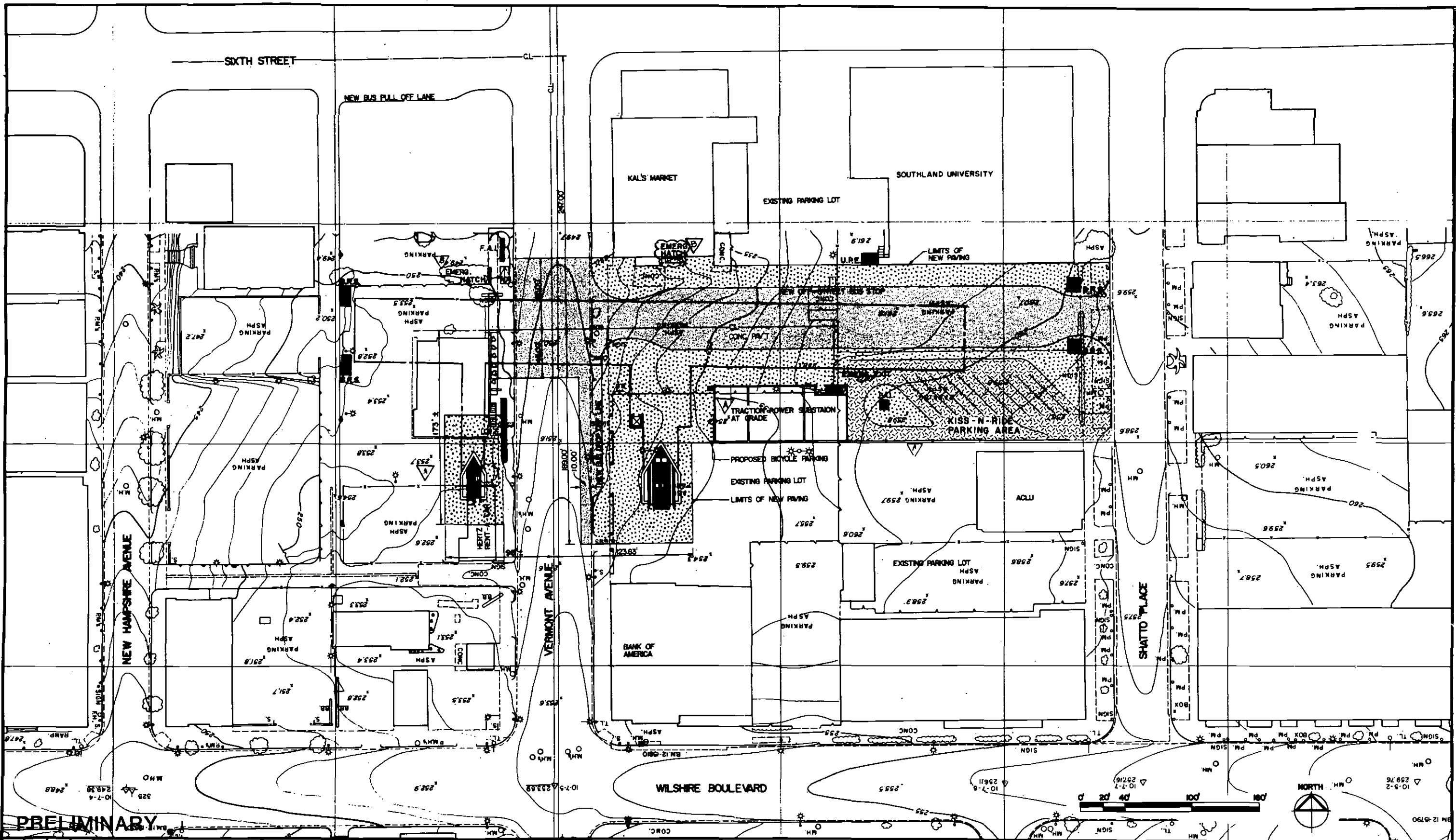
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ DATE _____
APPROVED _____ DATE _____
MANAGER / CHIEF ENGINEER _____ REG. NO. _____

WILSHIRE/VERMONT STATION
SITE PLAN
PRELIMINARY

CONTRACT NO. A195
DRAWING NO. A-25
SCALE 1" = 40'-0"
SHEET NO. 2 OF 17

Figure 6-31
Wilshire/Vermont Station: Site Plan



PRELIMINARY



REV.	DATE	BY	APP.	DESCRIPTION
7/20/08	JLD			REVISED EXIT TO MATCH
6/20/08	JLD			ADDED NEW ENTRANCE & REVISED EXTENT OF PAVING ALONG VERMONT AVE & KISS-N-RIDE AREA
				REDUCED STATION LENGTH & REVISED GRATINGS

DESIGNED BY	Date	6/12/08
TAMS		
DRAWN BY	Date	5/1/08
S.A.N / R.Q.L		
CHECKED BY	Date	5/15/08
JLD		

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STANTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

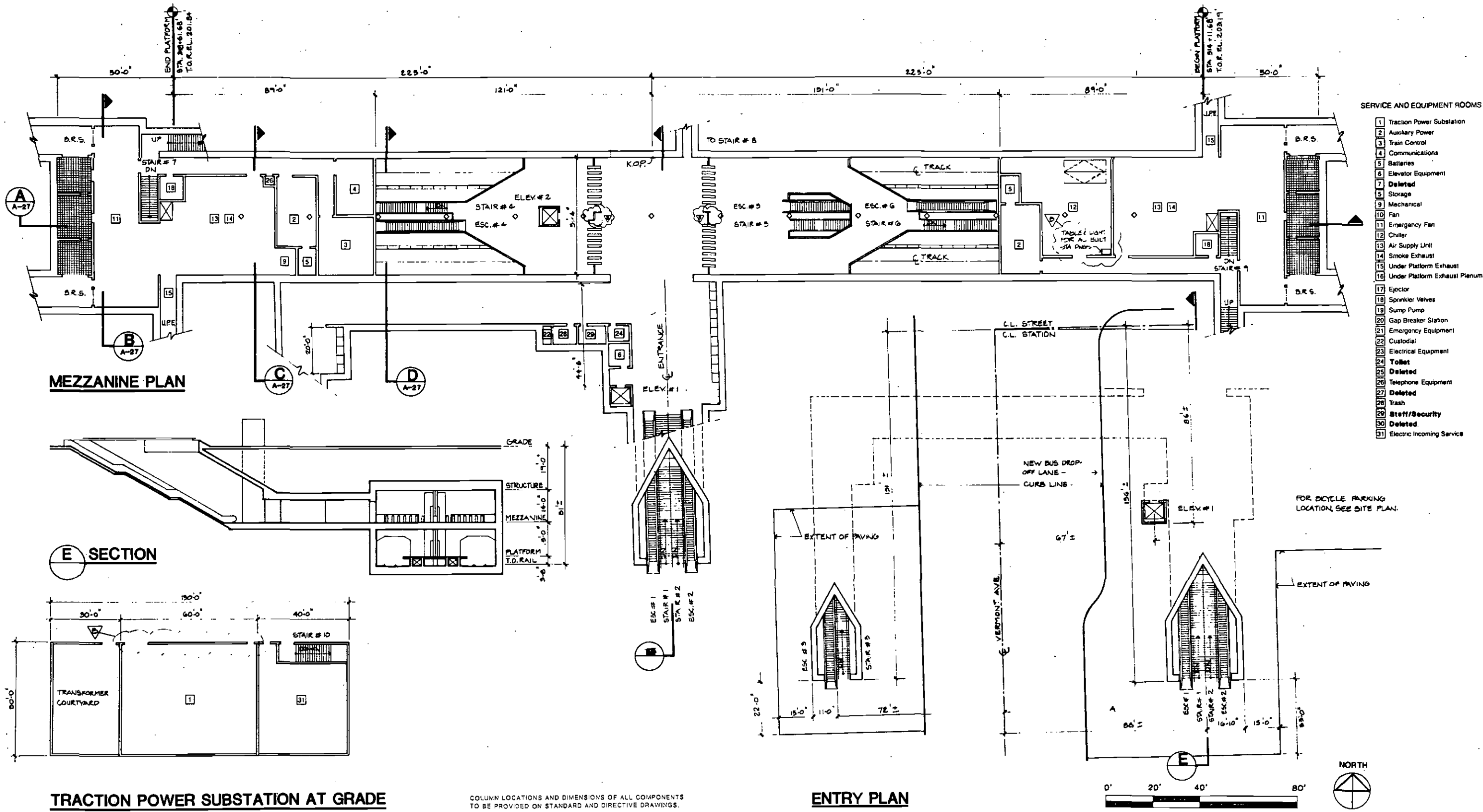
SUBMITTED BY: *[Signature]*
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT	
METRO RAIL PROJECT	
APPROVAL RECOMMENDED	APPROVED
Reg. No. _____	Date _____
MANAGER / CHIEF ENGINEER	Reg. No. _____

WILSHIRE/VERMONT STATION
 CIVIL SITE PLAN

CONTRACT NO.	A195
DRAWING NO.	C-7
SCALE	1" = 40'-0"
SHEET NO.	9 OF 17

Figure 6-33
 Wilshire/Vermont Station: Civil Site Plan



- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Toilet
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff/Security
 - 30 Deleted
 - 31 Electric Incoming Service

COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.

REV.	DATE	BY	APP.	DESCRIPTION
1/1/83		J.Y.		REVISIONS AS PER CRTD COMMENT.
5/4/83		J.Y.		ENTRY ADDED ON WEST SIDE OF VERMONT
5/26/83		J.Y.		REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY	Date: 5-26-83
HWA	
DRAWN BY	Date: 2-26-83
M. HOMER	
CHECKED BY	Date: 2-26-83
A. IEN. P. I. MATI	

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
 PROJECT MANAGER

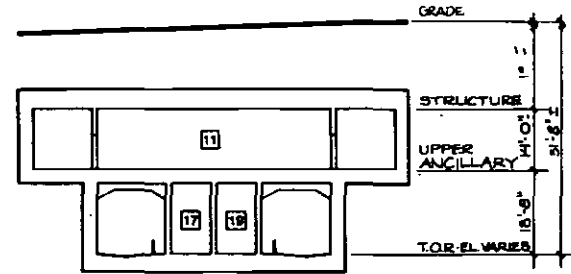
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	
_____	_____	Date _____
Reg. No. _____	MANAGER / CHIEF ENGINEER	Reg. No. _____

WILSHIRE/VERMONT STATION
 PLANS & SECTIONS

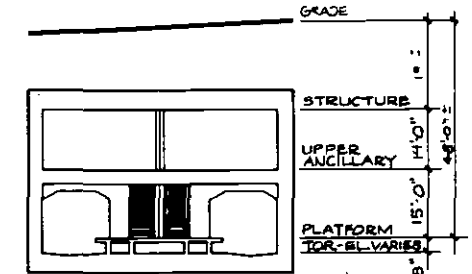
PRELIMINARY

CONTRACT NO.	A/95
DRAWING NO.	A-26
SCALE	1"=20'0"
SHEET NO.	11 OF 17

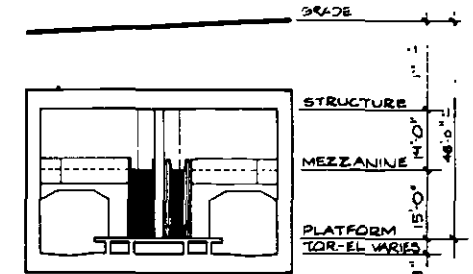
Figure 6-34 Wilshire/Vermont Station: Plans and Sections 113



B TRANSVERSE SECTION

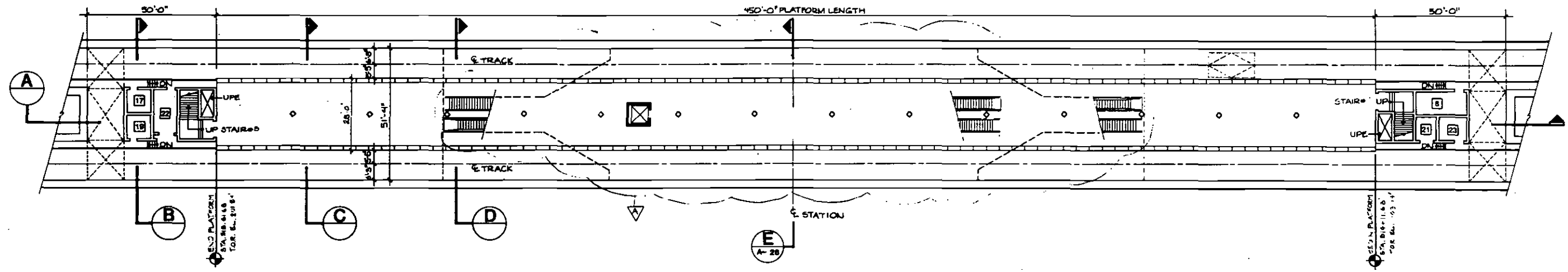


C TRANSVERSE SECTION

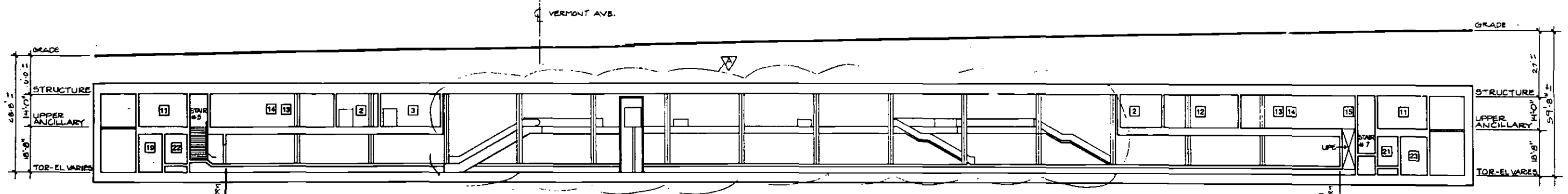


D TRANSVERSE SECTION

- SERVICE AND EQUIPMENT ROOMS**
- | | |
|----------------------------------|------------------------------|
| 1 Traction Power Substation | 17 Ejector |
| 2 Auxiliary Power | 18 Sprinkler Valve |
| 3 Train Control | 19 Sump Pump |
| 4 Communications | 20 Gap Breaker Station |
| 5 Batteries | 21 Emergency Equipment |
| 6 Elevator Equipment | 22 Custodial |
| 7 Deleted | 23 Electrical Equipment |
| 8 Storage | 24 Toilet |
| 9 Mechanical | 25 Deleted |
| 10 Fan | 26 Telephone Equipment |
| 11 Emergency Fan | 27 Deleted |
| 12 Chiller | 28 Trash |
| 13 Air Supply Unit | 29 Staff/Security |
| 14 Smoke Exhaust | 30 Deleted |
| 15 Under Platform Exhaust | 31 Electric Incoming Service |
| 16 Under Platform Exhaust Plenum | |



PLATFORM PLAN



A LONGITUDINAL SECTION



REV.	DATE	BY	APP.	DESCRIPTION
1	9/24/89	J.Y.		ENTRY ADDED ON WEST SIDE OF VERMONT.
2	9/26/89	J.Y.		REV. SCHEM. TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY	Date	9/24/89
DRAWN BY	Date	9/26/89
CHECKED BY	Date	10/17/89

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

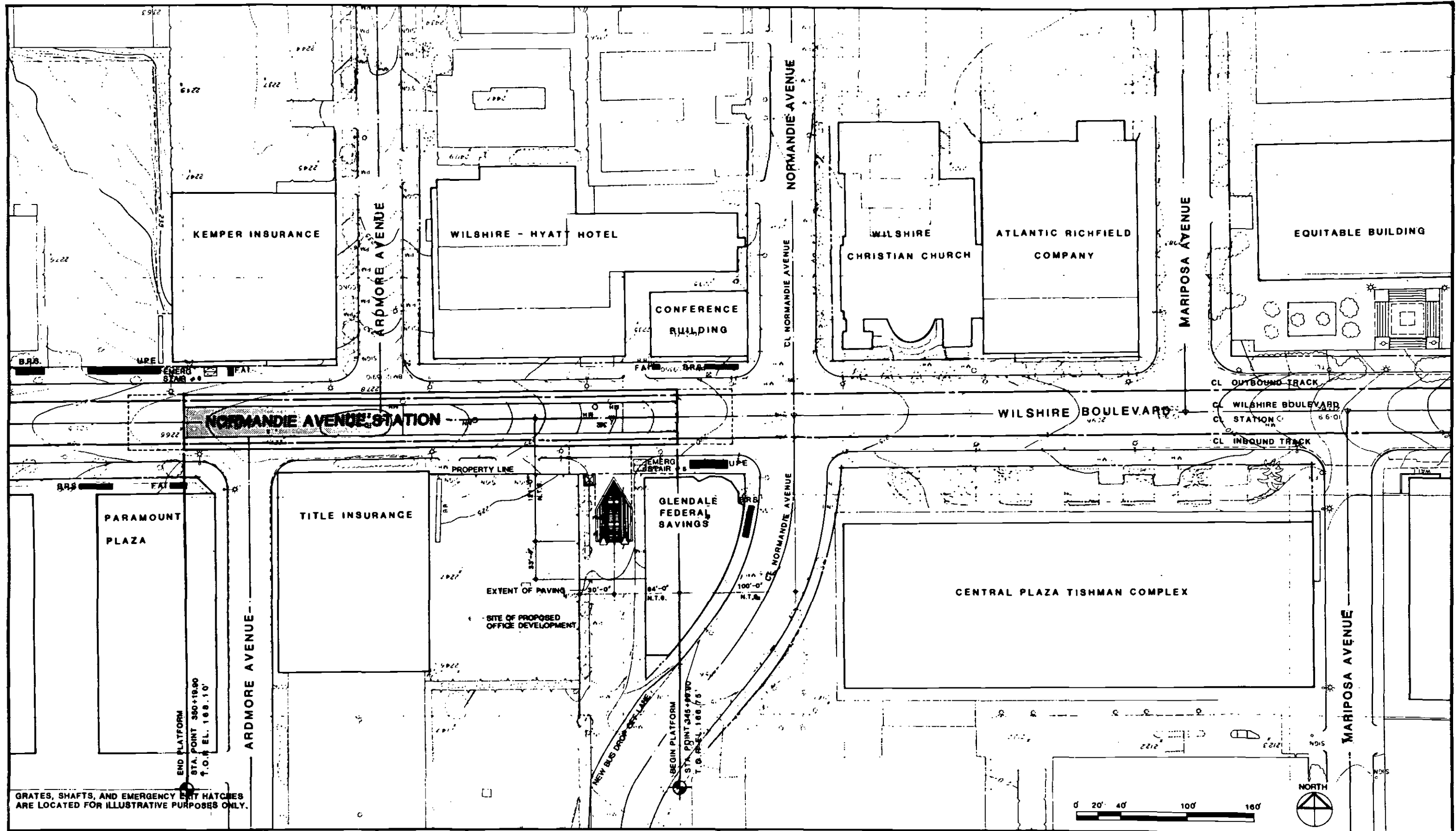
SUBMITTED BY: *[Signature]*
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED: _____ Date: _____
 APPROVED: _____ Date: _____
 MANAGER / CHIEF ENGINEER

WILSHIRE/VERMONT STATION
PLATFORM PLANS & SECTIONS
PRELIMINARY

CONTRACT NO.	A195
DRAWING NO.	A-27
SCALE	1"=20'-0"
SHEET NO.	12 of 17



GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.

REV.	DATE	BY	APP.	DESCRIPTION
422	03	RP		REVISIONS TO AUXILIARY ROOMS FOR COST REDUCTIONS

DESIGNED BY	Date
HWA	
DRAWN BY	Date
L LIM A UNICER	2/4/83
CHECKED BY	Date
R. FIGATI / J. YEN	2/4/83

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO BAIL PROJECT

APPROVAL RECOMMENDED: _____ Date: _____
 Reg. No. _____

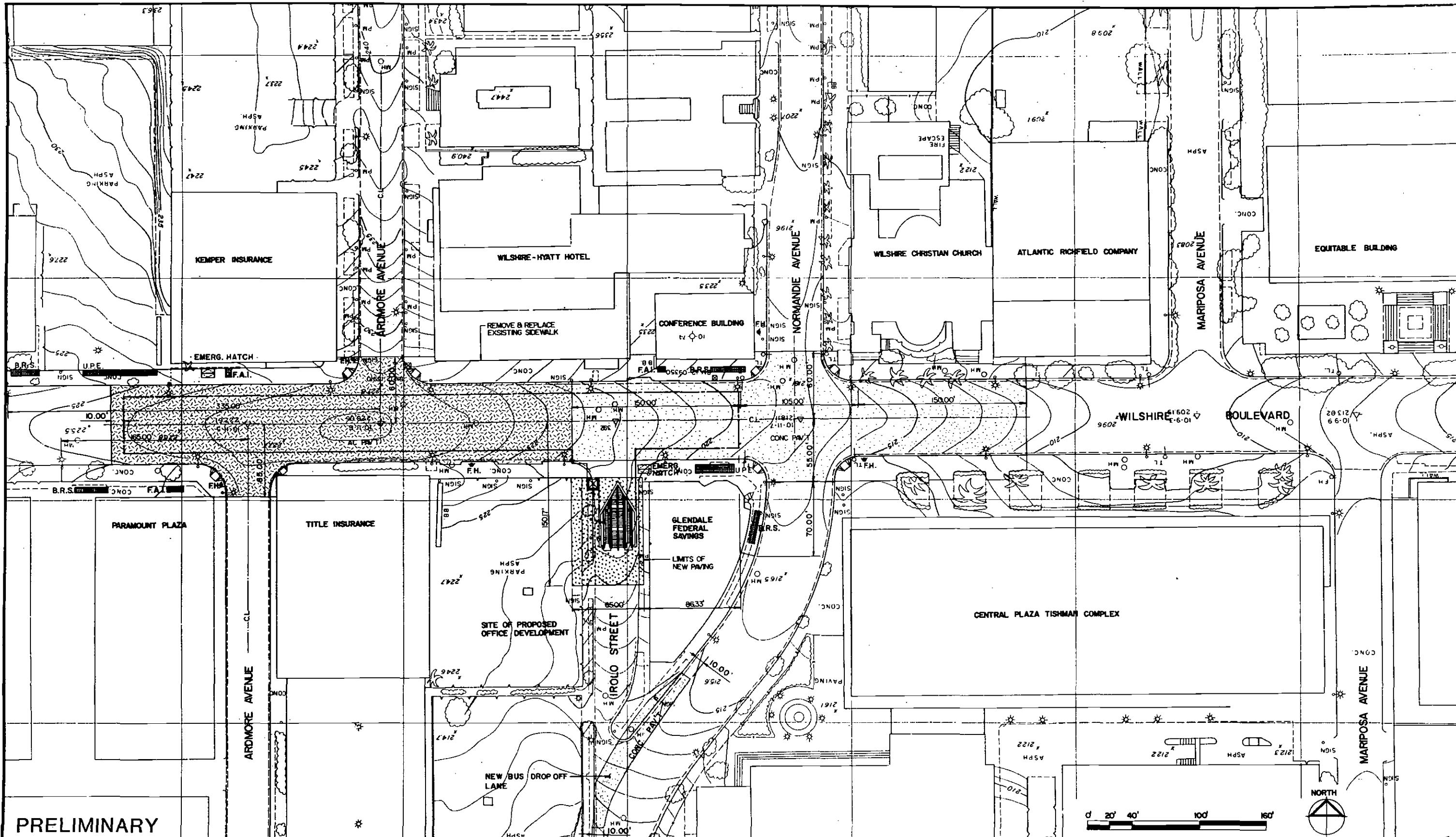
APPROVED: _____ Date: _____
 Reg. No. _____
 MANAGER / CHIEF ENGINEER

WILSHIRE/NORMANDIE STATION
 SITE PLAN

PRELIMINARY

CONTRACT NO.	A220
DRAWING NO.	A-28
SCALE	1" = 40'-0"
SHEET NO.	44 OF 63

Figure 6-36
 Wilshire/Normandie Station: Site Plan 115



PRELIMINARY


REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY	Date 5/17/83
TAMS	
DRAWN BY	Date 5/18/83
RGL	
CHECKED BY	Date 5/25/83
JLD	

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO BAIL PROJECT

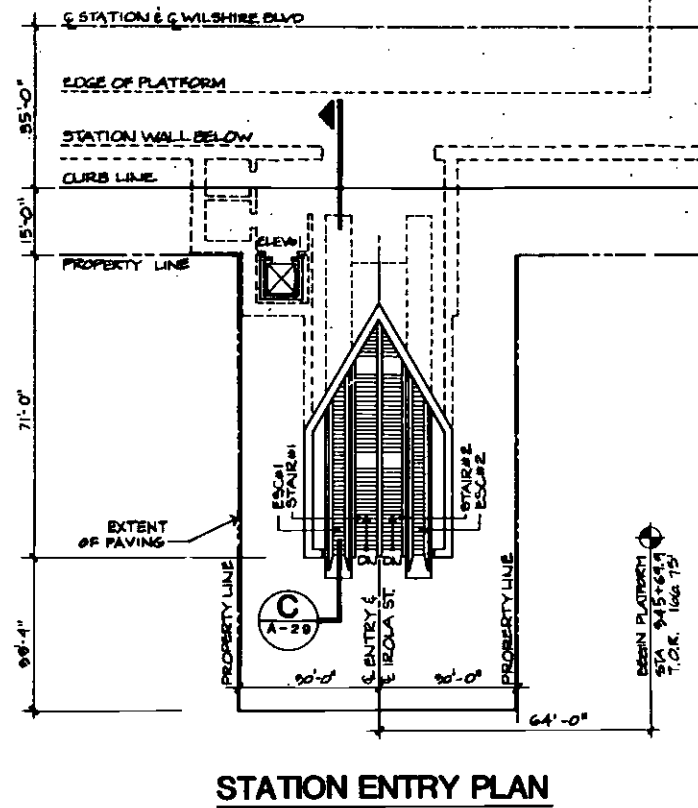
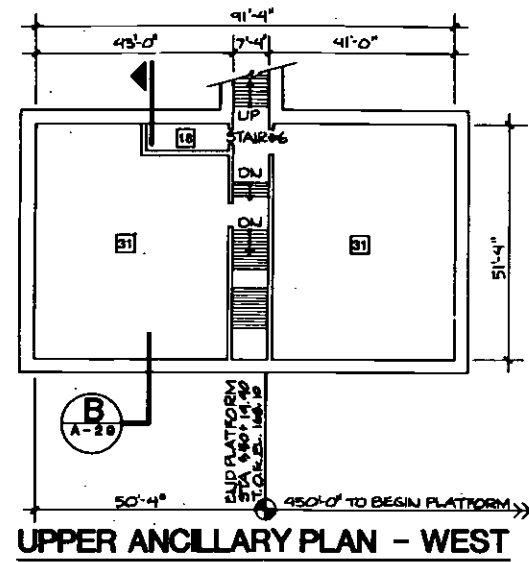


APPROVAL RECOMMENDED	APPROVED	Date
Reg. No.	MANAGER / CHIEF ENGINEER	Reg. No.

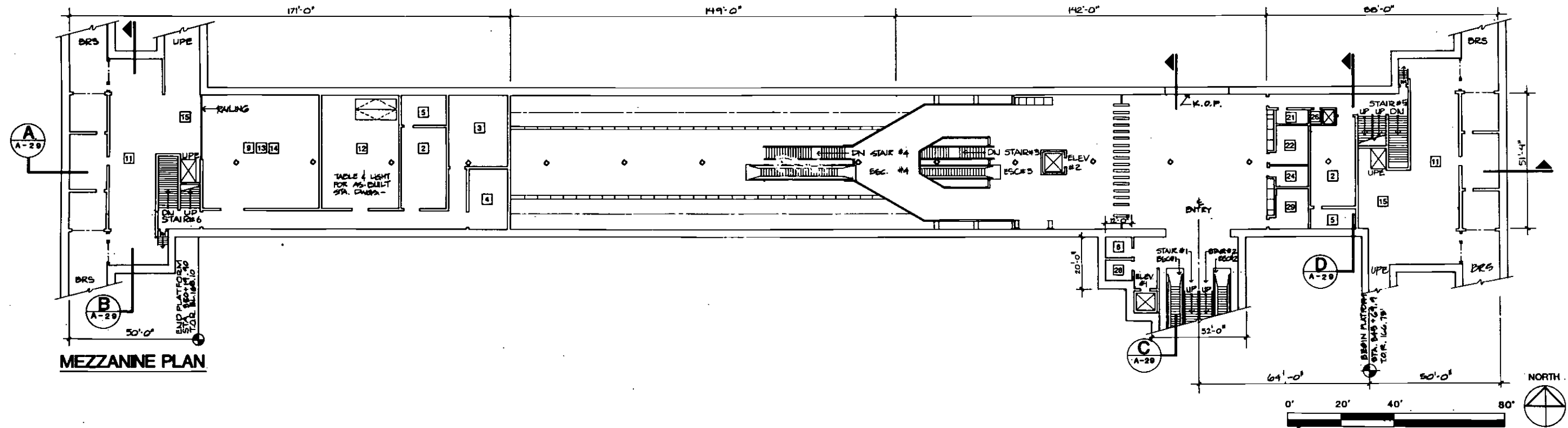
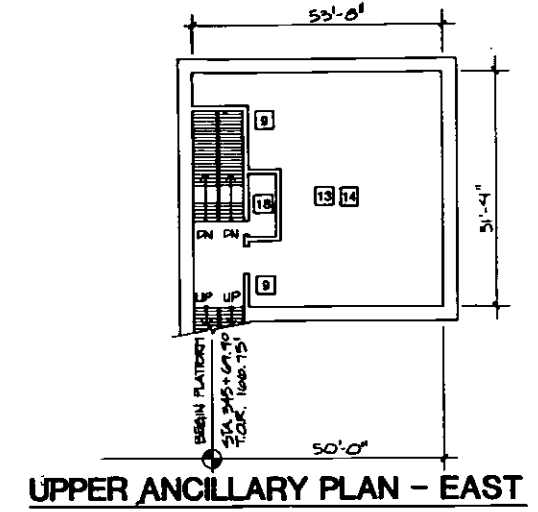
WILSHIRE/NORMANDIE STATION
 CIVIL SITE PLAN

CONTRACT NO.	A-220
DRAWING NO.	C-8
SCALE	1" = 40'-0"
SHEET NO.	

Figure 6-37
 Wilshire/Normandie Station: Civil Site Plan 116

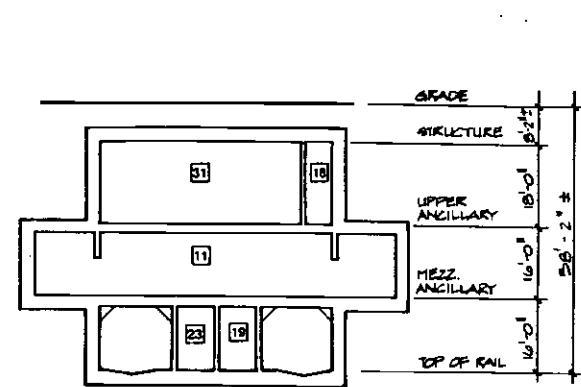


- Traction Power Substation
- Auxiliary Power
- Train Control
- Communications
- Batteries
- Elevator Equipment
- Deleted
- Storage
- Mechanical
- Fan
- Emergency Fan
- Chiller
- Air Supply Unit
- Smoke Exhaust
- Under Platform Exhaust
- Under Platform Exhaust Plenum
- Ejector
- Sprinkler Valves
- Sump Pump
- Gap Breaker Station
- Emergency Equipment
- Custodial
- Electrical Equipment
- Toilet
- Deleted
- Telephone Equipment
- Deleted
- Trash
- Staff/Security
- Deleted
- Electric Incoming Service

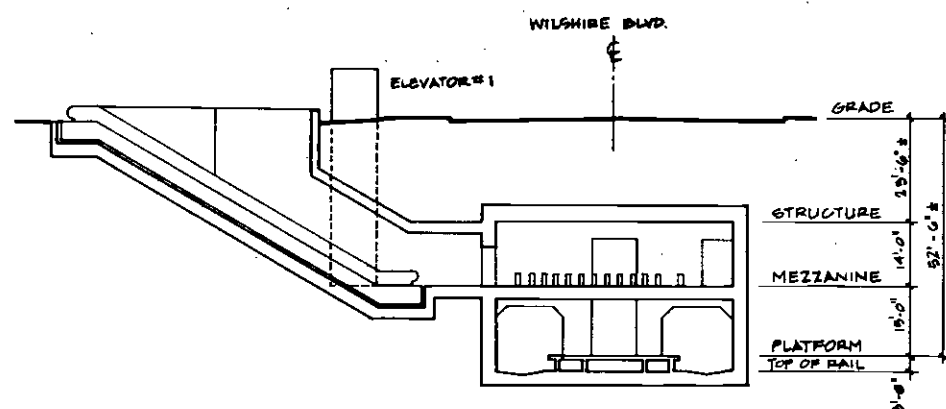


	DESIGNED BY HWA Date: 4/21/83	HARRY WEESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT	 RTD	WILSHIRE/NORMANDIE STATION PLANS PRELIMINARY	CONTRACT NO. A220
	DRAWN BY K. LIM A. SNIDER Date: 4/21/83		APPROVAL RECOMMENDED _____ Date _____ APPROVED _____ Date _____ <small>MANAGER / CHIEF ENGINEER</small>	DRAWING NO. A-29	SCALE 1"=20'-0"	SHEET NO. 47 OF 63
REV. DATE BY APP. DESCRIPTION	J. YEN REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTIONS	SUBMITTED BY: PROJECT MANAGER				

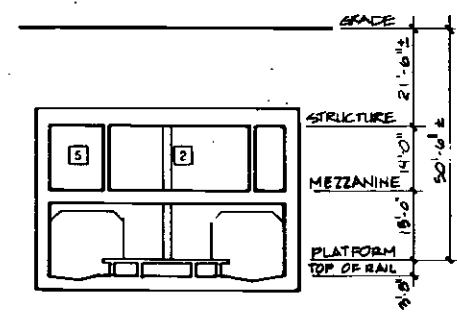
Figure 6-38
Wilshire/Normandie Station: Plans



B SECTION

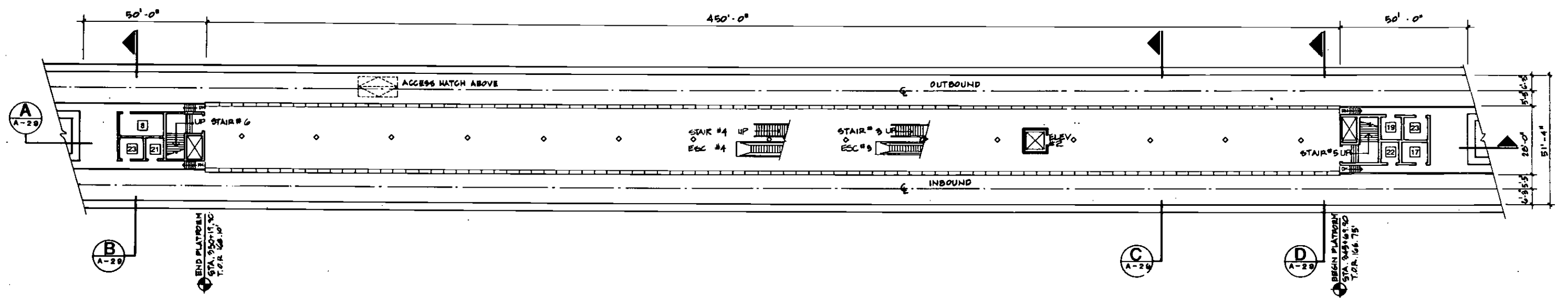


C SECTION

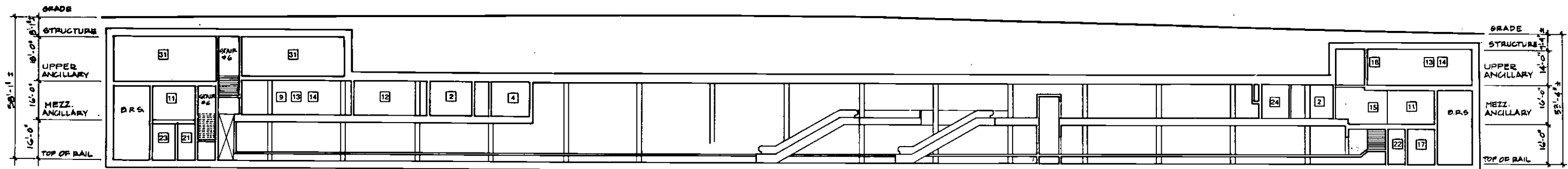


D SECTION

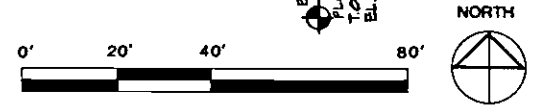
- SERVICE AND EQUIPMENT ROOMS**
- | | |
|----------------------------------|------------------------------|
| 1 Traction Power Substation | 17 Ejector |
| 2 Auxiliary Power | 18 Sprinkler Valves |
| 3 Train Control | 19 Sump Pump |
| 4 Communications | 20 Gap Breaker Station |
| 5 Batteries | 21 Emergency Equipment |
| 6 Elevator Equipment | 22 Custodial |
| 7 Deleted | 23 Electrical Equipment |
| 8 Storage | 24 Toilet |
| 9 Mechanical | 25 Deleted |
| 10 Fan | 26 Telephone Equipment |
| 11 Emergency Fan | 27 Deleted |
| 12 Chiller | 28 Trash |
| 13 Air Supply Unit | 29 Staff/Security |
| 14 Smoke Exhaust | 30 Deleted |
| 15 Under Platform Exhaust | 31 Electric Incoming Service |
| 16 Under Platform Exhaust Plenum | |



PLATFORM PLAN



A SECTION



REV.	DATE	BY	APP.	DESCRIPTION
1	4/20/83	RP		REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTIONS

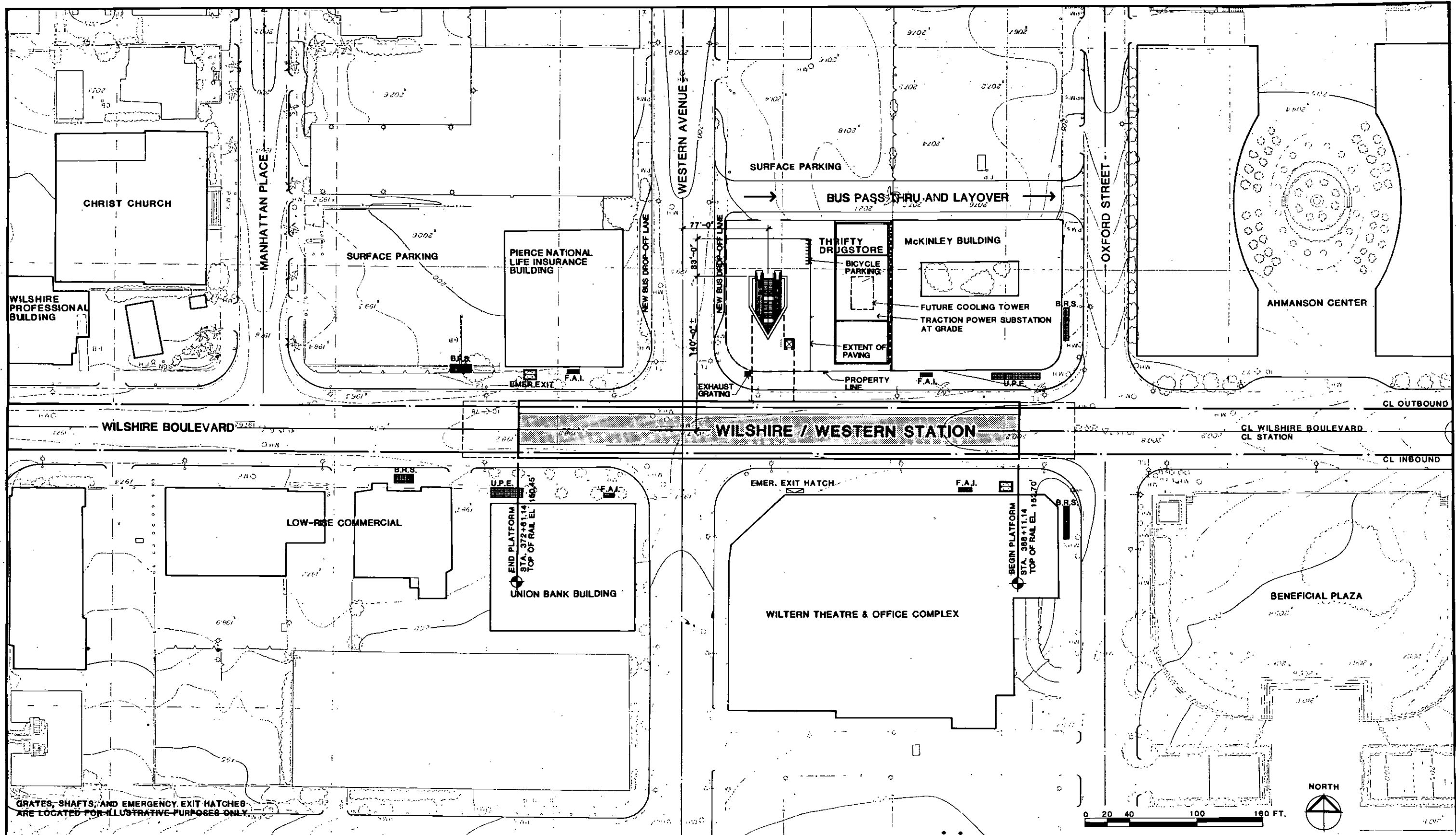
DESIGNED BY H.W.A. Date 4/20/83
 DRAWN BY K. LIM A. SWIDER Date 4/20/83
 CHECKED BY J. YEN Date 4/22/83

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY: *[Signature]*
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
 APPROVAL RECOMMENDED _____ Date _____
 APPROVED _____ Date _____
 MANAGER / CHIEF ENGINEER

WILSHIRE/NORMANDIE STATION
 PLANS AND SECTIONS
PRELIMINARY

CONTRACT NO. A220
 DRAWING NO. A-30
 SCALE 1"=20'-0"
 SHEET NO. 48 OF 63



GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.

REV.	DATE	BY	APP.	DESCRIPTION
5/12/03		J.Y.		REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION.
11/6/03		VERMA	AK	BUS PASS THRU, LAYOVER, NEW.

DESIGNED BY	Date 5-14-03
HWA	
DRAWN BY	Date 5-14-03
JMW	
CHECKED BY	Date 3-14-03
J. YEN	PERAT

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

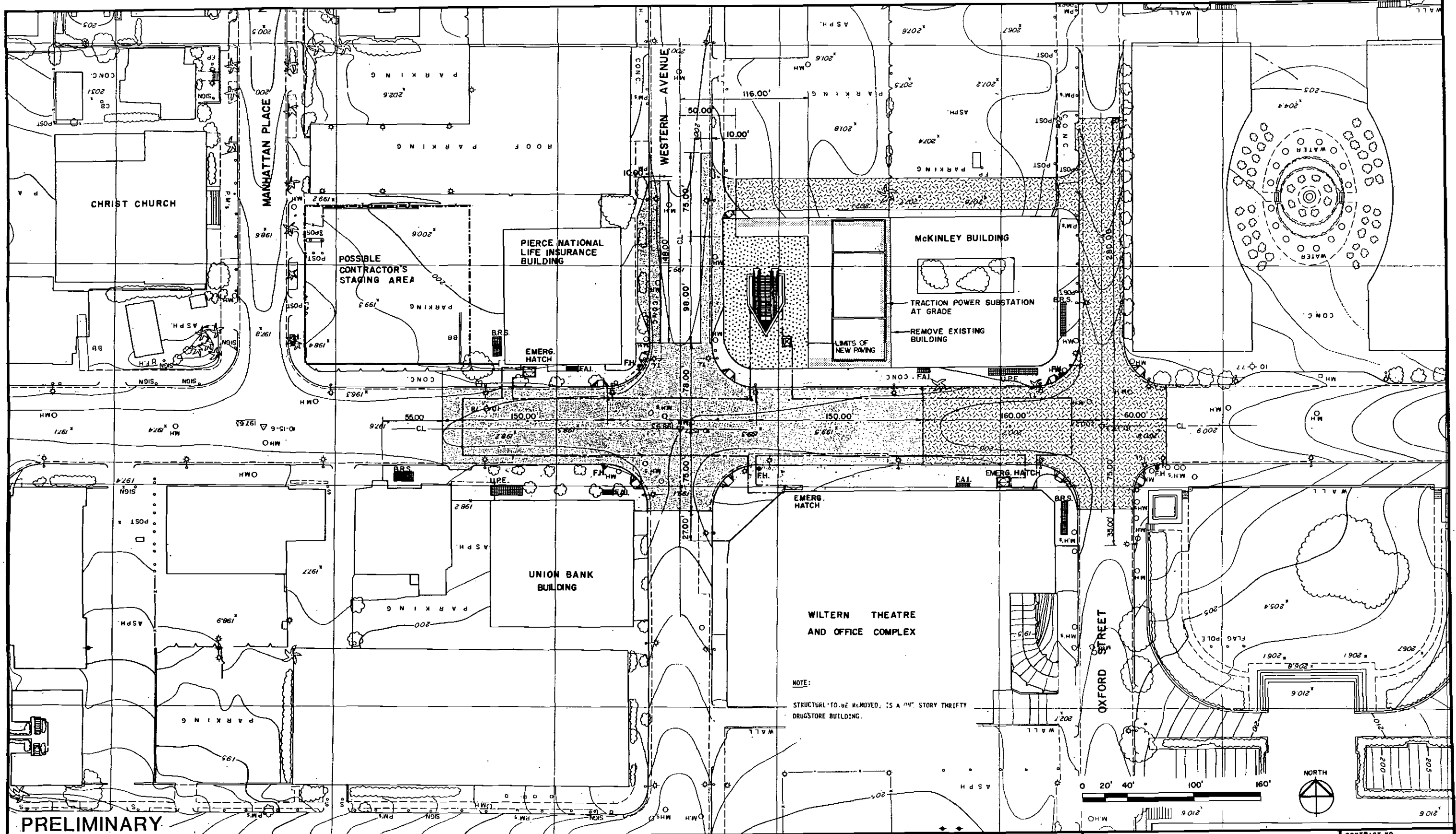
APPROVAL RECOMMENDED: _____ Date: _____
 Reg. No. _____

APPROVED: _____ Date: _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

WILSHIRE / WESTERN STATION
 SITE PLAN
 PRELIMINARY

CONTRACT NO.	A220
DRAWING NO.	A-31
SCALE	1" = 40'-0"
SHEET NO.	54 OF 63

Figure 6-40
 Wilshire/Western Station: Site Plan 119



PRELIMINARY

REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY TAMS	Date 5/15/83
DRAWN BY S. A. N.	Date 5/18/83
CHECKED BY JLD	Date 5/19/83

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

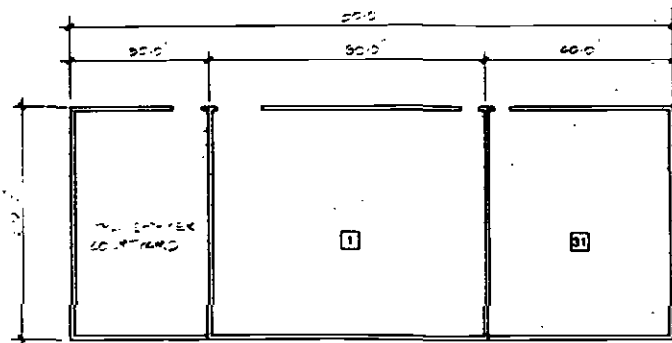
APPROVAL RECOMMENDED: _____
 Reg. No. _____

APPROVED: _____
 DATE: _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

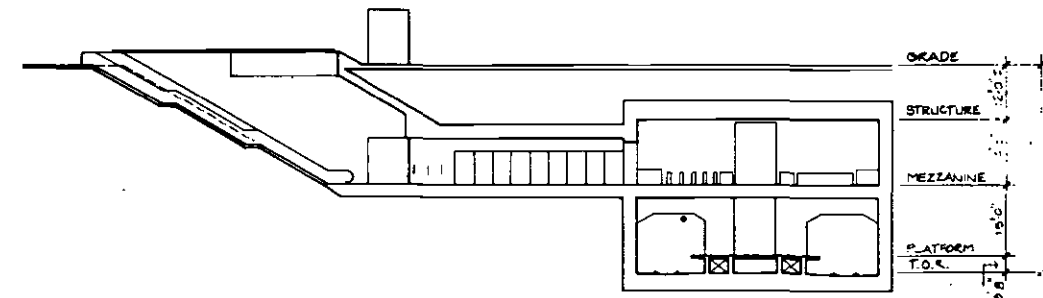
WILSHIRE / WESTERN STATION
 CIVIL SITE PLAN

CONTRACT NO. A220
DRAWING NO. C-9
SCALE 1" = 40'-0"
SHEET NO. 55 OF 63

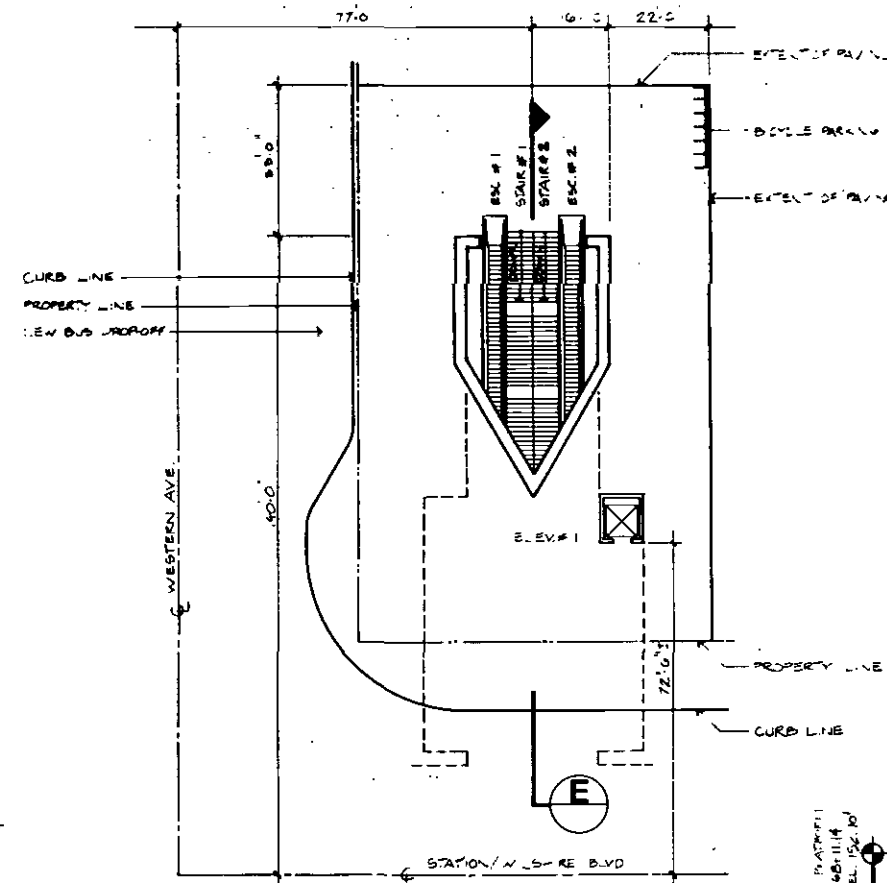
Figure 6-41
 Wilshire/Western Station: Civil Site Plan



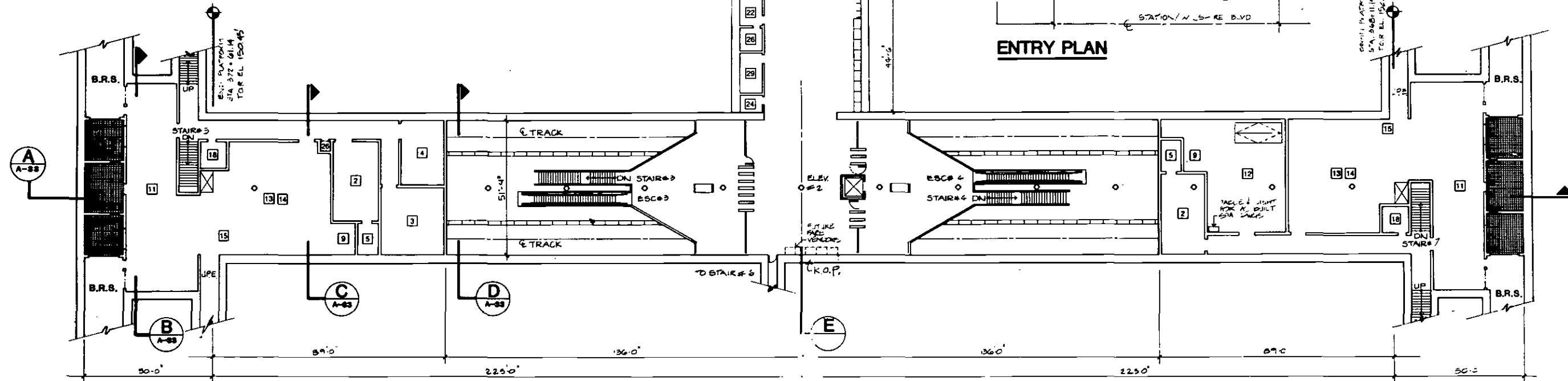
TRACTION POWER SUBSTATION PLAN



E SECTION



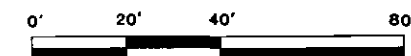
ENTRY PLAN



MEZZANINE PLAN

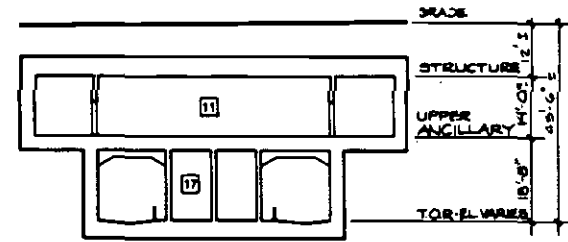
COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPO TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWING

- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Toilet
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff/Security
 - 30 Deleted
 - 31 Electric Incoming Service

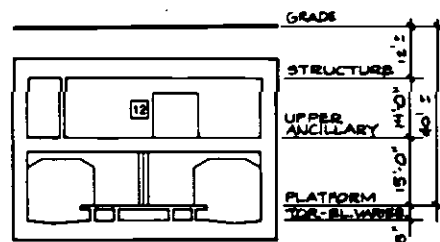


DESIGNED BY: <i>WA</i> Date: <i>2-27-88</i> DRAWN BY: <i>M. HOMER</i> Date: <i>2-27-88</i> CHECKED BY: <i>J. WEN</i> Date: <i>2-27-88</i>		HARRY WESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: <i>[Signature]</i> PROJECT MANAGER		SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT APPROVAL: <i>[Signature]</i> Date: _____ APPROVED: _____ Date: _____ Reg. No. _____ MANAGER / CHIEF ENGINEER Reg. No. _____		WILSHIRE/WESTERN STATION PLANS & SECTIONS PRELIMINARY		CONTRACT NO. A220 DRAWING NO. A-32 SCALE 1"=20'-0" SHEET NO. 57 OF 63	
---	--	---	--	--	--	---	--	--	--

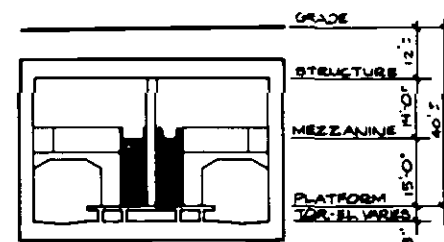
Figure 6-42
Wilshire/Western Station: Plans and Sections



B TRANSVERSE SECTION



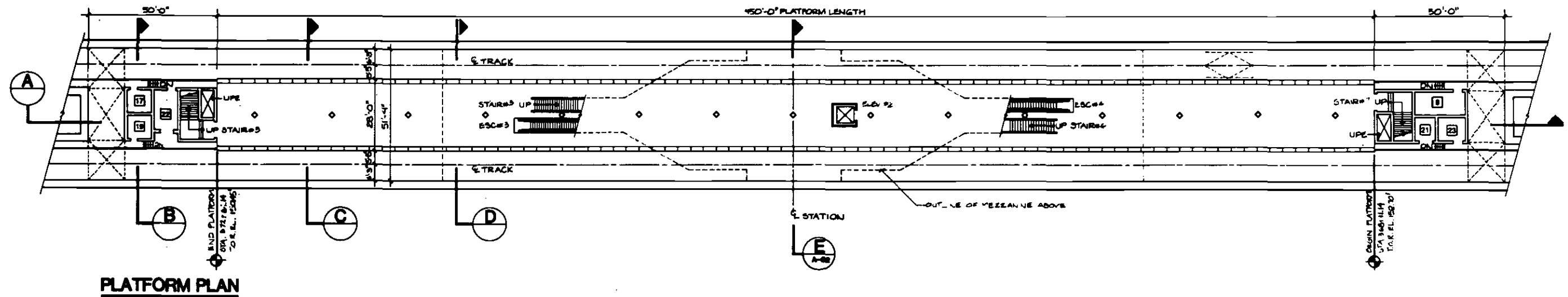
C TRANSVERSE SECTION



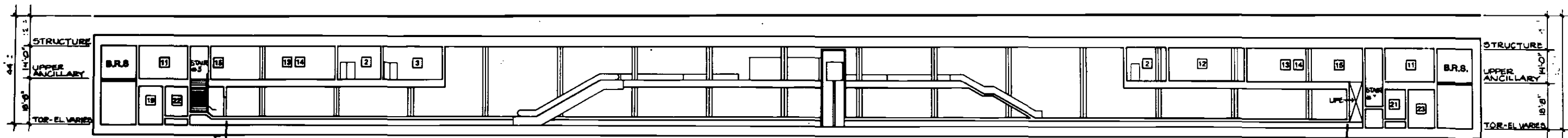
D TRANSVERSE SECTION

SERVICE AND EQUIPMENT ROOMS

1	Traction Power Substation	17	Ejector
2	Auxiliary Power	18	Sprinkler Valves
3	Train Control	19	Sump Pump
4	Communications	20	Gap Breaker Station
5	Batteries	21	Emergency Equipment
6	Elevator Equipment	22	Custodial
7	Deleted	23	Electrical Equipment
8	Storage	24	Toilet
9	Mechanical	25	Deleted
10	Fan	26	Telephone Equipment
11	Emergency Fan	27	Deleted
12	Chiller	28	Trash
13	Air Supply Unit	29	Staff/Security
14	Smoke Exhaust	30	Deleted
15	Under Platform Exhaust	31	Electric Incoming Service
16	Under Platform Exhaust Plenum		



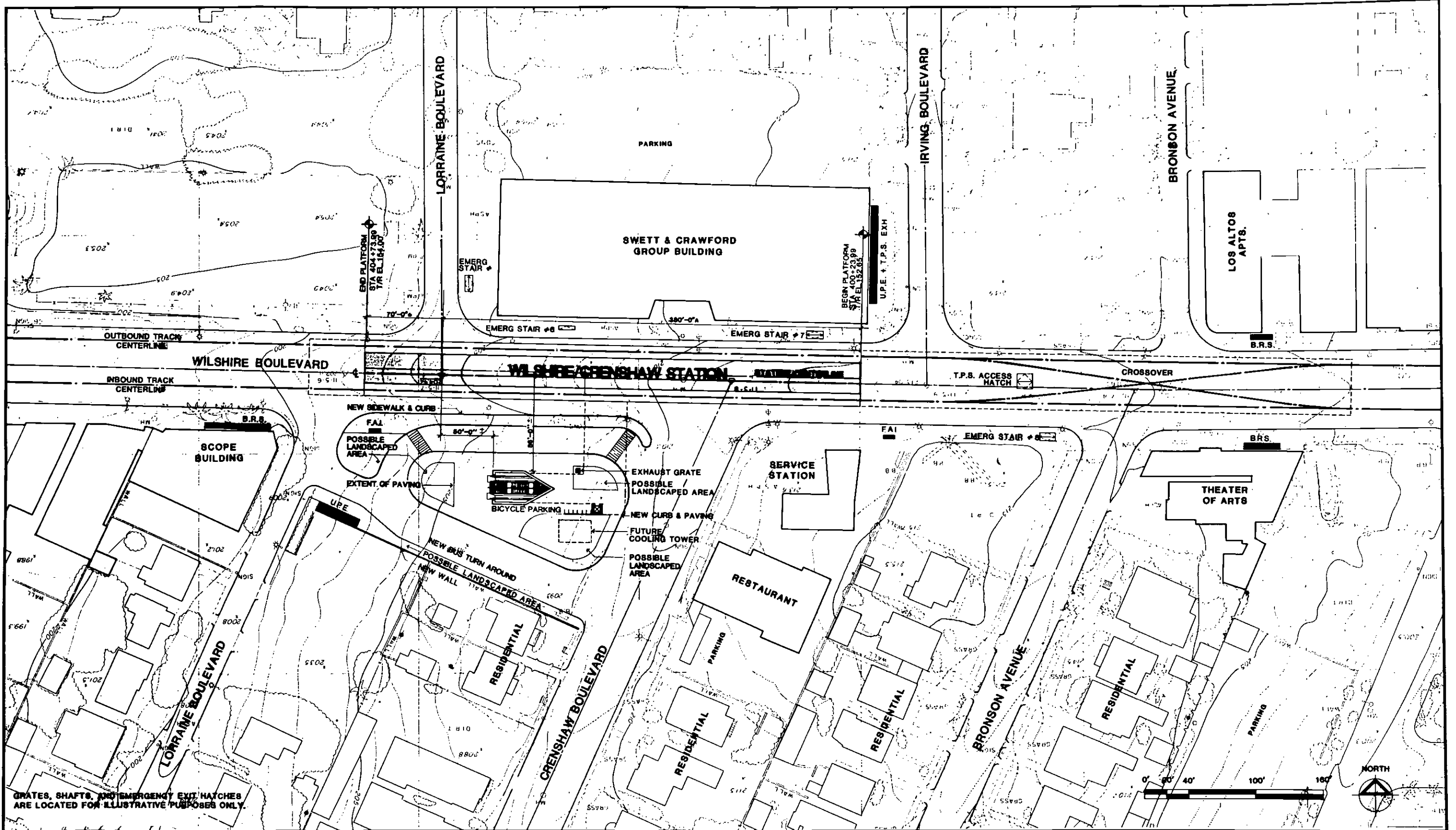
PLATFORM PLAN



A LONGITUDINAL SECTION



DESIGNED BY HWA Date 2-27-83			HARRY WESE & ASSOCIATES TIPPETTS-ABSETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 	WILSHIRE/WESTERN STATION PLANS & SECTIONS PRELIMINARY	CONTRACT NO. A220		
DRAWN BY M. OMER Date 2-13-83						DRAWING NO. A-33		
CHECKED BY J. TEN Date 2-27-83 DESCRIPTION REVISIONS TO ANCILLARY ROOMS FOR GOVT. ASSOCIATION						SCALE 1"=20'-0"		
REV.	DATE	BY	APP.	DESCRIPTION	APPROVAL RECOMMENDED	APPROVED	DATE	SHEET NO. 58 OF 63



GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.

REV.	DATE	BY	APP.	DESCRIPTION
1	2/17/83	HWA		DESIGNED BY
2	2/17/83	S. DEBNATH		DRAWN BY
3	6/19/83	J.YEN		CHECKED BY
				REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION.

DESIGNED BY
HWA Date 2-17-83

DRAWN BY
S. DEBNATH Date 2/17/83

CHECKED BY
J.YEN Date 6-19-83

HARRY WESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-BRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

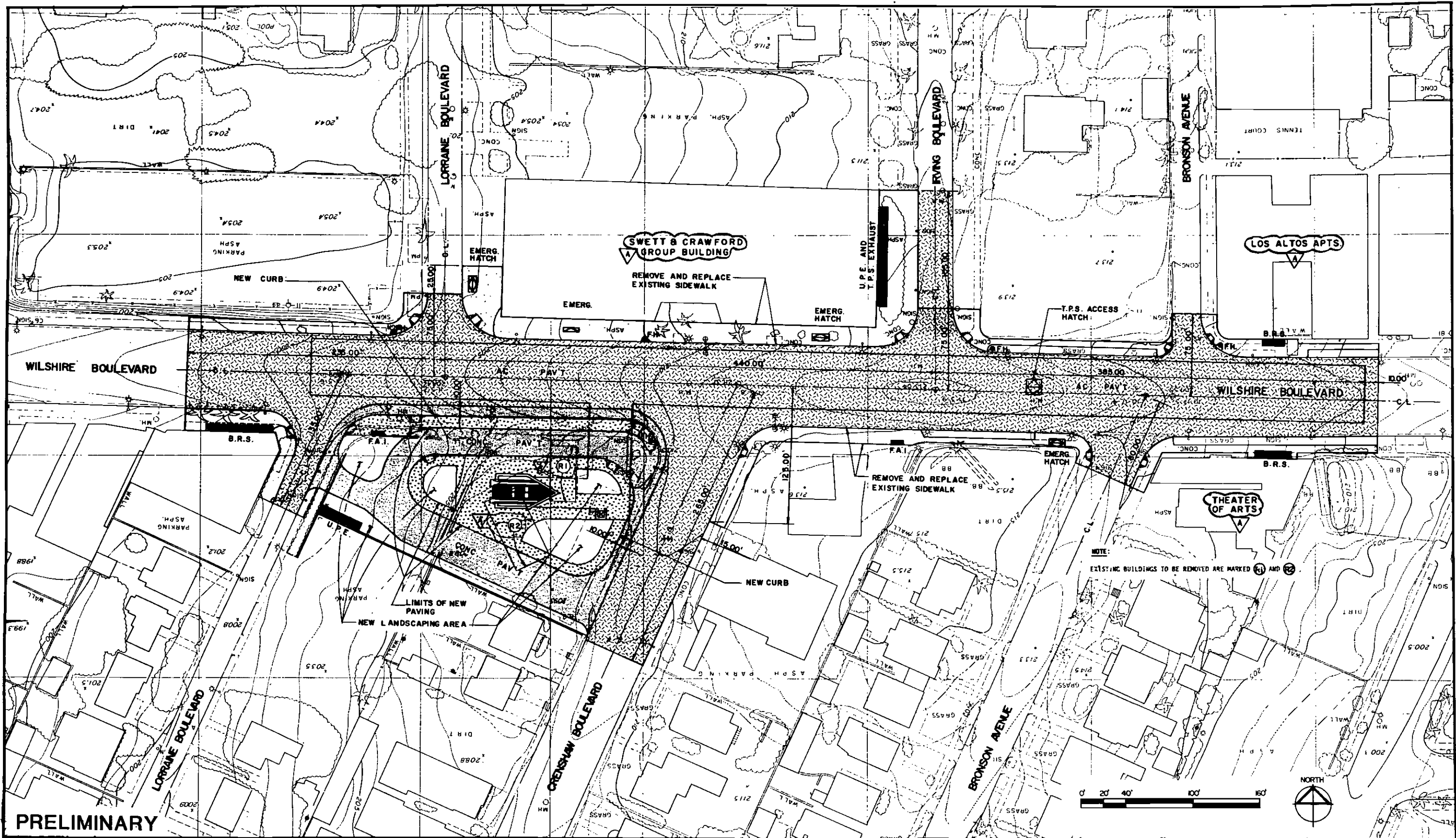
APPROVAL RECOMMENDED _____ DATE _____
APPROVED _____ DATE _____
MANAGER / CHIEF ENGINEER Reg. No. _____

WILSHIRE/CRENSHAW STATION
SITE PLAN
PRELIMINARY

CW-A-1

CONTRACT NO. _____
DRAWING NO. **A-34**
SCALE: **1" = 40'-0"**
SHEET NO. _____

Figure 6-44
Wilshire/Crenshaw Station: Site Plan 123



PRELIMINARY

REV.	DATE	BY	APP.	DESCRIPTION
1	7/18/83	JLD		ADDED NAME OF EAST BLDG AND REVISED NOTE ON BLDG REMOVAL.

DESIGNED BY TAM8	Date: 6/10/83
DRAWN BY HWW	Date: 6/10/83
CHECKED BY JLD	Date: 6/10/83

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

RTD

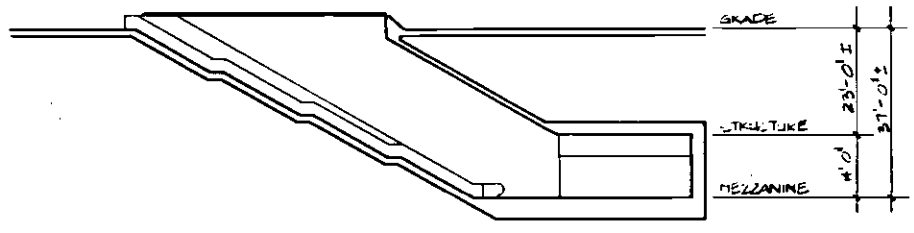
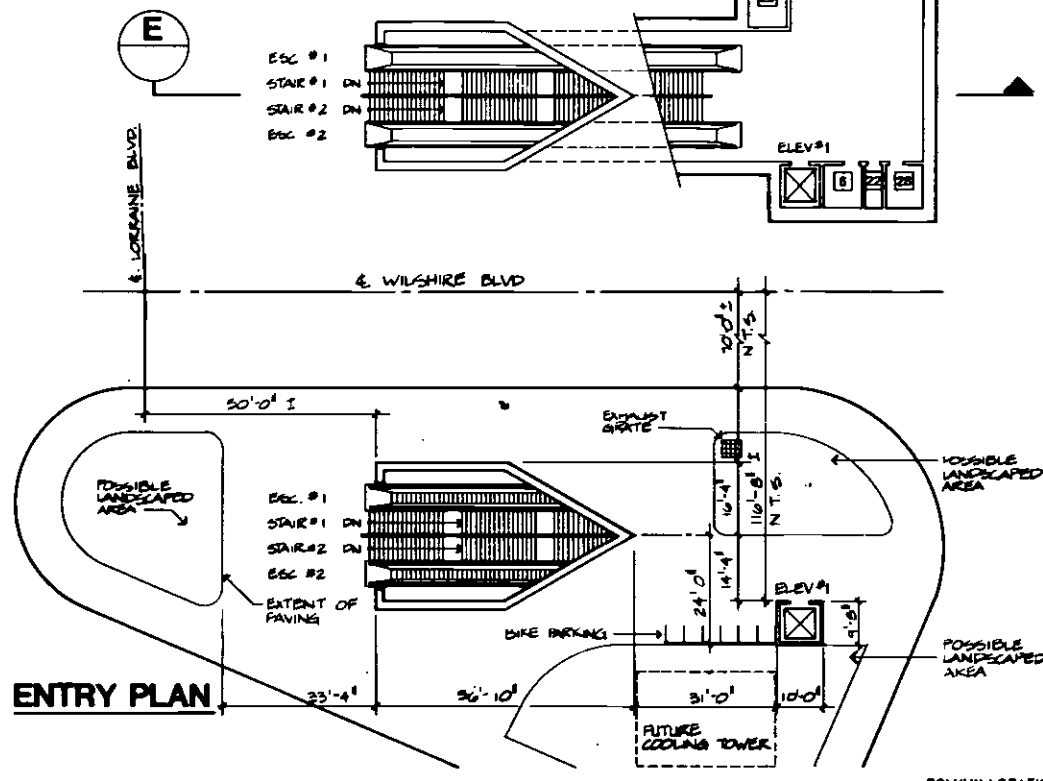
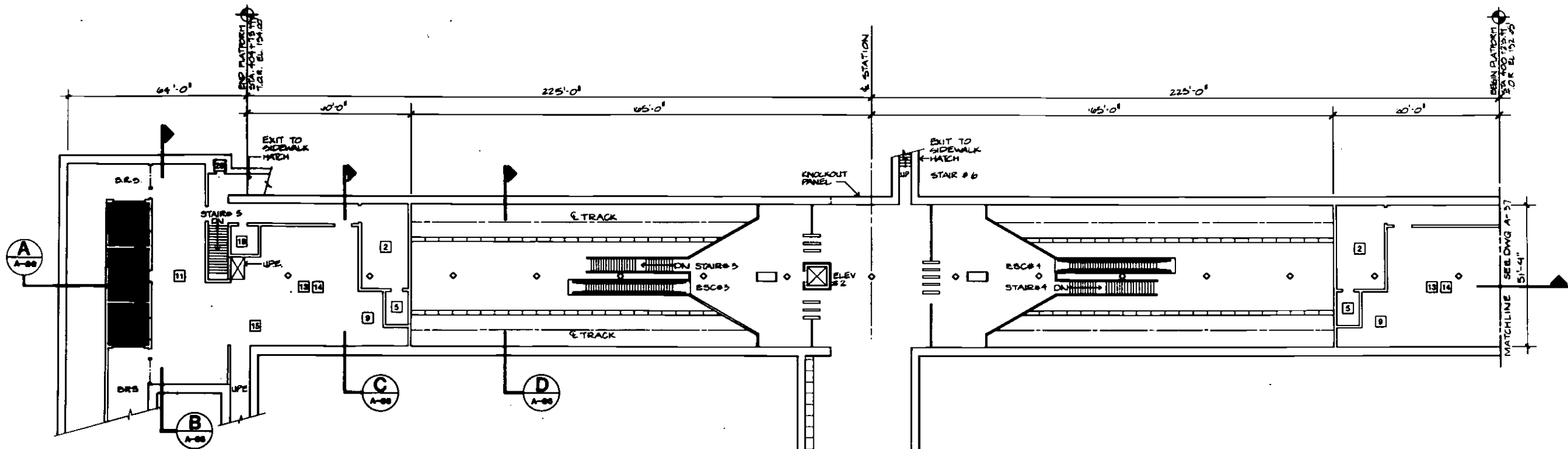
APPROVAL RECOMMENDED	APPROVED	Date
Reg. No. _____	MANAGER / CHIEF ENGINEER	Reg. No. _____

WILSHIRE/CRENSHAW STATION
 CIVIL SITE PLAN

CONTRACT NO.	
DRAWING NO.	C-10
SCALE	1" = 40'-0"
SHEET NO.	

Figure 6-45
 Wilshire/Crenshaw Station: Civil Site Plan

- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Toilet
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff/Security
 - 30 Deleted
 - 31 Electric Incoming Service



COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.



REV.	DATE	BY	APP.	DESCRIPTION
02/10/05		J.Y.		REVISIONS TO AUXILIARY ROOMS FOR COST REDUCTIONS

DESIGNED BY	Date
H.W.A.	
DRAWN BY	Date
M.W.D.	2-24-05
CHECKED BY	Date

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

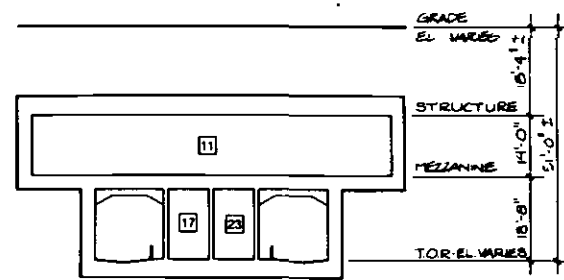
SUBMITTED BY:
[Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT		
METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	Date
Reg. No.	MANAGER / CHIEF ENGINEER	Reg. No.

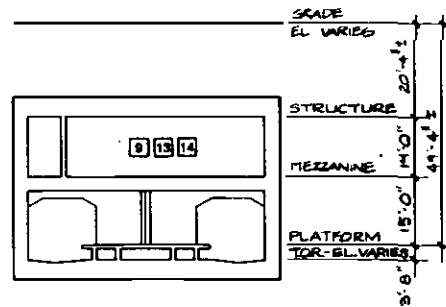
WILSHIRE/CRENSHAW STATION
 PLANS & SECTIONS

PRELIMINARY

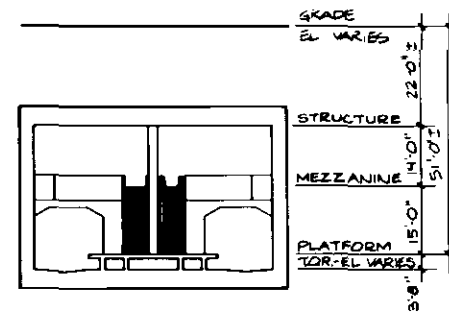
CONTRACT NO.
DRAWING NO. A-35
SCALE 1"=20'-0"
SHEET NO.



B TRANSVERSE SECTION

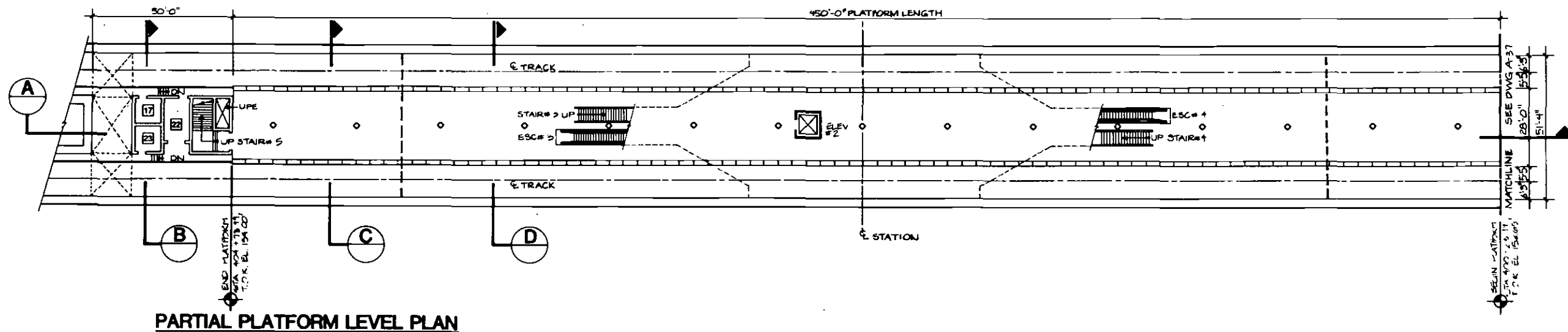


C TRANSVERSE SECTION

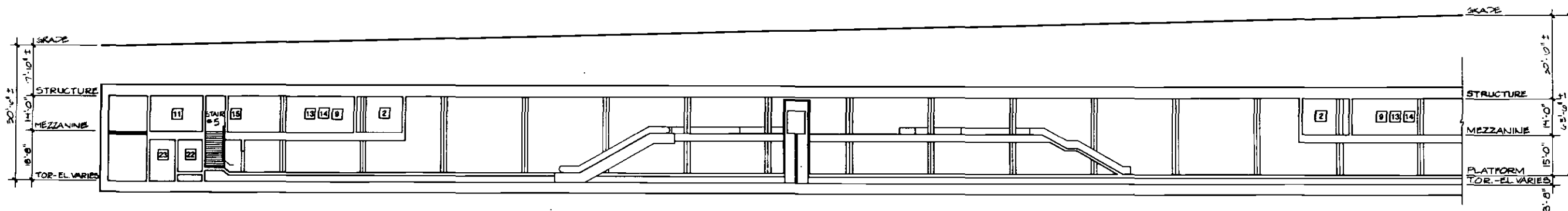


D TRANSVERSE SECTION

SERVICE AND EQUIPMENT ROOMS	
1	Traction Power Substation
2	Auxiliary Power
3	Train Control
4	Communications
5	Batteries
6	Elevator Equipment
7	Deleted
8	Storage
9	Mechanical
10	Fan
11	Emergency Fan
12	Chiller
13	Air Supply Unit
14	Smoke Exhaust
15	Under Platform Exhaust
16	Under Platform Exhaust Plenum
17	Ejector
18	Sprinkler Valves
19	Sump Pump
20	Gap Breaker Station
21	Emergency Equipment
22	Custodial
23	Electrical Equipment
24	Toilet
25	Deleted
26	Telephone Equipment
27	Deleted
28	Trash
29	Staff/Security
30	Deleted
31	Electric Incoming Service



PARTIAL PLATFORM LEVEL PLAN



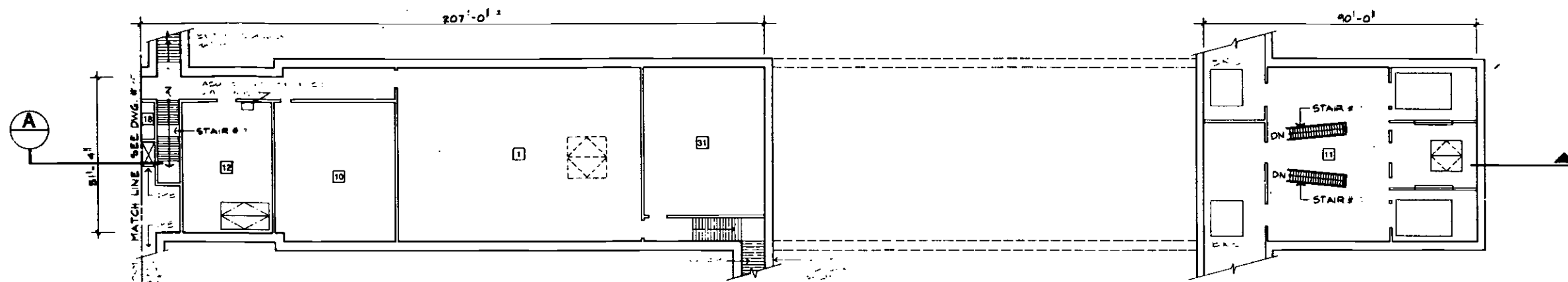
A PARTIAL LONGITUDINAL SECTION



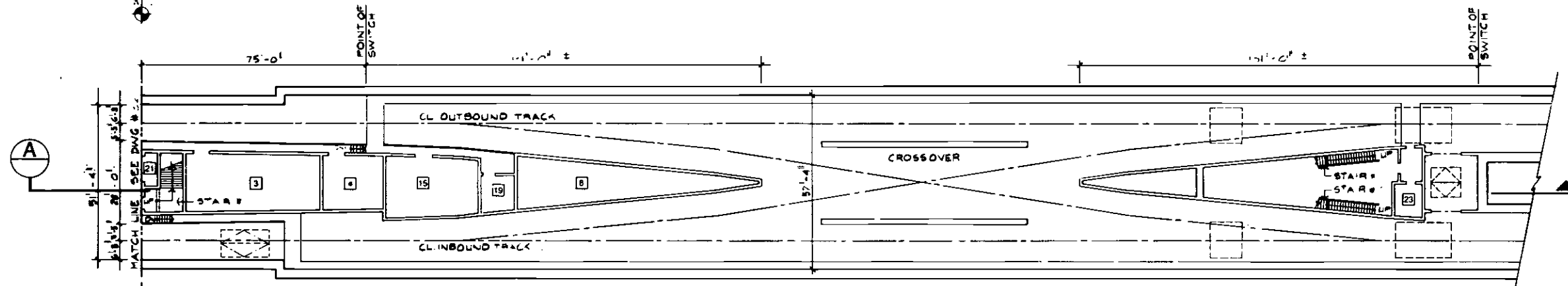
<table border="1"> <thead> <tr> <th>REV.</th> <th>DATE</th> <th>BY</th> <th>APP.</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2/1/02</td> <td>HW</td> <td></td> <td>REVISIONS TO ANGLIARY ROOMS FOR COST REDUCTION</td> </tr> </tbody> </table>	REV.	DATE	BY	APP.	DESCRIPTION	1	2/1/02	HW		REVISIONS TO ANGLIARY ROOMS FOR COST REDUCTION	DESIGNED BY Date 2/23/02 HWA DRAWN BY Date 2/14/02 MWD CHECKED BY Date 2/23/02 LWEN PIGMT	HARRY WEESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. QIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: [Signature] PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT APPROVAL RECOMMENDED APPROVED DATE MANAGER / CHIEF ENGINEER	WILSHIRE/CRENSHAW STATION PLANS & SECTIONS PRELIMINARY	CONTRACT NO. DRAWING NO. A-36 SCALE 1"=20'-0" SHEET NO.
	REV.	DATE	BY	APP.	DESCRIPTION										
1	2/1/02	HW		REVISIONS TO ANGLIARY ROOMS FOR COST REDUCTION											

Figure 6-47
Wilshire/Crenshaw Station: Plans and Sections

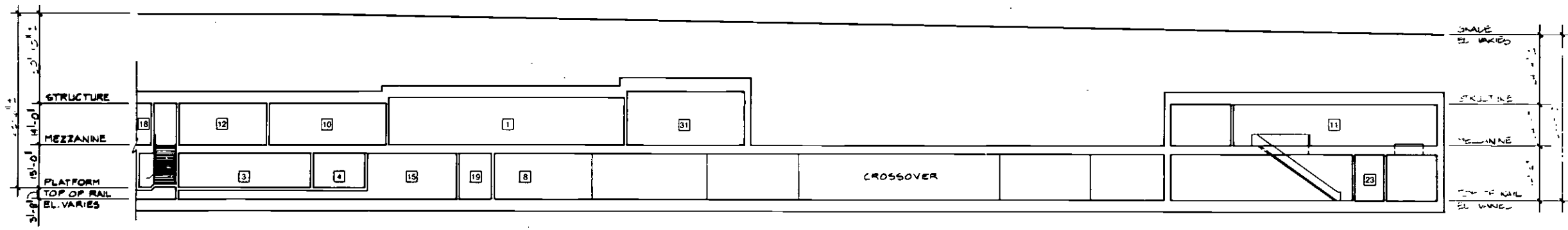
- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Toilet
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff / Security
 - 30 Deleted
 - 31 Electric Incoming Service



PARTIAL MEZZANINE LEVEL PLAN

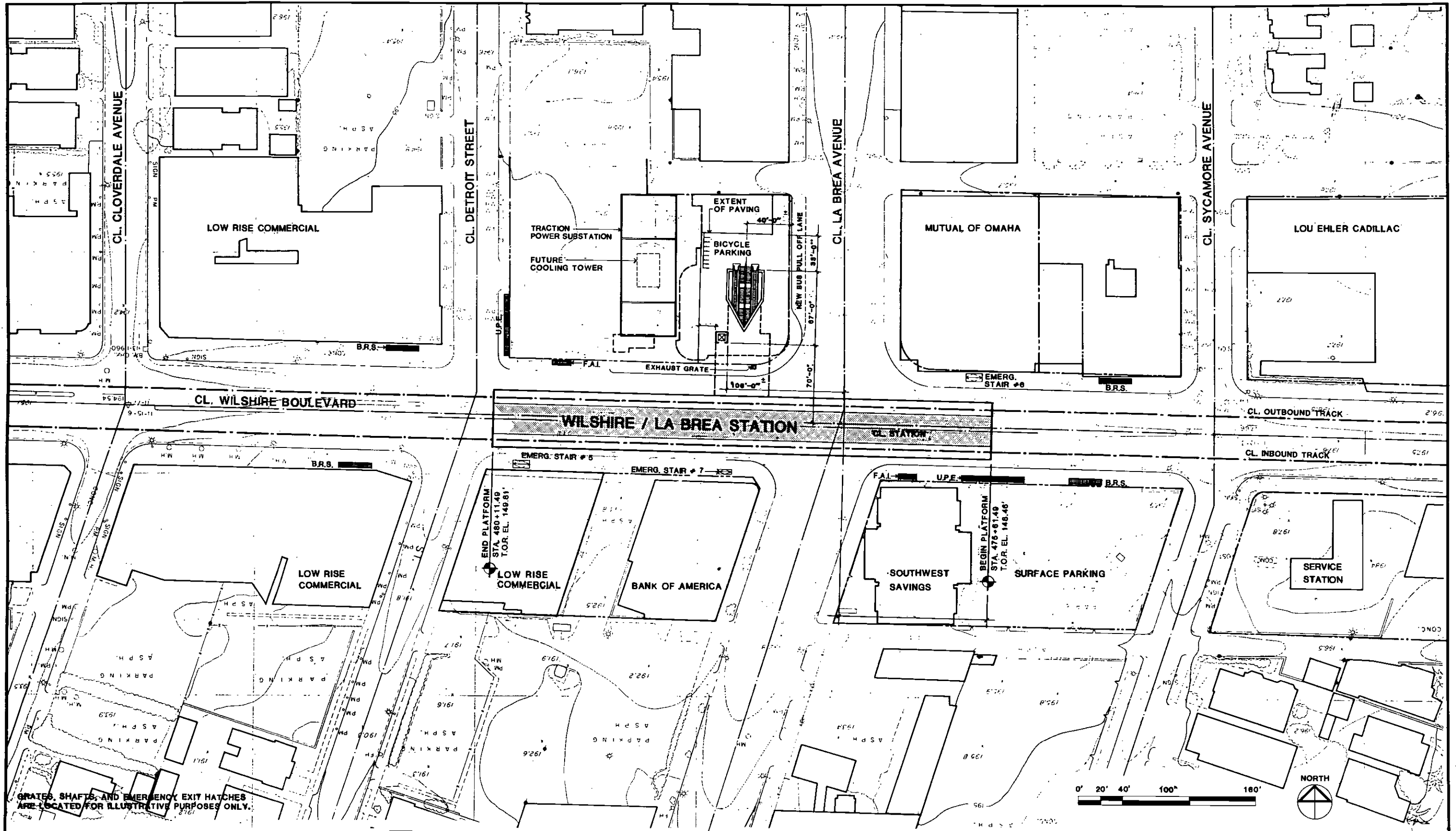


PARTIAL PLATFORM LEVEL PLAN



PARTIAL LONGITUDINAL SECTION

	DESIGNED BY: <i>[Signature]</i> Date: <i>[Date]</i>	HARRY WESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIM WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: <i>[Signature]</i> PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 	WILSHIRE/CRENSHAW STATION PLANS & SECTION PRELIMINARY	CONTRACT NO.	
	DRAWN BY: <i>[Signature]</i> Date: <i>[Date]</i>		APPROVAL RECOMMENDED _____ Date: _____ MANAGER / CHIEF ENGINEER	APPROVED _____ Date: _____ MANAGER / CHIEF ENGINEER		DRAWING NO. A-37
	CHECKED BY: <i>[Signature]</i> Date: <i>[Date]</i>					SCALE 1"=20'-0"
REV. DATE BY APP. DESCRIPTION					SHEET NO.	

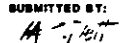


GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.

REV.	DATE	BY	APP.	DESCRIPTION
1	6/23/03	B.M. J.Y.		REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY	Date	2/1/03
HWA		
DRAWN BY	Date	6/20/03
B.K./M.D.		
CHECKED BY	Date	2/8/03
R. PIGATI/J. YEN		

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

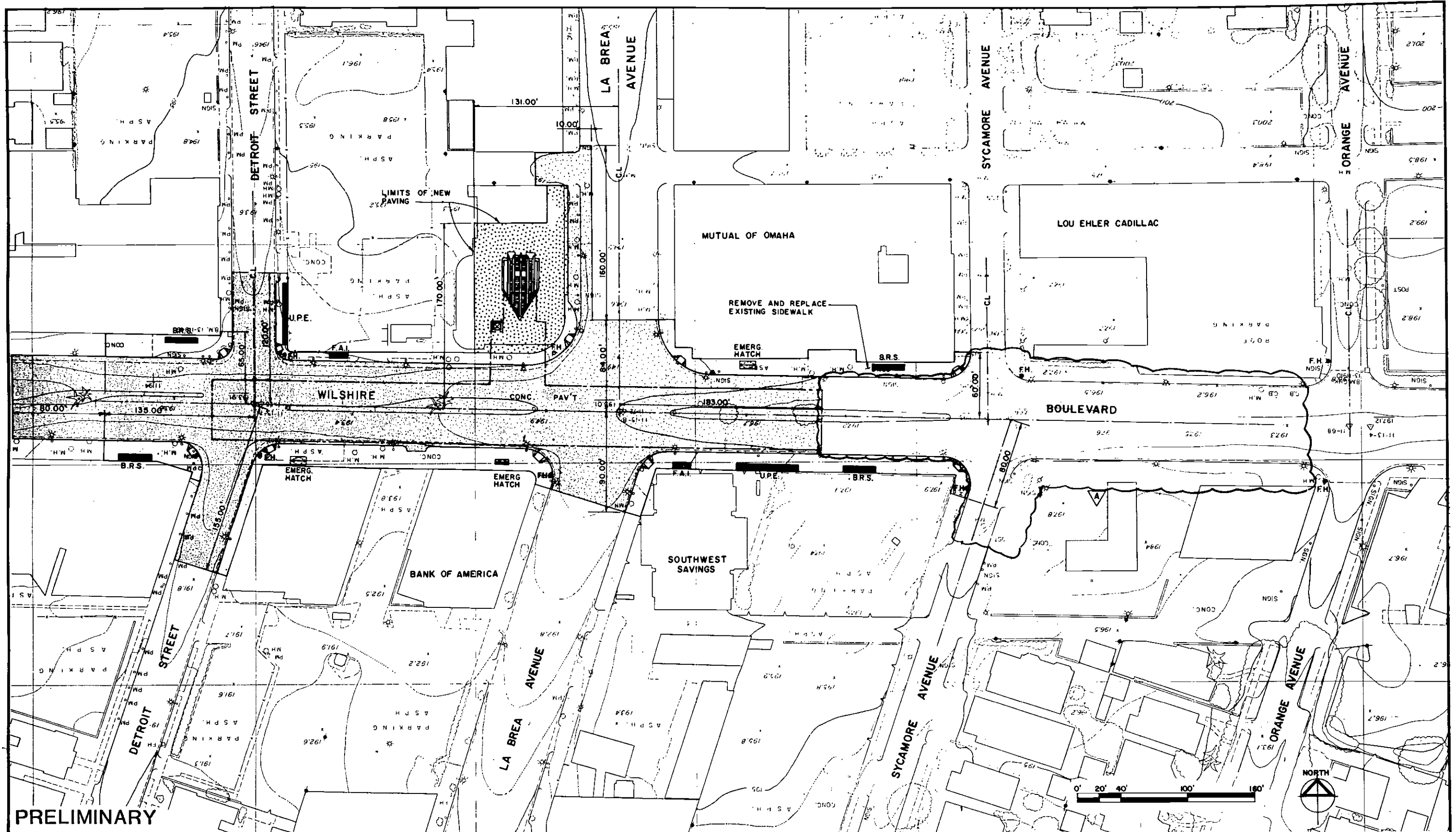
APPROVAL RECOMMENDED: _____ Date: _____
 Reg. No. _____

APPROVED: _____ Date: _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

WILSHIRE / LA BREA STATION
 SITE PLAN
 PRELIMINARY

CONTRACT NO.	A245
DRAWING NO.	A-38
SCALE	1" = 40'-0"
SHEET NO.	9 OF 21

Figure 6-49
 Wilshire/LaBrea Station: Site Plan 128



PRELIMINARY

REV.	DATE	BY	APP.	DESCRIPTION
1	6/3/83	JLD		DESIGNED BY
2	6/7/83	HWW		DRAWN BY
3	6/8/83	JLD		CHECKED BY
4				REVISOR

DESIGNED BY **TAMS** Date: **6/3/83**
 DRAWN BY **HWW** Date: **6/7/83**
 CHECKED BY **JLD** Date: **6/8/83**

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 QIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY: *[Signature]*
 PROJECT MANAGER

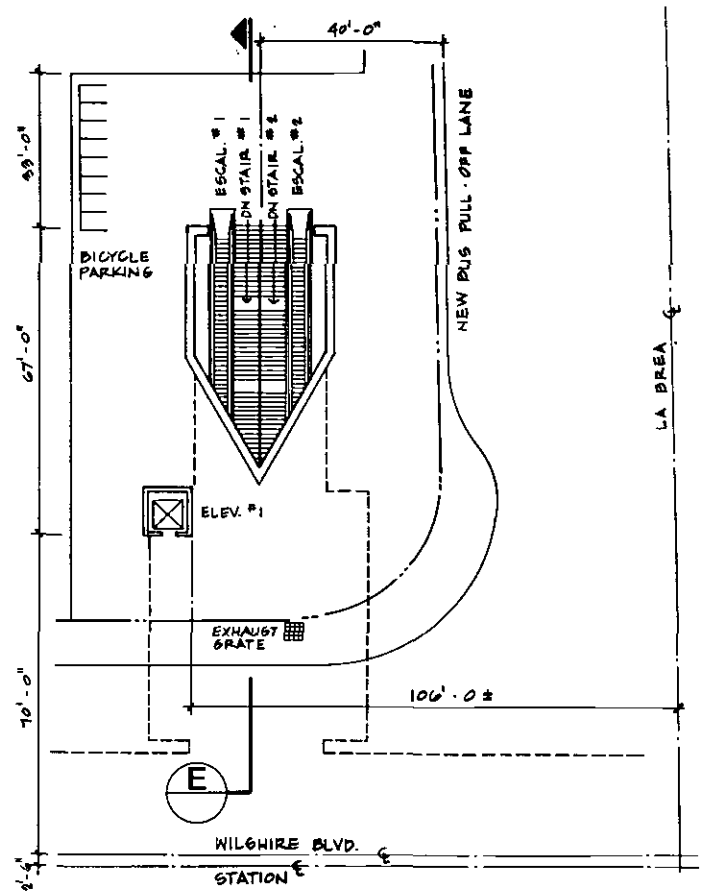
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ Date: _____
 APPROVED _____ Date: _____
 R.e.g. No. _____ MANAGER / CHIEF ENGINEER R.e.g. No. _____

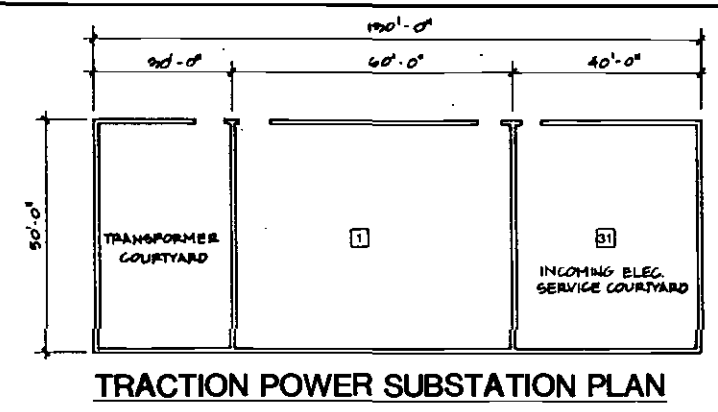
WILSHIRE / LA BREA STATION
CIVIL SITE PLAN

CONTRACT NO. **A245**
 DRAWING NO. **C-11**
 SCALE **1"=40'-0"**
 SHEET NO. **10 OF 21**

Figure 6-50
 Wilshire/LaBrea Station: Civil Site Plan

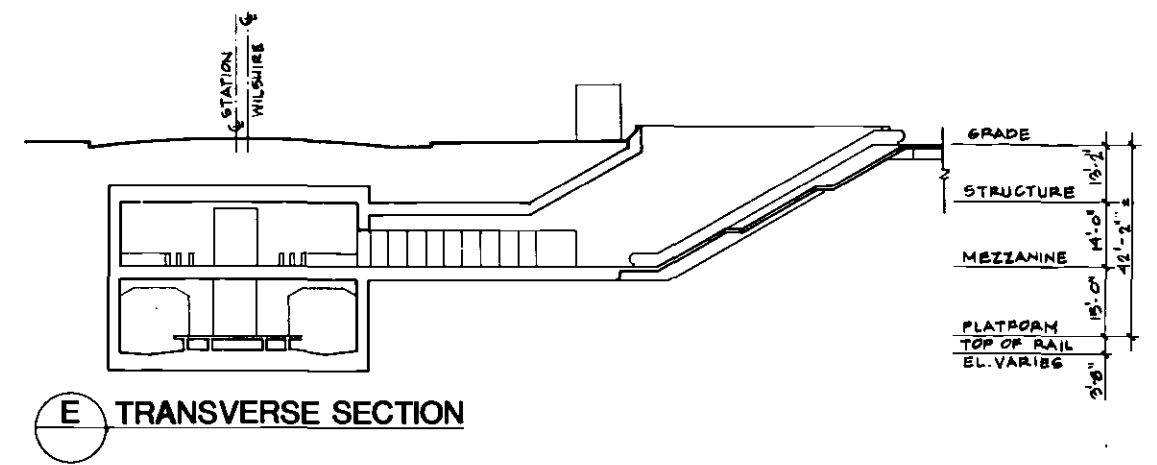


ENTRANCE LEVEL PLAN

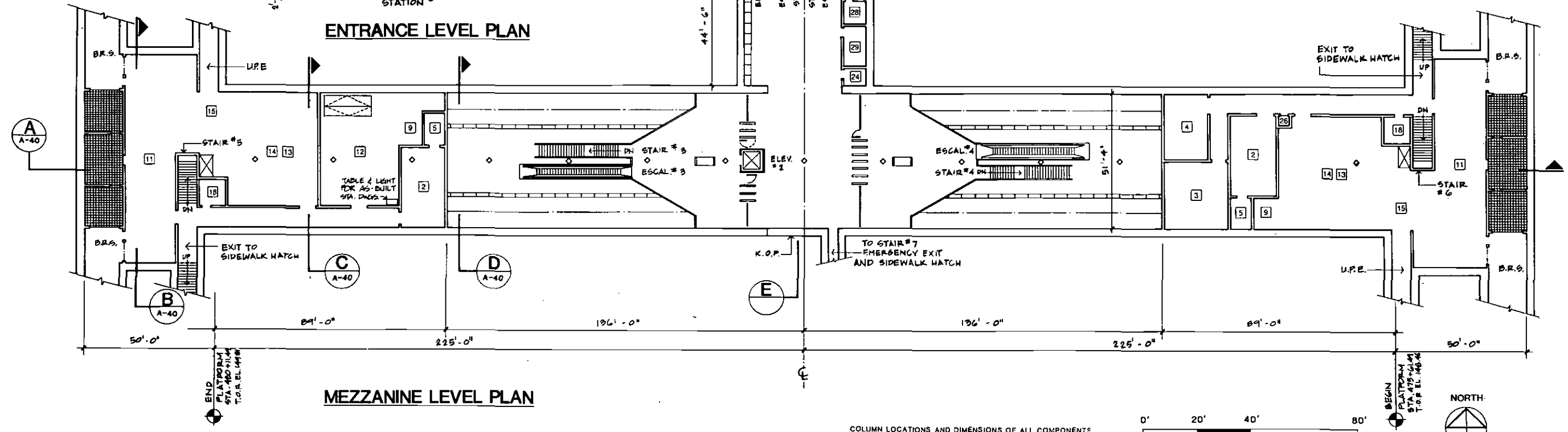


TRACTION POWER SUBSTATION PLAN

- SERVICE AND EQUIPMENT ROOMS**
- | | |
|----------------------------------|------------------------------|
| 1 Traction Power Substation | 17 Ejector |
| 2 Auxiliary Power | 18 Sprinkler Valves |
| 3 Train Control | 19 Sump Pump |
| 4 Communications | 20 Gap Breaker Station |
| 5 Batteries | 21 Emergency Equipment |
| 6 Elevator Equipment | 22 Custodial |
| 7 Deleted | 23 Electrical Equipment |
| 8 Storage | 24 Toilet |
| 9 Mechanical | 25 Deleted |
| 10 Fan | 26 Telephone Equipment |
| 11 Emergency Fan | 27 Deleted |
| 12 Chiller | 28 Trash |
| 13 Air Supply Unit | 29 Staff/Security |
| 14 Smoke Exhaust | 30 Deleted |
| 15 Under Platform Exhaust | 31 Electric Incoming Service |
| 16 Under Platform Exhaust Plenum | |

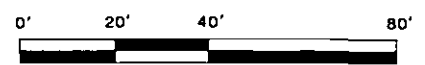


E TRANSVERSE SECTION



MEZZANINE LEVEL PLAN

COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.



REV.	DATE	BY	APP.	DESCRIPTION
1/1/05		J.Y.		REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION.

DESIGNED BY H.W.A.	DATE 6/20/05
DRAWN BY K.LIM	DATE 6/20/05
CHECKED BY J.YEN	DATE 6/30/05

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

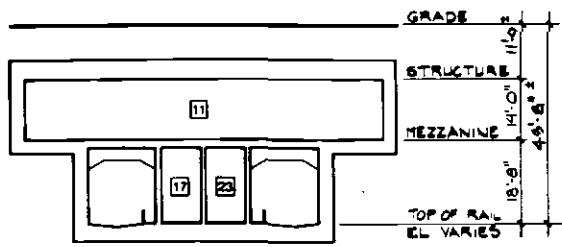
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT		
METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	DATE
Reg. No. _____	MANAGER / CHIEF ENGINEER	Reg. No. _____

WILSHIRE/LA BREA STATION
 PLANS AND SECTIONS

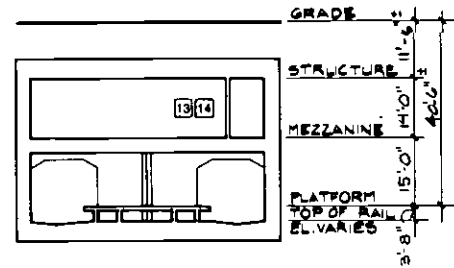
PRELIMINARY

CONTRACT NO.	A245
DRAWING NO.	A-39
SCALE	1"=20'-0"
SHEET NO.	12 OF 21

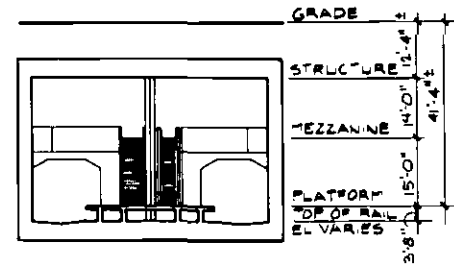
Figure 6-51
 Wilshire/LaBrea Station: Plans and Sections



B TRANSVERSE SECTION

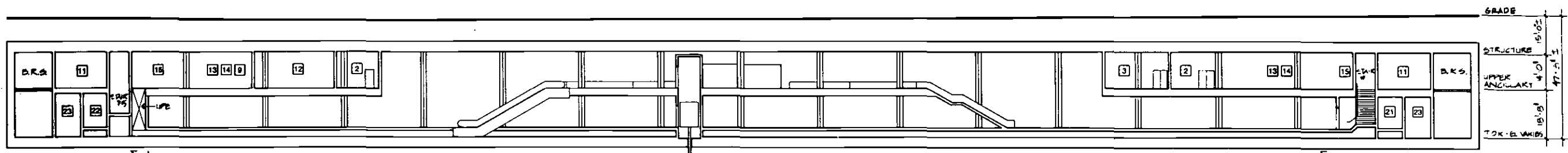
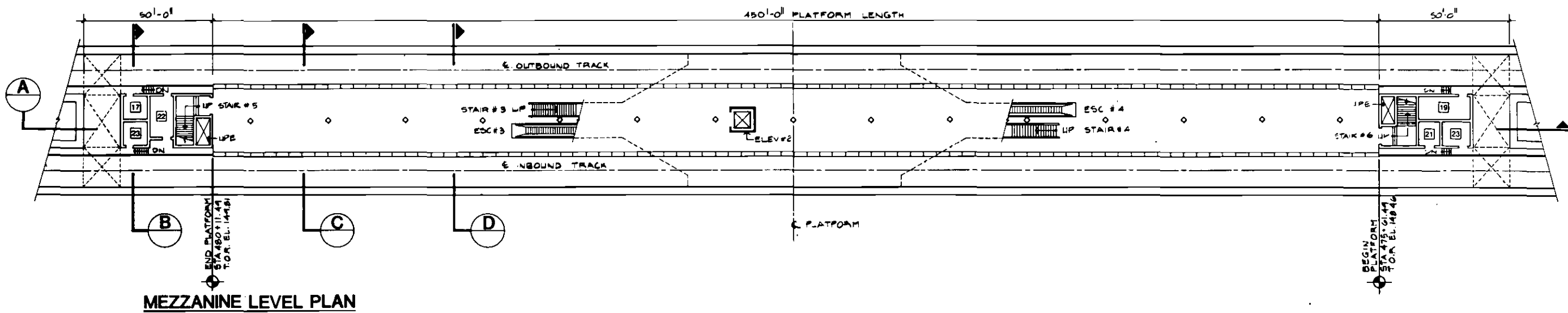


C TRANSVERSE SECTION



D TRANSVERSE SECTION

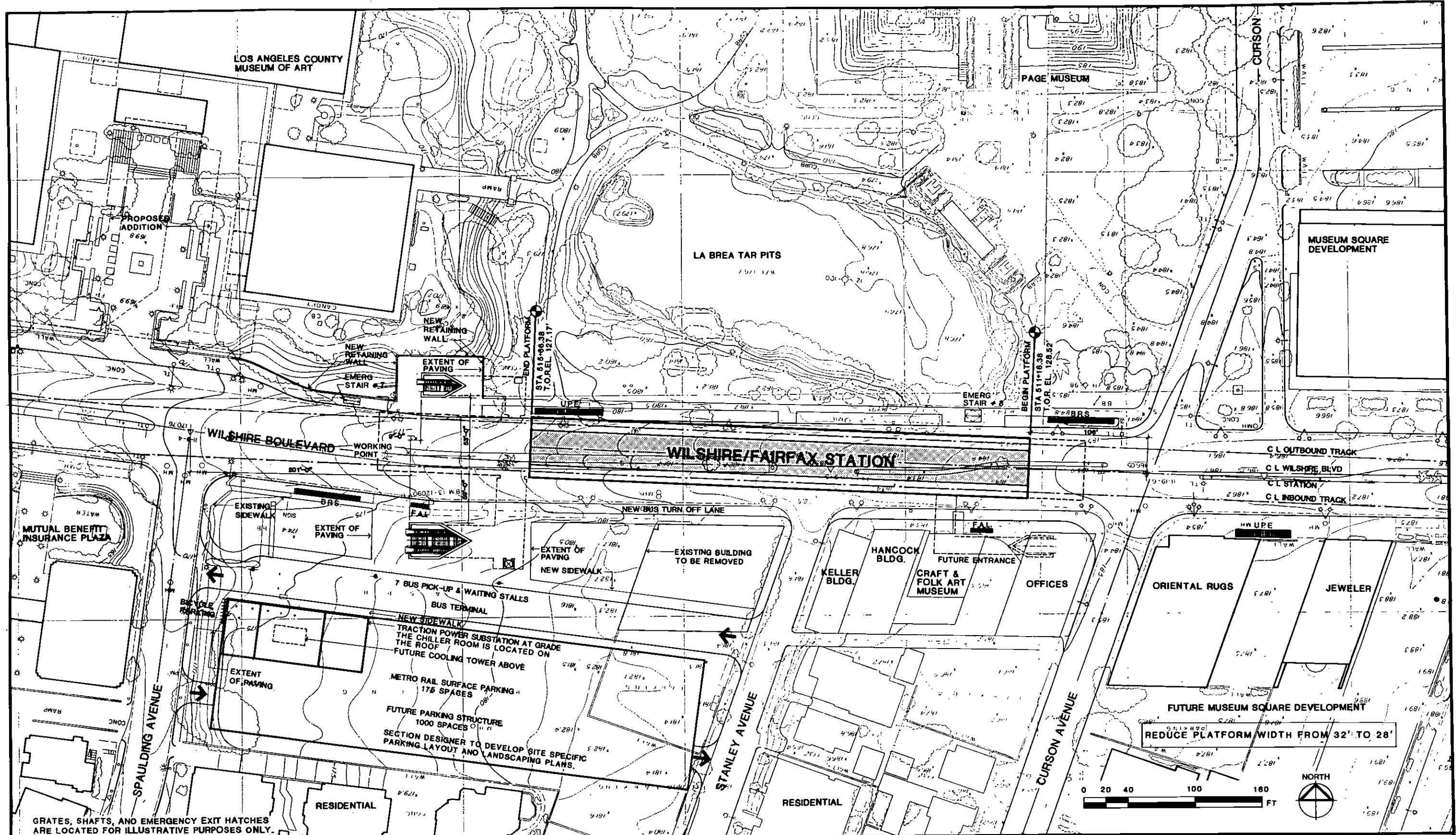
- SERVICE AND EQUIPMENT ROOMS**
- | | |
|----------------------------------|------------------------------|
| 1 Traction Power Substation | 17 Ejector |
| 2 Auxiliary Power | 18 Sprinkler Valves |
| 3 Train Control | 19 Sump Pump |
| 4 Communications | 20 Gap Breaker Station |
| 5 Batteries | 21 Emergency Equipment |
| 6 Elevator Equipment | 22 Custodial |
| 7 Deleted | 23 Electrical Equipment |
| 8 Storage | 24 Toilet |
| 9 Mechanical | 25 Deleted |
| 10 Fan | 26 Telephone Equipment |
| 11 Emergency Fan | 27 Deleted |
| 12 Chiller | 28 Trash |
| 13 Air Supply Unit | 29 Staff/Security |
| 14 Smoke Exhaust | 30 Deleted |
| 15 Under Platform Exhaust | 31 Electric Incoming Service |
| 16 Under Platform Exhaust Plenum | |



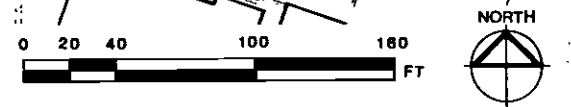
A LONGITUDINAL SECTION



DESIGNED BY H.W.A. Date 6-3-83 DRAWN BY B.A./M.D. Date 6-3-83 CHECKED BY J.YEN Date 6-3-83 REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION		HARRY WEESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: [Signature] PROJECT MANAGER		SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT APPROVAL RECOMMENDED: [Signature] Reg. No. _____ APPROVED: [Signature] Date _____ MANAGER / CHIEF ENGINEER Reg. No. _____		WILSHIRE / LA BREA STATION PLANS AND SECTIONS PRELIMINARY		CONTRACT NO. A245 DRAWING NO. A-40 SCALE 1"=20'-0" SHEET NO. 13 OF 21	
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GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.



REV.	DATE	BY	APP.	DESCRIPTION
6289	J.Y.			REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY	Date	6-2-89
HWA		
DRAWN BY	Date	6-2-89
M. HOMER		
CHECKED BY	Date	6-30-89
J.YEN		

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRAITON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY: [Signature]
 PROJECT MANAGER

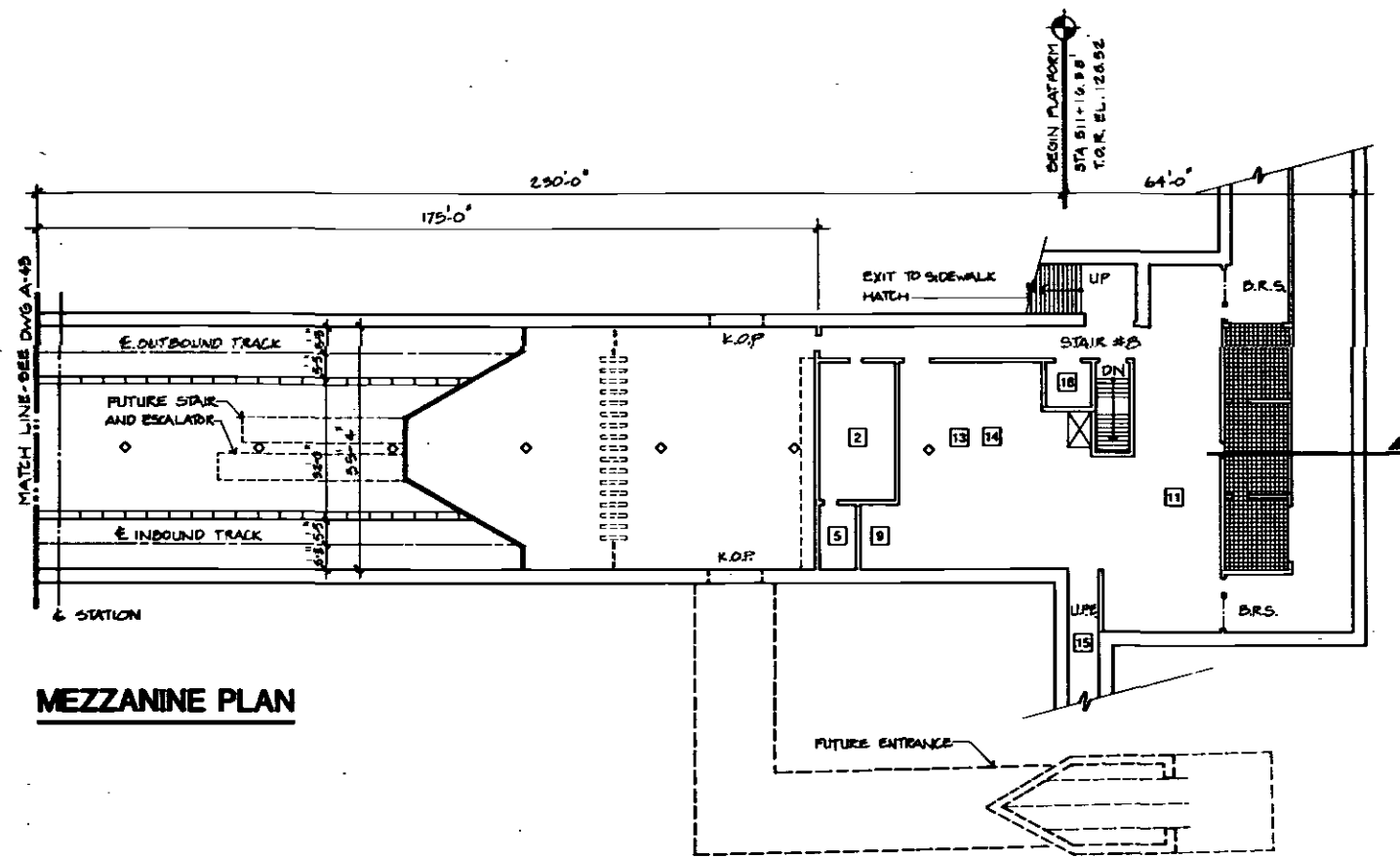
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED: _____ Date: _____
 APPROVED: _____ Date: _____
 MANAGER / CHIEF ENGINEER

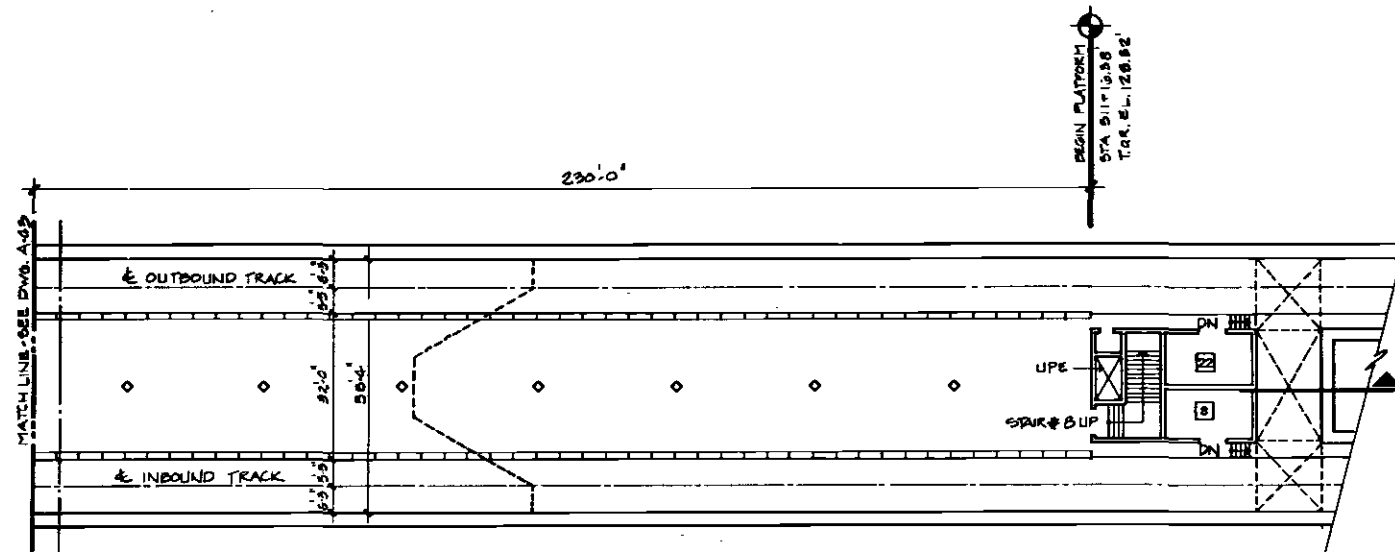
WILSHIRE / FAIRFAX STATION
SITE PLAN
PRELIMINARY

CONTRACT NO.	A-250
DRAWING NO.	A-42
SCALE	1"=40'-0"
SHEET NO.	27 OF 34

Figure 6-53
 Wilshire/Fairfax Station: Site Plan 132

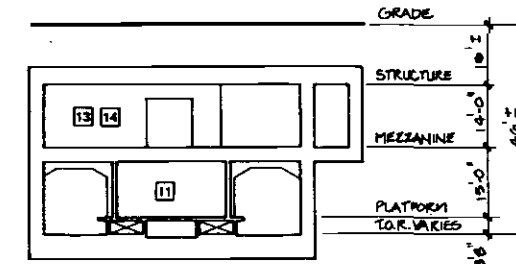


MEZZANINE PLAN

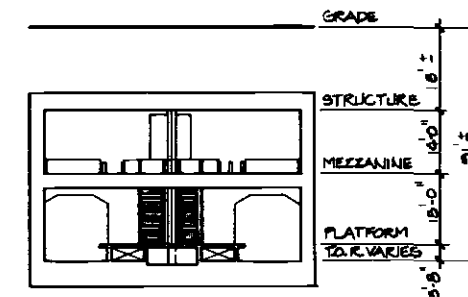


PLATFORM PLAN

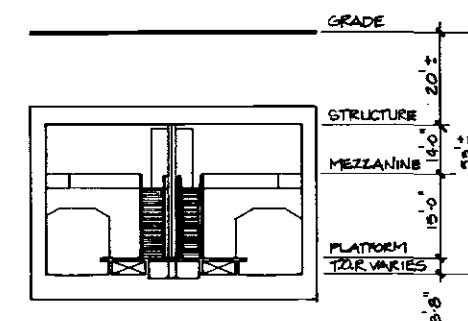
COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.



B SECTION



C SECTION



D SECTION

- 1 Traction Power Substation
- 2 Auxiliary Power
- 3 Train Control
- 4 Communications
- 5 Batteries
- 6 Elevator Equipment
- 7 Deleted
- 8 Storage
- 9 Mechanical
- 10 Fan
- 11 Emergency Fan
- 12 Chiller
- 13 Air Supply Unit
- 14 Smoke Exhaust
- 15 Under Platform Exhaust
- 16 Under Platform Exhaust Plenum
- 17 Ejector
- 18 Sprinkler Valves
- 19 Sump Pump
- 20 Gap Breaker Station
- 21 Emergency Equipment
- 22 Custodial
- 23 Electrical Equipment
- 24 Toilet
- 25 Deleted
- 26 Telephone Equipment
- 27 Deleted
- 28 Trash
- 29 Staff/Security
- 30 Deleted
- 31 Electric Incoming Service

NOTE :
REDUCE PLATFORM WIDTH
FROM 32 TO 28'

0' 20' 40' 80'



REV.	DATE	BY	APP.	DESCRIPTION
6-883		J.Y.		REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTIONS

DESIGNED BY	Date	6-8-83
HWA		
DRAWN BY	Date	6-8-83
M. HOMER		
CHECKED BY	Date	6-30-83
J.YEN		

HARRY WESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations

SUBMITTED BY:
[Signature]
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

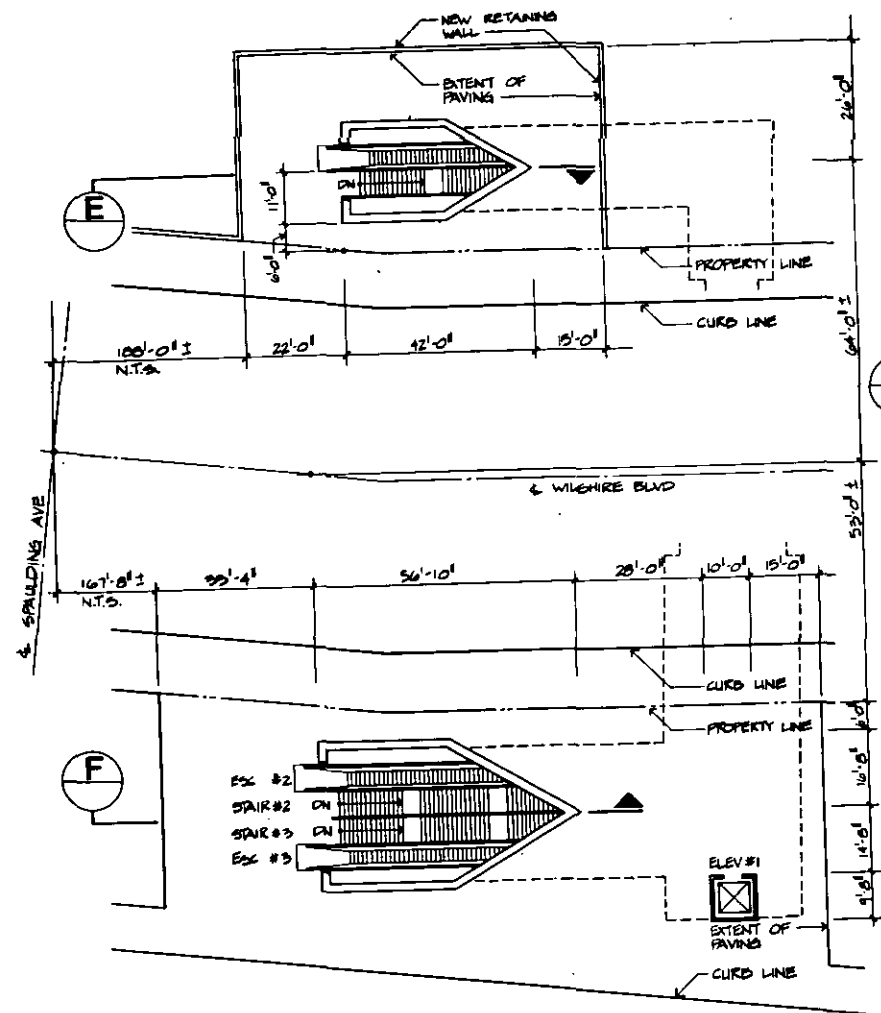
APPROVAL RECOMMENDED _____ Date _____
APPROVED _____ Date _____
MANAGER / CHIEF ENGINEER Reg. No. _____

WILSHIRE/FAIRFAX STATION
PLANS & SECTIONS
PRELIMINARY

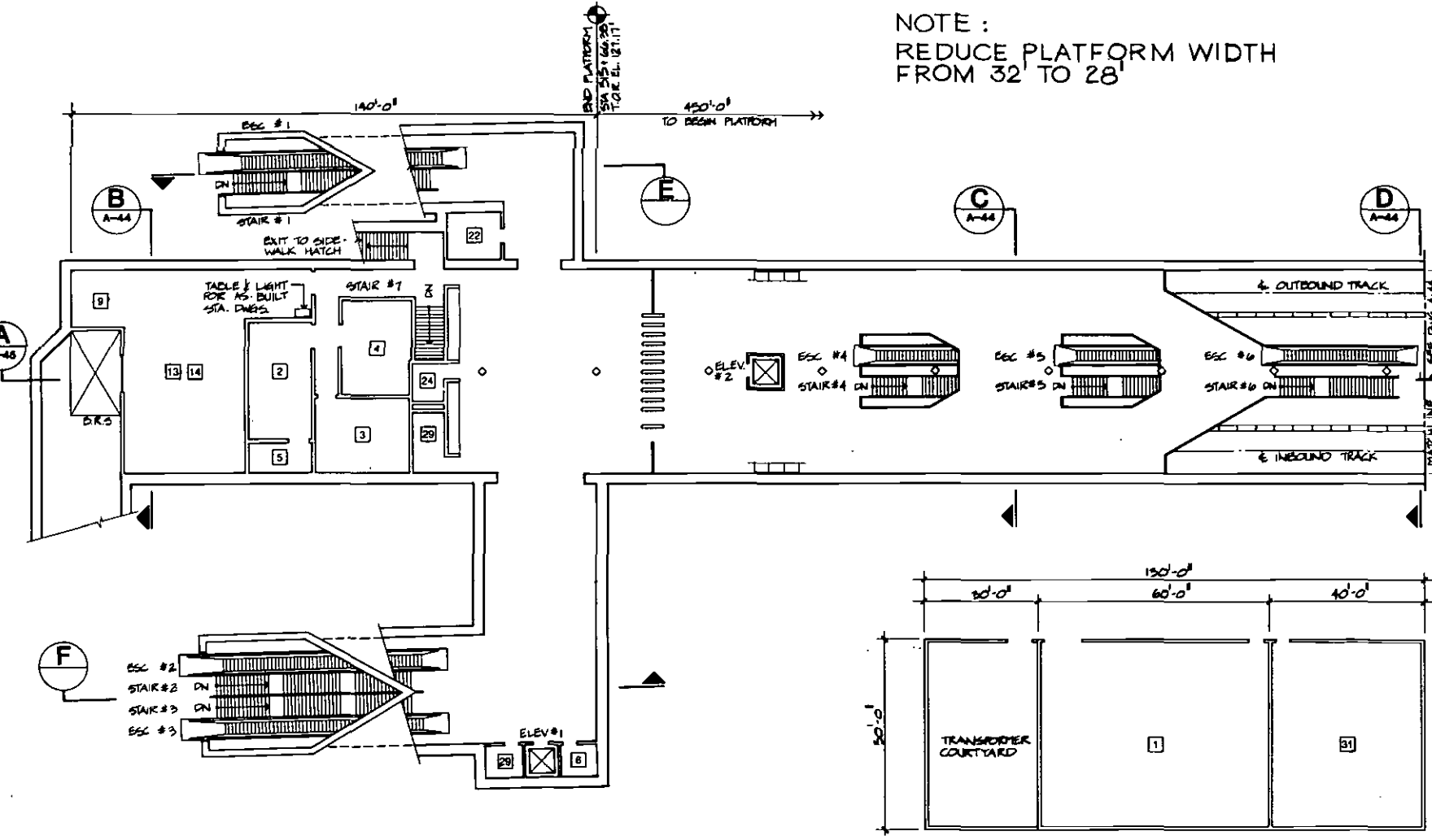
CONTRACT NO.	A-250
DRAWING NO.	A-44
SCALE	1"=20'-0"
SHEET NO.	31 OF 34

NOTE :
REDUCE PLATFORM WIDTH
FROM 32' TO 28'

- SERVICE AND EQUIPMENT ROOMS
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Toilet
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Deleted
 - 29 Trash
 - 30 Staff/Security
 - 31 Deleted
 - 32 Electric Incoming Service

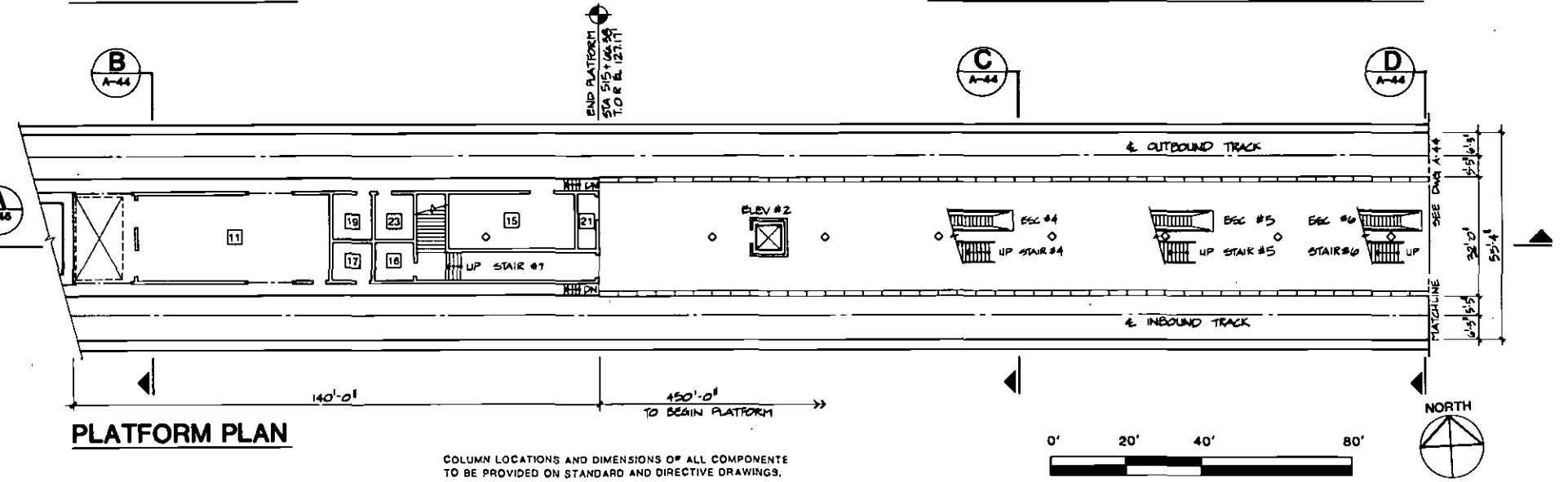
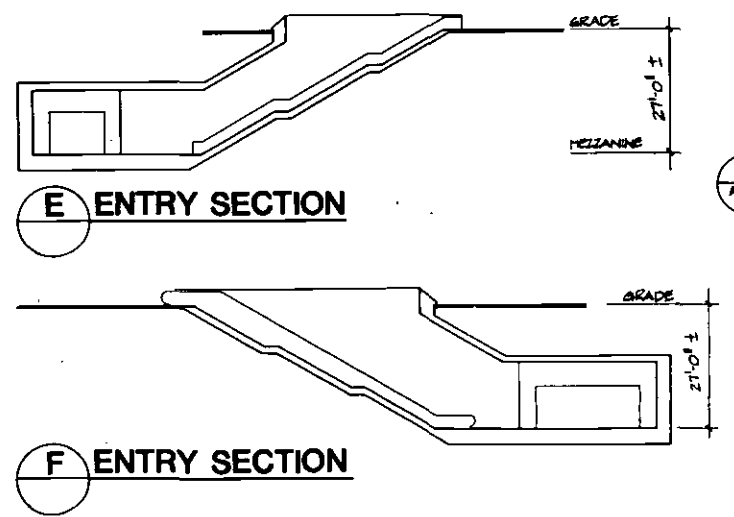


ENTRY PLAN



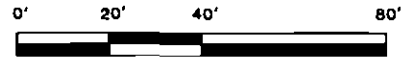
MEZZANINE PLAN

TRACTION POWER SUBSTATION PLAN



PLATFORM PLAN

COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.



DESIGNED BY HWA	Date
DRAWN BY MWD	Date 6-16-83
CHECKED BY J.YEN	Date 6-30-83
REV. DATE BY APP. DESCRIPTION	
6-2-83 J.Y. REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION.	

HARRY WEESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations

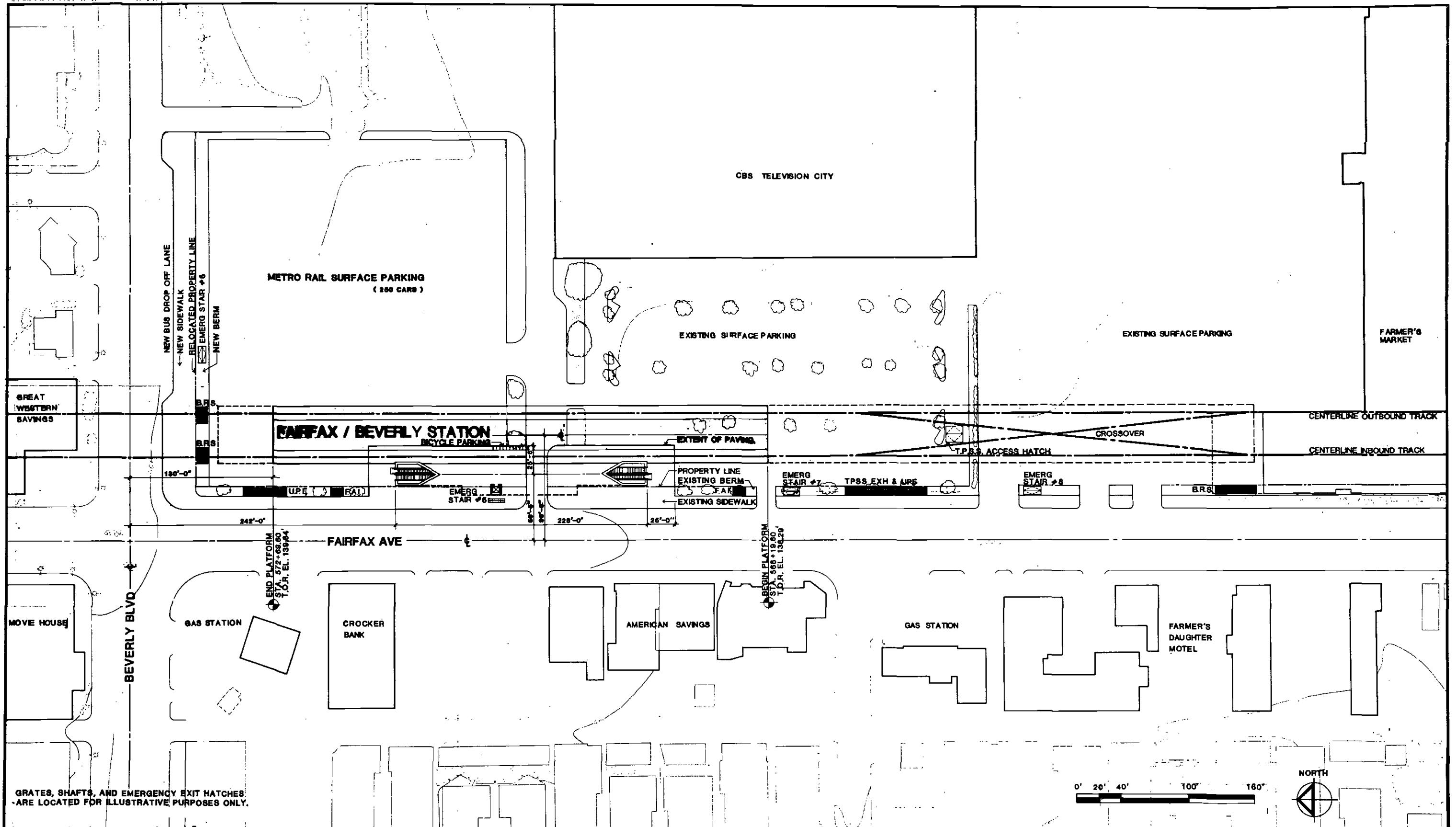
SUBMITTED BY:
[Signature]
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED: _____ Date _____
APPROVED: _____ Date _____
MANAGER / CHIEF ENGINEER

WILSHIRE/FAIRFAX STATION
PLANS
PRELIMINARY

CONTRACT NO.	A-250
DRAWING NO.	A-43
SCALE	1" = 20'-0"
SHEET NO.	30 OF 34



GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.

DESIGNED BY	HWA	Date	11/0/83	
DRAWN BY	A. SNIDER	Date	11/0/83	
CHECKED BY	J. YEN	Date	2/16/83	
REV.	DATE	BY	APP.	DESCRIPTION
1	11/0/83	J. YEN		REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION
2	1/10/83	A. SNIDER		METRO RAIL SURFACE PARKING

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:
 A. Snider
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ Date _____
 Reg. No. _____

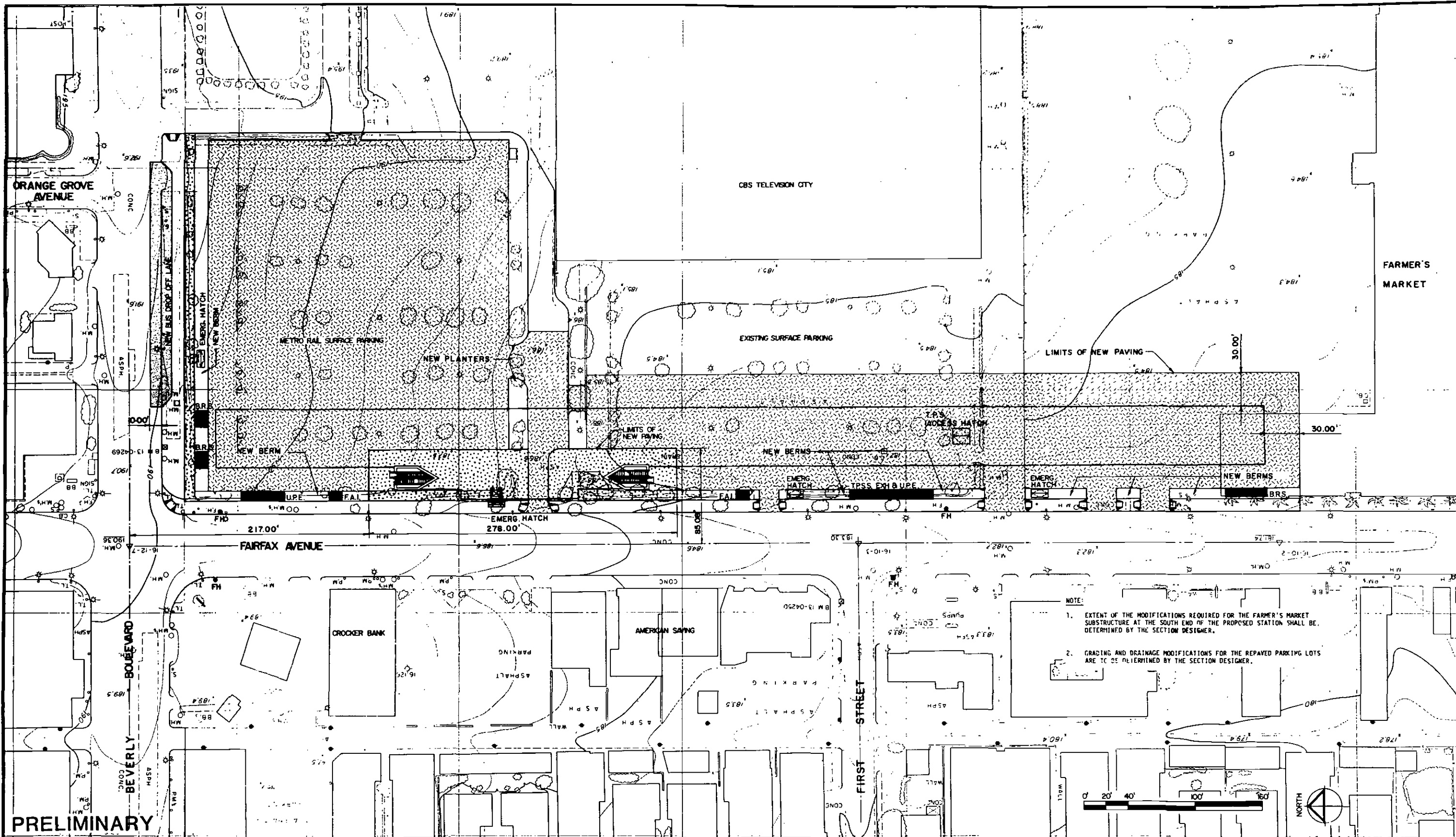
APPROVED _____ Date _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

FAIRFAX / BEVERLY STATION
 SITE PLAN

PRELIMINARY

CONTRACT NO. **A 275**
 DRAWING NO. **A-46**
 SCALE **1" = 40'-0"**
 SHEET NO. **7 OF 19**

Figure 6-57
 Wilshire/Fairfax Station: Site Plan 136



PRELIMINARY

REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY	Date 5/23/83
TAMS	
DRAWN BY	Date 5/27/83
HWW	
CHECKED BY	Date 6/27/83
JLD	

HARRY WEESE & ASSOCIATES
 TIPPETT-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY: *[Signature]*
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

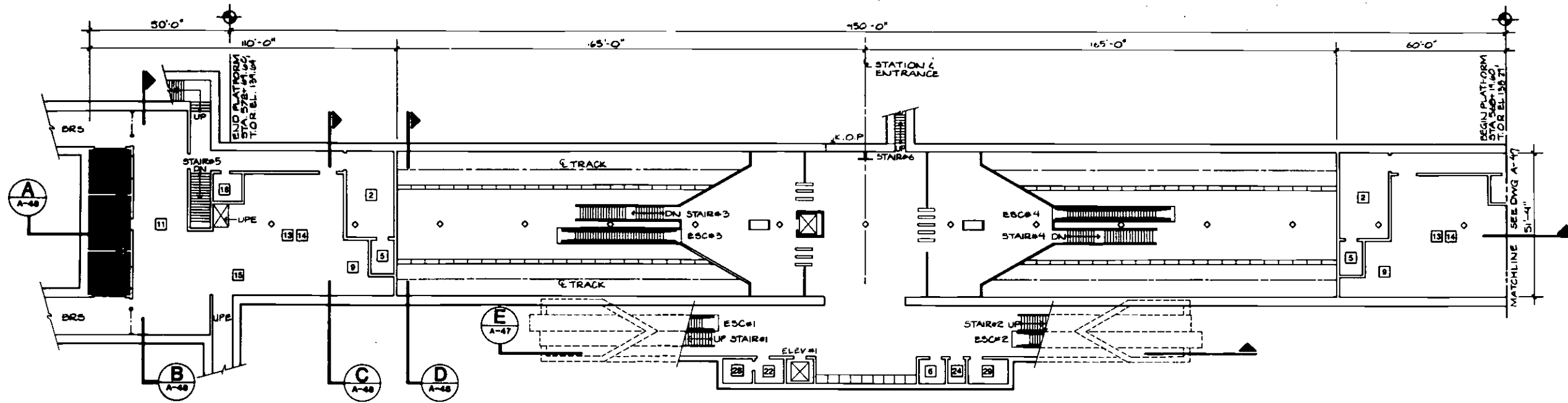
APPROVAL RECOMMENDED _____ Date _____
 Reg. No. _____

APPROVED _____ Date _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

FAIRFAX / BEVERLY STATION
CIVIL SITE PLAN

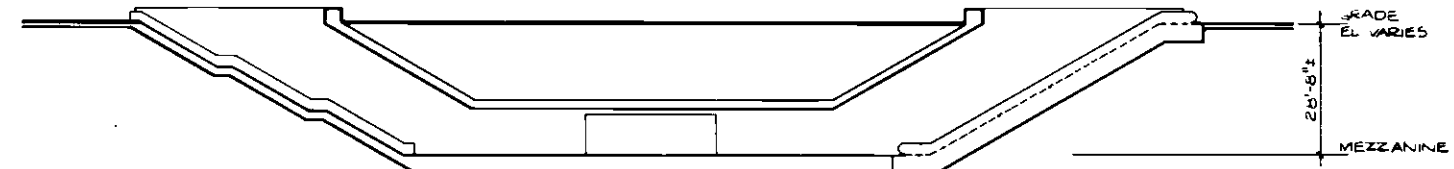
CONTRACT NO.	A275
DRAWING NO.	C-13
SCALE	1" = 40'-0"
SHEET NO.	8 OF 19

Figure 6-58
 Fairfax/Beverly Station: Civil Site Plan 137

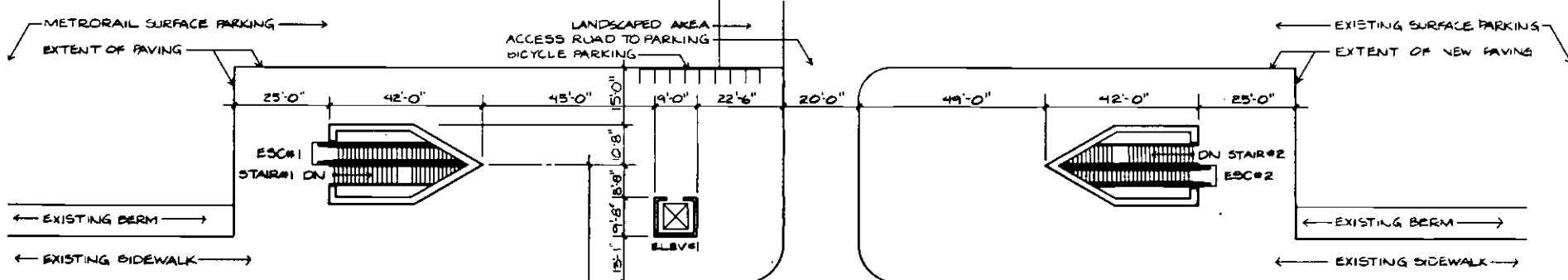


- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Toilet
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff/Security
 - 30 Deleted
 - 31 Electric Incoming Service

PARTIAL MEZZANINE LEVEL PLAN

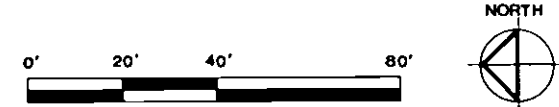


E SECTION THROUGH ENTRY

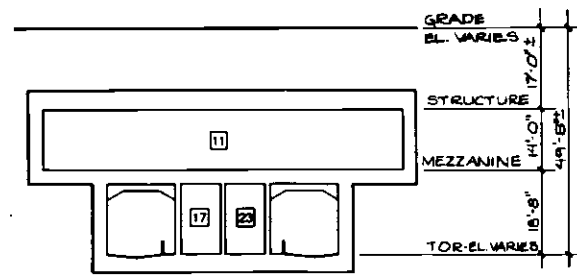


ENTRY PLAN

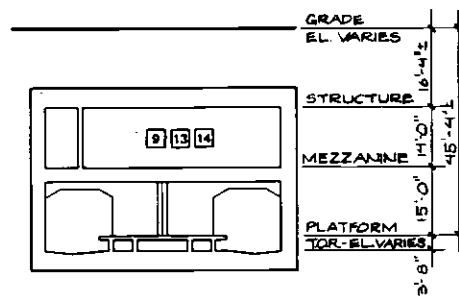
COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.



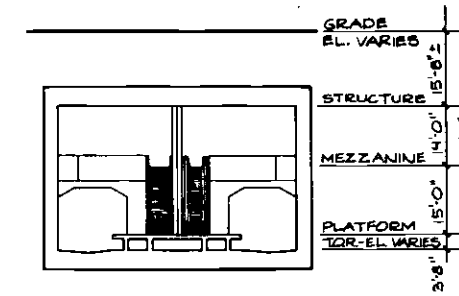
DESIGNED BY HWA Date 5/11/83		HARRY WESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: <i>[Signature]</i> PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 		FAIRFAX / BEVERLY STATION PLANS AND SECTION PRELIMINARY		CONTRACT NO. A275
DRAWN BY A SNIDER Date 5/11/83			APPROVAL RECOMMENDED _____ Reg. No. _____	APPROVED _____ MANAGER / CHIEF ENGINEER Reg. No. _____	SCALE 1"=20'-0"		DRAWING NO. A-47
CHECKED BY J.TEN Date 6/6/83 P.1001				SHEET NO. 10 OF 19			



B TRANSVERSE SECTION

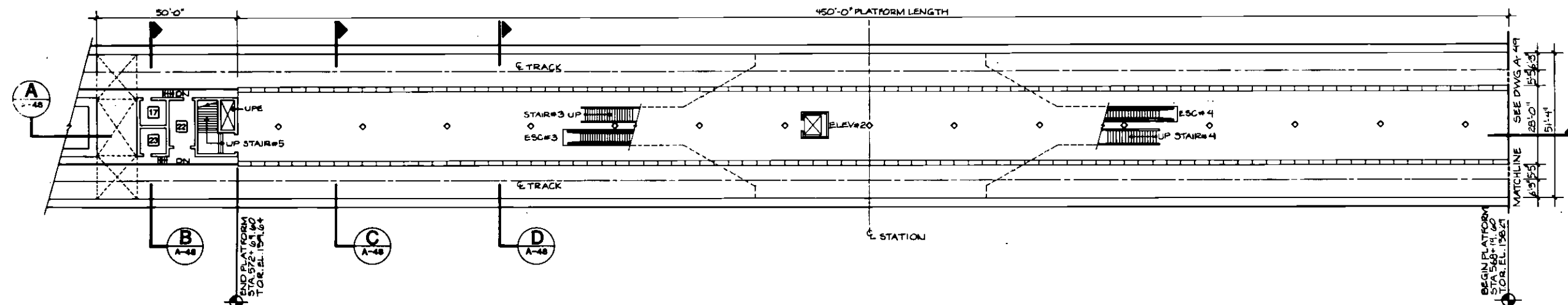


C TRANSVERSE SECTION

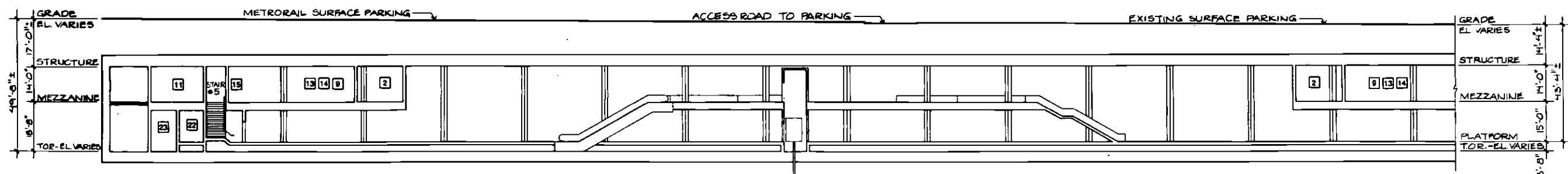


D TRANSVERSE SECTION

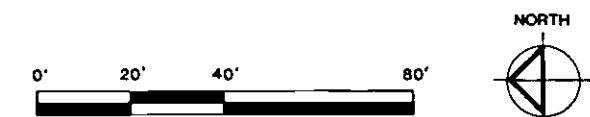
- SERVICE AND EQUIPMENT ROOMS**
- | | |
|-----------------------------|------------------------------|
| 1 Traction Power Substation | 17 Ejector |
| 2 Auxiliary Power | 18 Sprinkler Valves |
| 3 Train Control | 19 Sump Pump |
| 4 Communications | 20 Gap Breaker Station |
| 5 Batteries | 21 Emergency Equipment |
| 6 Elevator Equipment | 22 Custodial |
| 7 Deleted | 23 Electrical Equipment |
| 8 Storage | 24 Toilet |
| 9 Mechanical | 25 Deleted |
| 10 Fan | 26 Telephone Equipment |
| 11 Emergency Fan | 27 Deleted |
| 12 Chiller | 28 Trash |
| 13 Air Supply Unit | 29 Staff/Security |
| 14 Smoke Exhaust | 30 Deleted |
| 15 Under Platform Exhaust | 31 Electric Incoming Service |



PARTIAL PLATFORM LEVEL PLAN

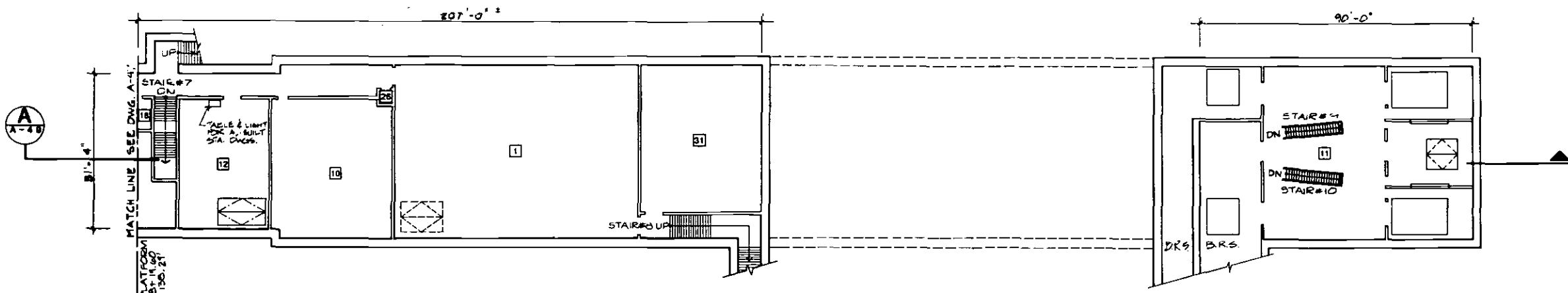


A PARTIAL LONGITUDINAL SECTION

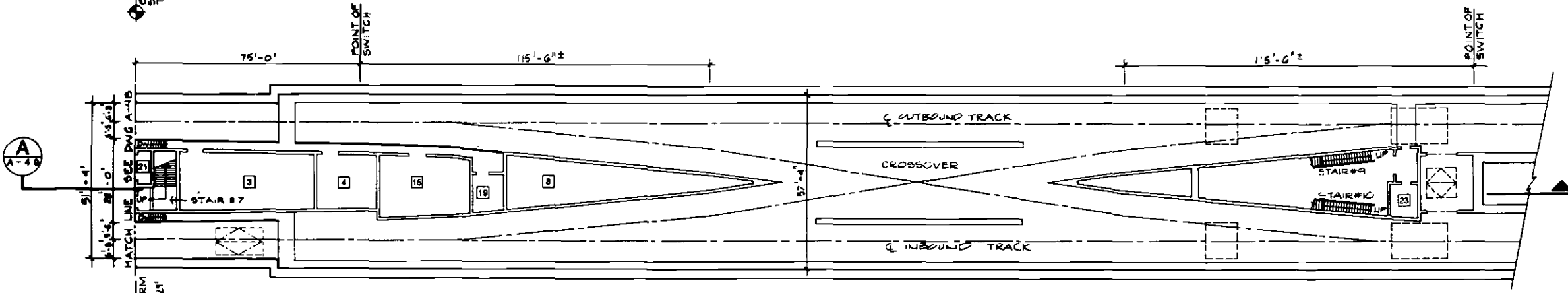


DESIGNED BY HWA Date 5/11/83		HARRY WESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 	FAIRFAX / BEVERLY STATION PLANS AND SECTIONS PRELIMINARY	CONTRACT NO. A275
DRAWN BY A. SNIDER Date 5/11/83					DRAWING NO. A-48
CHECKED BY LYEN Date 6/6/83		SUBMITTED BY: PROJECT MANAGER	APPROVAL RECOMMENDED _____ Mgr. No. _____	APPROVED _____ MANAGER / CHIEF ENGINEER Reg. No. _____	SCALE 1"=20'-0"
REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTIONS					SHEET NO. 11 OF 19

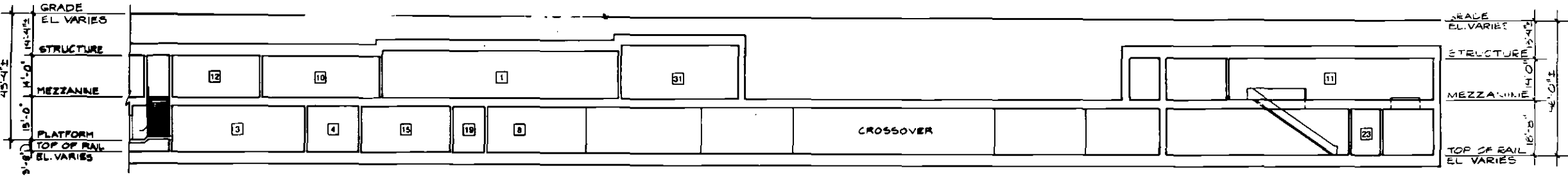
- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Toilet
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff / Security
 - 30 Deleted
 - 31 Electric Incoming Service



PARTIAL MEZZANINE LEVEL PLAN



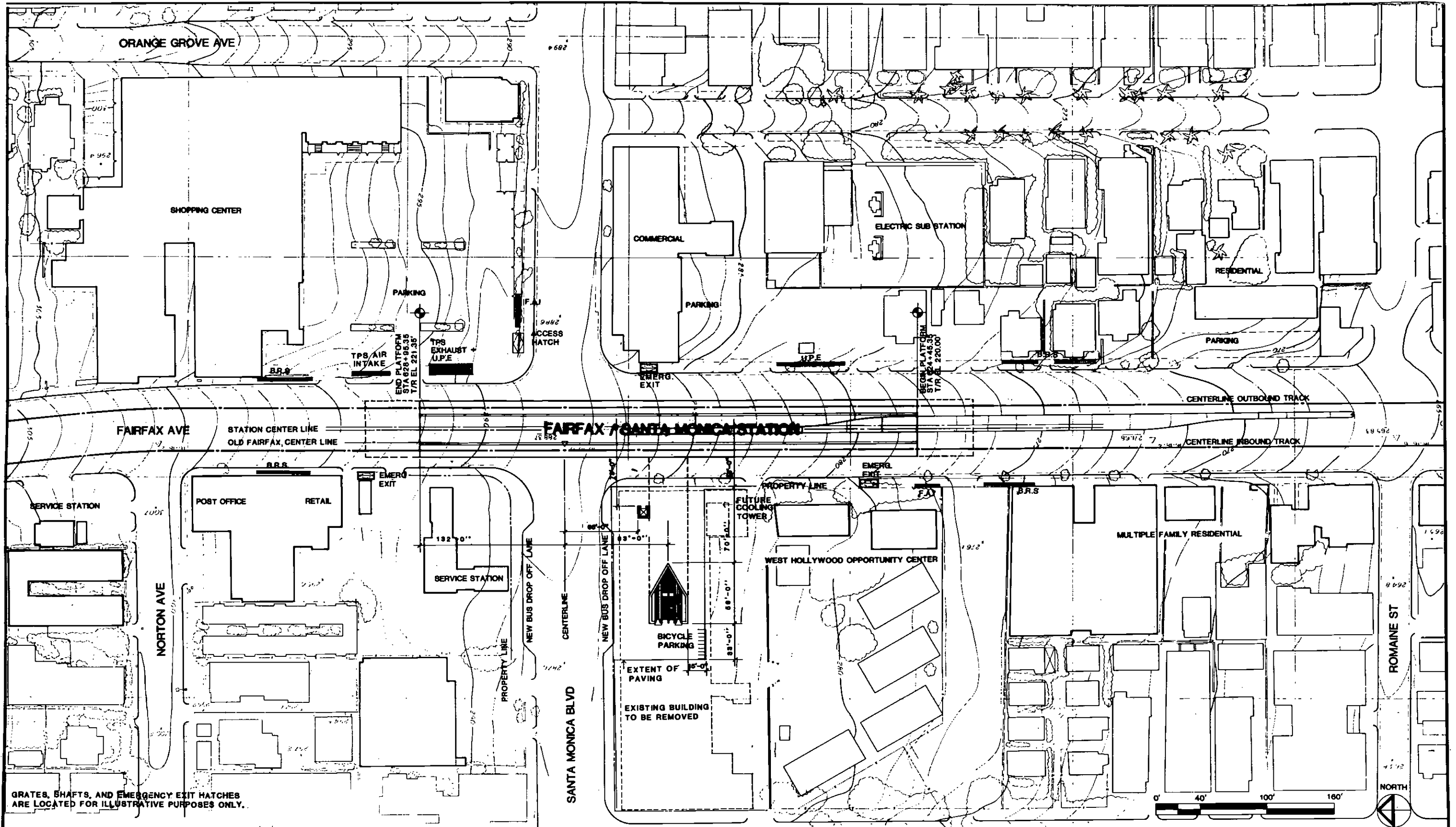
PARTIAL PLATFORM LEVEL PLAN



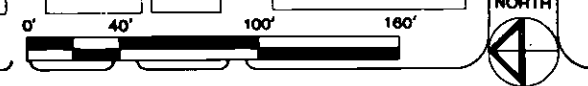
A PARTIAL LONGITUDINAL SECTION



	DESIGNED BY HWA Date 5/11/83	HARRY WEESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT FTD	FAIRFAX / BEVERLY STATION PLANS AND SECTION PRELIMINARY	CONTRACT NO. A275 DRAWING NO. A-49 SCALE 1"=20'-0" SHEET NO. 12 OF 19
REV. DATE BY APP. DESCRIPTION	CHECKED BY Date 5/11/83 2IGATI	SUBMITTED BY: PROJECT MANAGER	APPROVAL RECOMMENDED Date Reg. No.	APPROVED Date MANAGER / CHIEF ENGINEER Reg. No.	



GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.



DESIGNED BY HWA Date 2.7.83	DRAWN BY A. SNIDER Date 2.7.83	CHECKED BY J. YEN Date 2/11/83										
<table border="1"> <thead> <tr> <th>REV.</th> <th>DATE</th> <th>BY</th> <th>APP.</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2/11/83</td> <td>MP</td> <td>JY</td> <td>REVISION TO ANCILLARY ROOMS FOR COST REDUCTION</td> </tr> </tbody> </table>			REV.	DATE	BY	APP.	DESCRIPTION	1	2/11/83	MP	JY	REVISION TO ANCILLARY ROOMS FOR COST REDUCTION
REV.	DATE	BY	APP.	DESCRIPTION								
1	2/11/83	MP	JY	REVISION TO ANCILLARY ROOMS FOR COST REDUCTION								

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:
 [Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

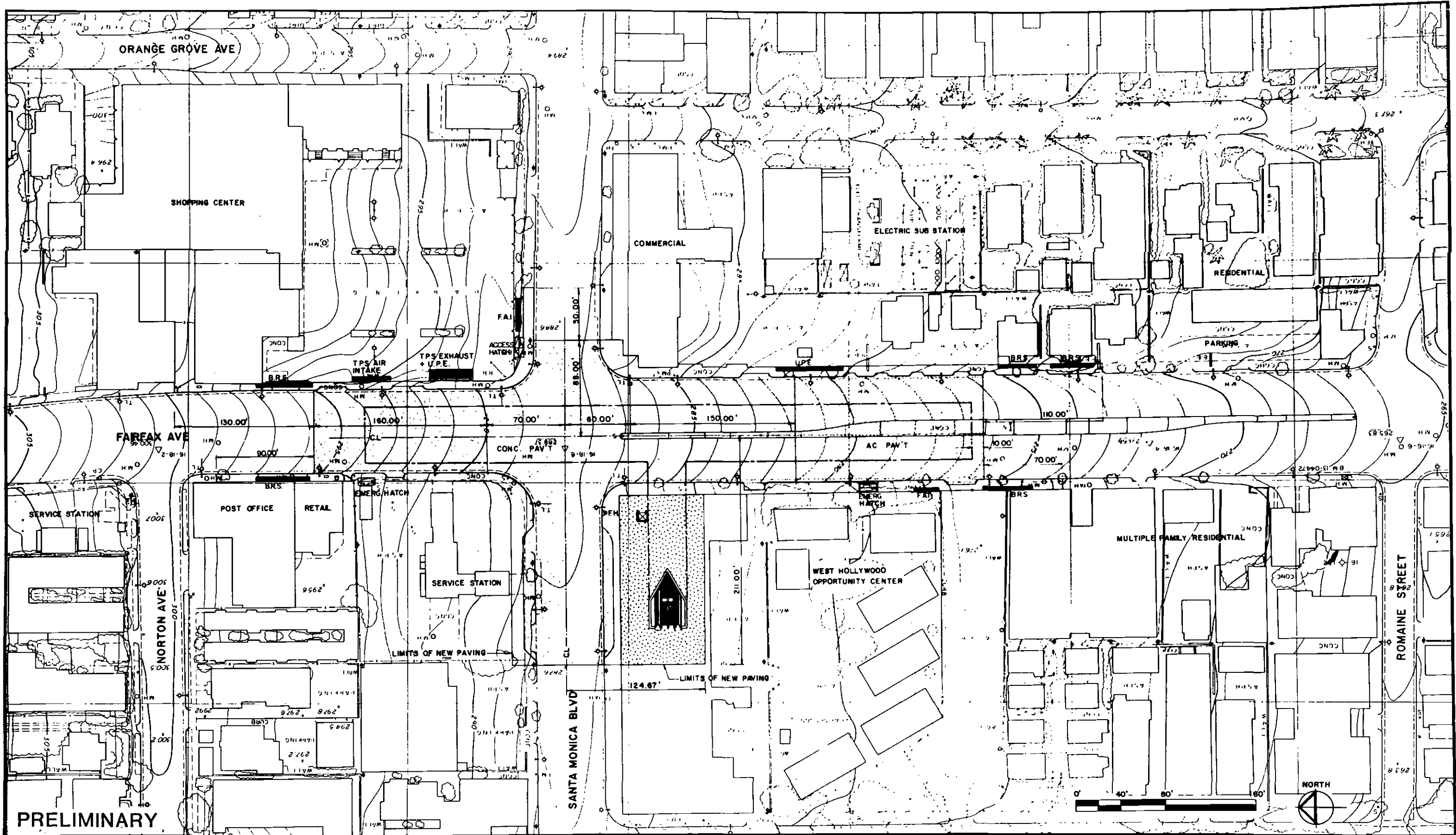
APPROVAL RECOMMENDED: _____ Date: _____
 Reg. No. _____

APPROVED: _____ Date: _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

FAIRFAX / SANTA MONICA STATION
 SITE PLAN
PRELIMINARY

CONTRACT NO. A310
 DRAWING NO. A-50
 SCALE 1" = 40'-0"
 SHEET NO. 48 OF 67

Figure 6-62
 Fairfax/Santa Monica Station: Site Plan 141




PRELIMINARY

REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY	Date 5/23/83
TAMS	
DRAWN BY	Date 5/25/83
HW W	
CHECKED BY	Date 5/25/83
JLD	

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

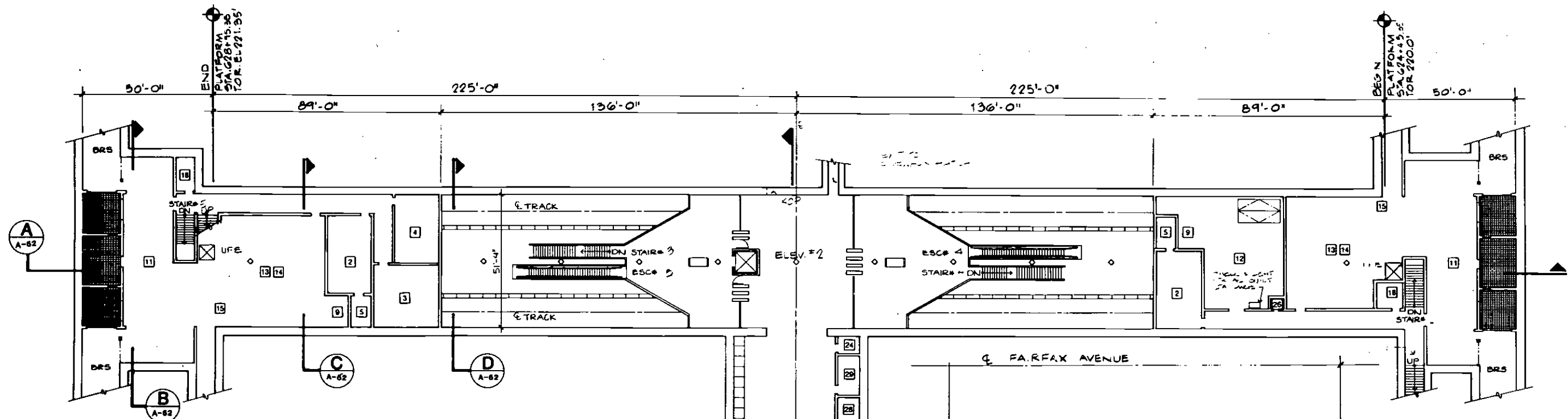
APPROVAL RECOMMENDED _____ Date _____
 Reg. No. _____

APPROVED _____ Date _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

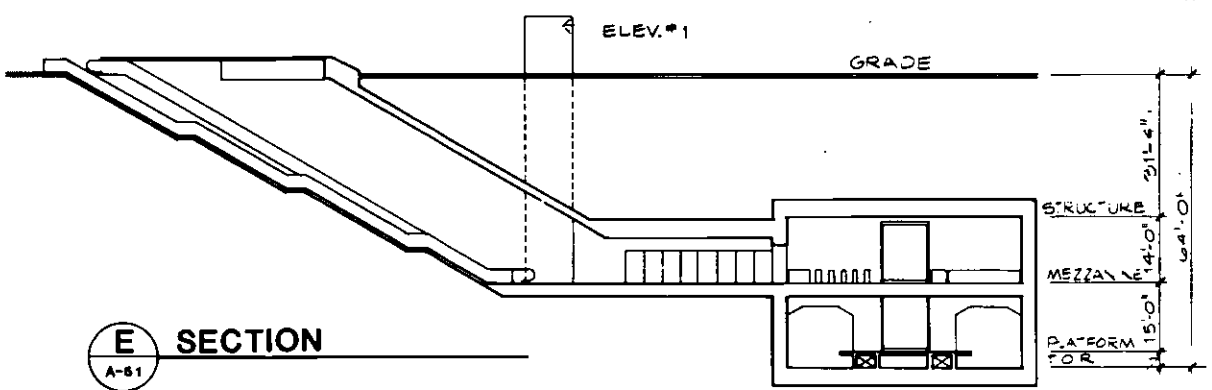
FAIRFAX/SANTA MONICA STATION
 CIVIL SITE PLAN

CONTRACT NO.	A310
DRAWING NO.	C-14
SCALE	1" = 40'-0"
SHEET NO.	49 of 67

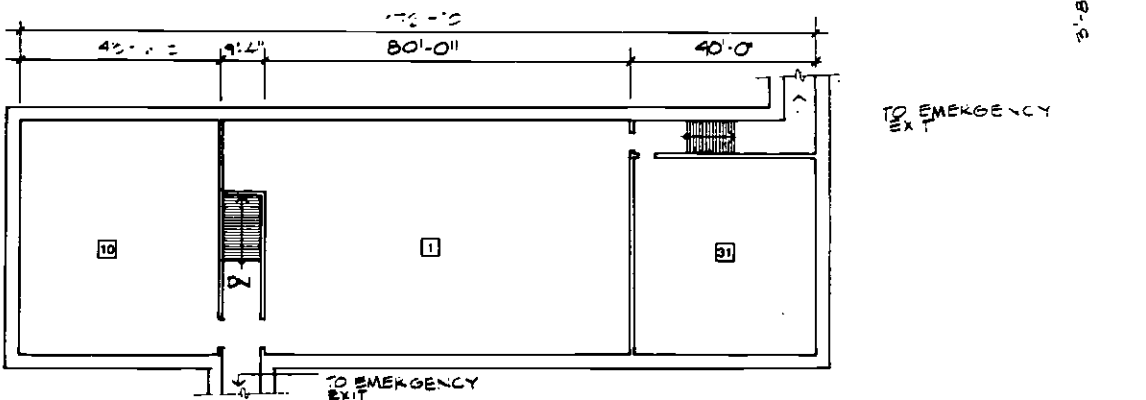
Figure 6-63
 Fairfax/Santa Monica Station: Civil Site Plan 142



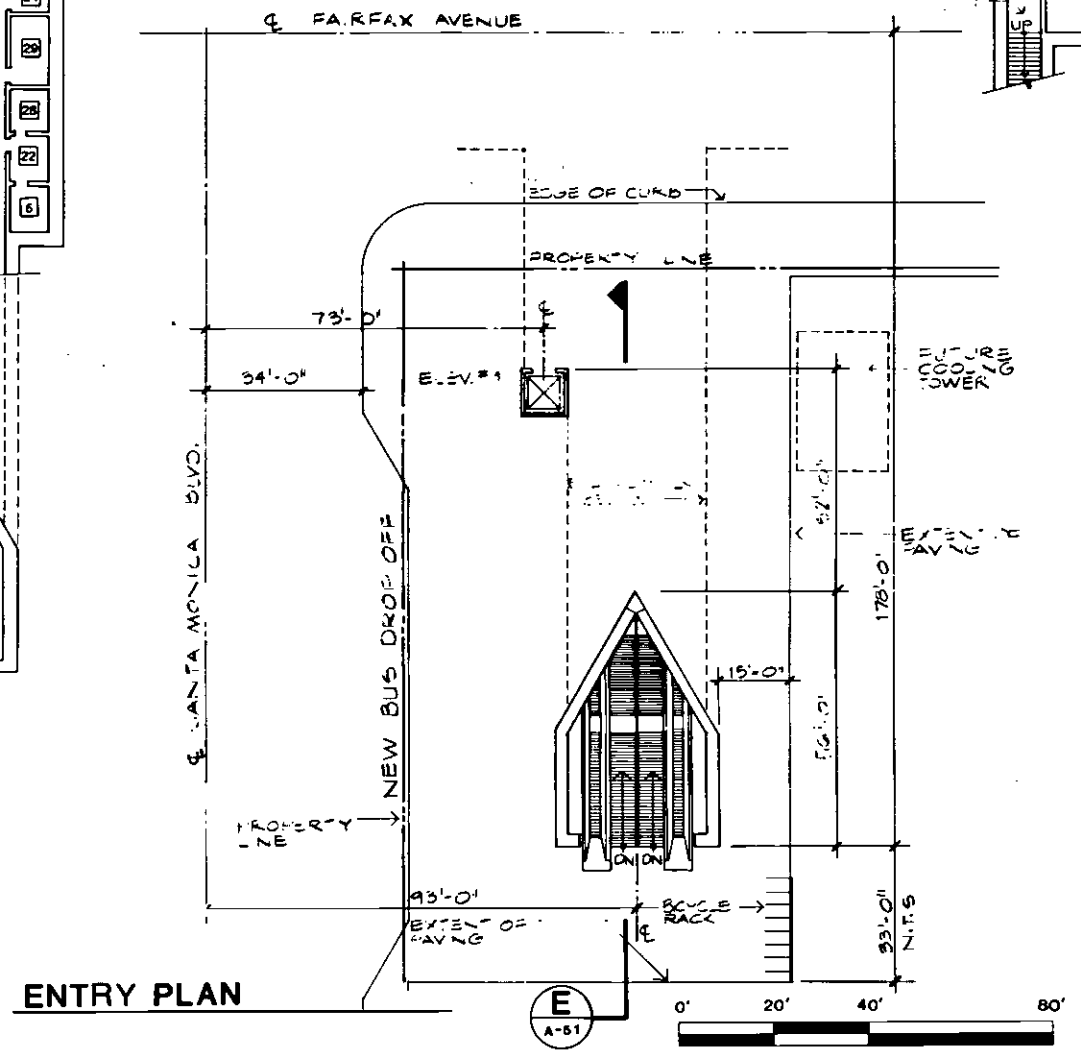
MEZZANINE PLAN



E SECTION



UPPER ANCILLARY PLAN



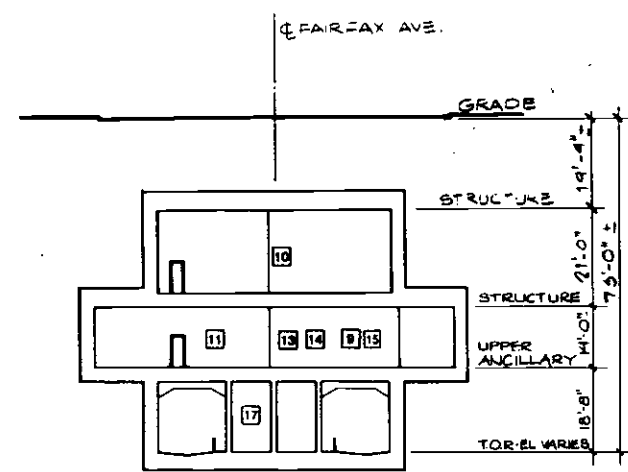
ENTRY PLAN

- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanics
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Penum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Deleted
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff
 - 30 Deleted
 - 31 Electric Incoming Service

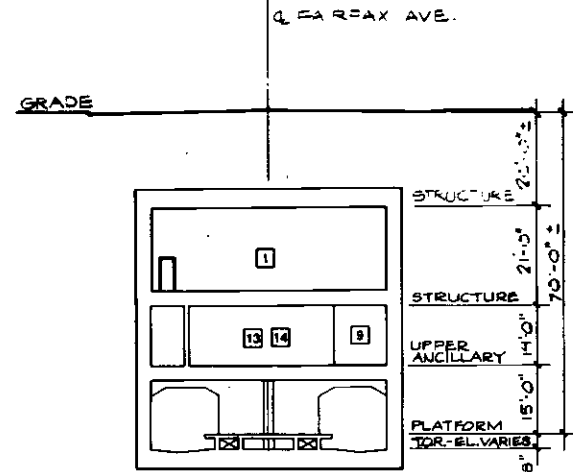
COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.

1 5-13-89 MP REVISION TO ANCILLARY ROOMS FOR COST REDUCTION	DESIGNED BY Date 2-23-89 H.A.T.	HARRY WESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT APPROVAL RECOMMENDED APPROVED Date Reg. No. MANAGER / CHIEF ENGINEER Reg. No.	FAIRFAX / SANTA MONICA STATION PLANS AND SECTIONS PRELIMINARY	CONTRACT NO. A310
	DRAWN BY Date 5-13-89 M. POINDEXTER				DRAWING NO. A-51
	CHECKED BY Date 6-6-89 J. YEN				SCALE 1"=20'-0"
	REV. DATE BY APP. DESCRIPTION				SHEET NO. 51 OF 27

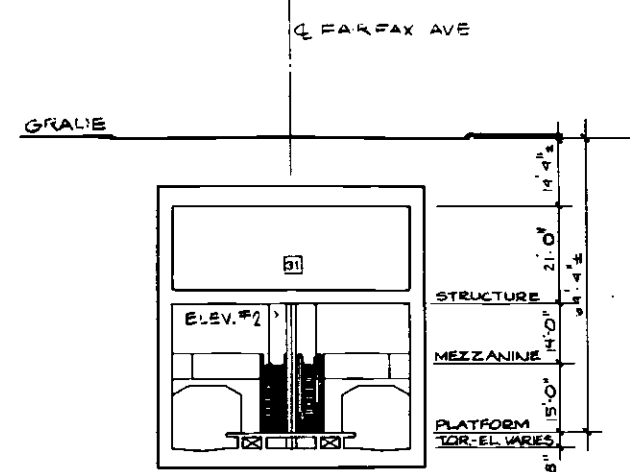
Figure 6-64
Fairfax/Santa Monica Station: Plans and Sections 143



B TRANSVERSE SECTION
A-82

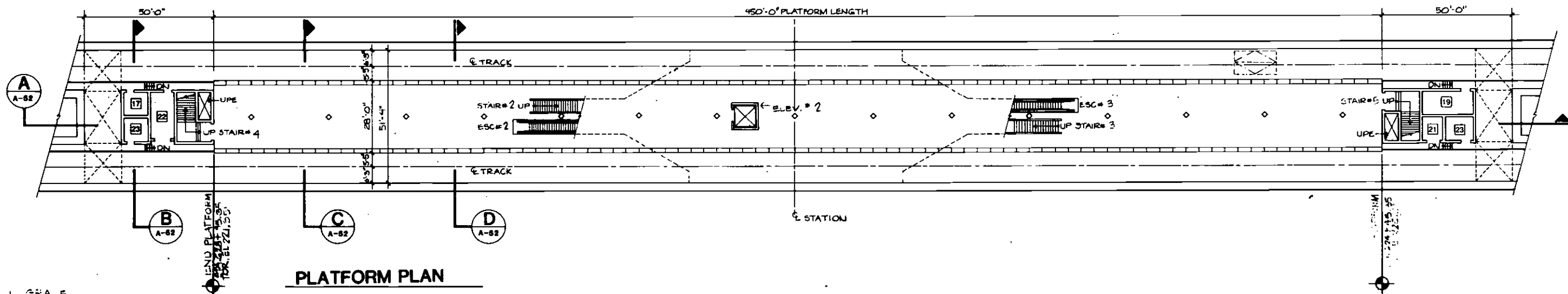


C TRANSVERSE SECTION
A-82

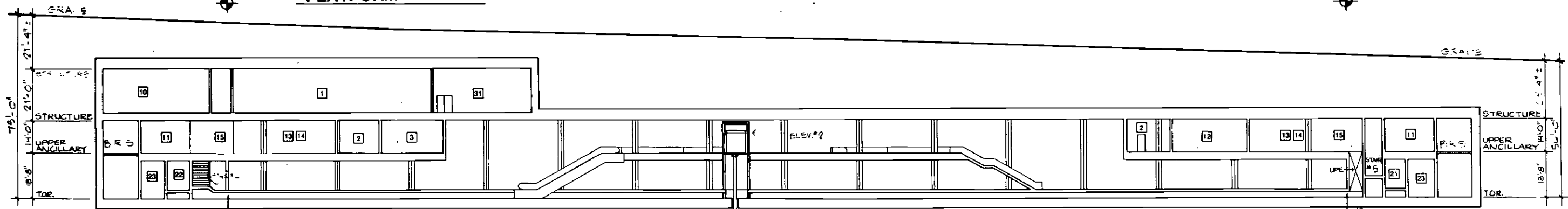


D TRANSVERSE SECTION
A-82

- SERVICE AND EQUIPMENT ROOMS**
- | | |
|----------------------------------|------------------------------|
| 1 Traction Power Substation | 17 Ejector |
| 2 Auxiliary Power | 18 Sprinkler Valves |
| 3 Train Control | 19 Sump Pump |
| 4 Communications | 20 Gap Breaker Station |
| 5 Batteries | 21 Emergency Equipment |
| 6 Elevator Equipment | 22 Custodial |
| 7 Deleted | 23 Electrical Equipment |
| 8 Storage | 24 Toilet |
| 9 Mechanical | 25 Deleted |
| 10 Fan | 26 Telephone Equipment |
| 11 Emergency Fan | 27 Deleted |
| 12 Chiller | 28 Trash |
| 13 Air Supply Unit | 29 Staff/Security |
| 14 Smoke Exhaust | 30 Deleted |
| 15 Under Platform Exhaust | 31 Electric Incoming Service |
| 16 Under Platform Exhaust Plenum | |



PLATFORM PLAN



A LONGITUDINAL SECTION
A-82



REV.	DATE	BY	APP.	DESCRIPTION
1	5-12-88	VP		REVISION TO ANCILLARY ROOMS FOR COURT RECONSTRUCTION

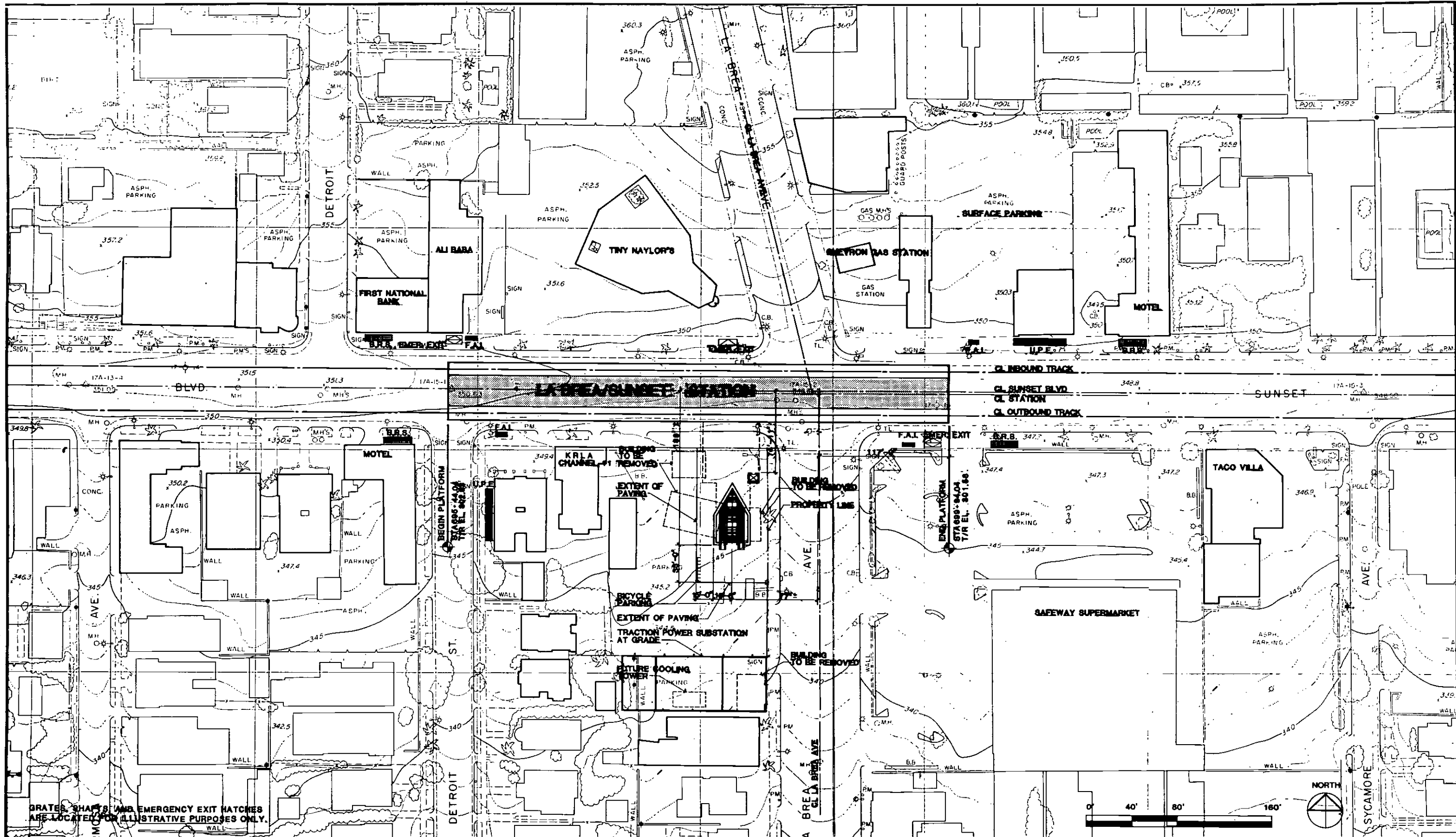
DESIGNED BY Date 5-13-83
DRAWN BY Date 5-13-83
M. PONDE/TER
CHECKED BY Date 5-13-83

HARRY WEESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations
SUBMITTED BY: [Signature]
PROJECT MANAGER

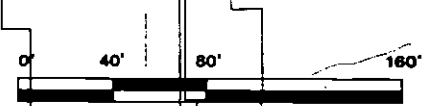
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
APPROVAL RECOMMENDED: _____ Date _____
APPROVED: _____ Date _____
MANAGER / CHIEF ENGINEER Reg. No. _____

FAIRFAX / SANTA MONICA STATION
PLANS AND SECTIONS
PRELIMINARY

CONTRACT NO. 13.5
DRAWING NO. A-52
SCALE 1"=20'-0"
SHEET NO. 52 OF 67



GRATES, SHAFTS AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.



REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY HWA	Date 6-3-82
DRAWN BY M. HOMER	Date 6-3-82
CHECKED BY J. TEN	Date 6-16-82

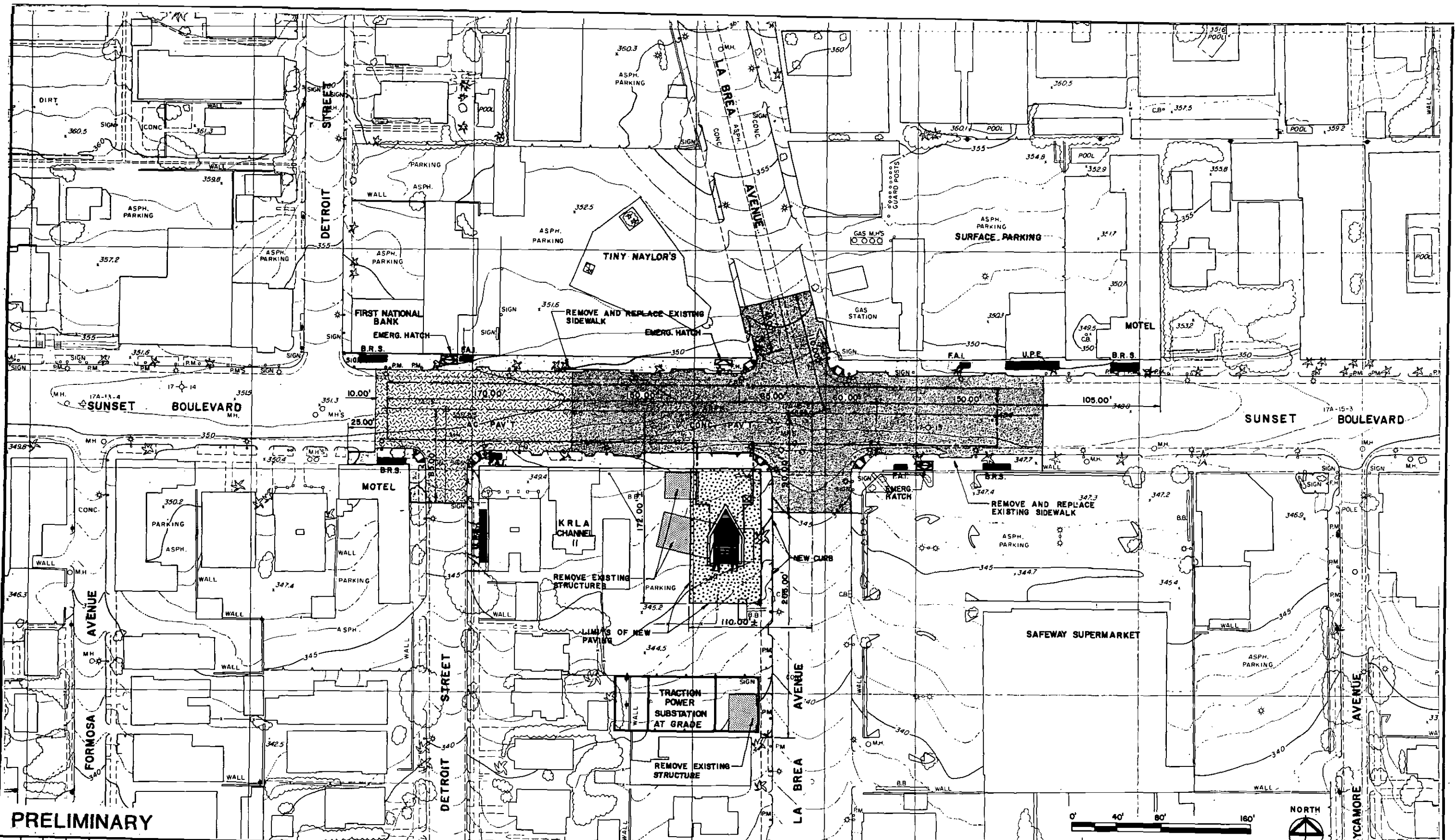
HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY: *[Signature]*
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT		
METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	Date
Reg. No.	MANAGER / CHIEF ENGINEER	Reg. No.

LA BREA/SUNSET STATION
 SITE PLAN
PRELIMINARY

CONTRACT NO.	A310
DRAWING NO.	A-53
SCALE	1"=40'-0"
SHEET NO.	50 OF 67

Figure 6-66
 LaBrea/Sunset Station: Site Plan



PRELIMINARY

REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY	Date	6/18/88
TAMS		
DRAWN BY	Date	6/18/88
HWW		
CHECKED BY	Date	6/18/88
JLD		

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY: *[Signature]*

PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

RTD

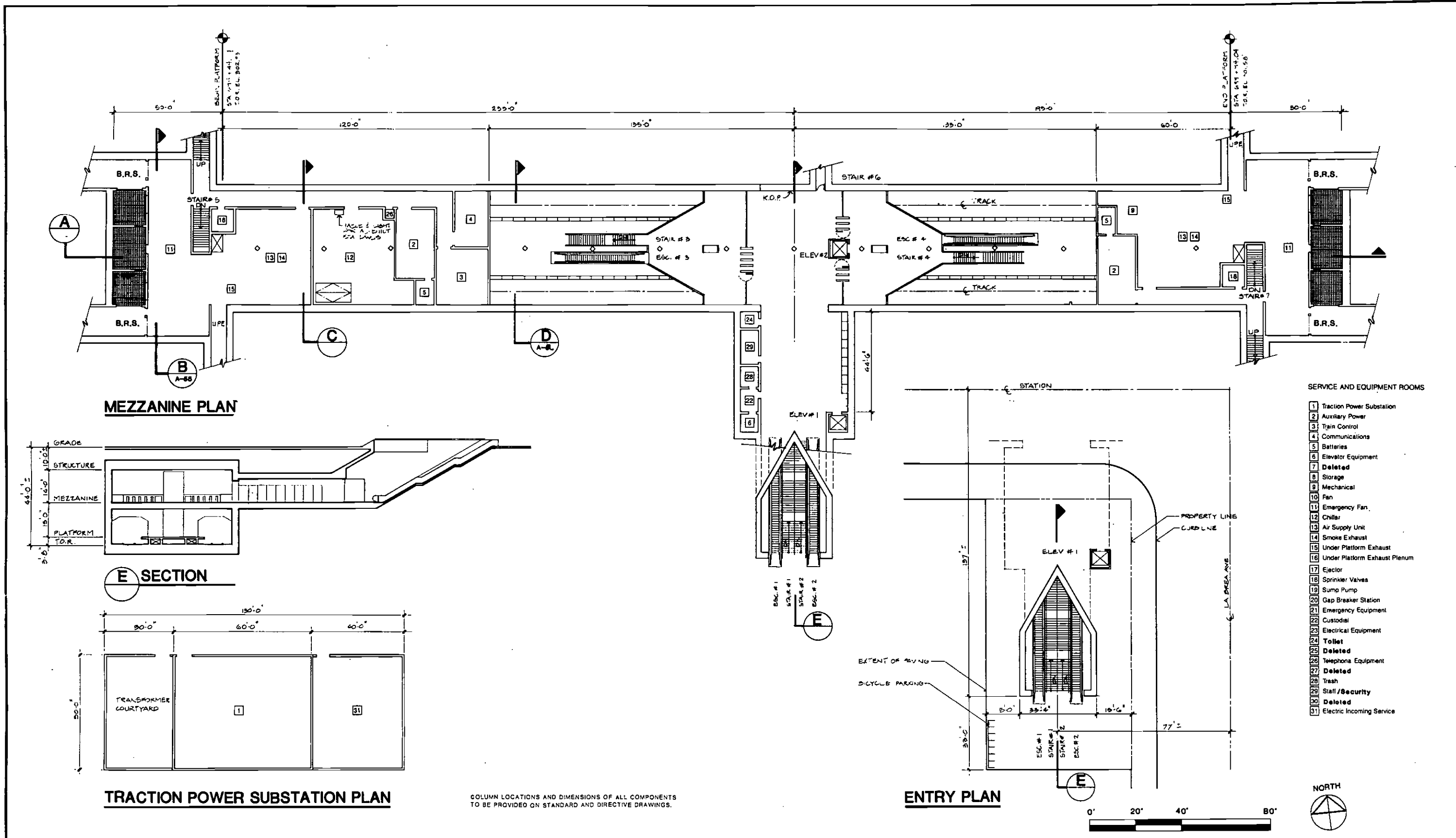
APPROVAL RECOMMENDED	APPROVED	DATE
Reg. No. _____	MANAGER / CHIEF ENGINEER	Reg. No. _____

LA BREA / SUNSET STATION

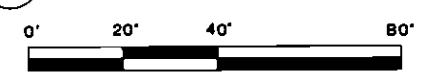
CIVIL SITE PLAN

CONTRACT NO.	A310
DRAWING NO.	C-15
SCALE	1" = 40'-0"
SHEET NO.	59 of 67

Figure 6-67
 LaBrea/Sunset Station: Civil Site Plan 146

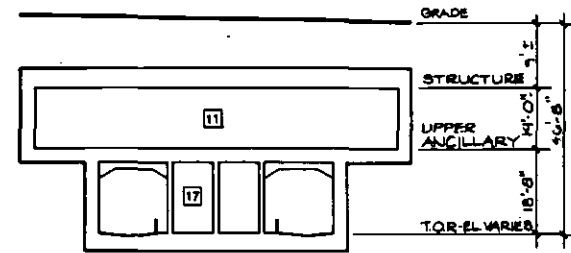


COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.

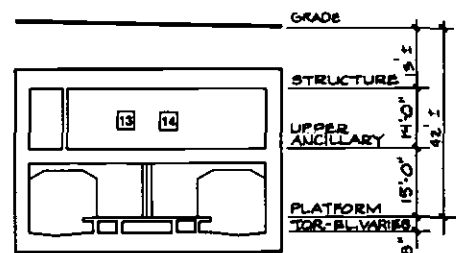


DESIGNED BY HWA Date 6-6-83				HARRY WEESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT		LA BREA/SUNSET STATION: PLANS & SECTIONS PRELIMINARY		CONTRACT NO. A310
DRAWN BY M. HOMER Date 6-6-83					APPROVAL RECOMMENDED _____ Reg. No. _____	APPROVED _____ Date _____ MANAGER / CHIEF ENGINEER Reg. No. _____	DRAWING NO. A-54		SCALE 1 1/2" = 20'-0"
CHECKED BY J.YEN Date 6-6-83 PIGAT					REV. DATE BY APP. DESCRIPTION		SHEET NO. 01 OF 07		

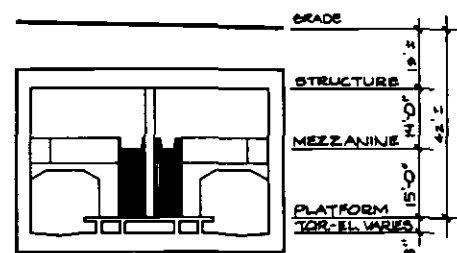
Figure 6-68
LaBrea/Sunset Station: Plans and Sections 147



B TRANSVERSE SECTION

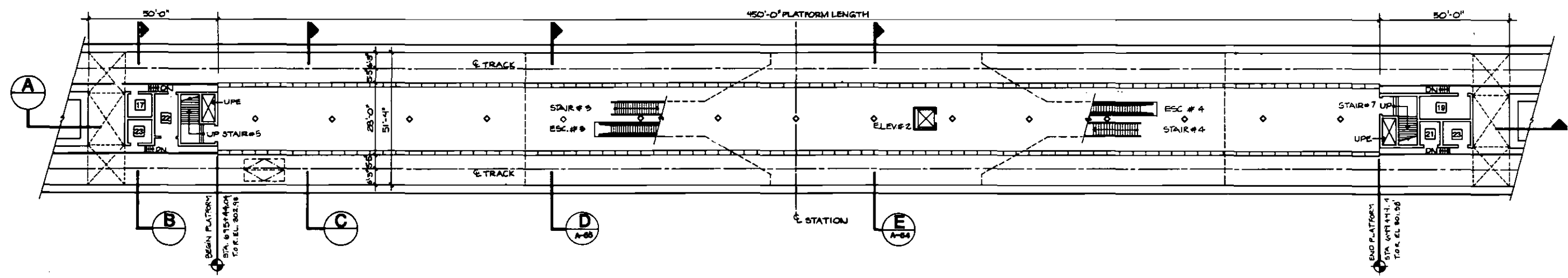


C TRANSVERSE SECTION

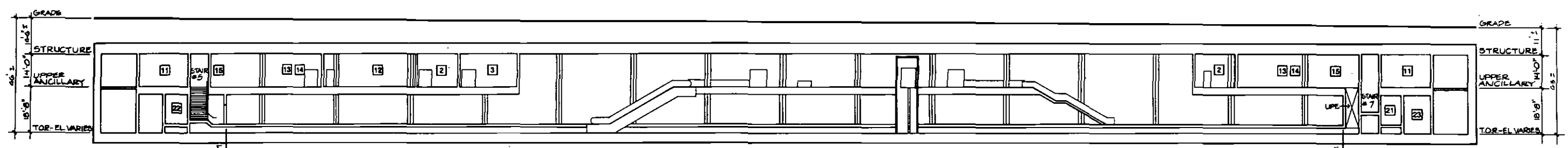


D TRANSVERSE SECTION

- SERVICE AND EQUIPMENT ROOMS**
- | | |
|----------------------------------|------------------------------|
| 1 Traction Power Substation | 17 Ejector |
| 2 Auxiliary Power | 18 Sprinkler Valves |
| 3 Train Control | 19 Sump Pump |
| 4 Communications | 20 Gap Breaker Station |
| 5 Batteries | 21 Emergency Equipment |
| 6 Elevator Equipment | 22 Custodial |
| 7 Deleted | 23 Electrical Equipment |
| 8 Storage | 24 Toilet |
| 9 Mechanical | 25 Deleted |
| 10 Fan | 26 Telephone Equipment |
| 11 Emergency Fan | 27 Deleted |
| 12 Chiller | 28 Staff/Security |
| 13 Air Supply Unit | 29 Deleted |
| 14 Smoke Exhaust | 30 Electric Incoming Service |
| 15 Under Platform Exhaust | |
| 16 Under Platform Exhaust Plenum | |



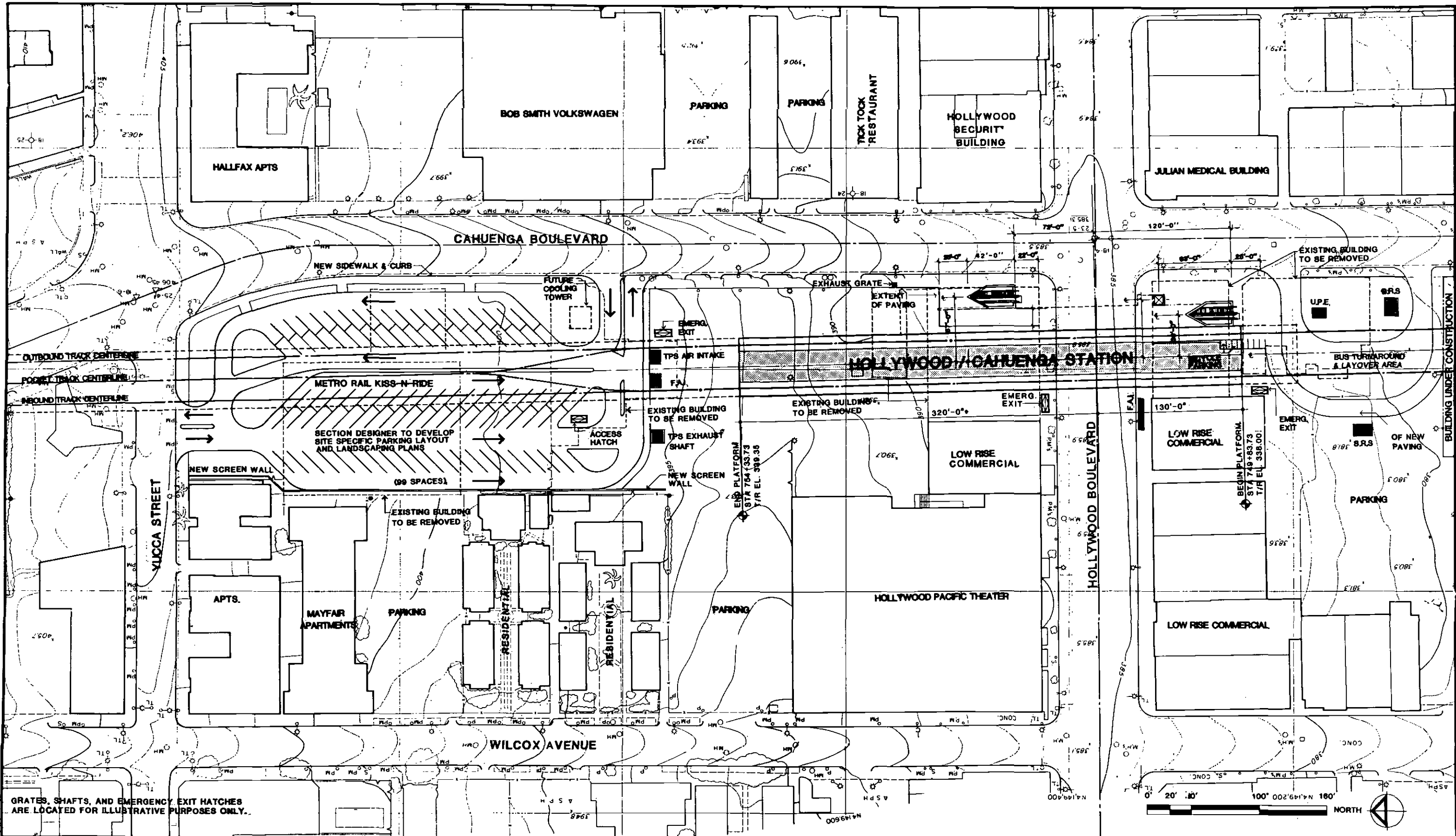
PLATFORM PLAN



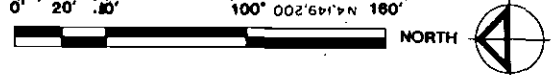
A LONGITUDINAL SECTION



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	REV.	DATE	BY	APP.	DESCRIPTION																				
DRAWN BY M. HOMER Date 6/6/83	APPROVAL RECOMMENDED _____ Date _____ Reg. No. _____	DRAWING NO. A-55																							
CHECKED BY J. YUN Date 6/6/83 PIENT	APPROVED _____ Date _____ Reg. No. _____	SCALE 1"=20'-0"																							
REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION	MANAGER / CHIEF ENGINEER _____ Date _____ Reg. No. _____	SHEET NO. 62 OF 67																							



GRATES, SHAFTS, AND EMERGENCY EXIT HATCHES ARE LOCATED FOR ILLUSTRATIVE PURPOSES ONLY.



REV.	DATE	BY	APP.	DESCRIPTION
1	11/11/03	MP	JY	REVISIONS TO ACCOMMODATE ROOMS FOR COST REDUCTION
2	11/11/03	VERMA	AK	KISS-N-RIDE LAYOUT
3	11/11/03	VERMA	AK	BICYCLE PARKING ADDED

DESIGNED BY HWA	Date 3/11/03
DRAWN BY S. DEBNATH	Date 3/11/03
CHECKED BY J. YEN	Date 3/11/03

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABSETT-MCCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

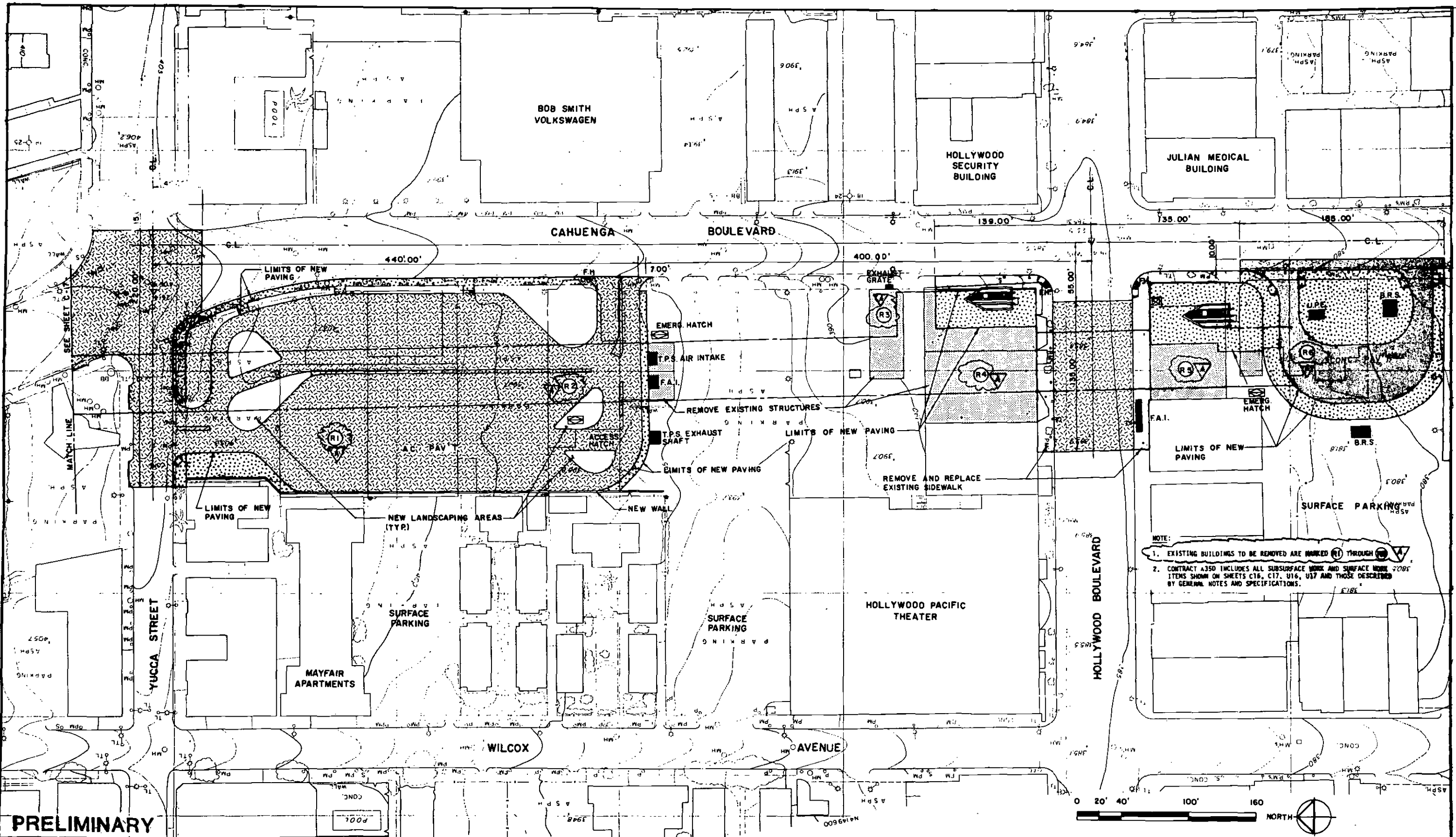
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT		
METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	Date
_____ REG. NO. _____	_____ MANAGER / CHIEF ENGINEER	REG. NO. _____

HOLLYWOOD/CAHUENGA STATION
 SITE PLAN
 PRELIMINARY

CONTRACT NO. A350
DRAWING NO. A-56
SCALE 1" = 40'-0"
SHEET NO. 10 OF 24

Figure 6-70
 Hollywood/Cahuenga Station: Site Plan 149



DESIGNED BY	Date	01/18/83		
TAM8				
DRAWN BY	Date	6/13/83		
RGL				
CHECKED BY	Date	9/15/83		
JLD				
REV.	DATE	BY	APP.	DESCRIPTION
1	6/30/83	JLD		REVISED BLDG. REMOVAL NOTE

DESIGNED BY
TAM8
 Date 01/18/83
 DRAWN BY
RGL
 Date 6/13/83
 CHECKED BY
JLD
 Date 9/15/83

HARRY WEESE & ASSOCIATES
 TYPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY:

 PROJECT MANAGER

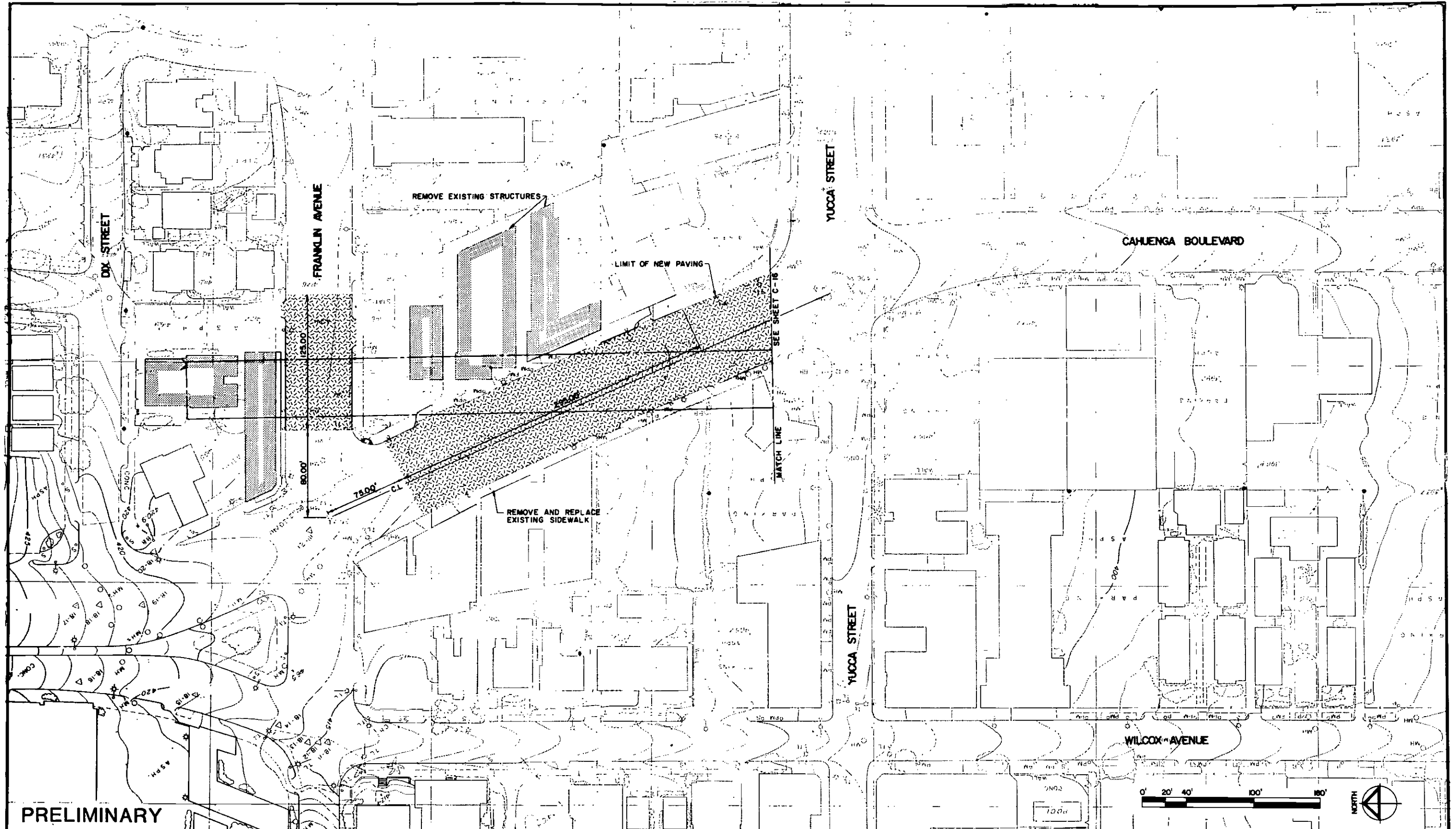
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____
 APPROVED _____ DATE _____
 MANAGER / CHIEF ENGINEER _____ REG. NO. _____

HOLLYWOOD/CAHUENGA STATION
CIVIL SITE PLAN
SOUTH END

CONTRACT NO. **A 350**
 DRAWING NO. **0-16**
 SCALE **1" = 40'-0"**
 SHEET NO. **11 OF 24**


Figure 6-71
Hollywood/Cahuenga Station: Civil Site Plan - North End




PRELIMINARY

REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY TAM	Date 6/10/03
DRAWN BY RGL	Date 6/10/03
CHECKED BY JLD	Date 6/10/03

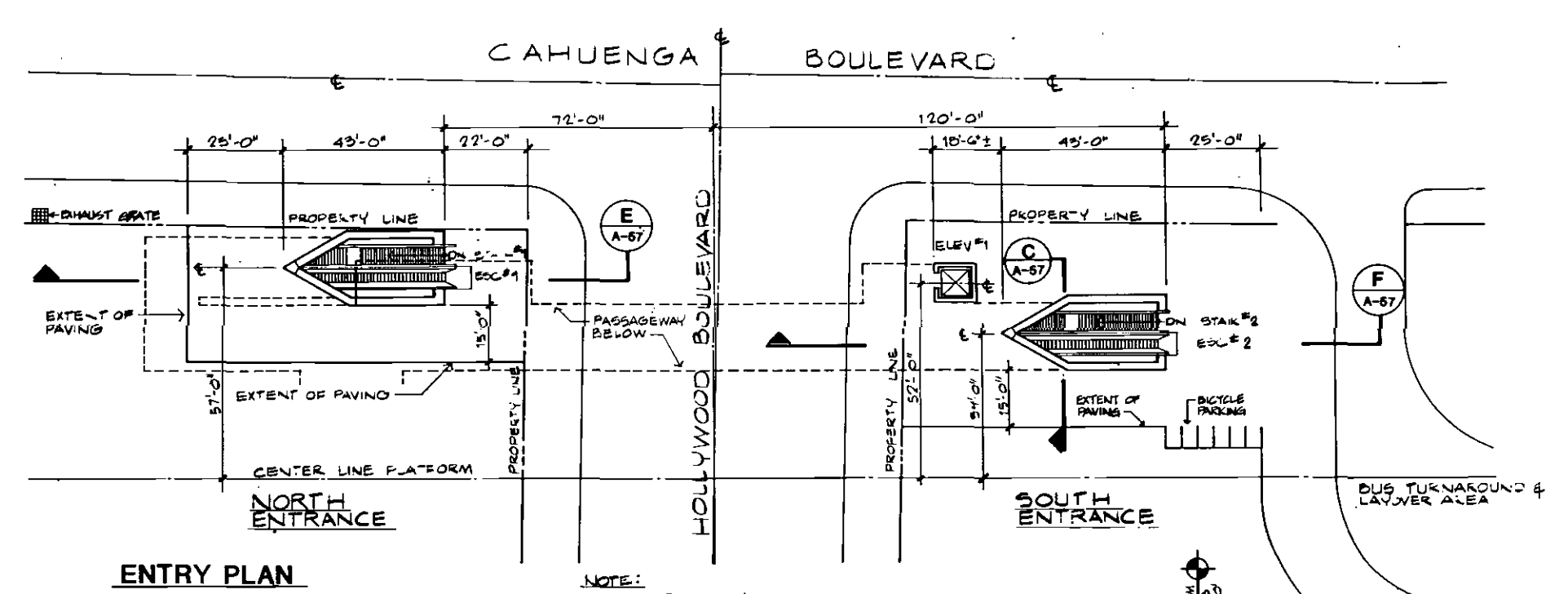
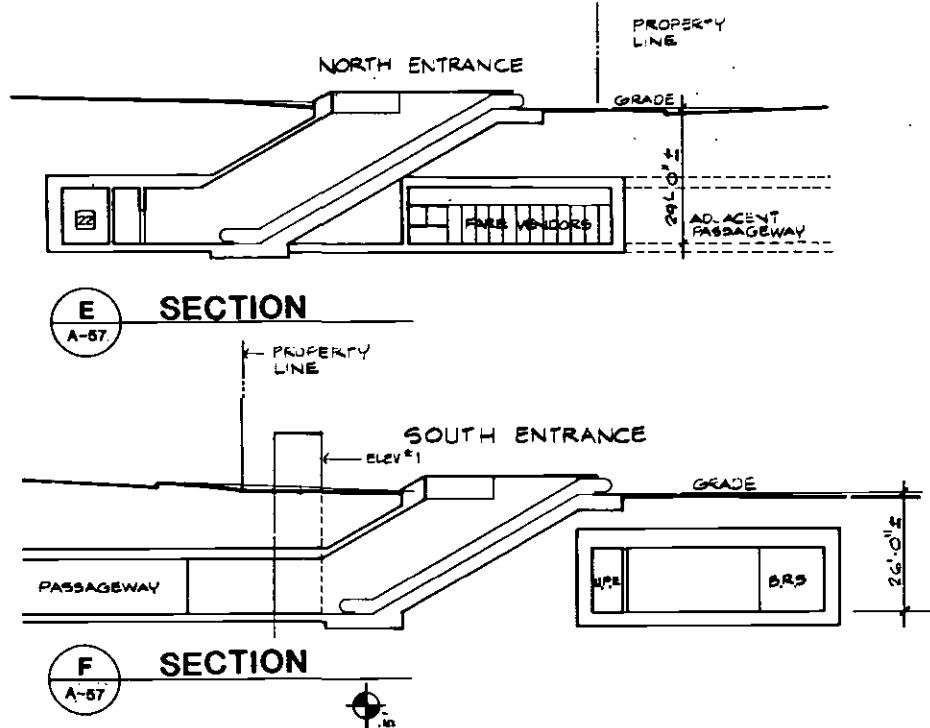
HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY:

 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	
		Date
Reg. No. _____	MANAGER / CHIEF ENGINEER	Reg. No. _____

HOLLYWOOD/CAHUENGA STATION
 CIVIL SITE PLAN
 NORTH END

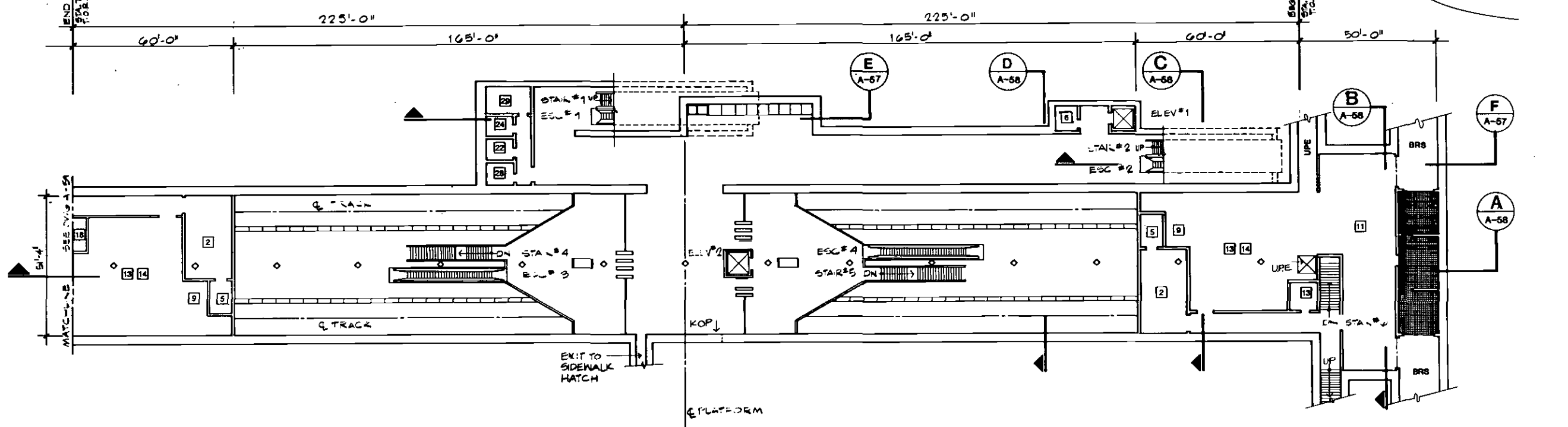
CONTRACT NO. A350
DRAWING NO. 0-17
SCALE 1"=40'-0"
SHEET NO. 12 of 24

Figure 6-72
 Hollywood/Cahuenga Station: Civil Site Plan - North End 151



SERVICE AND EQUIPMENT ROOMS

- 1 Traction Power Substation
- 2 Auxiliary Power
- 3 Train Control
- 4 Communications
- 5 Batteries
- 6 Elevator Equipment
- 7 Deleted
- 8 Storage
- 9 Mechanical
- 10 Fan
- 11 Emergency Fan
- 12 Chiller
- 13 Air Supply Unit
- 14 Smoke Exhaust
- 15 Under Platform Exhaust
- 16 Under Platform Exhaust Plenum
- 17 Ejector
- 18 Sprinkler Valves
- 19 Sump Pump
- 20 Gap Breaker Station
- 21 Emergency Equipment
- 22 Custodial
- 23 Electrical Equipment
- 24 Men
- 25 Women
- 26 Telephone Equipment
- 27 Deleted
- 28 Trash
- 29 Staff
- 30 Deleted
- 31 Electric Incoming Service

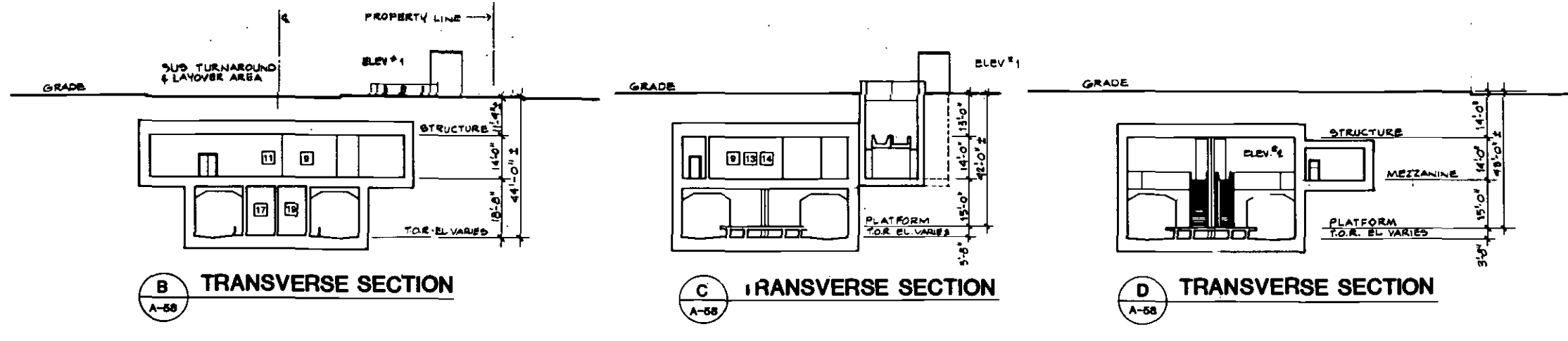


COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.

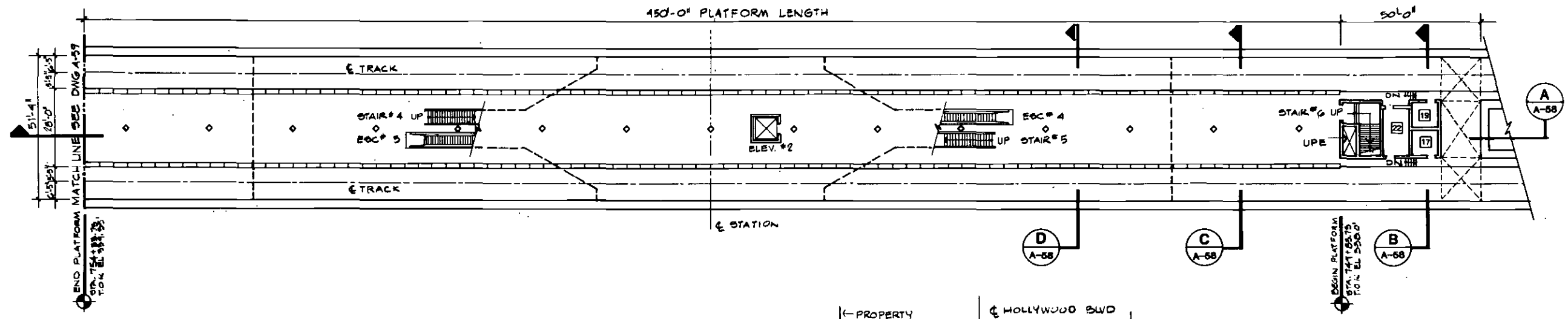


DESIGNED BY HWA Date 6/19/83		HARRY WESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 		CONTRACT NO. A350
DRAWN BY M. POINDEXTER Date 6/19/83			APPROVAL RECOMMENDED _____ Reg. No. _____		DRAWING NO. A-57
CHECKED BY J.TEN Date 6/19/83			APPROVED _____ MANAGER / CHIEF ENGINEER Reg. No. _____		SCALE 1"=20'-0" SHEET NO. 15 OF 24
REV. DATE BY APP. DESCRIPTION					

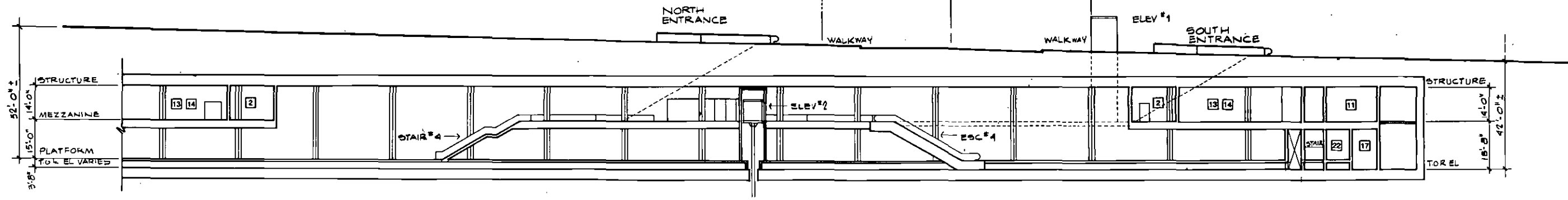
Figure 6-73
Hollywood/Cahuenga Station: Plans and Sections 152



- SERVICE AND EQUIPMENT ROOMS**
- | | |
|----------------------------------|------------------------------|
| 1 Traction Power Substation | 17 Ejector |
| 2 Auxiliary Power | 18 Sprinkler Valves |
| 3 Train Control | 19 Sump Pump |
| 4 Communications | 20 Gap Breaker Station |
| 5 Batteries | 21 Emergency Equipment |
| 6 Elevator Equipment | 22 Custodial |
| 7 Deleted | 23 Electrical Equipment |
| 8 Storage | 24 Men |
| 9 Mechanical | 25 Women |
| 10 Fan | 26 Telephone Equipment |
| 11 Emergency Fa. | 27 Deleted |
| 12 Chiller | 28 Trash |
| 13 Air Supply Unit | 29 Staff |
| 14 Smoke Exhaust | 30 Deleted |
| 15 Under Platform Exhaust | 31 Electric Incoming Service |
| 16 Under Platform Exhaust Plenum | |



PARTIAL PLATFORM LEVEL PLAN



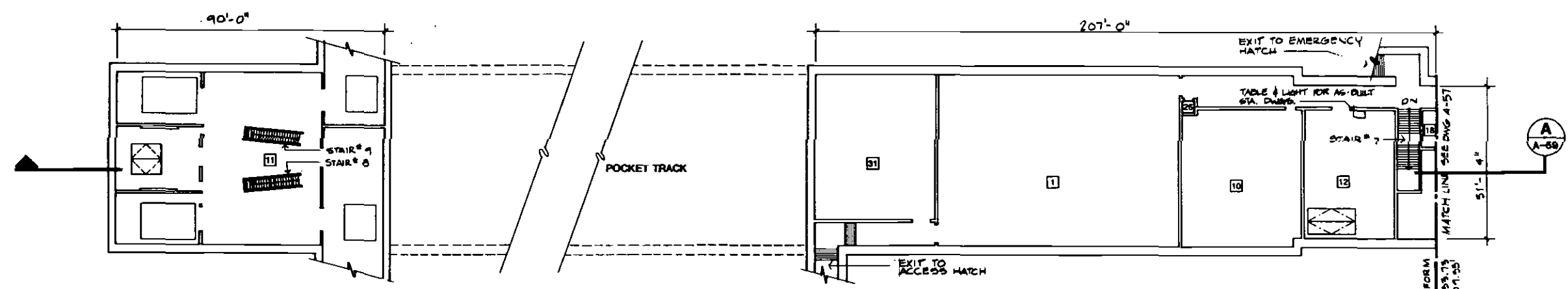
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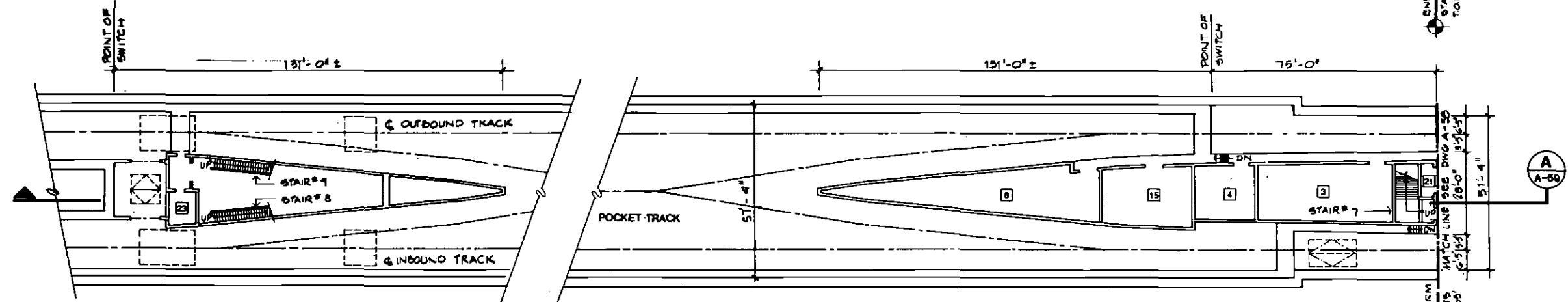
DESIGNED BY: HWA Date: 6/3/89 DRAWN BY: M. POINDEXTER Date: 6/3/89 CHECKED BY: J.TEN Date: 6/15/89 PIGATI		HARRY WEESE & ASSOCIATES TIPPETTS-ABBETT-MCCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: [Signature] PROJECT MANAGER		SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 		HOLLYWOOD/CAHUENGA STATION PLANS & SECTIONS PRELIMINARY		CONTRACT NO. A 350 DRAWING NO. A - 58 SCALE 1"=20'-0" SHEET NO. 16 OF 24
REV.	DATE	BY	APP.	DESCRIPTION	APPROVAL RECOMMENDED	APPROVED	DATE	
1	5/4/89	J.Y.		REVISION TO ANCILLARY ROOMS FOR COST REDUCTION				

SERVICE AND EQUIPMENT ROOMS

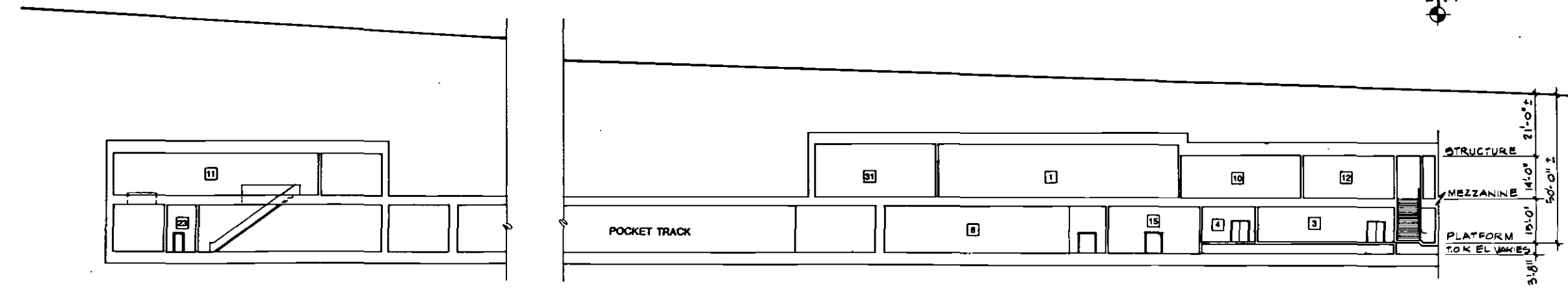
- 1 Traction Power Substation
- 2 Auxiliary Power
- 3 Train Control
- 4 Communications
- 5 Batteries
- 6 Elevator Equipment
- 7 Deleted
- 8 Storage
- 9 Mechanical
- 10 Fan
- 11 Emergency Fan
- 12 Chiller
- 13 Air Supply Unit
- 14 Smoke Exhaust
- 15 Under Platform Exhaust
- 16 Under Platform Exhaust Plenum
- 17 Ejector
- 18 Sprinkler Valves
- 19 Sump Pump
- 20 Gap Breaker Station
- 21 Emergency Equipment
- 22 Custodial
- 23 Electrical Equipment
- 24 Men
- 25 Women
- 26 Telephone Equipment
- 27 Deleted
- 28 Trash
- 29 Staff
- 30 Deleted
- 31 Electric Incoming Service



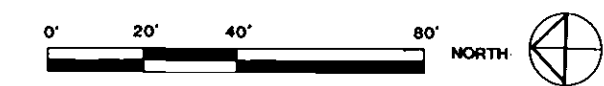
PARTIAL MEZZANINE PLAN



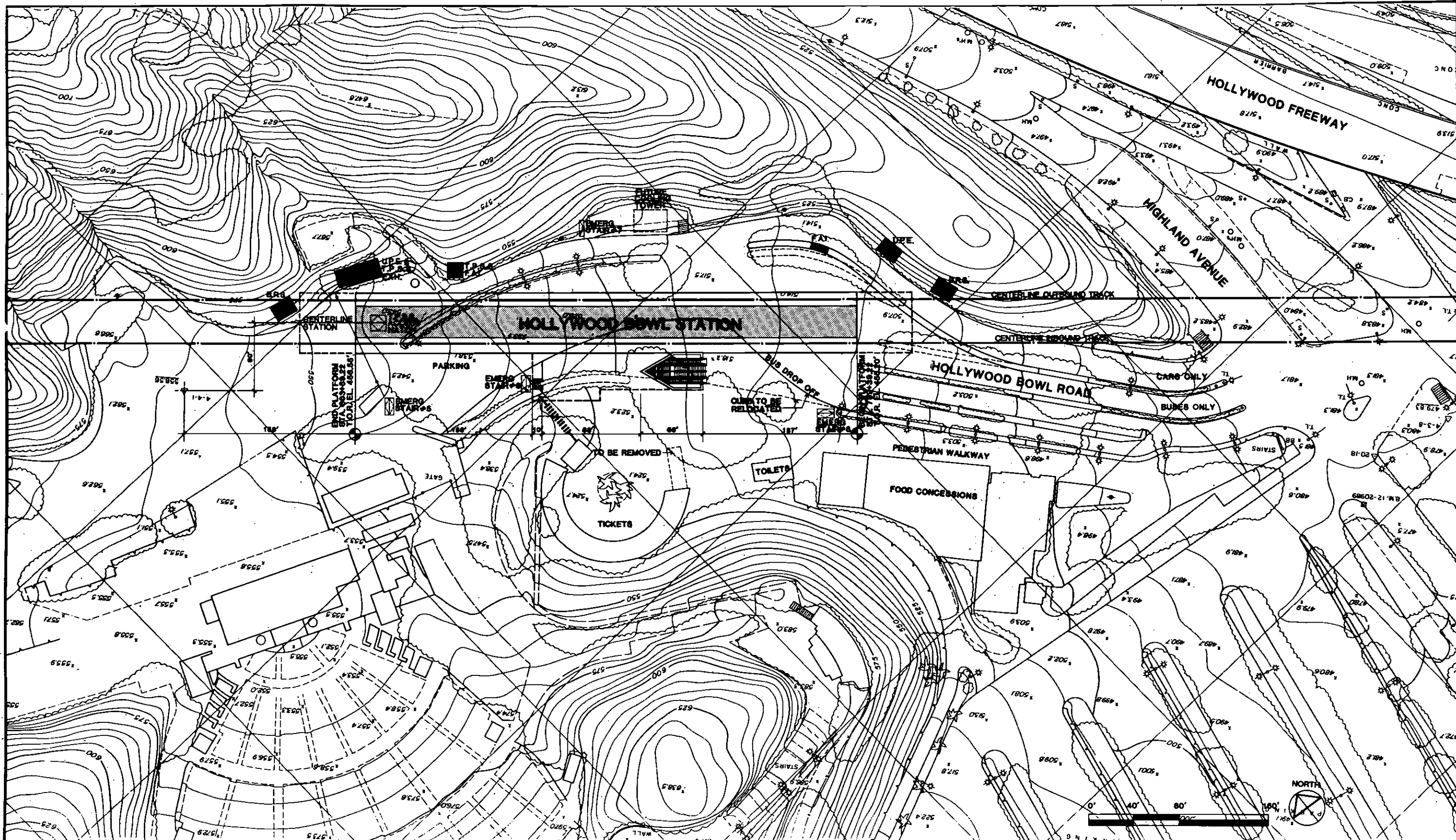
PARTIAL PLATFORM LEVEL PLAN



PARTIAL LONGITUDINAL SECTION



	DESIGNED BY HWA Date 6/2/85	HARRY WESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 	HOLLYWOOD/CAHUENGA STATION PLANS & SECTIONS PRELIMINARY	CONTRACT NO. A350
	DRAWN BY M. POINDEXTER Date 4/3/85		APPROVAL RECOMMENDED _____ Date _____ APPROVED _____ Date _____ MANAGER / CHIEF ENGINEER	DRAWING NO. A - 59 SCALE 1" = 20'-0" SHEET NO. 17 OF 24	
3 5/6/85 MP J.Y. REVISIONS TO ANCILLARY ROOMS FOR CIVIL REDUCTION REV. DATE BY APP. DESCRIPTION	CHECKED BY J.YEN Date 6/13/85 P/MT				




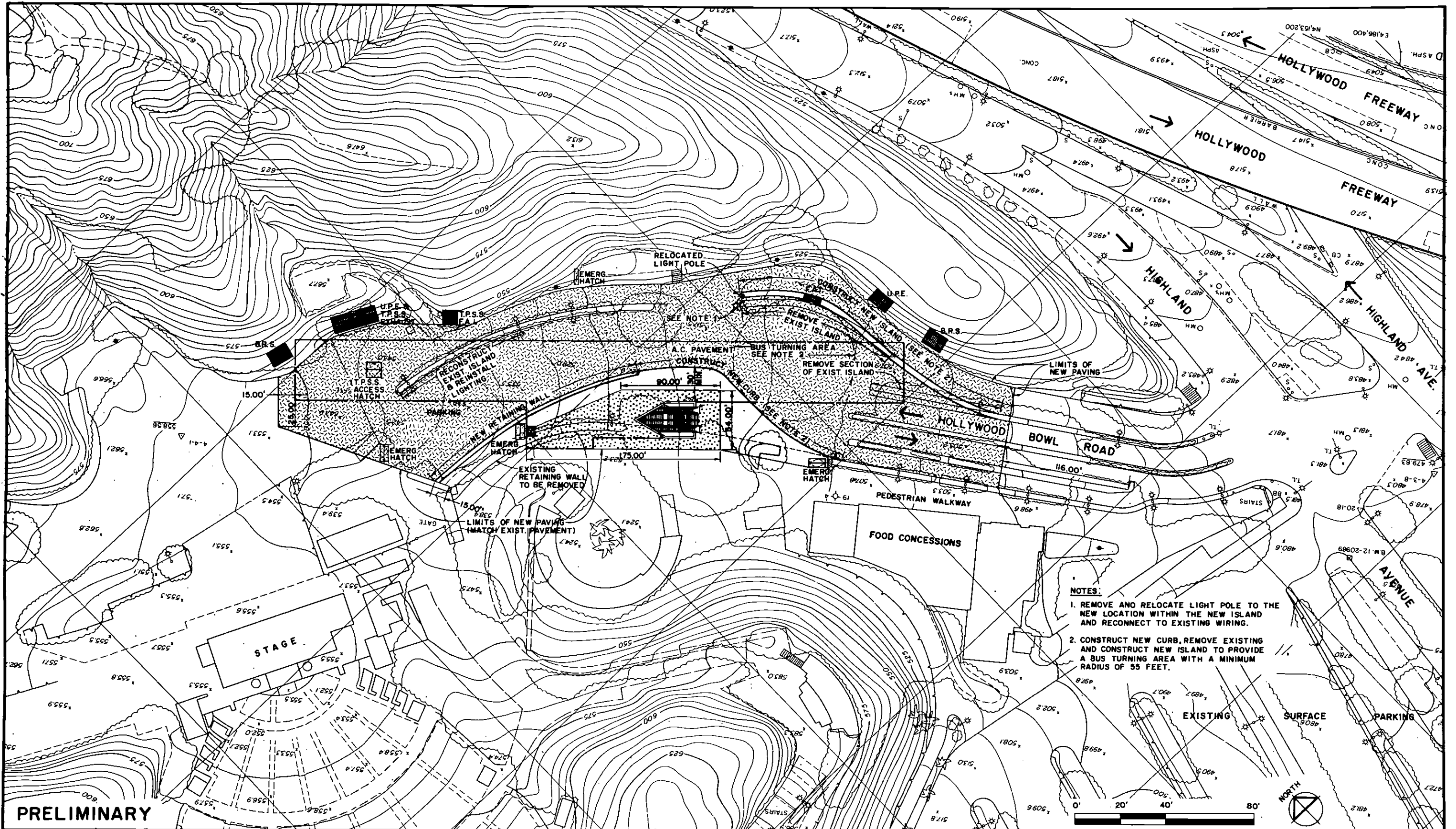
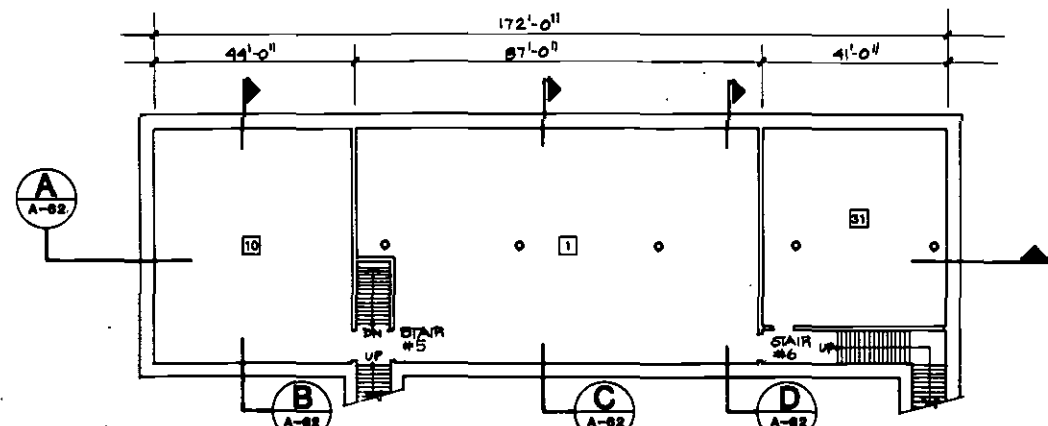
DESIGNED BY: 0611 DRAWN BY: 0110 CHECKED BY: 0610		HARRY WESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. QIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: _____ PROJECT MANAGER: _____	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT APPROVAL RECOMMENDED: _____ Reg. No. _____	 APPROVED: _____ Date: _____ MANAGER / CHIEF ENGINEER: _____ Reg. No. _____	HOLLYWOOD BOWL STATION CONTRACT NO. _____ DRAWING NO. A-60 SCALE 1" = 40' - 0" SHEET NO. _____
REV.	DATE	BY	APP.	DESCRIPTION	

Figure 6-76
Hollywood Bowl Station: Site Plan



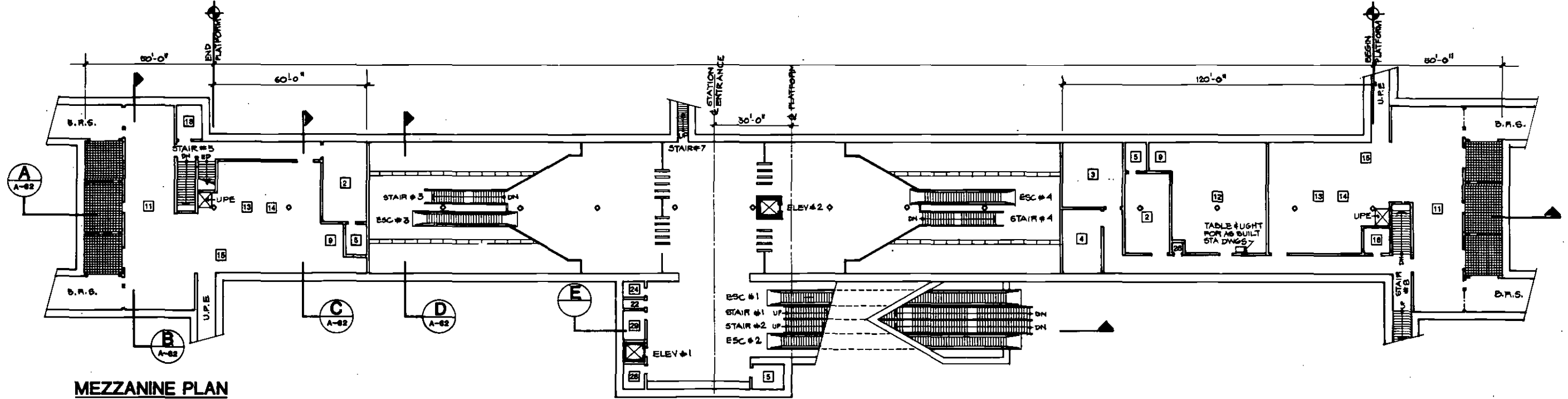
PRELIMINARY			DESIGNED BY Date <u>8/26/83</u> TAMS	HARRY WEESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: _____ PROJECT MANAGER _____	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT			HOLLYWOOD BOWL STATION		CONTRACT NO. _____
			DRAWN BY Date <u>8/29/83</u> R.G.L.					CIVIL SITE PLAN		DRAWING NO. C-18
REV. DATE BY APP. DESCRIPTION			CHECKED BY Date <u>8/30/83</u> J.L.D.		APPROVAL RECOMMENDED _____ Reg. No. _____	APPROVED _____ Date _____ MANAGER / CHIEF ENGINEER Reg. No. _____		SCALE 1"=20'-0"	SHEET NO. _____	

Figure 6-77
Hollywood Bowl Station: Civil Site Plan

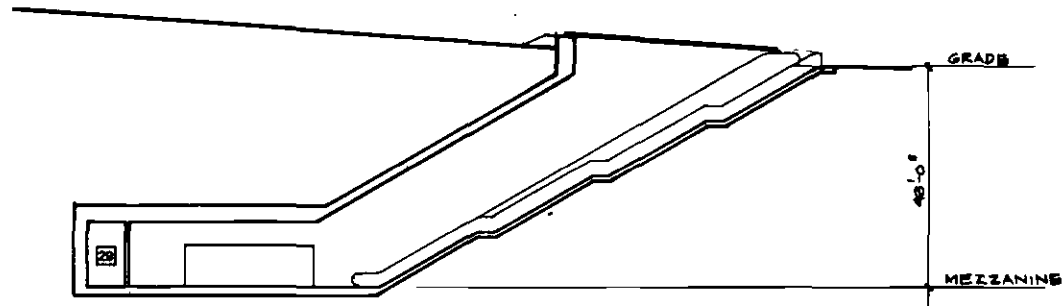


TRACTION POWER SUBSTATION PLAN

- SERVICE AND EQUIPMENT ROOMS**
- | | |
|----------------------------------|------------------------------|
| 1 Traction Power Substation | 17 Ejector |
| 2 Auxiliary Power | 18 Sprinkler Valves |
| 3 Train Control | 19 Sump Pump |
| 4 Communications | 20 Gap Breaker Station |
| 5 Batteries | 21 Emergency Equipment |
| 6 Elevator Equipment | 22 Custodial |
| 7 Deleted | 23 Electrical Equipment |
| 8 Storage | 24 Toilet |
| 9 Mechanical | 25 Deleted |
| 10 Fan | 26 Telephone Equipment |
| 11 Emergency Fan | 27 Deleted |
| 12 Chiller | 28 Trash |
| 13 Air Supply Unit | 29 Staff/Security |
| 14 Smoke Exhaust | 30 Deleted |
| 15 Under Platform Exhaust | 31 Electric Incoming Service |
| 16 Under Platform Exhaust Plenum | |



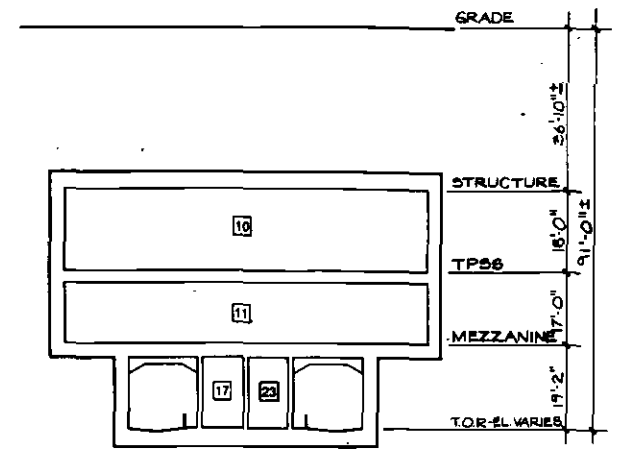
MEZZANINE PLAN



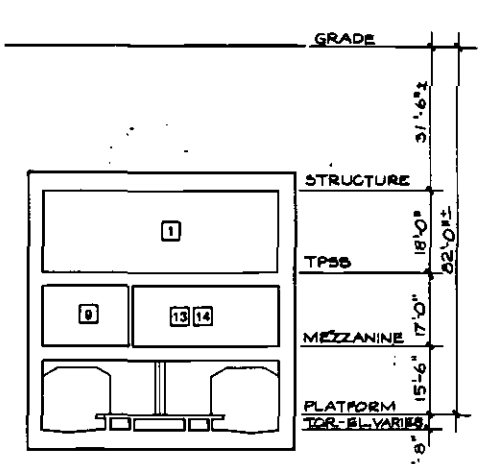
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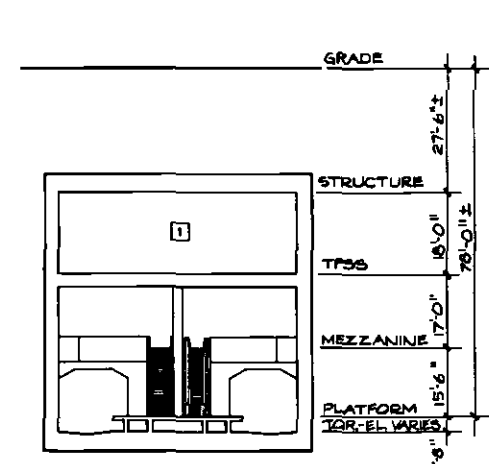
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REV. DATE BY APP. DESCRIPTION																					



B TRANSVERSE SECTION

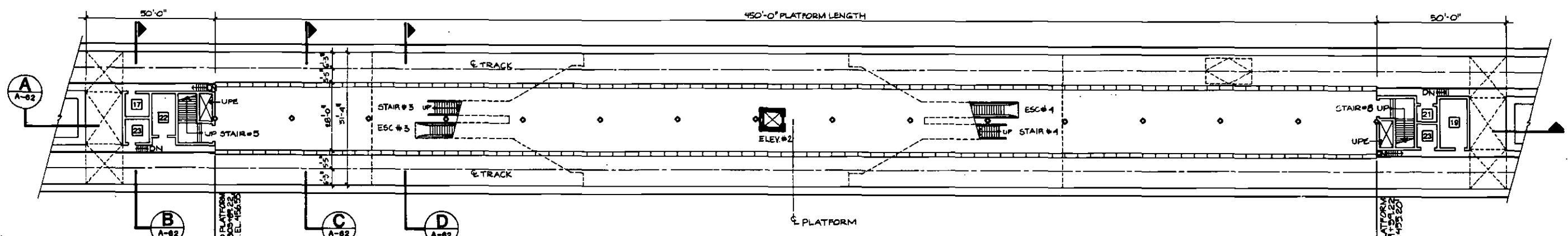


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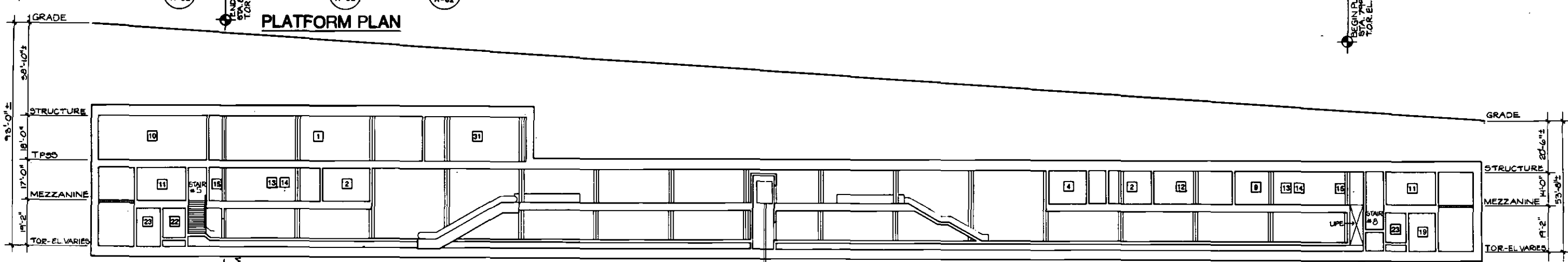


D TRANSVERSE SECTION

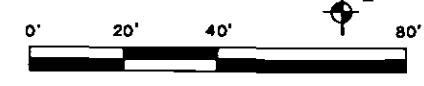
- SERVICE AND EQUIPMENT ROOMS**
- | | | | |
|----|-------------------------------|----|---------------------------|
| 1 | Traction Power Substation | 17 | Ejector |
| 2 | Auxiliary Power | 18 | Sprinkler Valves |
| 3 | Train Control | 19 | Sump Pump |
| 4 | Communications | 20 | Gap Breaker Station |
| 5 | Batteries | 21 | Emergency Equipment |
| 6 | Elevator Equipment | 22 | Custodial |
| 7 | Deleted | 23 | Electrical Equipment |
| 8 | Storage | 24 | Toilet |
| 9 | Mechanical | 25 | Deleted |
| 10 | Fan | 26 | Telephone Equipment |
| 11 | Emergency Fan | 27 | Deleted |
| 12 | Chiller | 28 | Trash |
| 13 | Air Supply Unit | 29 | Staff/Security |
| 14 | Smoke Exhaust | 30 | Deleted |
| 15 | Under Platform Exhaust | 31 | Electric Incoming Service |
| 16 | Under Platform Exhaust Plenum | | |



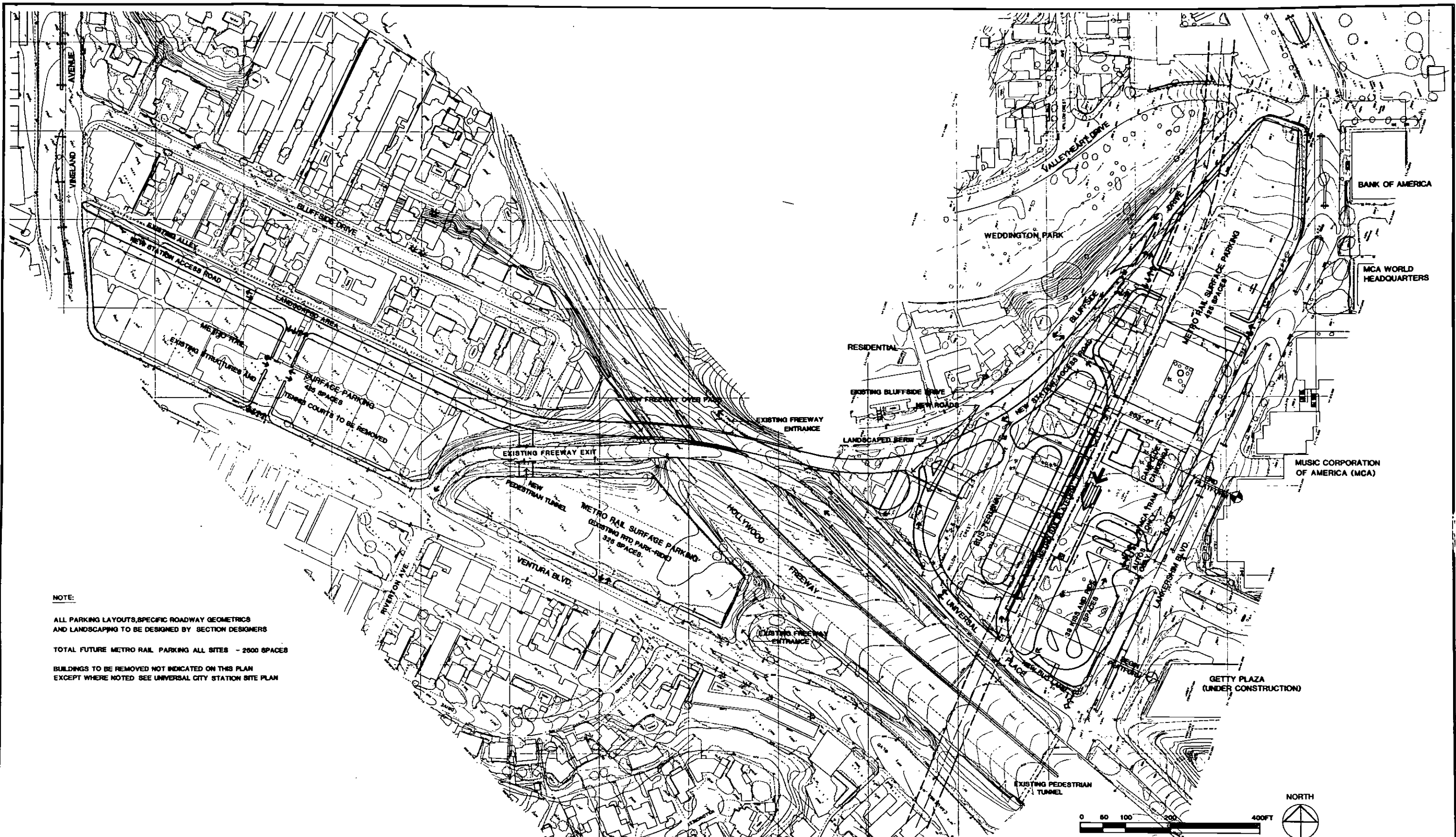
PLATFORM PLAN



A LONGITUDINAL SECTION



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	REV.	DATE	BY	APP.	DESCRIPTION															



NOTE:
 ALL PARKING LAYOUTS, SPECIFIC ROADWAY GEOMETRICS
 AND LANDSCAPING TO BE DESIGNED BY SECTION DESIGNERS
 TOTAL FUTURE METRO RAIL PARKING ALL SITES - 2500 SPACES
 BUILDINGS TO BE REMOVED NOT INDICATED ON THIS PLAN
 EXCEPT WHERE NOTED SEE UNIVERSAL CITY STATION SITE PLAN

REV.	DATE	BY	APP.	DESCRIPTION
1	6/14/05	J.Y.		REVISIONS TO ANCILLARY ROOFS FOR COST REDUCTION

DESIGNED BY	Date	6/14/05
H.W.A.		
DRAWN BY	Date	6/14/05
K. LIM		
CHECKED BY	Date	6/30/05
J. YEN		

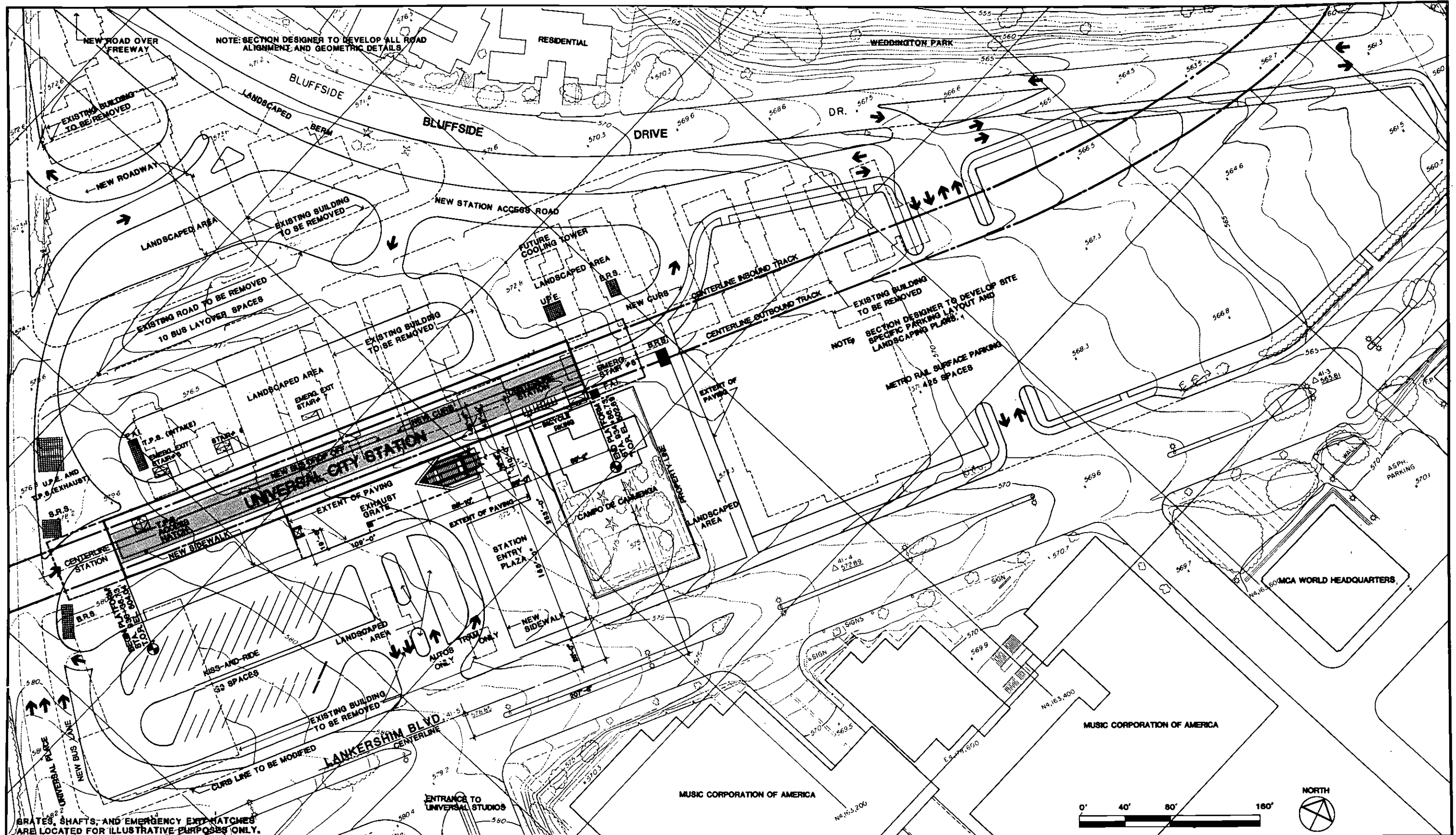
HARRY WESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: PROJECT MANAGER
--

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT APPROVAL RECOMMENDED _____ Reg. No. _____	APPROVED _____ MANAGER / CHIEF ENGINEER Reg. No. _____
--	---

CONTRACT NO. A 425 DRAWING NO. A-63 SCALE 1" = 100' SHEET NO. 8 OF 20
--

UNIVERSAL CITY STATION VICINITY PLAN PRELIMINARY
--

Figure 6-80
 Universal City Station: Vicinity Plan 159



REV.	DATE	BY	APP.	DESCRIPTION
1	6-14-89	JY		REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY HWA	Date 5-22-89
DRAWN BY A. SNIDER / K. LIM	Date 6-1-89
CHECKED BY JYEN	Date 6-20-89

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY:
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ Date _____
 Reg. No. _____

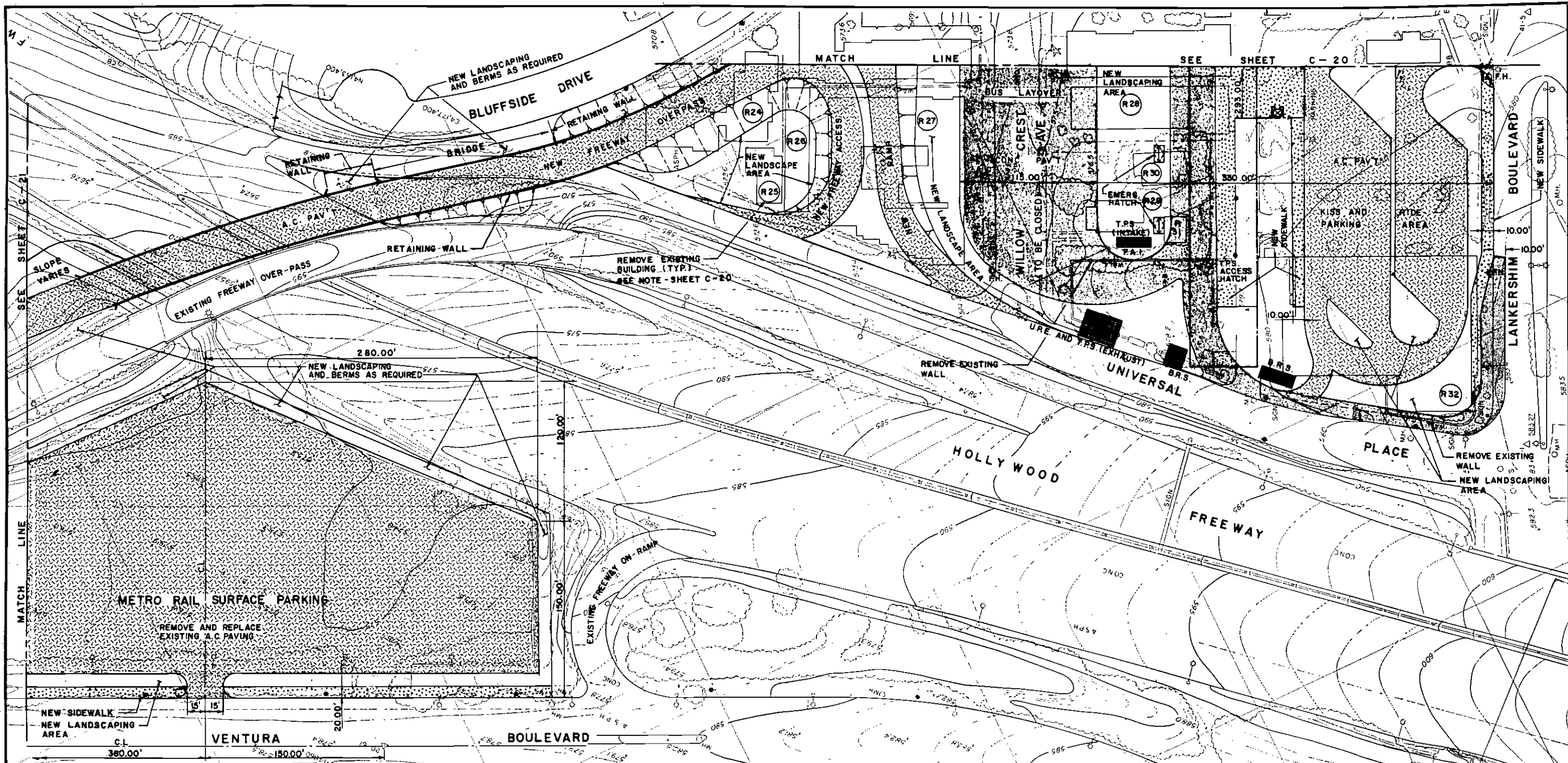
APPROVED _____ Date _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

UNIVERSAL CITY STATION
 SITE PLAN

PRELIMINARY

CONTRACT NO. A425
DRAWING NO. A-64
SCALE 1"=40'-0"
SHEET NO. 9 OF 20

Figure 6-81
 Universal City Station: Site Plan 160



- NOTES:
- THE FOLLOWING ITEMS ARE TO BE FINALLY DETERMINED BY THE SECTION DESIGNER:
 - ALL ROAD PROFILES, ALIGNMENTS AND GEOMETRICS.
 - ALL PARKING LAYOUTS AND BUS STALLS.
 - ALL LANDSCAPING, BERMS AND RETAINING WALLS.
 - TRAFFIC SIGNALIZATION, RECHANNELIZATION AND ROAD STRIPING REQUIREMENTS.
 - DESIGN OF THE NEW HOLLYWOOD FREEWAY OVERPASS SHALL BE COORDINATED BY THE SECTION DESIGNER WITH THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION.

PRELIMINARY



REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY	Date	6/16/03
TAMS		
DRAWN BY	Date	6/17/03
HWW		
CHECKED BY	Date	6/18/03
JLD		

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

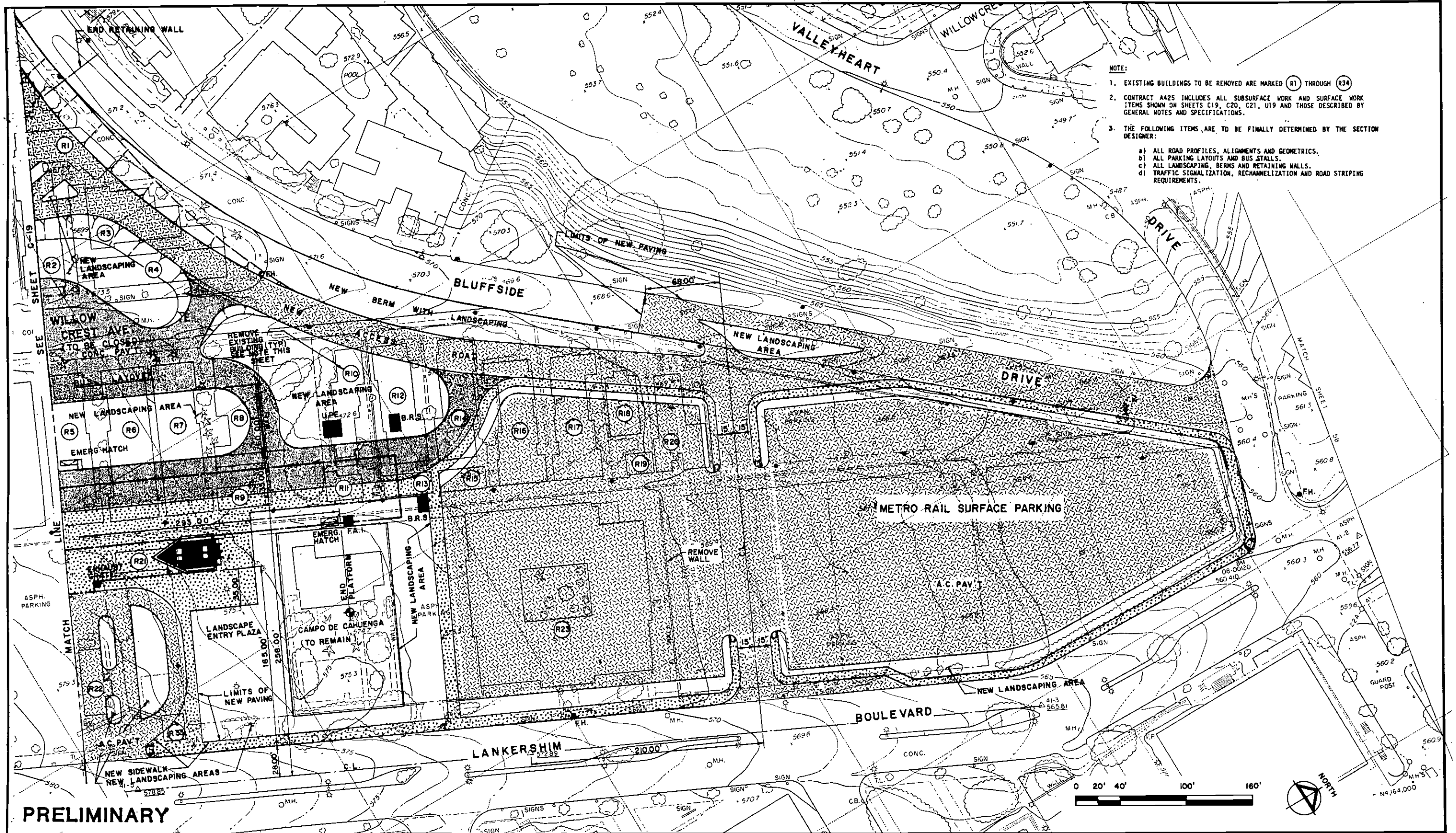
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT		
METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	Date
Reg. No.	MANAGER / CHIEF ENGINEER	Reg. No.

UNIVERSAL CITY STATION
 CIVIL SITE PLAN
 SOUTH END

CONTRACT NO.	A 425
DRAWING NO.	C-19
SCALE	1" = 40' - 0"
SHEET NO.	10 OF 20

Figure 6-82
 Universal City Station: Civil Site Plan - South End 161



- NOTE:**
- EXISTING BUILDINGS TO BE REMOVED ARE MARKED (R1) THROUGH (R34)
 - CONTRACT A425 INCLUDES ALL SUBSURFACE WORK AND SURFACE WORK ITEMS SHOWN ON SHEETS C19, C20, C21, U19 AND THOSE DESCRIBED BY GENERAL NOTES AND SPECIFICATIONS.
 - THE FOLLOWING ITEMS ARE TO BE FINALLY DETERMINED BY THE SECTION DESIGNER:
 - ALL ROAD PROFILES, ALIGNMENTS AND GEOMETRICS.
 - ALL PARKING LAYOUTS AND BUS STALLS.
 - ALL LANDSCAPING, BERMS AND RETAINING WALLS.
 - TRAFFIC SIGNALIZATION, RECHANNELIZATION AND ROAD STRIPING REQUIREMENTS.

PRELIMINARY

REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY	Date	6/12/13
TAMS		
DRAWN BY	Date	6/17/13
HWW		
CHECKED BY	Date	6/10/13
JLD		

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

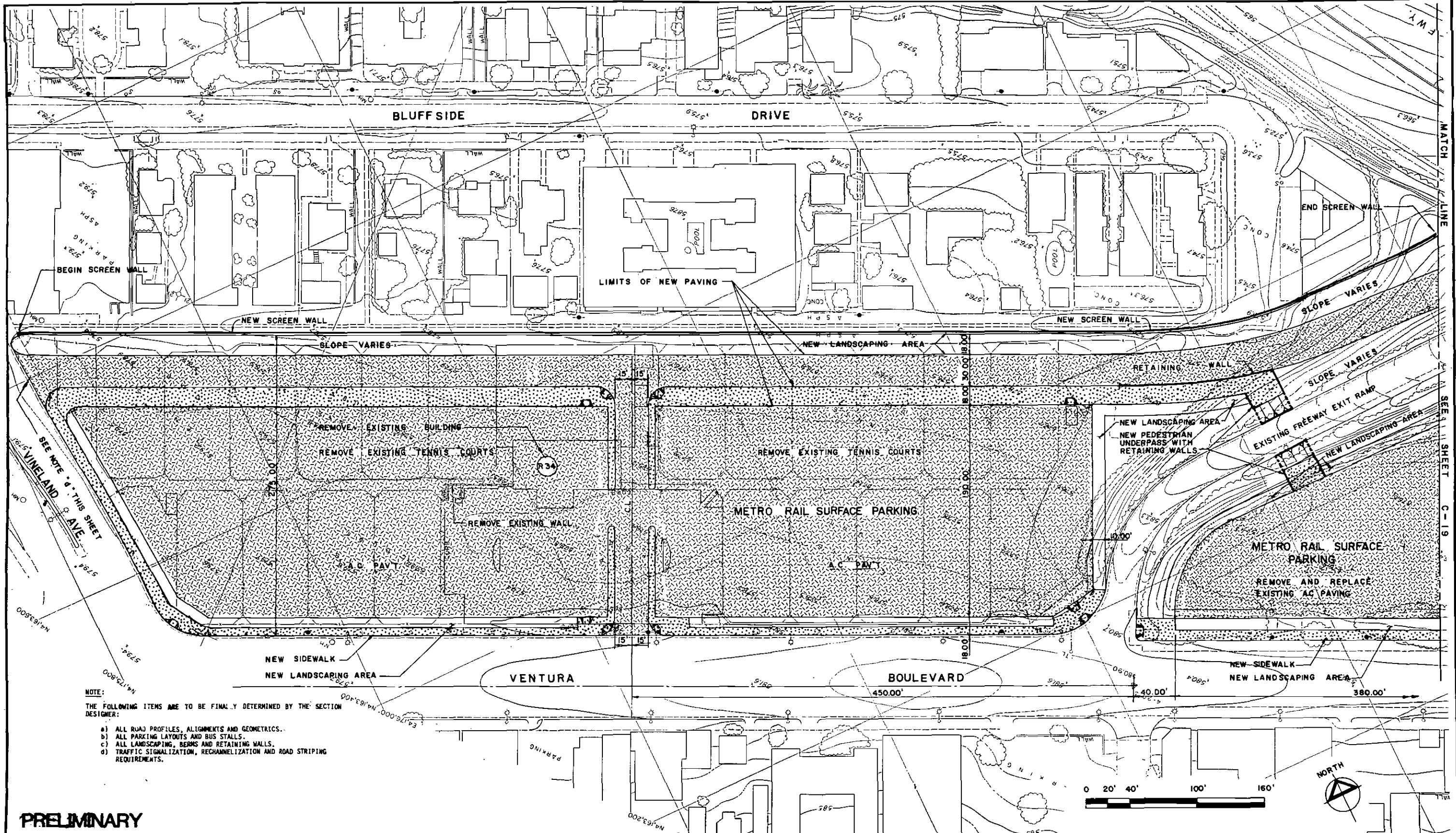
SUBMITTED BY: *[Signature]*
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT		
METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	Date
Reg. No. _____	MANAGER / CHIEF ENGINEER	Reg. No. _____

UNIVERSAL CITY STATION
 CIVIL SITE PLAN
 NORTH END

CONTRACT NO.	A425
DRAWING NO.	C-20
SCALE	1" = 40' - 0"
SHEET NO.	11 OF 20

Figure 6-83
 Universal City Station: Civil Site Plan - North End



NOTE:
THE FOLLOWING ITEMS ARE TO BE FINALLY DETERMINED BY THE SECTION DESIGNER:

- a) ALL ROAD PROFILES, ALIGNMENTS AND GEOMETRICS.
- b) ALL PARKING LAYOUTS AND BUS STALLS.
- c) ALL LANDSCAPING, BERMS AND RETAINING WALLS.
- d) TRAFFIC SIGNALIZATION, RECHANNELIZATION AND ROAD STRIPING REQUIREMENTS.

PRELIMINARY

REV.	DATE	BY	APP.	DESCRIPTION

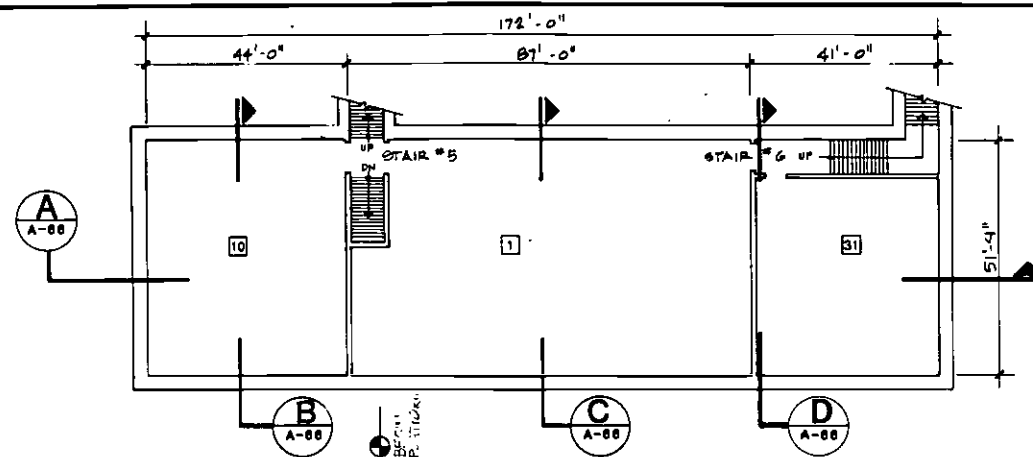
DESIGNED BY TAMS DATE 6/15/03
DRAWN BY HWW DATE 6/17/03
CHECKED BY JLD DATE 6/18/03

HARRY WESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations
SUBMITTED BY:
[Signature]
PROJECT MANAGER

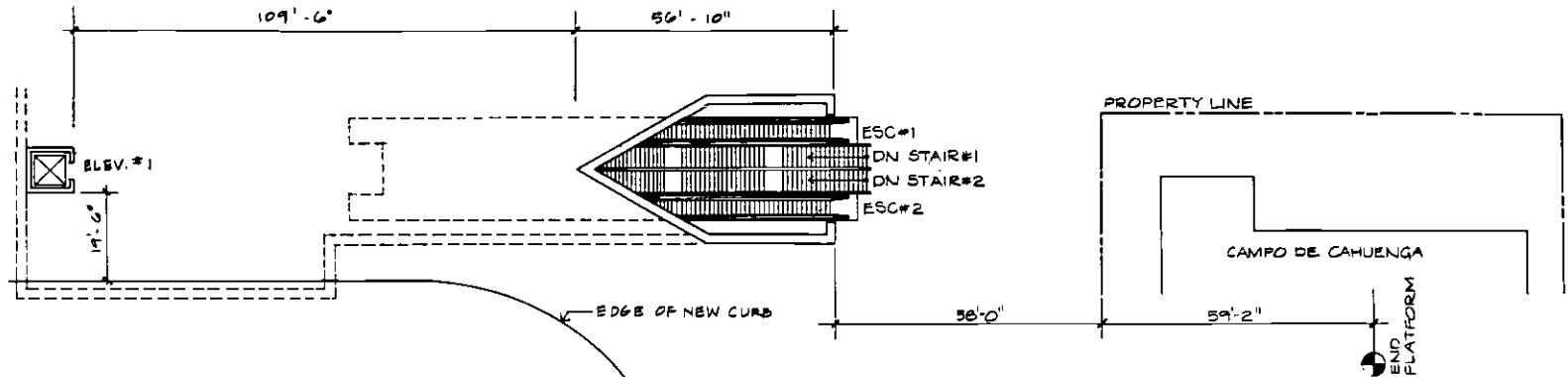
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	DATE
Reg. No. _____	MANAGER / CHIEF ENGINEER	Reg. No. _____

UNIVERSAL CITY STATION
CIVIL SITE PLAN
SURFACE PARKING - WEST

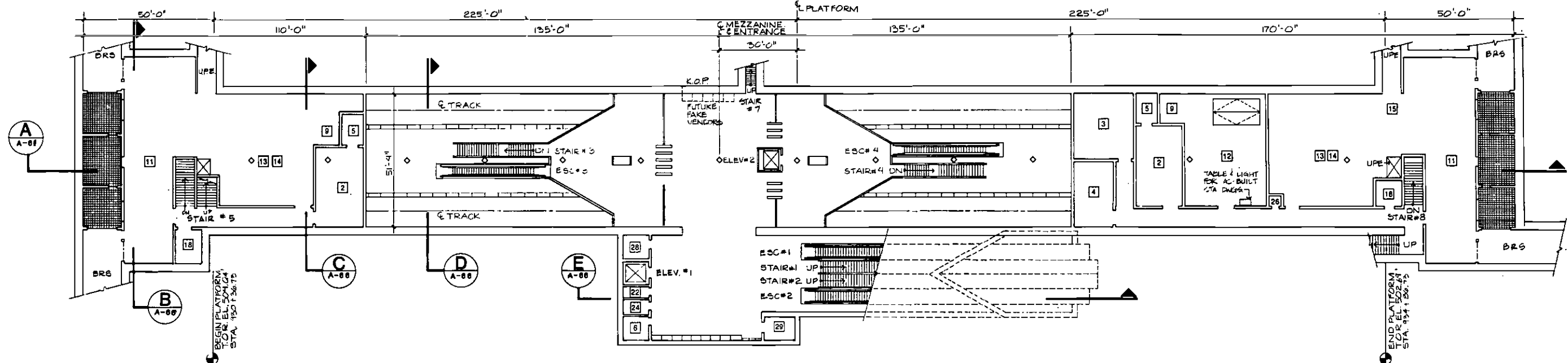
CONTRACT NO. A425
DRAWING NO. C-21
SCALE 1" = 40' - 0"
SHEET NO. 12 OF 20



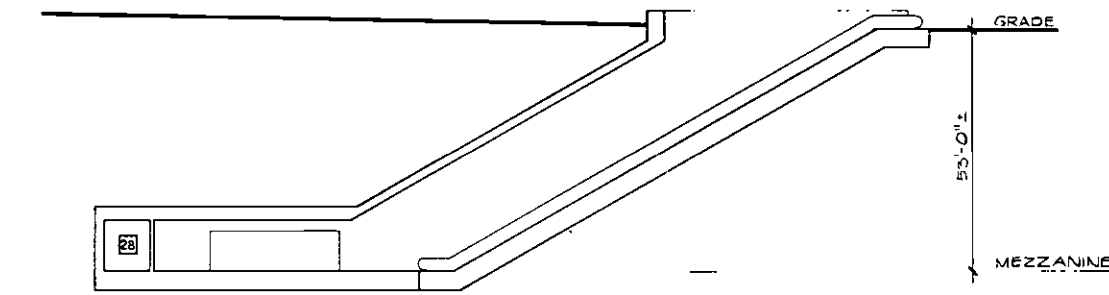
TRACTION POWER SUBSTATION PLAN



ENTRY PLAN



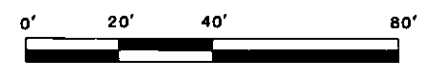
MEZZANINE PLAN



(E) SECTION THROUGH ENTRY

- SERVICE AND EQUIPMENT ROOMS**
- | | |
|----------------------------------|------------------------------|
| 1 Traction Power Substation | 17 Ejector |
| 2 Auxiliary Power | 18 Sprinkler Valves |
| 3 Train Control | 19 Sump Pump |
| 4 Communications | 20 Gap Breaker Station |
| 5 Batteries | 21 Emergency Equipment |
| 6 Elevator Equipment | 22 Custodial |
| 7 Deleted | 23 Electrical Equipment |
| 8 Storage | 24 Toilet |
| 9 Mechanical | 25 Deleted |
| 10 Fan | 26 Telephone Equipment |
| 11 Emergency Fan | 27 Deleted |
| 12 Chiller | 28 Trash |
| 13 Air Supply Unit | 29 Staff/Security |
| 14 Smoke Exhaust | 30 Deleted |
| 15 Under Platform Exhaust | 31 Electric Incoming Service |
| 16 Under Platform Exhaust Plenum | |

COLUMN LOCATIONS AND DIMENSIONS OF ALL COMPONENTS TO BE PROVIDED ON STANDARD AND DIRECTIVE DRAWINGS.



REV.	DATE	BY	APP.	DESCRIPTION
6	6/2/03	J.Y.		REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

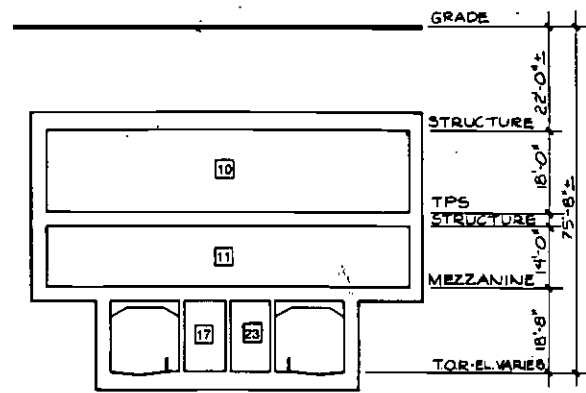
DESIGNED BY HWA Date: 6/15/03
DRAWN BY A. SHIDER / K. LIM Date: 6/15/03
CHECKED BY J. YEN Date: 6/30/03

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY:
 [Signature]
 PROJECT MANAGER

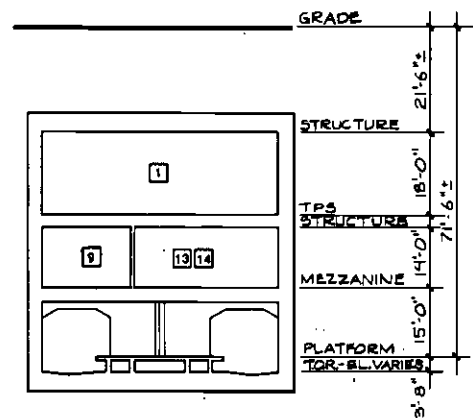
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT		
METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	Date
_____ REG. NO. _____	_____ MANAGER / CHIEF ENGINEER	_____ REG. NO. _____

UNIVERSAL CITY STATION
 PLANS AND SECTION
PRELIMINARY

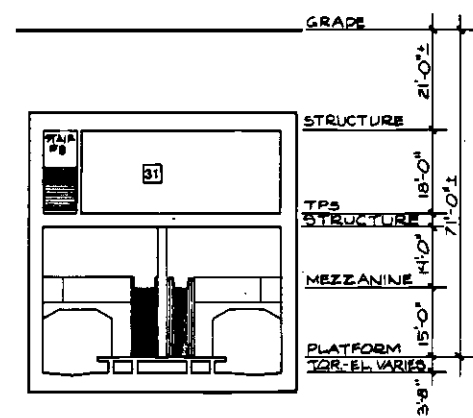
CONTRACT NO.	A425
DRAWING NO.	A-65
SCALE	1"=20'-0"
SHEET NO.	14 OF 20



B TRANSVERSE SECTION

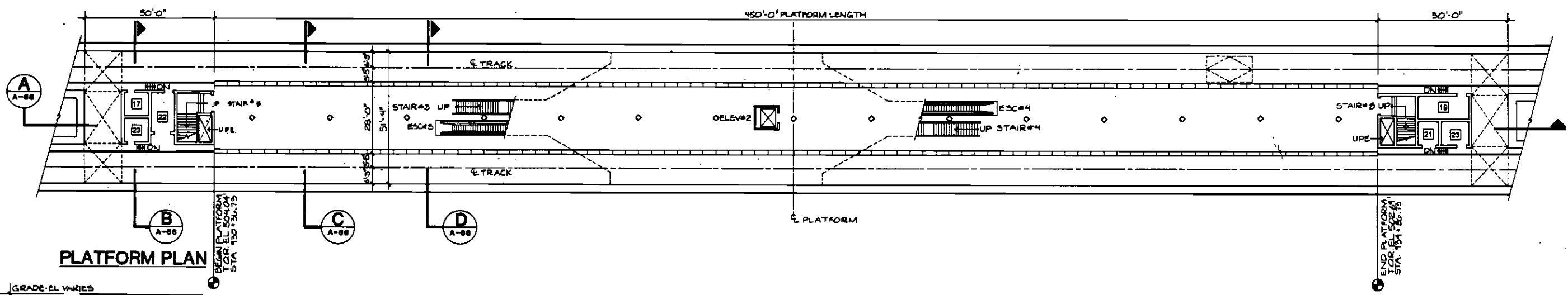


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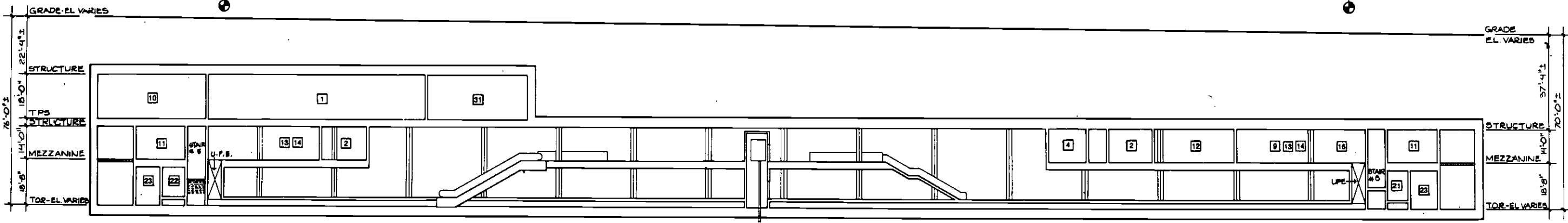


D TRANSVERSE SECTION

- SERVICE AND EQUIPMENT ROOMS**
- | | |
|----------------------------------|------------------------------|
| 1 Traction Power Substation | 17 Ejector |
| 2 Auxiliary Power | 18 Sprinkler Valves |
| 3 Train Control | 19 Sump Pump |
| 4 Communications | 20 Gap Breaker Station |
| 5 Batteries | 21 Emergency Equipment |
| 6 Elevator Equipment | 22 Custodial |
| 7 Deleted | 23 Electrical Equipment |
| 8 Storage | 24 Toilet |
| 9 Mechanical | 25 Deleted |
| 10 Fan | 26 Telephone Equipment |
| 11 Emergency Fan | 27 Deleted |
| 12 Chiller | 28 Trash |
| 13 Air Supply Unit | 29 Staff/Security |
| 14 Smoke Exhaust | 30 Deleted |
| 15 Under Platform Exhaust | 31 Electric Incoming Service |
| 16 Under Platform Exhaust Plenum | |



PLATFORM PLAN



A LONGITUDINAL SECTION



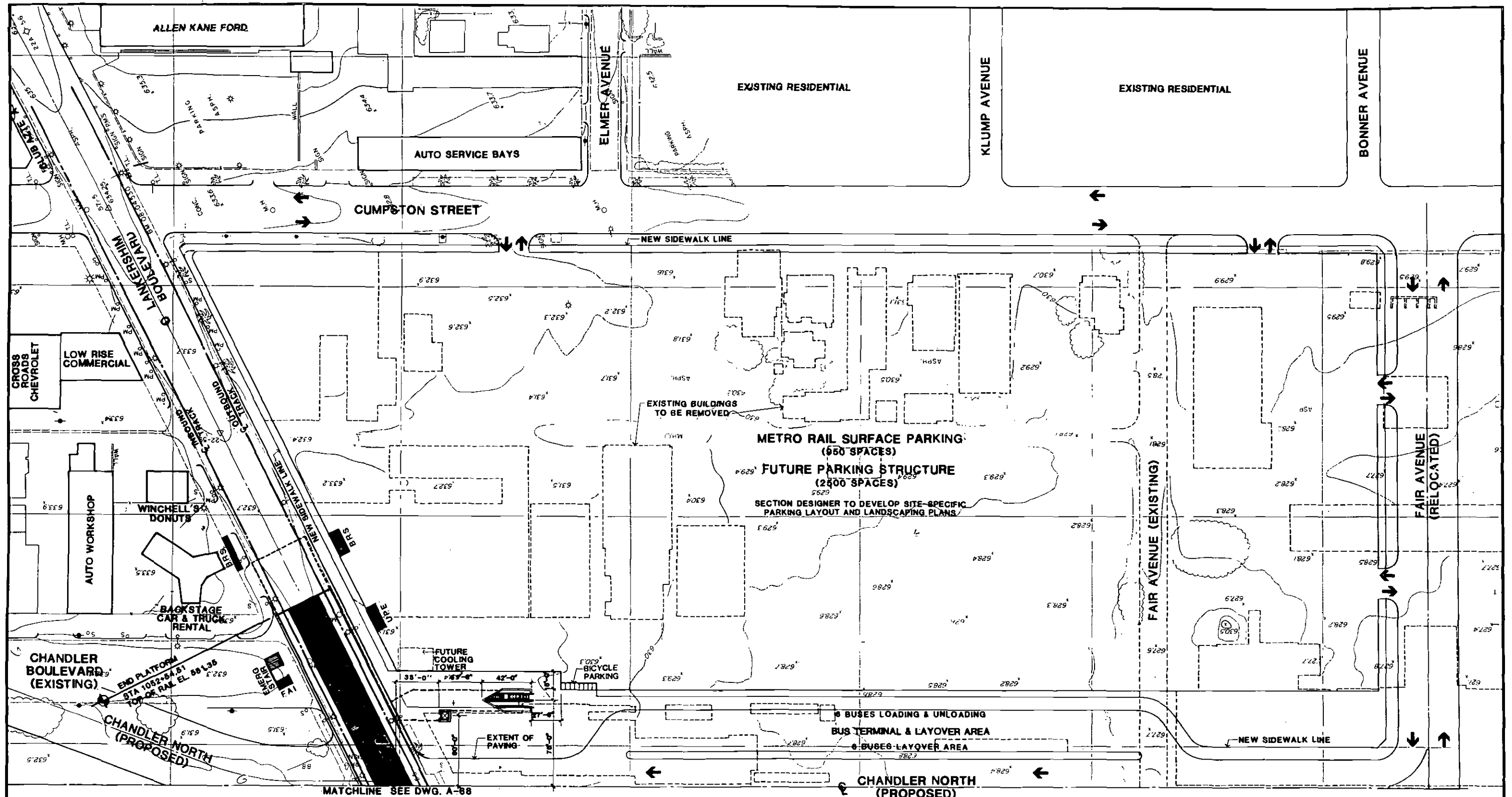
DESIGNED BY HWA Date 5/25/83	DRAWN BY A. SNIDER Date 5/25/83	CHECKED BY J. YEN Date 6/22/83
REVISIONS TO AUXILIARY ROOMS FOR COST REDUCTION		
REV.	DATE	BY

HARRY WESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations
SUBMITTED BY:
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
APPROVAL RECOMMENDED
APPROVED
MANAGER / CHIEF ENGINEER

UNIVERSAL CITY STATION
PLAN AND SECTIONS
PRELIMINARY

CONTRACT NO. A425
DRAWING NO. A-66
SCALE 1"=20'-0"
SHEET NO. 15 of 20



MATCHLINE SEE DWG. A-88



DESIGNED BY HWA	Date 6/2/83
DRAWN BY S DEBNATH	Date 6/1/83
CHECKED BY J. YEN	Date 6/30/83
REV. DATE BY APP. DESCRIPTION	
1/83 J.Y. REVISIONS TO ANCILLARY DETAILS FOR COST REDUCTION	

HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 QIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY:
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

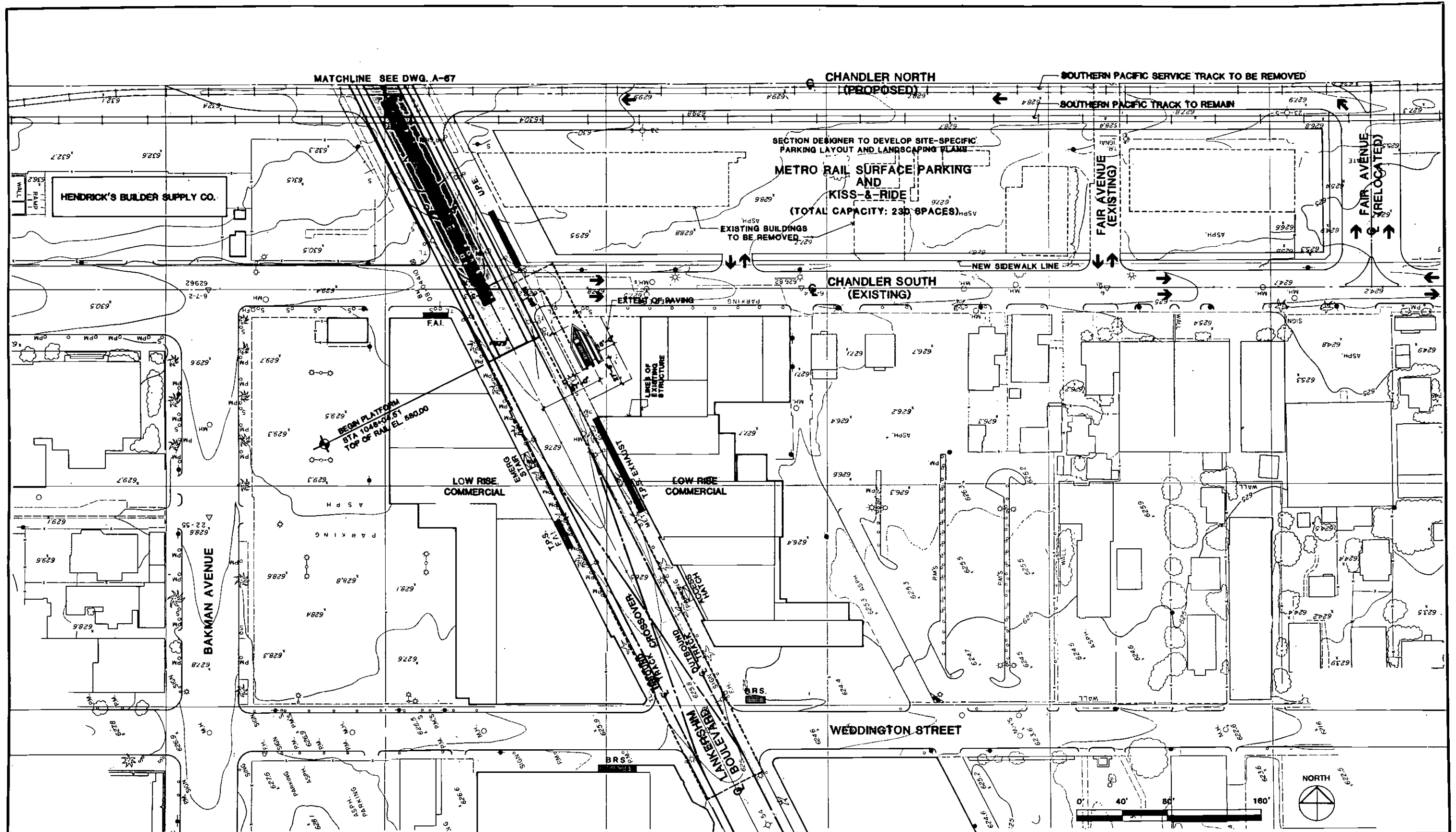
APPROVAL RECOMMENDED: _____ Date: _____
 Reg. No. _____

APPROVED: _____ Date: _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

NORTH HOLLYWOOD STATION
 SITE PLAN - NORTH
PRELIMINARY

CONTRACT NO. A 445
DRAWING NO. A-67
SCALE 1" = 40'-0"
SHEET NO. 11 OF 26

Figure 6-87
 North Hollywood Station: Site Plan - North End 166



REV.	DATE	BY	APP.	DESCRIPTION
1/6/83		J.Y.		REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY	Date	6/14/83
HWA		
DRAWN BY	Date	6/14/83
S DEBNATH		
CHECKED BY	Date	6/30/83
J.TEN		

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY:
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

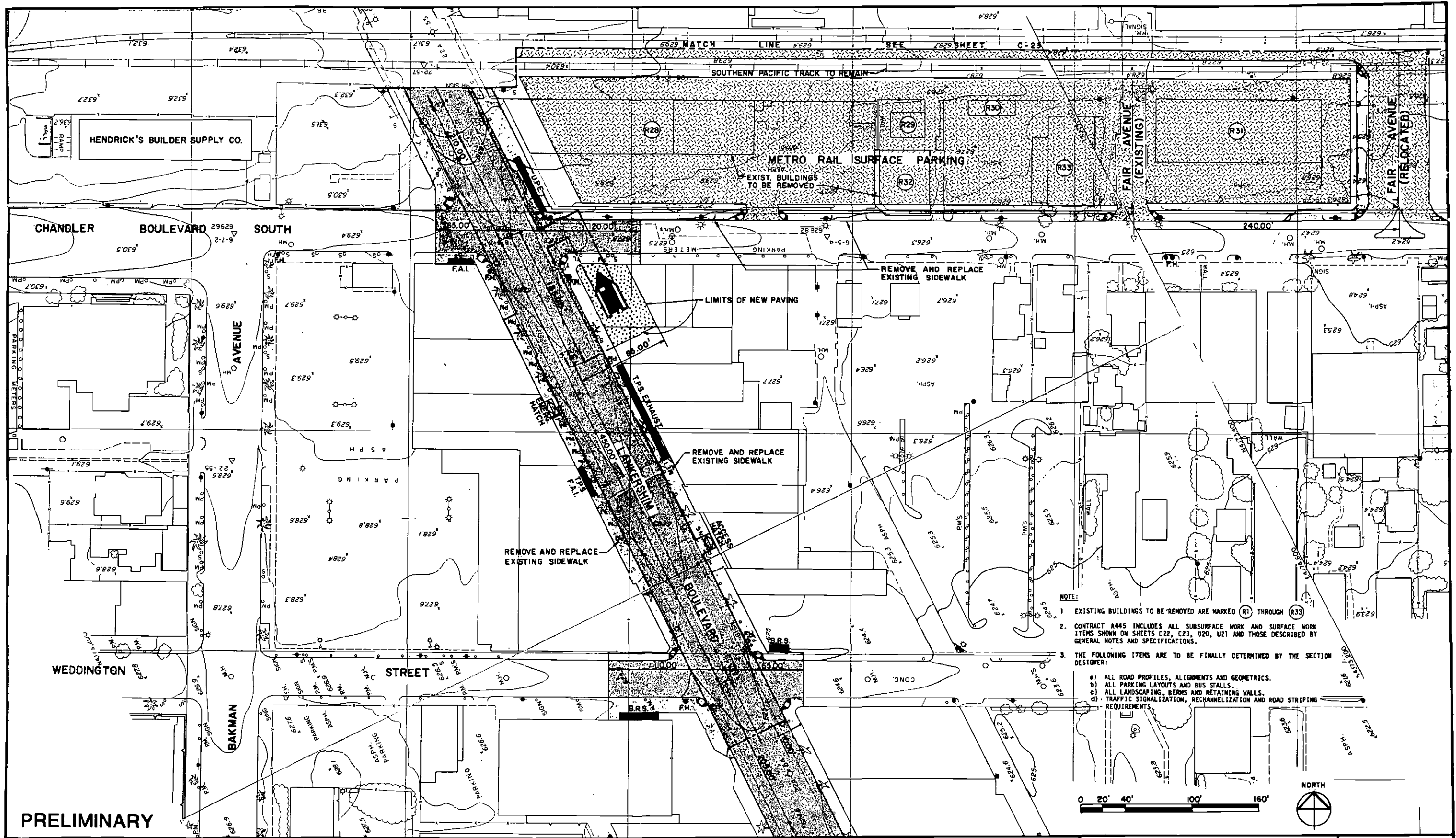
APPROVAL RECOMMENDED _____ Date _____
 Reg. No. _____

APPROVED _____ Date _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

NORTH HOLLYWOOD STATION
 SITE PLAN - SOUTH
PRELIMINARY

CONTRACT NO. A445
 DRAWING NO. A-68
 SCALE 1" = 40'-0"
 SHEET NO. 12 OF 26

Figure 6-88
 North Hollywood Station: Site Plan - South End 167

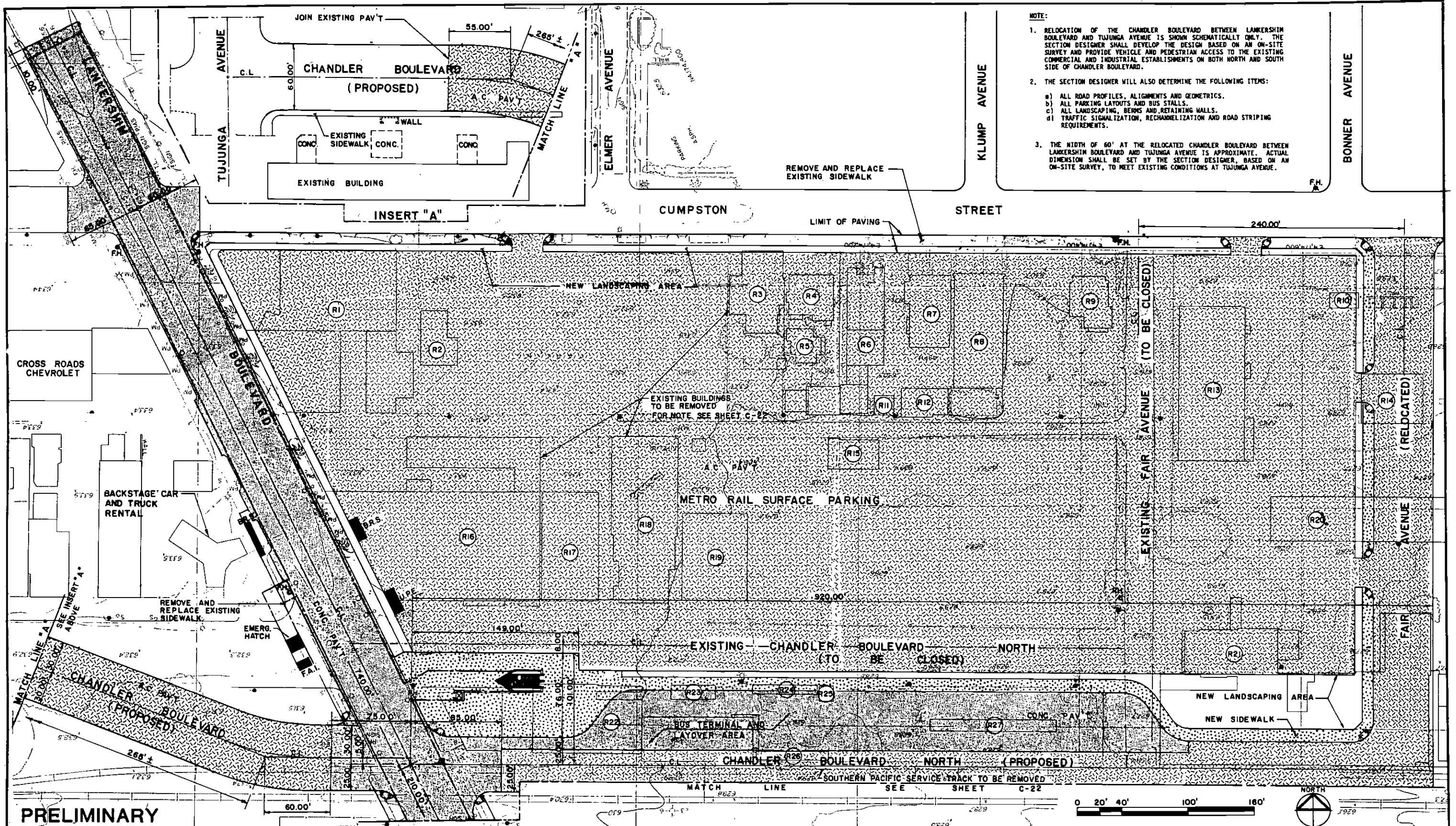


- NOTE:**
- EXISTING BUILDINGS TO BE REMOVED ARE MARKED (R1) THROUGH (R33)
 - CONTRACT A445 INCLUDES ALL SUBSURFACE WORK AND SURFACE WORK ITEMS SHOWN ON SHEETS C22, C23, U20, U21 AND THOSE DESCRIBED BY GENERAL NOTES AND SPECIFICATIONS.
 - THE FOLLOWING ITEMS ARE TO BE FINALLY DETERMINED BY THE SECTION DESIGNER:
 - a) ALL ROAD PROFILES, ALIGNMENTS AND GEOMETRICS.
 - b) ALL PARKING LAYOUTS AND BUS STALLS.
 - c) ALL LANDSCAPING, BERMS AND RETAINING WALLS.
 - d) TRAFFIC SIGNALIZATION, RECHANNELIZATION AND ROAD STRIPING REQUIREMENTS.

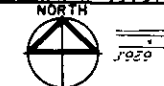
PRELIMINARY

DESIGNED BY TAMS Date: 6/17/89		HARRY WEESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 		NORTH HOLLYWOOD STATION CIVIL SITE PLAN SOUTH END		CONTRACT NO. A445
DRAWN BY RGL Date: 6/17/89			APPROVAL RECOMMENDED _____ Reg. No. _____		APPROVED Date: _____ _____ MANAGER / CHIEF ENGINEER Reg. No. _____		DRAWING NO. C-22
CHECKED BY JLD Date: 6/17/89							SCALE 1" = 40'-0"
REV.	DATE	BY	APP.	DESCRIPTION		SHEET NO. 15 of 26	

Figure 6-89
 North Hollywood Station: Civil Site Plan - South End 168



PRELIMINARY



REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY	Date 6/17/89
TAMS	
DRAWN BY	Date 6/17/89
RGL	
CHECKED BY	Date 6/17/89
JLD	

HARRY WESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations

SUBMITTED BY:

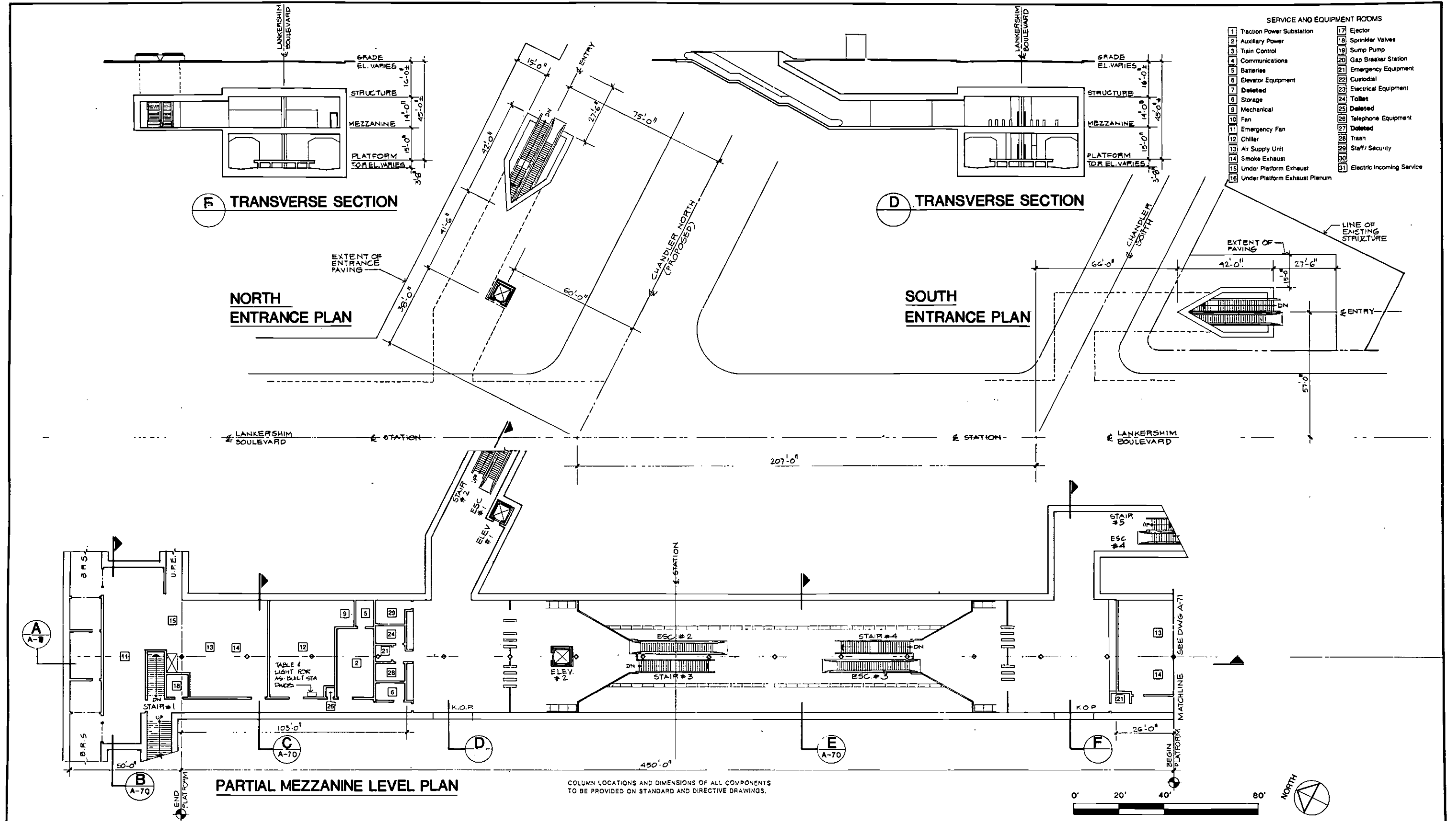
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT		
METRO RAIL PROJECT		
APPROVAL RECOMMENDED	APPROVED	Date
Reg. No.	MANAGER / CHIEF ENGINEER	Reg. No.

NORTH HOLLYWOOD STATION
 CIVIL SITE PLAN
 NORTH END

CONTRACT NO.	A445
DRAWING NO.	C-23
SCALE	1" = 40'-0"
SHEET NO.	14 OF 24

Figure 6-90
 North Hollywood Station: Civil Site Plan - North End 169



REV.	DATE	BY	APP.	DESCRIPTION
1	11/10/83	J.Y.	J.Y.	REVISIONS TO ANCILLARY ROOMS FOR COST REDUCTION

DESIGNED BY HWA Date 6/15/83
 DRAWN BY S DEBNATH Date 6/13/83
 CHECKED BY J. YEN Date 6/30/83

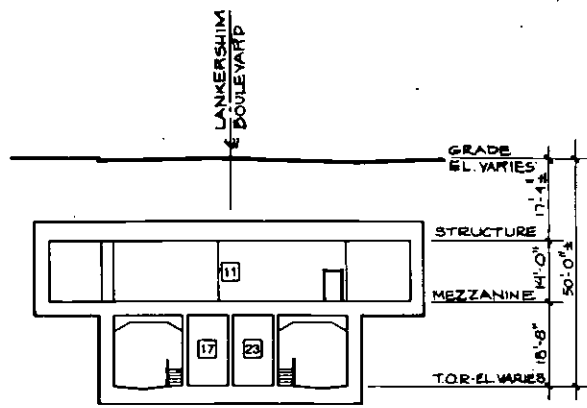
HARRY WEESE & ASSOCIATES
 TIPPETTS-ABBETT-McCARTHY-STRATTON
 ENVIRONMENTAL COLLABORATIVE, INC.
 GIN WONG ASSOCIATES
 General Architectural Consultants: Stations
 SUBMITTED BY: [Signature]
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
 APPROVAL RECOMMENDED _____ Date _____
 APPROVED _____ Date _____
 Reg. No. _____ MANAGER / CHIEF ENGINEER Reg. No. _____

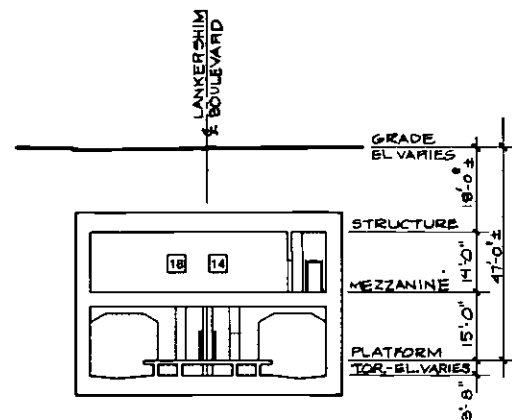
NORTH HOLLYWOOD STATION
 PLANS & SECTIONS
PRELIMINARY

CONTRACT NO. A445
 DRAWING NO. A-69
 SCALE 1"=20'-0"
 SHEET NO. 17 OF 26

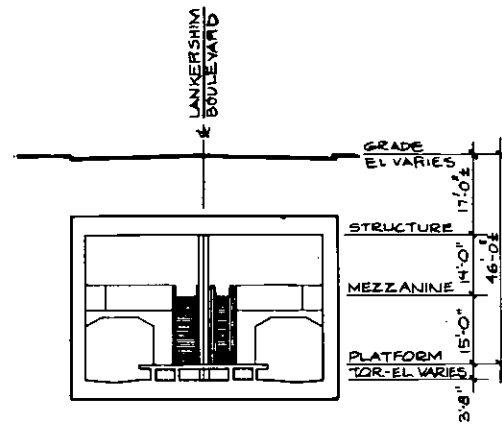
Figure 6-91
 North Hollywood Station: Plans and Sections 170



B TRANSVERSE SECTION

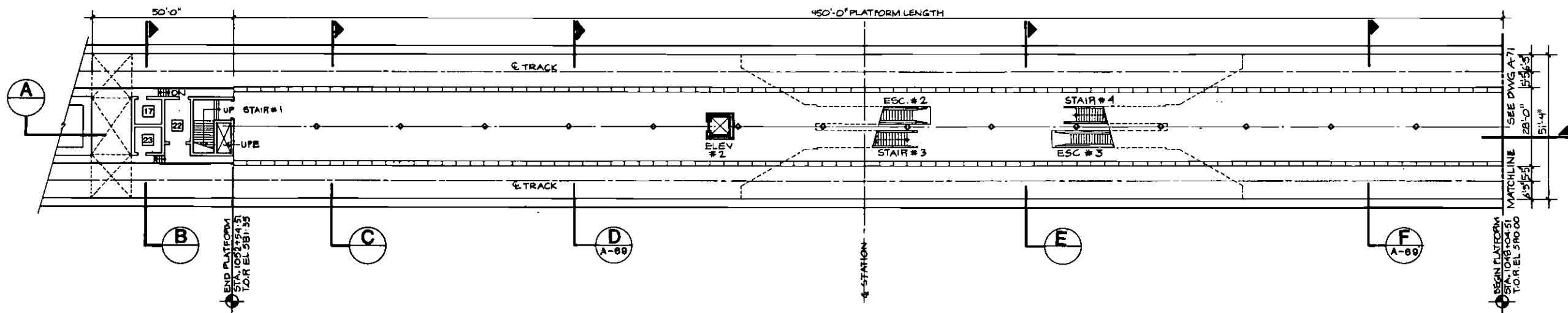


C TRANSVERSE SECTION

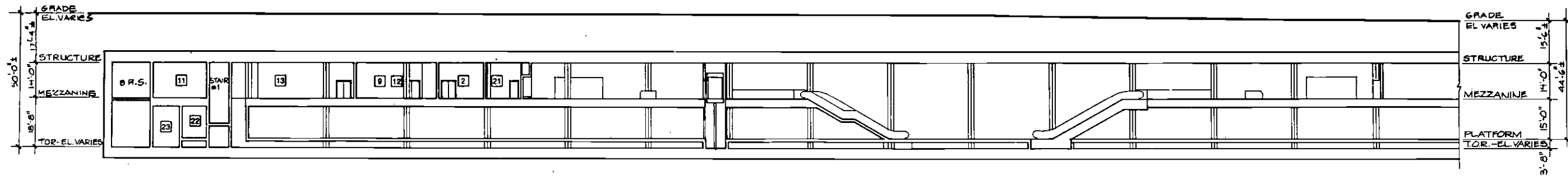


E TRANSVERSE SECTION

- SERVICE AND EQUIPMENT ROOMS**
- | | | | |
|----|-------------------------------|----|---------------------------|
| 1 | Traction Power Substation | 17 | Ejector |
| 2 | Auxiliary Power | 18 | Sprinkler Valves |
| 3 | Train Control | 19 | Sump Pump |
| 4 | Communications | 20 | Gap Breaker Station |
| 5 | Batteries | 21 | Emergency Equipment |
| 6 | Elevator Equipment | 22 | Custodial |
| 7 | Deleted | 23 | Electrical Equipment |
| 8 | Storage | 24 | Toilet |
| 9 | Mechanical | 25 | Deleted |
| 10 | Fan | 26 | Telephone Equipment |
| 11 | Emergency Fan | 27 | Deleted |
| 12 | Chiller | 28 | Trash |
| 13 | Air Supply Unit | 29 | Staff/Security |
| 14 | Smoke Exhaust | 30 | Deleted |
| 15 | Under Platform Exhaust | 31 | Deleted |
| 16 | Under Platform Exhaust Plenum | 32 | Electric Incoming Service |



PARTIAL PLATFORM LEVEL PLAN



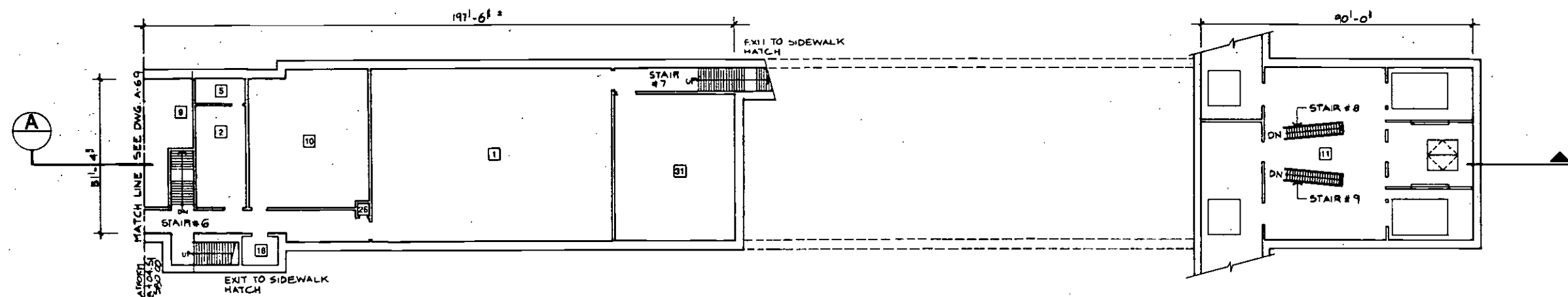
A PARTIAL LONGITUDINAL SECTION



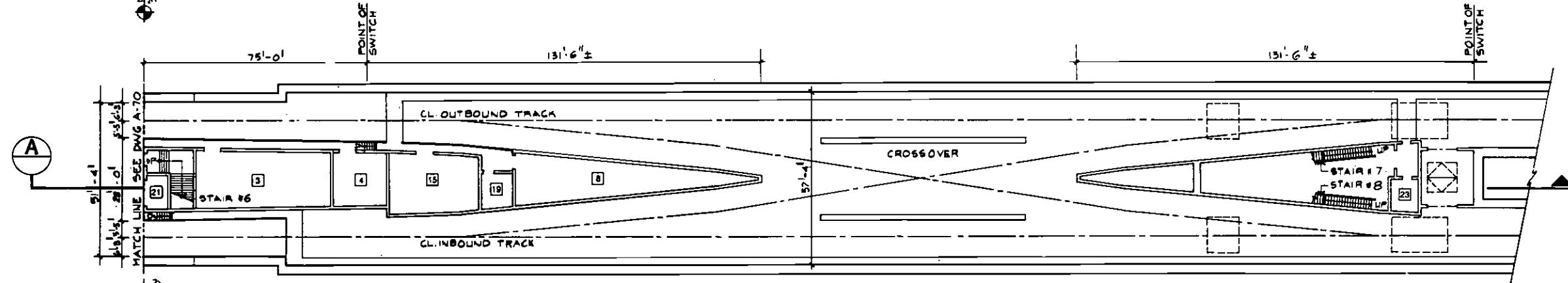
DESIGNED BY HWA Date 6/6/88			HARRY WESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT			NORTH HOLLYWOOD STATION PLANS & SECTIONS		CONTRACT NO. A445	
DRAWN BY S DEBNATH Date 6/6/88				APPROVAL RECOMMENDED _____ Date _____			APPROVED _____ Date _____		DRAWING NO. A-70	
CHECKED BY J.YEN Date 6/30/88				SUBMITTED BY: 			MANAGER / CHIEF ENGINEER _____ Date _____		SCALE 1"=20'-0"	
REV. DATE BY APP. DESCRIPTION			PROJECT MANAGER _____				SHEET NO. 18 OF 26			

Figure 6-92
North Hollywood Station: Plans and Sections

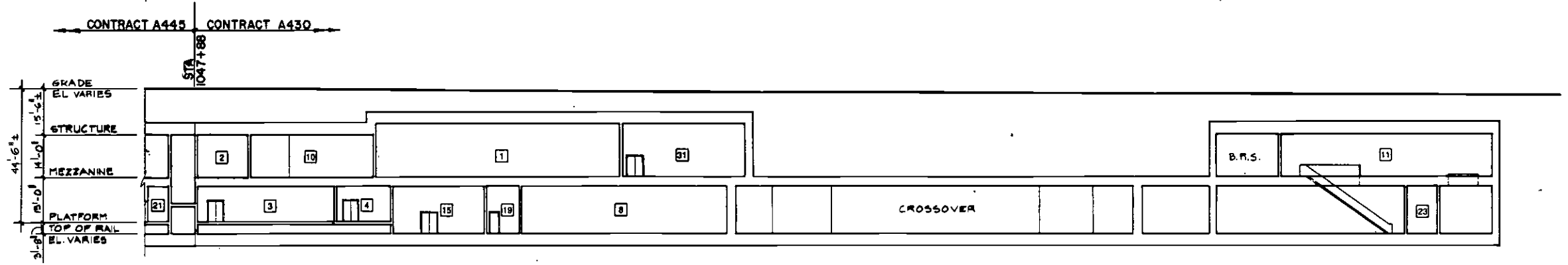
- SERVICE AND EQUIPMENT ROOMS**
- 1 Traction Power Substation
 - 2 Auxiliary Power
 - 3 Train Control
 - 4 Communications
 - 5 Batteries
 - 6 Elevator Equipment
 - 7 Deleted
 - 8 Storage
 - 9 Mechanical
 - 10 Fan
 - 11 Emergency Fan
 - 12 Chiller
 - 13 Air Supply Unit
 - 14 Smoke Exhaust
 - 15 Under Platform Exhaust
 - 16 Under Platform Exhaust Plenum
 - 17 Ejector
 - 18 Sprinkler Valves
 - 19 Sump Pump
 - 20 Gap Breaker Station
 - 21 Emergency Equipment
 - 22 Custodial
 - 23 Electrical Equipment
 - 24 Toilet
 - 25 Deleted
 - 26 Telephone Equipment
 - 27 Deleted
 - 28 Trash
 - 29 Staff / Security
 - 30 Deleted
 - 31 Electric Incoming Service



PARTIAL MEZZANINE LEVEL PLAN



PARTIAL PLATFORM LEVEL PLAN



A PARTIAL LONGITUDINAL SECTION



	DESIGNED BY HWA Date 6/28/83	HARRY WESE & ASSOCIATES TIPPETTS-ABBETT-McCARTHY-STRATTON ENVIRONMENTAL COLLABORATIVE, INC. GIN WONG ASSOCIATES General Architectural Consultants: Stations SUBMITTED BY: PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 	NORTH HOLLYWOOD STATION PLANS & SECTIONS PRELIMINARY	CONTRACT NO. A430 & A445 DRAWING NO. A-71 SCALE 1"=20'-0" SHEET NO. 19 OF 26	
	DRAWN BY S DEBNATH Date 6/11/83		APPROVAL RECOMMENDED _____ Reg. No. _____	APPROVED _____ MANAGER / CHIEF ENGINEER Reg. No. _____		
REV. DATE BY APP. DESCRIPTION	CHECKED BY J. YEN Date 6/30/83					

TABLE 6-1

SUMMARY OF STATION ACCESS FEATURES

	Auto Facilities		Bus Facilities		Bicycle Parking
	Park-and-Ride	Kiss-and-Ride	Terminals	Pull-Offs	
Union Station	X	X	X		X
Civic Center				X	
5th/Hill					
7th/Flower					
Wilshire/Alvarado		X		X	X
Wilshire/Vermont		X	X	X	X
Wilshire/Normandie				X	
Wilshire/Western			X	X	X
Wilshire/La Brea				X	X
Wilshire/Fairfax	X	X	X	X	X
Fairfax/Beverly	X	X		X	X
Fairfax/Santa Monica				X	X
La Brea/Sunset					X
Hollywood/Cahuenga		X	X		
Universal City	X	X	X		X
North Hollywood	X	X	X	X	X

6.8 VERTICAL CIRCULATION

In all stations, the primary means of verticle circulation shall be by escalators and stairs. Escalators and stairs shall be so situated that they carry passengers directly to the platform at a location convenient for boarding their particular train.

Elevators from street level to concourse level, and from concourse level to platform level, or levels, shall be provided as required to make the System accessible to the handicapped, and for use by Metro Rail personnel.

6.8.1 General Requirements

Where changes in level occur escalators and stairs shall be provided in accordance with the following minimum criteria:

- ° 0' to 40' rise - one escalator "up" and one stair.
- ° Over 40' rise - two escalators one "up" and one "down", and one stair.

Additional stairs and escalators shall be provided between the platform and concourse and between the concourse and street to clear the platform of detraining passengers prior to the arrival of the next train.

To fulfill this requirement, sufficient escalators and stairs shall be provided to allow the passage of the "Peak Fifteen Minute Patronage" (pp15m) in five minutes or less.

The capacities of vertical circulation elements shall be assumed as follows:

- Escalators
48" Nominal width, 120 (feet per minute) 133 (patrons per minute)
90 (feet per minute) 75 (patrons per minute)
- Stairs and Ramps Over 4% Slope 22 (patrons per minute)
(per 22" wide exit lane)
- Horizontal Corridors and Ramps under 4% Slope
(per 22" wide exit lane) 30 (patrons per minute)

An unobstructed run-off or queue space shall be provided at each end of all stairs and escalators.

All vertical circulation elements shall comply with the requirements of Fire and Safety Section.

Elevators or ramps shall be required in all stations from the street level to concourse and from concourse to each platform to provide access for maintenance equipment and those patrons who would have difficulty using stairs or escalators.

6.8.2 Stairs

General requirements for stairs are:

- All treads, landings and nosing shall have nonslip surfaces.
- All stairs for public use shall be 5'-8" wide (minimum).
- Emergency stairs and service stairs shall be 3'-8" wide (minimum).
- Public stairs shall have a slope ranging from 30 degrees to 35 degrees.
- The maximum height of riser at public stairs shall be 7". A riser height of 6-1/2" is recommended.

- Number of risers in any one run of public stairs shall not exceed twenty-one.
- Handrails shall be provided on both sides of all stairs.

6.8.3 Escalators

General requirements for escalators are:

- All escalators shall be 48" nominal width.
- All escalators shall be dual speed, 90 and 120 feet per minute (fpm) in both "up" and "down" directions. They shall be capable of operating 24 hours each day.
- All escalators shall be installed with a slope of 30 degrees.

6.8.4 Elevators

Elevators shall be installed in all stations, between each platform and the paid area of the concourse, and between the free area of the concourse and the street.

Travel between elevators at the concourse level will require passing from the paid area to the free area or vice versa through the service gate. Elevators shall be located to keep the travel distance through the service gate to a minimum.

Elevators at street level should be located near a loading zone. Elevators shall be sized to be capable of carrying maintenance carts and emergency equipment such as stretchers.

6.9 ENVIRONMENTAL CONTROL SYSTEM

Heating, ventilating and air conditioning (HVAC) equipment shall be installed to control temperature, ventilation and drafts. HVAC equipment shall provide necessary conditions for the proper operation of all mechanical, automatic train control, communications, electrification, lighting, and auxiliary electrical systems, and provide for the rapid purging of smoke from all areas in case of fire.

6.9.1 Intake And Exhaust Locations

Depending on external factors such as site configuration and availability of real estate, locations of intake and exhaust shaft outlets, in order of preference, should be as follows:

- Opening ten feet or more above grade.
- Openings above grade located in street medians, at off-street locations which are not pedestrian ways, or in planters.
- Shaft openings in sidewalks or other pedestrian ways. In sidewalks, locate gratings covering such openings immediately behind the street curb. Extent of sidewalk width occupied by these gratings shall conform to the following limitations:
 - Sidewalk width from 0 feet to 6 feet: No gratings allowed.
 - Sidewalk width from 6 feet to 10 feet: 4 feet maximum.
 - Sidewalk width 10 feet or more: 40% of sidewalk width.

6.9.2 Station Ventilation

Station ventilation shall be achieved through an air supply/exhaust system. An underplatform exhaust shall capture much of the heat released from trains while they are in the station before entering the

passenger (platform) space. During the initial years of systems operation (3-1/2-minute headway) outside air shall be supplied to the station to maintain platform conditions at 89°F. When traffic reaches the ultimate capacity (2-minute headway), mechanical refrigeration shall be required and platform conditions shall be reduced to 85°F. Provisions shall be made for future installation of mechanical refrigeration when the stations are constructed.

During emergencies the ventilation system will provide outside air to assist passenger evacuation and purge smoke from the system. Station ventilation is achieved by drawing outside air in through the entrances, sweeping it through the mezzanine and platform area, and exhausting it through ventilation shafts at both ends of the station. A smoke exhaust system is provided at the mezzanine ceiling of each station to purge pockets of smoke.

No heating shall be provided in public areas of stations.

6.9.3 Ancillary Areas

Heating, ventilation and air conditioning for the ancillary spaces are:

- Staff Room: Provide heating and air conditioning.
- Automatic Train Control Room: Provide heating and air conditioning.
- Toilets: Provide heating and mechanical ventilation.
- Battery Rooms: Provide exhaust mechanical ventilation.
- Traction Power Substations: Provide mechanical ventilation.

- Auxiliary Electrical Rooms: Provide mechanical ventilation.
- All Other Ancillary Rooms: Provide Exhaust mechanical ventilation.
- Chiller Plants: Provide mechanical ventilation.

6.9.5 Emergency Ventilation

Provisions shall be made for emergency ventilation for the protection of patrons and employees from fire and products of combustion.

Normal and emergency ventilation may be necessary to preserve the safety of underground facilities in the event of intrusion of toxic or flammable gasses.

The ventilation systems shall be so designed that in a fire emergency the air temperature upper limit in exit pathways shall not exceed 120°F.

Emergency ventilation systems shall produce airflow rates so as to provide a stream of noncontaminated air to patrons in a path of egress.

6.10 PLUMBING AND DRAINING

Each station shall have one men's and one women's staff toilet and locker room. Each toilet should preferably be located within the "paid" area. Doors to these facilities will be locked and under TV or employee surveillance.

Provision shall be made for emergency use of toilet facilities by patrons, including the handicapped, subject to the Controls described elsewhere in this specification. At least one toilet stall shall be designed to accommodate the handicapped.

A drinking fountain shall be provided in the staff area. No public drinking fountains will be provided.

Drainage facilities at all stations shall be adequate to handle all anticipated rainfall, runoff, and maintenance flows.

6.11 ELECTRICAL SYSTEMS

Electrical systems that shall be provided include:

- Complete lighting of all facilities
- Station power systems
- Traction power substations

The location of the power systems are shown in the station plans.

6.11.1 Lighting

Adequate lighting shall be provided in all station areas to insure passenger safety and convenience, and provide an adequate working environment for the staff. Standardized lighting fixtures shall be used throughout the system, although the placement of the fixtures may vary from station to station. Lighting shall be direct rather than indirect. A battery-powered emergency lighting system shall provide sufficient light for safe exiting of passengers if normal power fails.

6.11.2 Station Power

Station power systems shall provide power to all auxiliary equipment, and lighting within, and adjacent to, each station. These systems are separate and distinct from the traction power system. They are also separate from the train control and communication systems, but will serve to provide power to those systems. Two (2) separate line feeds shall be provided to each auxiliary power substation.

A separate room shall be used for batteries which supply the emergency power system. Room sizes are listed in Table 6.2.

6.11.3 Traction Power Substations

Traction power substations shall transform and rectify the high voltage supply to DC power. This will be supplied to the contact rail (third rail) which furnishes power to the traction equipment of the vehicles.

Substation shall be located mostly at or near each passenger station, generally below grade. Third rail connections from these substations shall be made within a zone extending from station platform end to 200 feet maximum beyond the station platform end. Substation space requirements are listed in Table 6-2.

6.12 SIGNING, ARTWORK AND ADVERTISING

Requirements for signing and artwork of station areas are the following:

6.12.1 Signing

Signs shall be standard throughout the system. Signs shall be designed to:

- Guide patrons through the system in the most efficient, and least complicated manner.
- Provide orientation and information to aid the patron in directional decision making.
- Accommodate visually impaired patrons.
- Provide a safe trip for patrons and warn of potential system hazards.
- Provide a fast safe exit in case of emergency.

6.12.2 Artwork

Artwork shall provide stations with visual interest, local color and identity. To avoid the appearance of "afterthought" or "tack-on" artwork, funds shall be allocated as part of the station design budget. The Designer will be responsible for clearly establishing the interface between artwork and other station work. The artwork shall not significantly affect the combustible heat load of a station.

6.12.3 Advertising

Advertising will be permitted in the Metro Rail System on a carefully controlled basis. Marketable advertising space shall be provided in the design of Metro Rail stations wherever feasible.

All advertising space in Metro Rail System shall conform to the standard sizes of advertising in general use in the United States.

Advertisements shall be carefully located: adjacent to areas of heavy traffic, but out of the direct passenger flow, so that they do not obstruct or retard such flow.

Advertisements shall be located out of public reach to prevent defacement.

No advertising shall be visible from outside the Metro Rail System.

6.13 ANCILLARY SPACES

Ancillary spaces shall be provided at each station to accommodate the following:

- Mechanical subsystems
- Electrical subsystems

- Automatic Train control equipment
- Communications equipment
- Station maintenance equipment
- Elevator machinery
- Safety and security equipment
- Batteries for emergency power
- A trash room

Specific placements of these facilities is shown on the station plans, and space requirements are shown in table 6-2. Spaces such as Sewage Ejector Rooms, Sump Pump Rooms, and Valve rooms shall be provided as required, of a size to house the required equipment. Appropriate access shall be provided.

Ancillary spaces shall be sufficiently protected to provide fire separation in public areas.

6.14 LANDSCAPING

Landscaping shall be provided at stations to:

- Create an aesthetically pleasing environment.
- Visually separate heterogeneous elements such as auto and bus traffic from residential neighborhoods and pedestrian malls.
- Create a unique identity for station entrances.

Landscaping shall be tailored to the specific requirements of individual stations.

6.15 MAINTENANCE AND CLEANING

Stations shall be designed:

- To create environments with an easily maintained high level of cleanliness throughout the system.
- To provide facilities for an efficient maintenance program which operates at a minimum cost.
- To integrate maintenance elements in the stations as a part of station design, without detracting from the appearance of the stations.
- To provide uniform interchangeable facilities within each station or between stations where possible, to facilitate replacement of damaged items.

The following are station requirements to aid maintenance and cleaning of the stations.

6.15.1 Entrance

A 110 volt a.c. water proof outlet and hose bib shall be provided at each station entrance. A trash receptacle shall be placed at all entrances.

6.15.2 Concourse

Pairs of utility outlets consisting of a hose bib and a 110 volt outlet shall be provided. Additional electrical outlets shall be provided so that no floor space is more than 50 feet from an outlet. Trash and ash receptacles shall be located in pairs at key points where people stop, such as vending machines, fare gates, seating areas, etc.

TABLE 6-2
METRO RAIL STATIONS
ANCILLARY AND SERVICE ROOM SIZING REQUIREMENTS

	Standard Station	
	Size	Clg. Hts.
1. Traction Power Substations	51' x 80'	16'
2. Auxiliary Power (@ each end)	17' x 31'	14'
3. Train Control (w/cross over @ station) (w/no cross over @ station)	20' x 40' 20' x 25'	12' 12'
4. Communications	20' x 17.5' or 15' x 23'-6"	
5. Battery Room	8' x 12'	12'
6. Elevator Equipment (per each elevator)	10' x 10'	8'
7. Fare Collection Storage	10' x 10'	8'
8. Storage	Not Req'd	-
9. Mech. Rm. (for T.C.C. & Ancil. Rm.)	16' x 15'	12'
9.1. Mech. Rm. (for other end Ancil. Rm.)	12' x 12'	12'
10. Fan Rm. (for Traction Power)	40' x 40'	14'
11. Emergency fan Rm. (@ each platform @ each end)	20'6" x 75'	14'
12. Chiller Room	30' x 50'	14'
13. Air Supply Unit Room (@ Mezz. level @ each end) (@ Each platform level @ each end)	30' x 50' Not Req'd	14' -
14. Smoke Exhaust Room (next air supply) (@ Mezz. level @ each end) (@ Each lower platform level @ each end)	14' x 50' Not Req'd	14' -

TABLE 6-2 (cont'd)

	Standard Station	
	Size	Clg. Hts.
15. Under Platform Exhaust Room (@ Each platform level @ each end)	10'6 x 30'	14'
16. Under Platform Exhaust Plenum (@ Each platform level)	21 Sq. Ft./Track	
17. Ejector Room	10' x 10'	8'
18. Valve Room (@ each end)	19' x 6'	10'
19. Sump Pump	10' x 10'	8'
20. Gap Breaker Station	16' x 22'	12'
21. Emergency Equip. (@ each level)	4'6" x 8'	8'
22. Custodial Room (@ Mezz. or Concourse Level) (@ Platform Level)	10' x 16' 8' x 10'	8'
23. Electrical Room (@ each Platform Level @ each end)	8' x 10'	8'
24. Toilet (Mezz. or Concourse Level)	12' x 12'	8'
25. Telephone Room (Mezz. or Concourse Level)	4' x 4'	8'
26. Deleted	-	-
27. Trash Room (Mezz. or Concourse Level)	10' x 10'	8'
28. Staff/Security Room (Mezz. or Concourse Level)	12' x 15'	8'
29. Deleted	-	-
30. Electric Incoming Service Room	40' x 40'	18'

6.15.3 Custodial and Trash Room

A custodial room shall be provided at each station to serve as a base for station cleaning. A trash room shall be provided in each station to store collection trash.

6.15.4 Building Maintenance Storage

A locked space shall be made available to house building maintenance materials. The size of this space shall be determined by the volume of materials to be stored.

6.15.5 Platforms

Pairs of locked utility boxes and additional electrical outlets shall be located throughout this area. Trash receptacles should be placed at all central waiting areas approximately 45 feet apart.

6.16 FIRE AND SAFETY

In order that passenger safety is assured in times of fire or other emergency, the station design shall include the following special considerations.

6.16.1 Fire Protection and Safety Equipment

Standpipe system coverage shall be provided throughout the station. Fire hose outlets shall be located so that any point may be reached, including in and around transit vehicles which may be stopped at the station, with 100 feet of hose and 30 feet of water stream.

Manual and remote actuation of under-vehicle water spray extinguishing systems shall be provided at stations, supplied from platform standpipe systems. Separately controlled systems shall be provided on each track for lengths along the platform corresponding to each vehicle pair, considering variations in stopping position. Provisions for removing

third rail power shall be provided so that power is automatically removed from that section of track, prior to actuating the under-vehicle extinguishing system.

Portable fire extinguishers shall be placed at each fire hose location and at other locations as required by hazard type and space utilization. Multipurpose dry chemical extinguishers shall be used, supplemented by carbon dioxide extinguishers in rooms used for electrical equipment; except that Halon 1211 extinguishers shall be provided in train control and communication rooms.

The maximum travel distance to the nearest extinguisher shall not exceed 150 feet in public areas.

Automatic sprinkler protection shall be provided for areas with other than minimal combustible content. Portable fire extinguishers shall be located to provide protection of the appropriate type for the ancillary space.

An emergency equipment room shall be provided at suitable locations in all stations. This room shall contain:

- ° Axe and pry bar
- ° First aid kit
- ° Stretcher

Emergency and fire phones shall be provided for manual fire alarm signaling. At a minimum, phones shall be located at all fire hose cabinets and emergency management panels. These shall be conspicuously indicated and visible.

A fire alarm system shall be provided in all stations. The fire detection devices shall be located in all ancillary areas except where sprinklered. A fire alarm annunciator panel located in Central Control, station staff room and/or other suitable locations, shall be activated by:

- Fire detection devices.
- Fire protection water flow.

The activation of the fire alarm system shall:

- Ring an audible alarm in Central Control.
- Notify the annunciator panels in the station and Central Control of the location and nature of the alarm.

An emergency management panel (EMP) shall be provided for the purpose of consolidating all necessary on-site control and communication facilities. The emergency management panel shall contain Emergency Telephone, Administrative Telephone, Fire Phone, Annunciation Panel, Ventilation Control, Security Controls and Evacuation Controls.

Central Control shall have the capability of:

- Notifying the local fire department.
- Notifying patrons in the affected station by way of the public address system that the station is to be evacuated.
- Deactivating all fare collection and service gates in the affected station, allowing them to operate in the free exit mode.

Battery powered emergency electrical systems shall be installed in all stations. These systems shall provide power for emergency lighting, illumination of exit signs, operation of fire alarm system during power failure, and operation of the public address system.

6.16.2 Emergency Egress

Station exiting shall be designed to accommodate the maximum plausible emergency condition. That is the case of a train entering the station in a condition of emergency. The station occupancy load for exiting

requirements shall be the projected passenger load of trains entering the station and entraining patron load awaiting that train.

6.16.3 Number and Location of Required Exits

There shall be a minimum of two exits from each platform located a minimum of 100 feet apart. Platform exits shall be stairs or stopped escalators to concourse level, emergency stairs, doorways, corridors, or walkways to a point of safety.

There shall be a minimum of two exits from each concourse. Exits shall be located as far apart as possible. Where more than two exits are necessary, they shall be a minimum of 40 feet apart to be considered separate. No point on the platform(s) or concourse shall be more than 200 feet from an exit.

There shall be sufficient exit lanes to evacuate the platform load in four minutes or less. The station shall also be designed to permit evacuation from the most remote point on the platform to a point of safety in six minutes or less.

7.0 YARD AND SHOPS

This section provides the basic criteria for elements of the yard and shop facilities of the SCRTD.

The main yard and shop complex (See Figures 7-2 and 7-3) will consist of the following major elements:

- ° Vehicle storage yard
- ° Transfer tracks
- ° Passenger vehicle interior cleaning and exterior washing facilities
- ° Yard control and line operations administrative facilities
- ° Outdoor materials storage area
- ° Passenger vehicle and plant maintenance shops
- ° Administrative and supervisory space

7.1 PASSENGER VEHICLE STORAGE YARD

The purpose of the storage yard is to provide a location where cars and trains may be kept, in a secure and accessible condition, when not in service, and for transfer of trains to the wash track or to the transit vehicle shops.

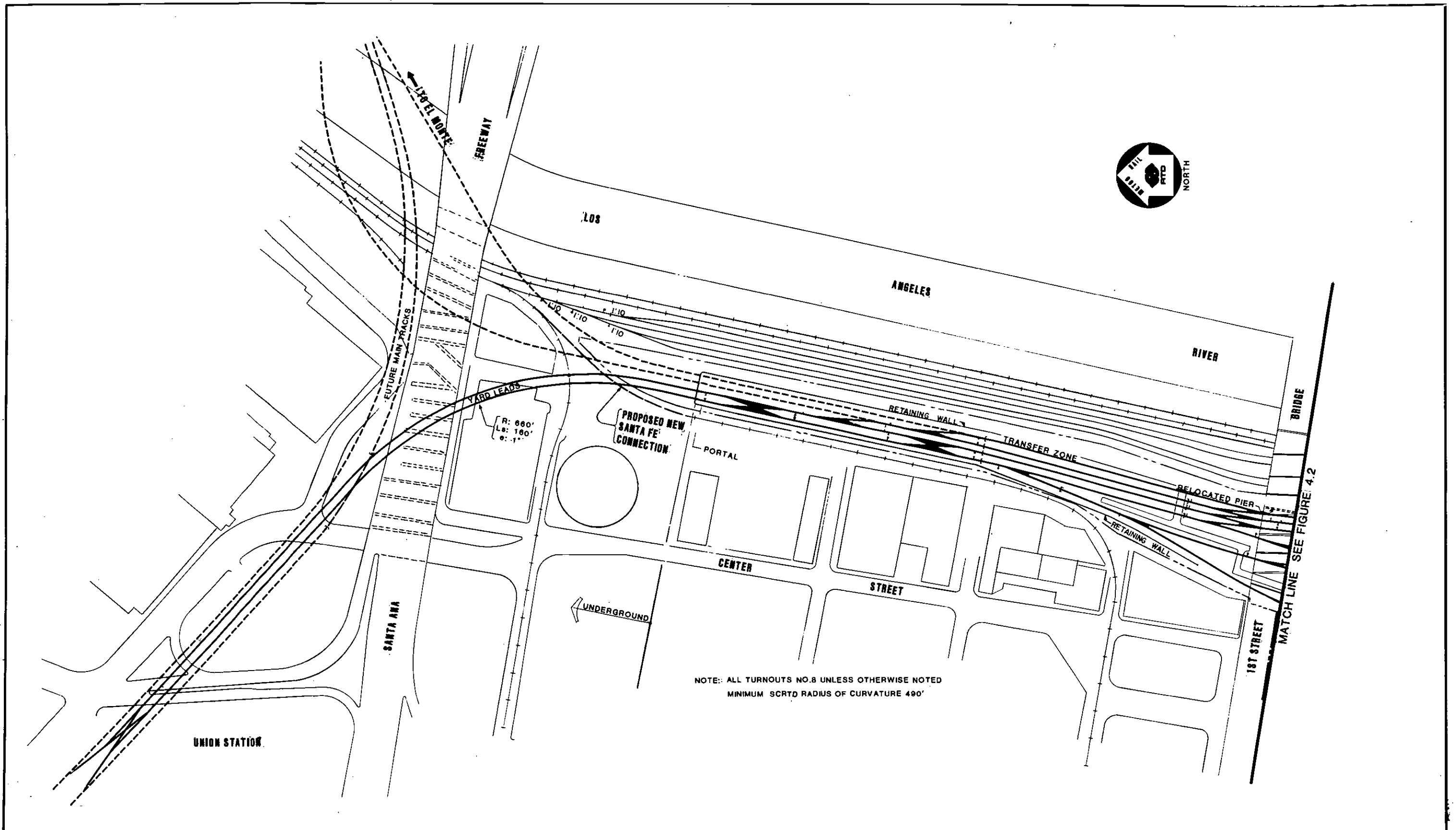
The main storage yard, Figures 7-2 and 7-3, will be a double-ended layout with leads and turnouts arranged at each end to provide storage capacity for at least 107 dependent pairs. The yard shall be arranged to provide:

- ° Individual tracks of sufficient length to accommodate the maximum number of six-car trains.
- ° Grouping of storage tracks, with each grouping having sufficient lead tracks to permit switching operations without blocking the leads to other groupings.
- ° The lead tracks to the groupings shall be connected to multiple ladder tracks arranged to enable simultaneous, bi-directional, non-conflicting movement to and from each grouping.
- ° The storage tracks shall be straight and level with alternate track spacings of 14 feet and 19 feet.
- ° The yard facility shall be capable of dispatching and receiving consists of trains to and from revenue service at a maximum rate of one six car unit every three minutes at ultimate capacity.

7.2 TRANSFER ZONE AREA

The transfer zone area, Figure 7-1 will provide for controlled transition between main line operation, under automatic train operation, and yard control, under manual train operation. All train movements between the yard and the main line will be through the transfer zone.

A single transfer zone will service both inbound and outbound train movements. The transfer zone shall include sufficient trackage and special trackwork to handle 6 six-car trains, and shall be arranged to provide maximum flexibility of trains moving in either direction to utilize any track. In addition, trains must be able to return to the yard or the mainline from the transfer zone. At least three tracks shall be provided in order to provide access from the mainline into any portion of the yard.



REV.	DATE	BY	APP.	DESCRIPTION
I	7/8/83	D.C.		MODIFIED TO COMPLY WITH MILESTONE II

DESIGNED BY	Date
G. P. STANSKE	
DRAWN BY	Date
DEL CASTILLO	1/18/83
CHECKED BY	Date
D. MALICK	1/21/83

DMJM/PBQD
 A Joint Venture
 General Engineering
 Consultant - Ways and Structures

SUBMITTED BY: _____
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

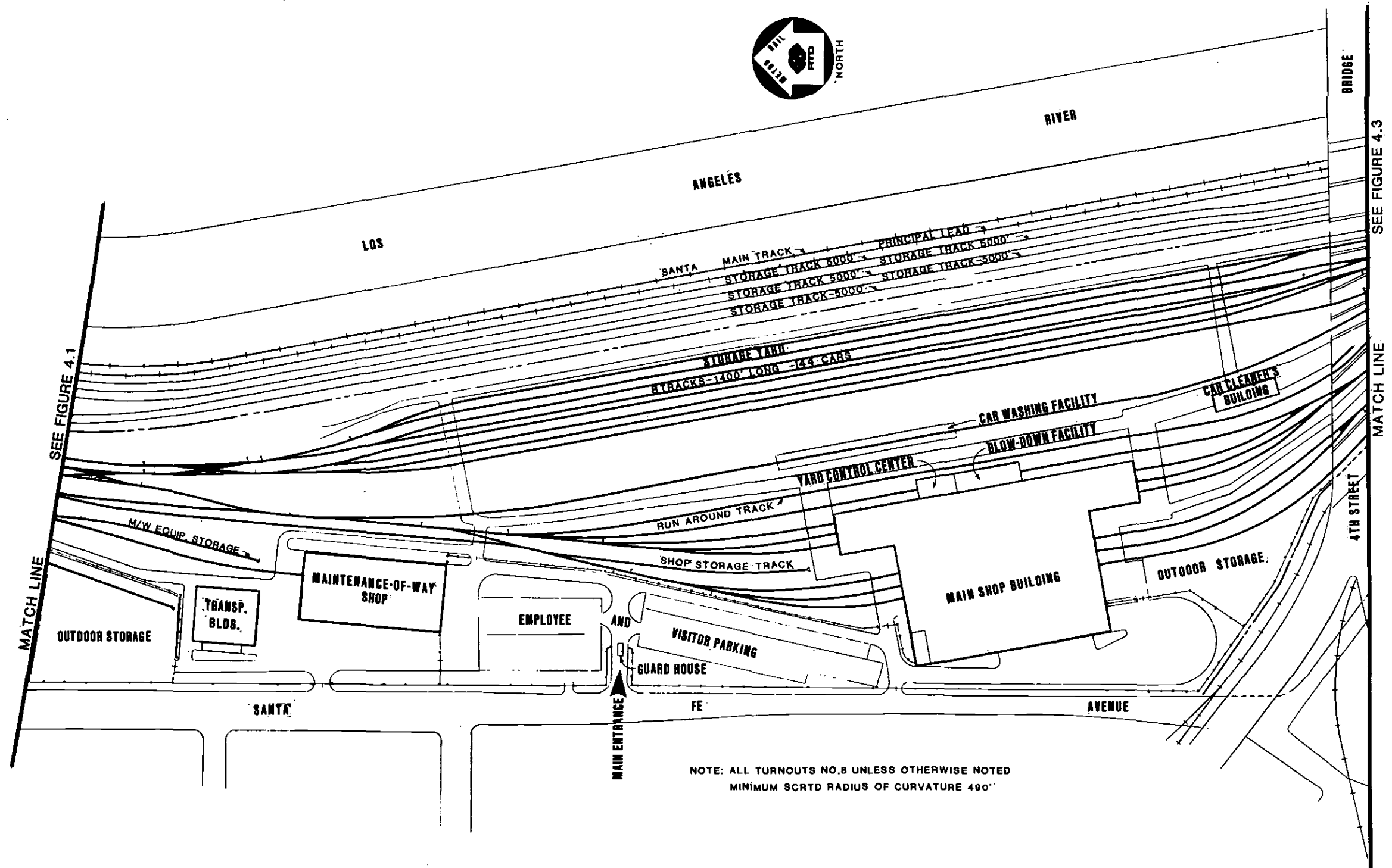
APPROVAL RECOMMENDED _____ Date _____
 Reg. No. _____

APPROVED _____ Date _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

MAIN YARD AND SHOPS
 YARD LAYOUT
 TRANSFER ZONE AREA

CONTRACT NO. _____
 DRAWING NO. AC-14AAG-C-013(1)
 SCALE 1"=100'-0"
 SHEET NO. FIGURE 4.1

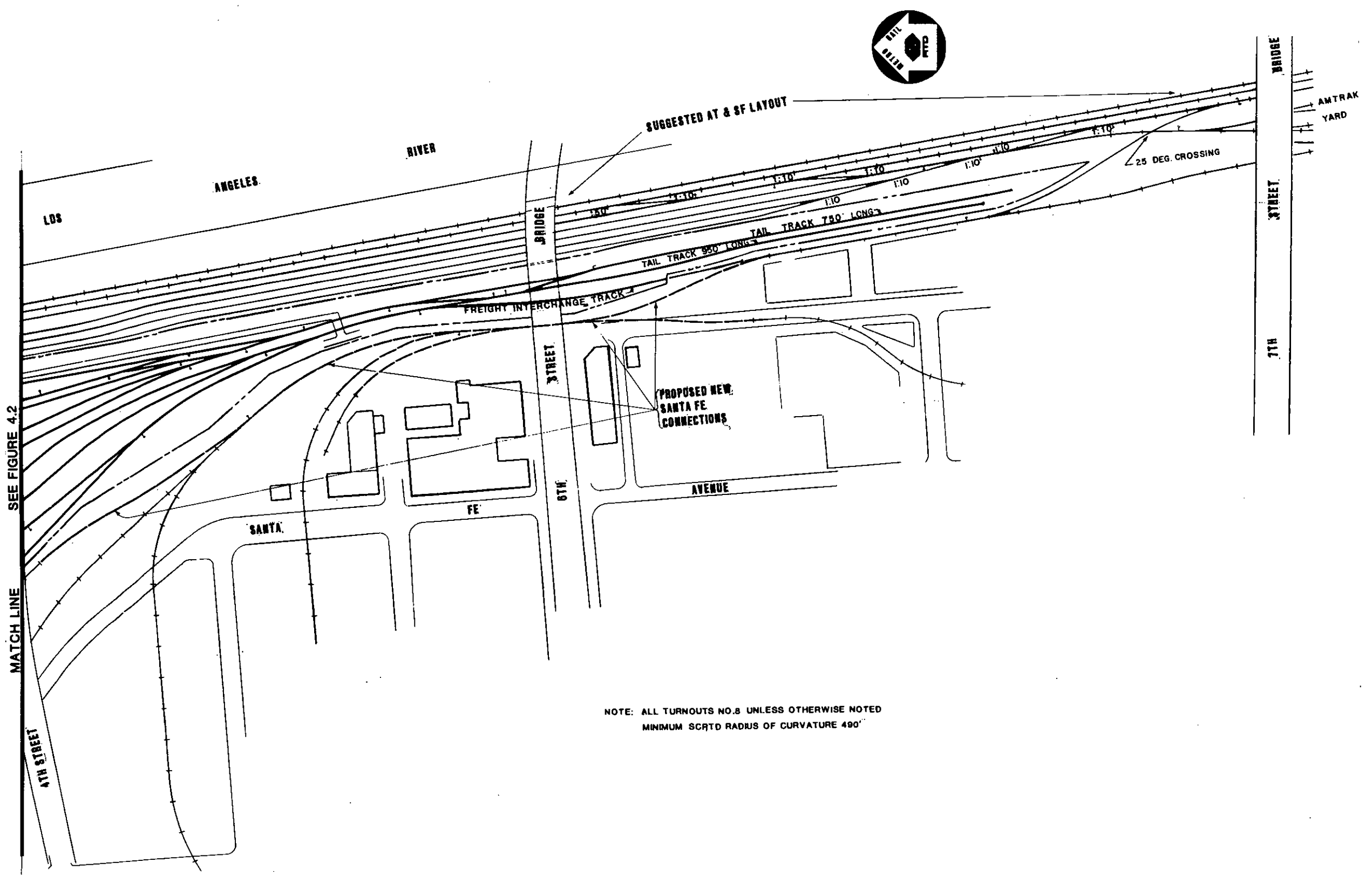
Figure 7-7
 Main Shop Building: Second Floor Plan



NOTE: ALL TURNOUTS NO.8 UNLESS OTHERWISE NOTED
 MINIMUM SCRTD RADIUS OF CURVATURE 490'

DESIGNED BY Date 1/18/83 Q. P. STANSKE		DMJM/PBQD A Joint Venture General Engineering Consultant - Ways and Structures	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT			MAIN YARD AND SHOPS YARD LAYOUT CENTRAL AREA		CONTRACT NO.	
DRAWN BY Date 1/18/83 DEL CASTILLO			APPROVAL RECOMMENDED _____ Date _____ Reg. No. _____			APPROVED _____ Date _____ MANAGER / CHIEF ENGINEER Reg. No. _____		DRAWING NO. AC-14AAG-C-014(1)	SCALE 1"=100'-0"
CHECKED BY Date 1/21/83 D. MALICK			SUBMITTED BY: _____ PROJECT MANAGER					SHEET NO. FIGURE 4.2	
REV. DATE BY APP. DESCRIPTION									
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Figure 7-6
 Main Shop Building: First Floor Plan



REV.	DATE	BY	APP.	DESCRIPTION
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G. P. STANSKE	
DRAWN BY	Date
DEL CASTILLO	
CHECKED BY	Date
D. MALICK	1/21/83

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SUBMITTED BY: _____
 PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED: _____ Date: _____
 Reg. No. _____

APPROVED: _____ Date: _____
 MANAGER / CHIEF ENGINEER Reg. No. _____

MAIN YARD AND SHOPS
 YARD LAYOUT
 TAIL TRACK AREA

CONTRACT NO.
DRAWING NO. AC-14AAG-C-015(1)
SCALE 1"=100'-0"
SHEET NO. FIGURE 4.3

Figure 7-3
 Main Yard: Tail Track Area 185

7.3 PASSENGER VEHICLE CLEANING FACILITIES

Facilities shall be provided in the yard for exterior washing and interior cleaning of cars which have been in revenue service. Car cleaner's facilities is shown in Figure 7-4.

7.3.1 Interior Cleaning Facility

Car cleaning crews shall be provided with a building with toilets, showers, locker, and lunchroom facilities at a point close to, but not within the storage yard. Crews will report for duty at this location, and using utility vehicles, proceed with their materials to the storage yard.

Interior cleaning will be performed in the storage yard. Cleaning areas in the yard shall be supplied with water, electric power, vacuum and compressed air.

7.3.2 Car Washing Facility

Exterior car washing shall be performed in the main yard on a single, dedicated track, of sufficient length to enable the movement of at least two six-car trains onto the track, and through the washer without blocking rail movement past this facility. The washer facility shall be equipped with automatic wash and rinse facilities. Platforms will be provided to facilitate manual washing of areas such as ends that may not be adequately cleaned by the automated equipment, as well as for any touch-up cleaning that may be required.

The washing facility shall be provided with water reclamation equipment to reduce water consumption and pre-treatment units for neutralization of all effluent prior to discharge to city sewers.

7.4 YARD CONTROL AND LINE OPERATIONS ADMINISTRATIVE FACILITIES

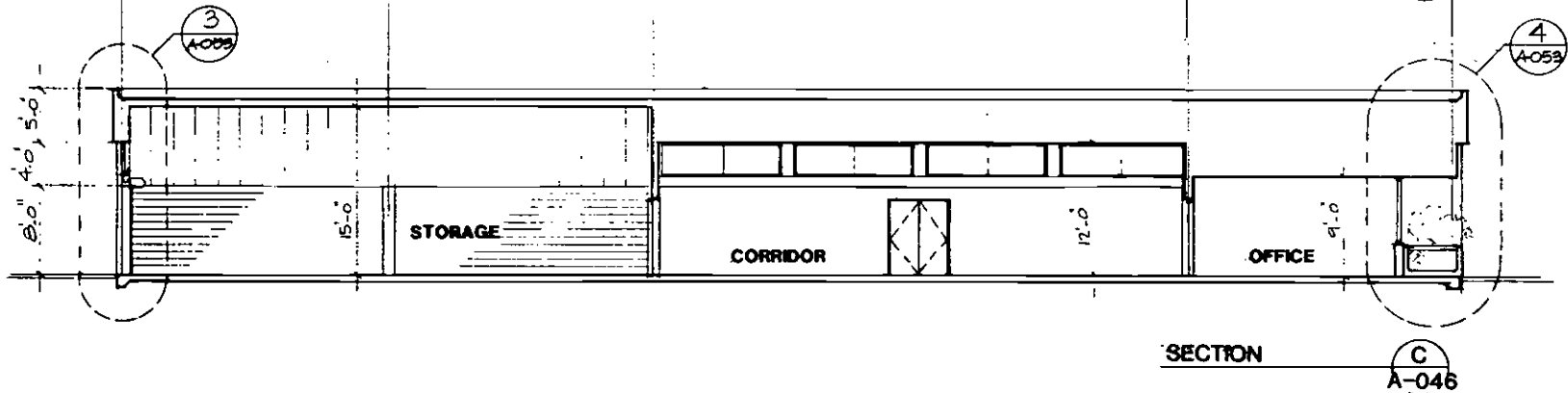
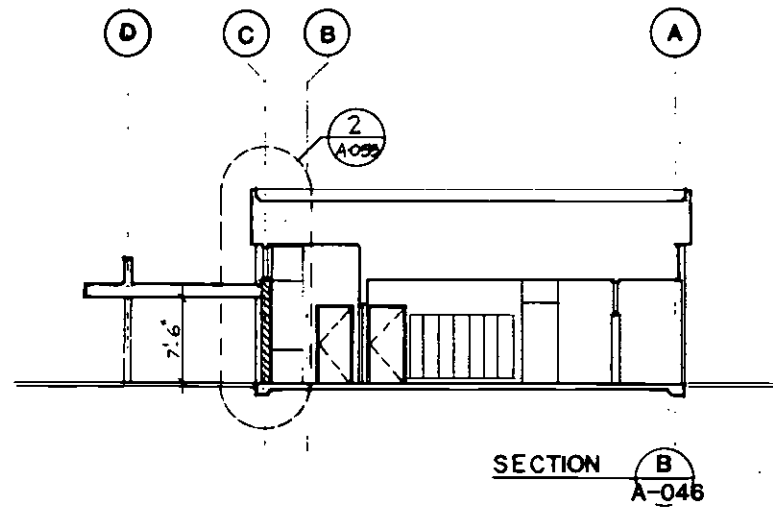
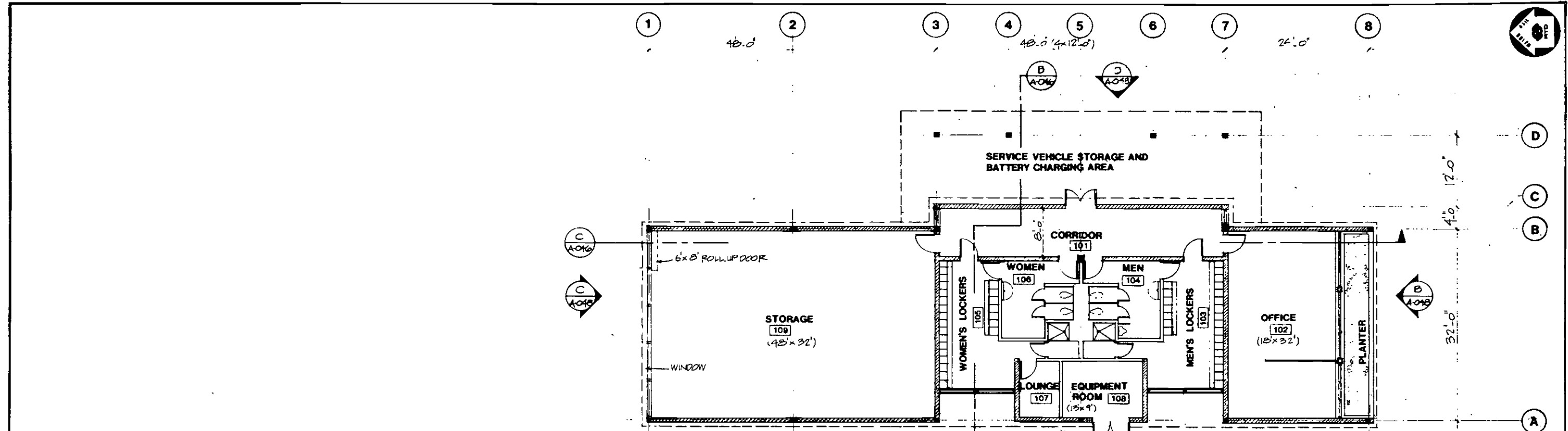
A yard control tower shall be provided for safe, effective, and timely supervision of yard activities. Direct supervision of all train movements within the yard will be exercised from this tower. In the main yard, the tower shall have visibility of the storage yard, train washing facility, the various yard leads, ladder tracks, and loop tracks, and, to the extent possible, the shop leads and the transfer zone.

Line Operations Administrative Facilities shall be provided that include facilities for the administrative support of the transportation organization line operations activities. These facilities will consist of:

- Office accommodations for supervision and clerical staff
- Crew dispatching and timekeeping office
- Toilet, shower, locker, lunch, meeting, and training rooms
- Storage and issue facilities for radios, batteries, uniforms and publications

The yard control tower will have glass windows, will be located at a point within the yard, and will be of sufficient height to optimize unobstructed vision of as much of the yard complex as possible, with priority given to the following:

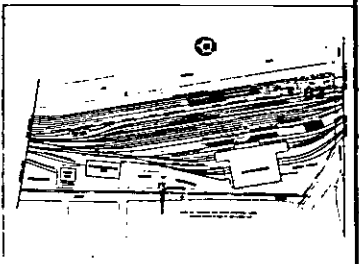
- The vehicle storage yard
- The various yard leads and ladder tracks
- The wye tracks



FIRST FLOOR PLAN
A-046

PRELIMINARY
6.27.83

KDG
kennard design group
architecture and planning
4929 Wilshire Blvd., Suite 700,
Los Angeles, California 90010



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[Signature]
DATE 6/20/83

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[Signature]
DATE 6/20/83

CHECKED BY
[Signature]
DATE 6/20/83

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SUBMITTED BY:
[Signature]
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED

Reg. No. _____

APPROVED

MANAGER / CHIEF ENGINEER Reg. No. _____

DATE _____

**MAIN YARD AND SHOPS
CAR CLEANER'S BUILDING**

FIRST FLOOR PLAN
AND BUILDING SECTIONS

CONTRACT NO.
A-100

DRAWING NO.
AP-16AAB-A-046(0)

SCALE
1/8" = 1'-0"

SHEET NO.
A-046

105 OF 173

Figure 7-4
Car Cleaner's Building: First Floor Plan and Building Sections 187

The following areas shall be visible from the tower to the extent practicable:

- The transfer zone
- The shop leads
- The main gate
- The outdoor material storage area

The line operations administrative facility shall be arranged as a small industrial-type office building.

7.5 OUTDOOR MATERIALS STORAGE AREA

The purpose of this facility is to provide accessible, controlled, and secure storage of materials that cannot be handled in the stores facility within the main shop. Typical materials to be stored include:

- Track ballast, in bulk
- Running rail and contact rail
- Various rail fasteners, joint bars, and other appurtenances
- Special trackwork components
- Crossties
- Building and station maintenance and repair supplies
- Spare tunnel lining components and other structural components
- Bulk solvents, cleaners, lubricants and other chemicals, in drums

- Underground fuel tanks with dispensers
- Secure area for combustible, corrosive, and toxic material.

The outdoor storage area shall be level, paved in appropriate areas, and have drainage sufficient to preclude standing water. The entire area shall be fenced and illuminated. Locked entry gates will be provided in compliance with the security requirements.

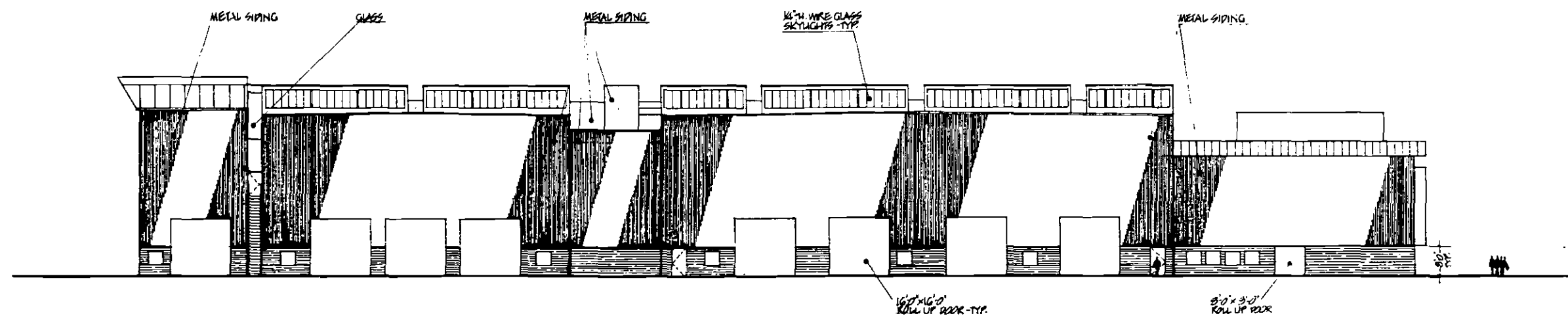
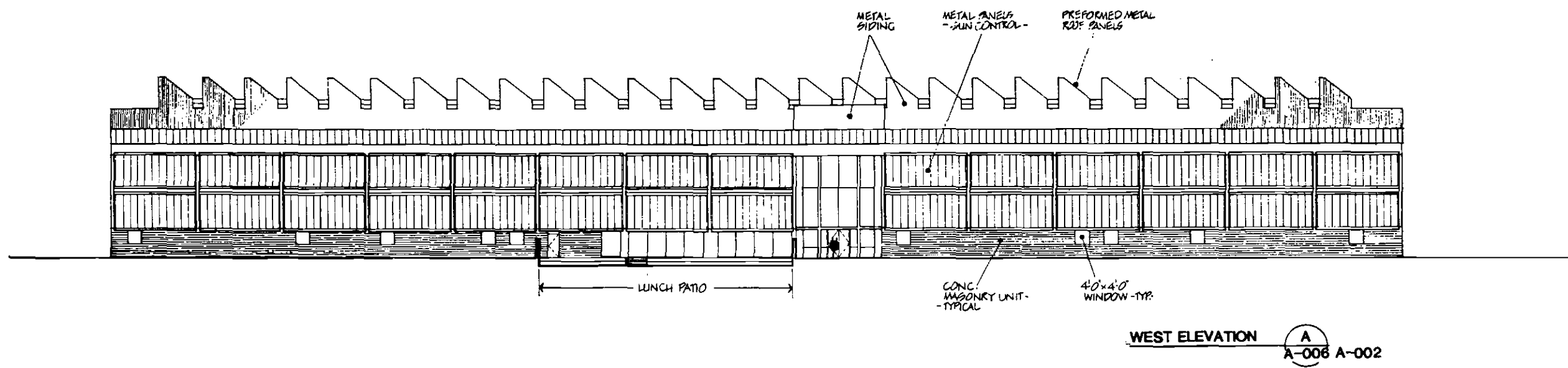
7.6 PASSENGER VEHICLE AND PLANT MAINTENANCE SHOPS

Within the main yard complex there shall be a system maintenance facilities, as shown in Figure 7-5 through 7-10, consisting of inter-related shops and facilities devoted to:

- Maintenance and repair of transit vehicles
- Maintenance and repair of systemwide equipment components
- Backshops and staging activities associated with maintenance-of-way and other fixed-facility maintenance.
- Maintenance and repair of work equipment, shop equipment, and various vehicles utilized in maintenance-of-way and other fixed-facility maintenance.
- Administrative support of maintenance operations.

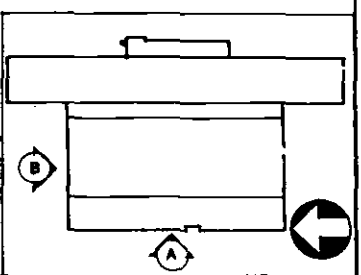
7.6.1 Service and Inspection Shop

The purpose of the service and inspection (S&I) shop is to perform scheduled inspection, preventive maintenance, component replacement, and minor corrective maintenance. Vehicles brought into the S&I shop will generally not require heavy equipment removal. Undercar access in



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DESIGNED BY Date: 10-83
[Signature]

DRAWN BY Date: 10-83
[Signature]

CHECKED BY Date: 10-83
[Signature]

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A Joint Venture
General Engineering Consultant - Ways and Structures

SUBMITTED BY:
[Signature]
PROJECT MANAGER

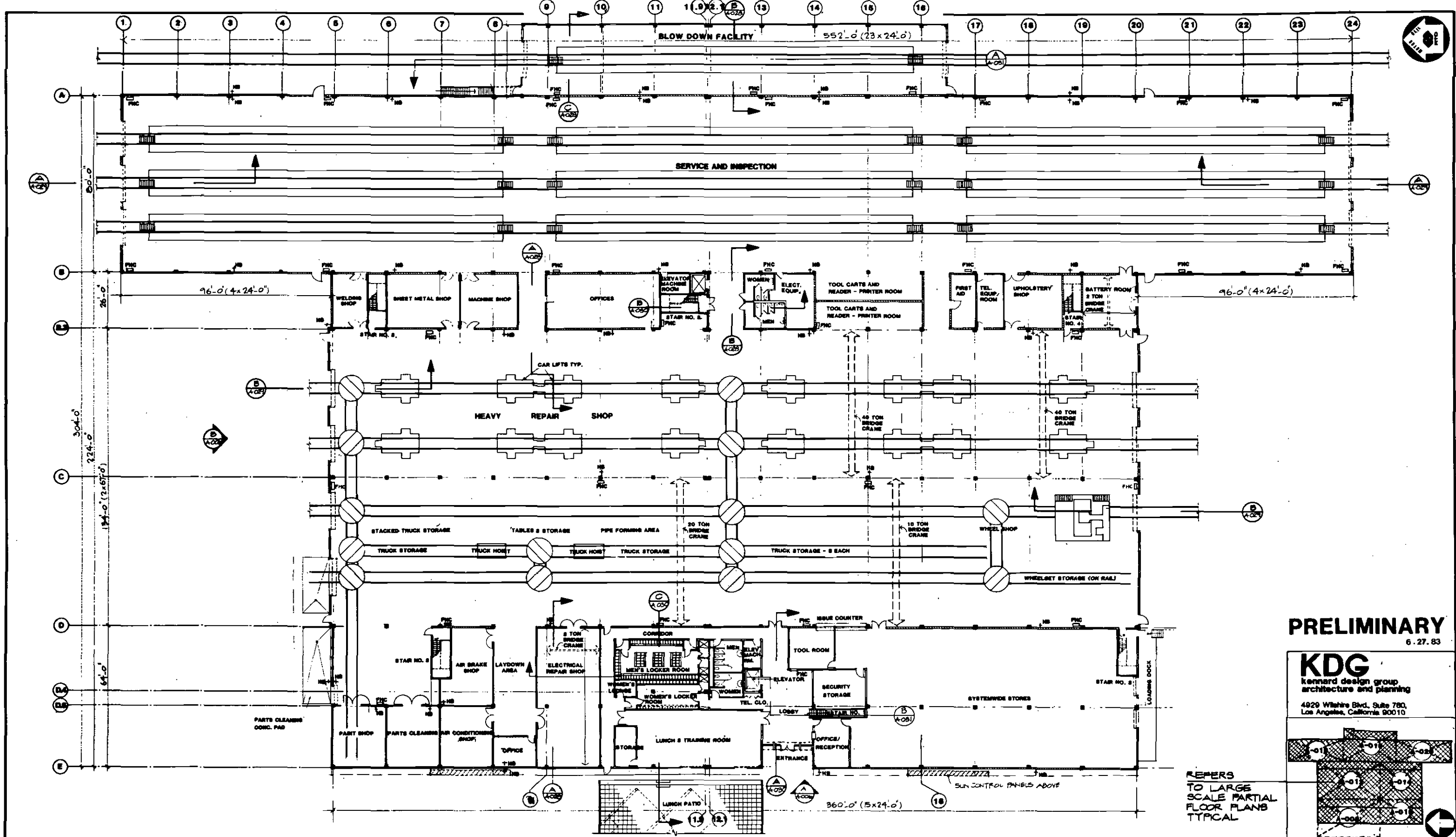
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____ Date _____
MANAGER / CHIEF ENGINEER

APPROVED _____ Date _____
MANAGER / CHIEF ENGINEER

MAIN YARD AND SHOPS
MAIN SHOP BUILDING
BUILDING ELEVATION

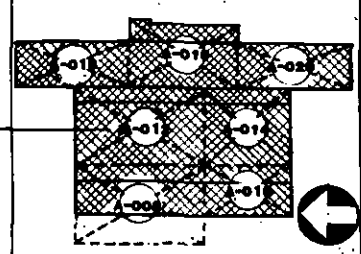
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SCALE 1/16" = 1'-0"
SHEET NO. A-006 65 OF 173



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REFERS
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SCALE PARTIAL
FLOOR PLANS
TYPICAL

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DESIGNED BY *DAVID L. BROWN* Date: 12-82
DRAWN BY *Carol Davidson* Date: 2-83
CHECKED BY *Max Hammet* Date: 2-83

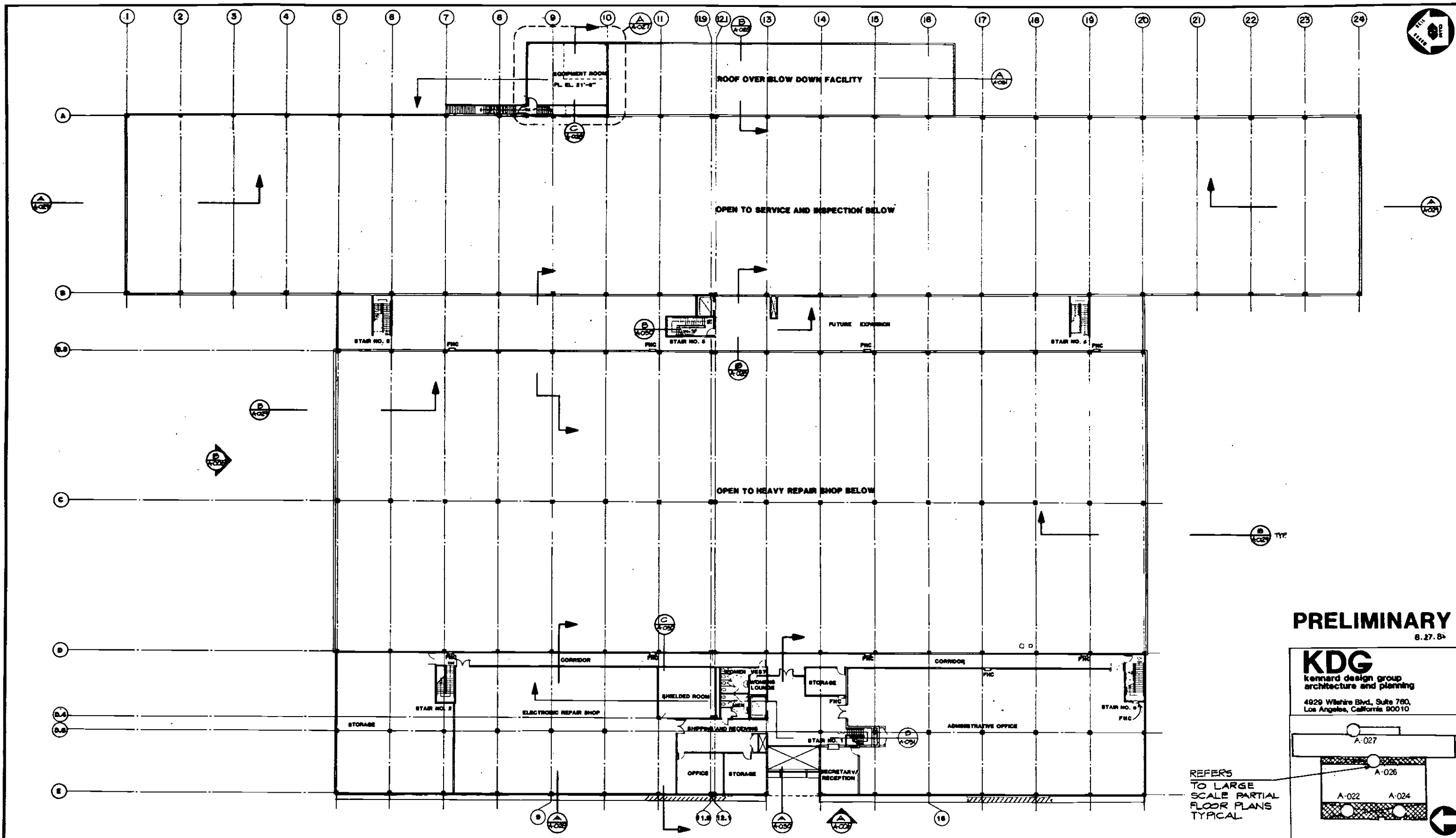
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General Engineering Consultant - Ways and Structures
SUBMITTED BY *Dr. H. H. Lopez*
PROJECT MANAGER

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METRO RAIL PROJECT
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APPROVED _____ Date _____
MANAGER / CHIEF ENGINEER

MAIN YARD AND SHOPS
MAIN SHOP BUILDING
FIRST FLOOR PLAN

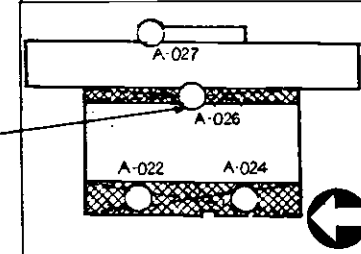
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DRAWING NO. AP-16AAB-A-002(0)
SCALE 1/20" = 1'-0"
SHEET NO. A-002
61 OF 173

Figure 7-6
Main Shop Building: First Floor Plan



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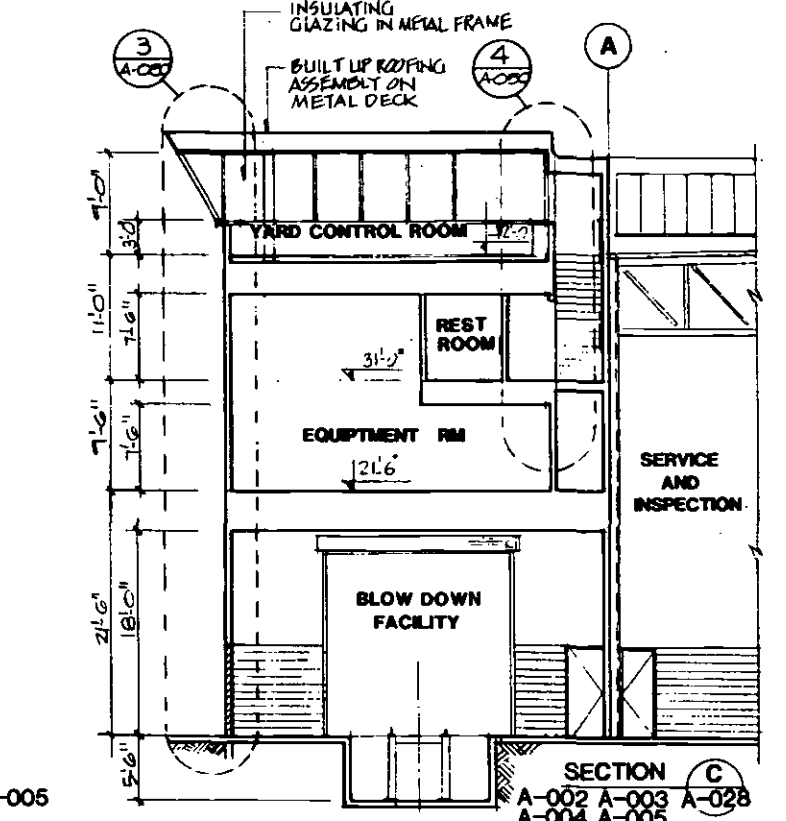
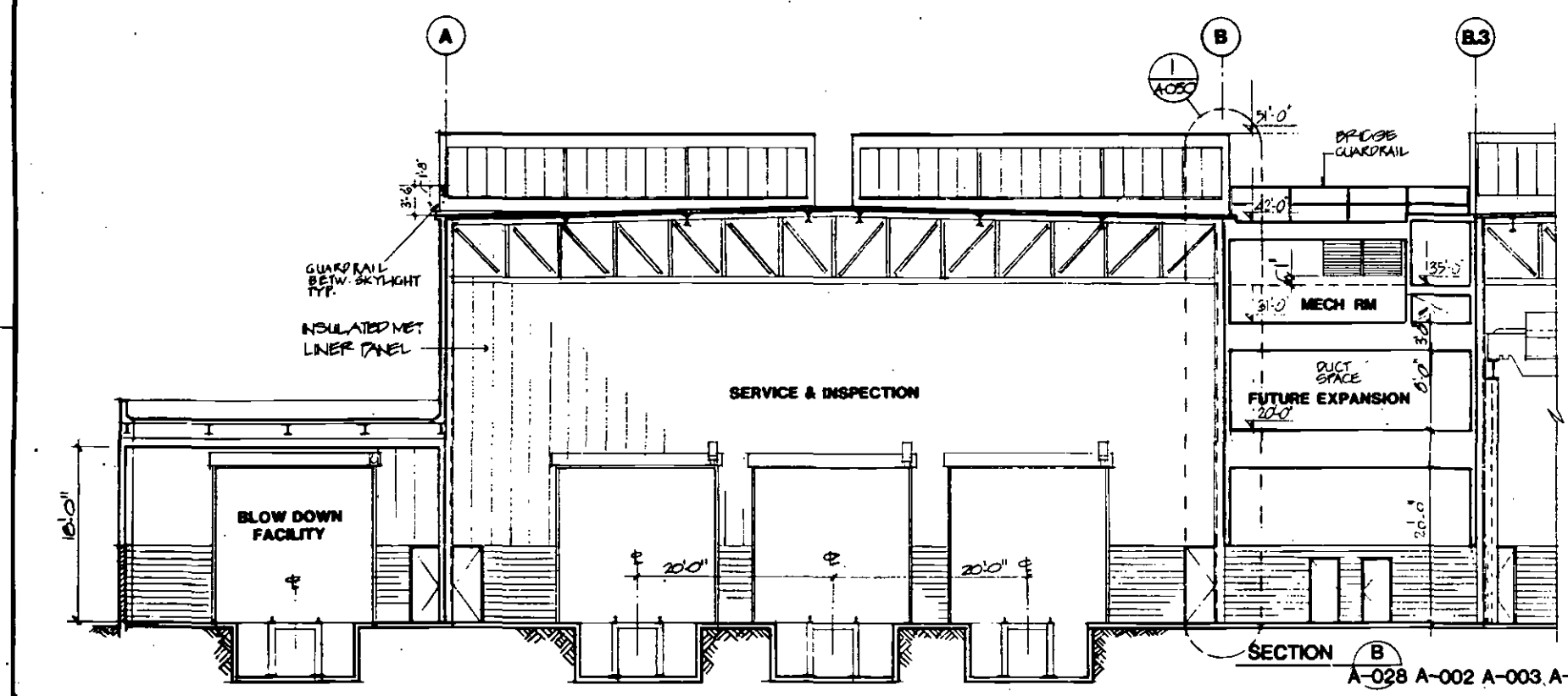
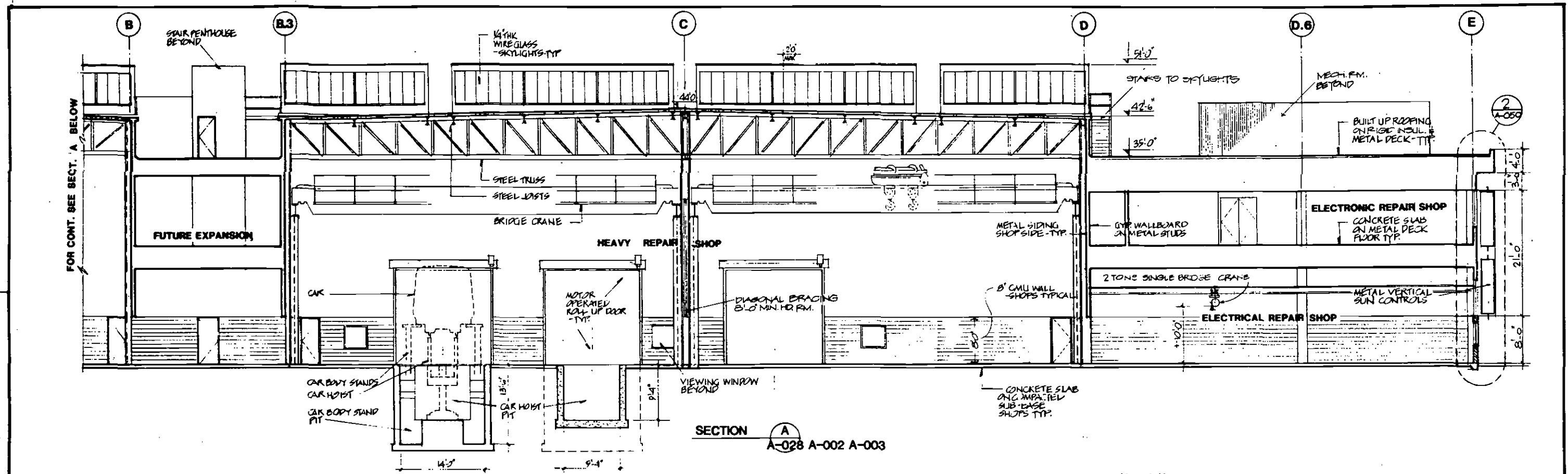
DMJM/PBQD
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Engineering
Consultant: Ways and Structures
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PROJECT MANAGER

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METRO RAIL PROJECT
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**MAIN YARD AND SHOPS
MAIN SHOP BUILDING
SECOND FLOOR PLAN.**

CONTRACT NO. A-100
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SHEET NO. A-003 62 OF 173

Figure 7-7
Main Shop Building: Second Floor Plan 191



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DRAWN BY <i>[Signature]</i> Date: 10-20-82	
CHECKED BY <i>[Signature]</i> Date: 10-20-82	
REV. DATE BY APP. DESCRIPTION	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

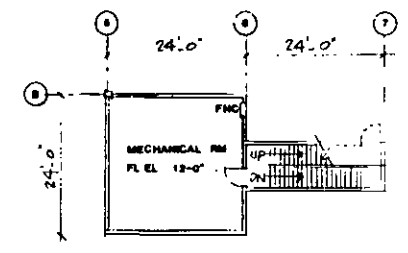
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MANAGER / CHIEF ENGINEER

APPROVED: _____ Date: _____
MANAGER / CHIEF ENGINEER

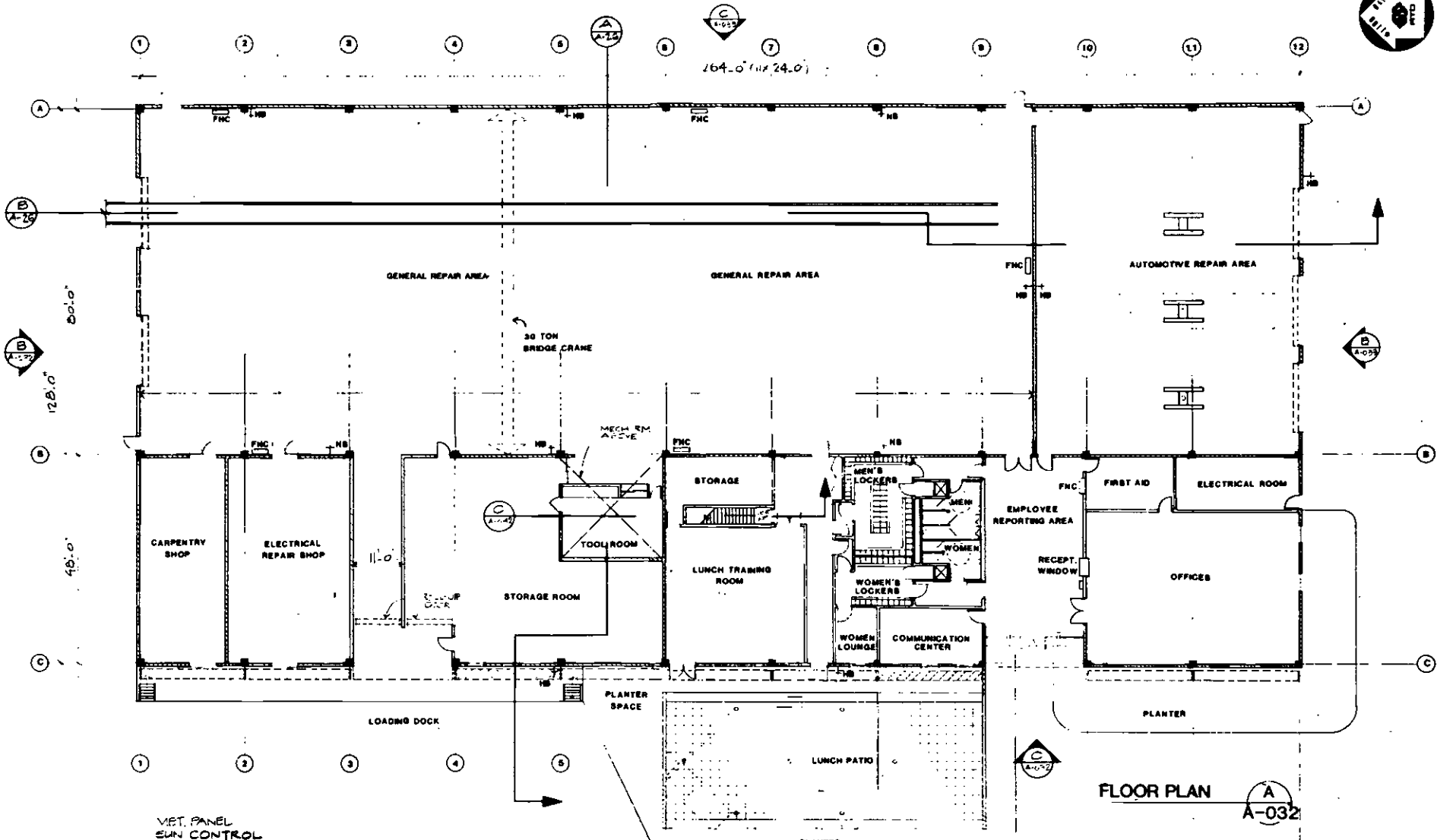
**MAIN YARD AND SHOPS
MAIN SHOP BUILDING
BUILDING SECTIONS:**

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SHEET NO. A-028 87 OF 173

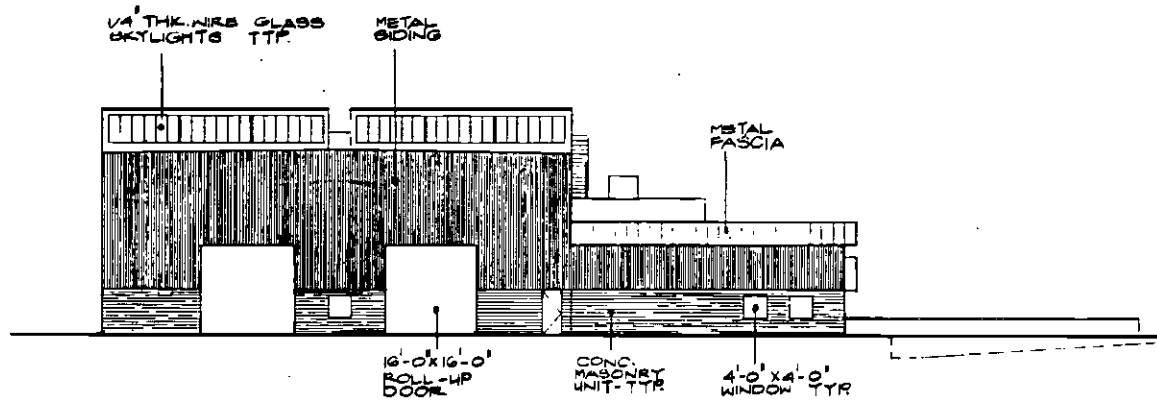
Figure 7-8
Main Shop Building: Building Sections



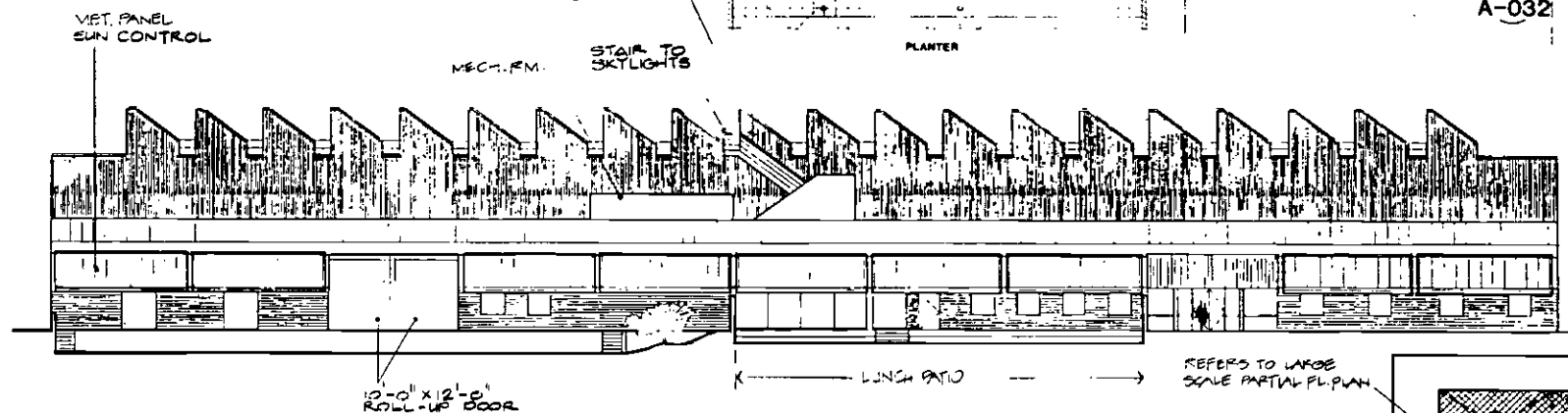
MECHANICAL ROOM PLAN **D**
A-032



FLOOR PLAN **A**
A-032

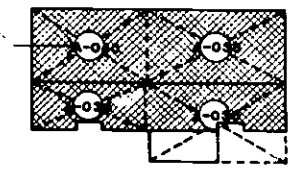


NORTH ELEVATION **B**
A-032



WEST ELEVATION **C**
A-032

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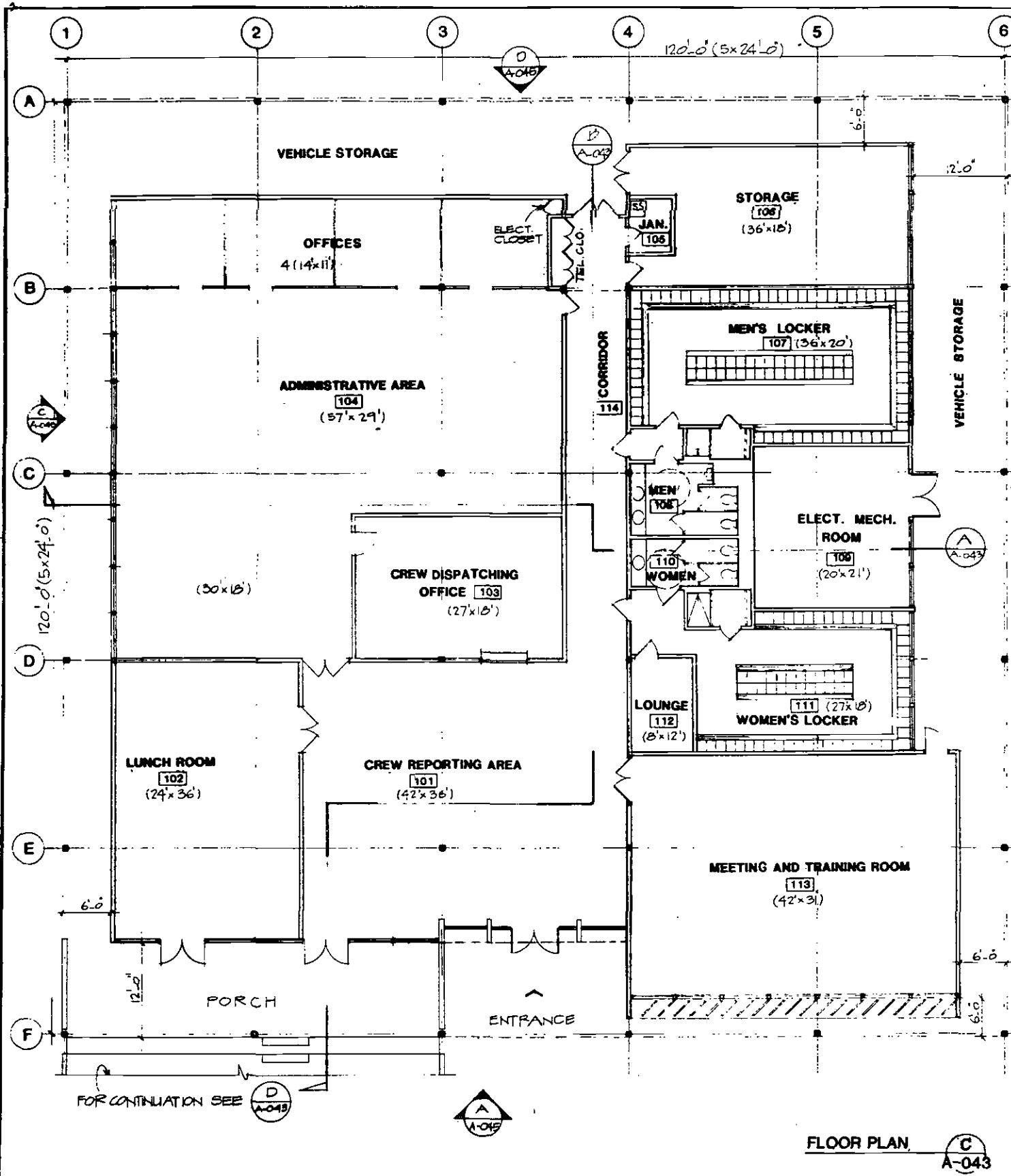
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 DRAWN BY *[Signature]* Date: 6/20/83
 CHECKED BY *[Signature]* Date: 6/20/83

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 PROJECT MANAGER

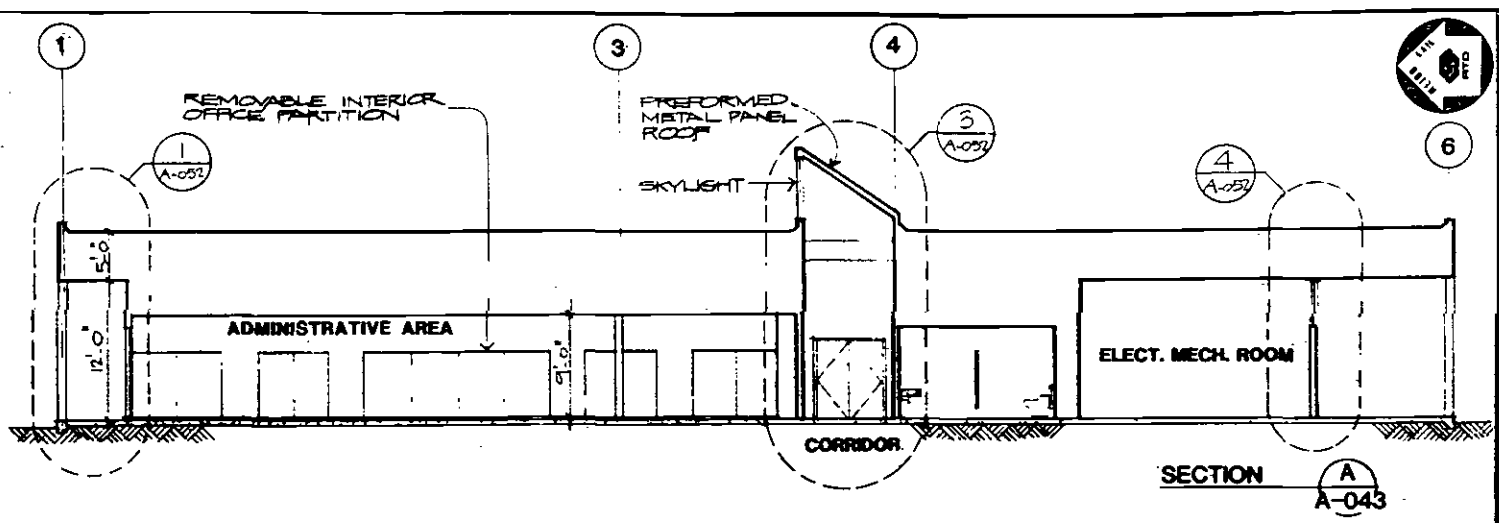
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METRO RAIL PROJECT
 APPROVAL RECOMMENDED _____
 APPROVED _____ Date: _____
 Reg. No. _____ MANAGER / CHIEF ENGINEER Reg. No. _____

**MAIN YARD AND SHOPS
 MAINTENANCE-OF-WAY
 SHOP BUILDING**
 FIRST FLOOR PLAN
 AND BUILDING ELEVATIONS

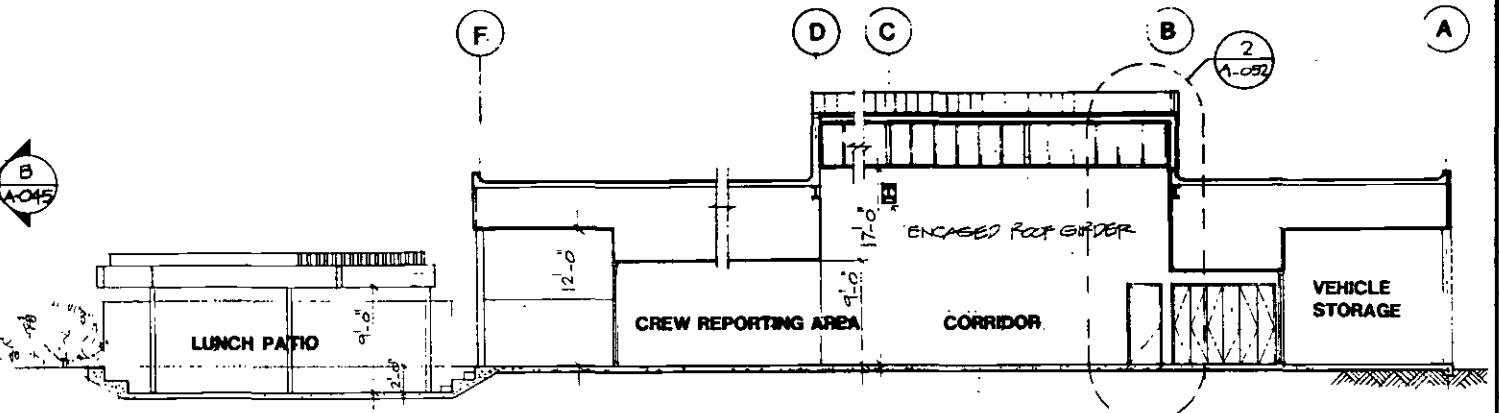
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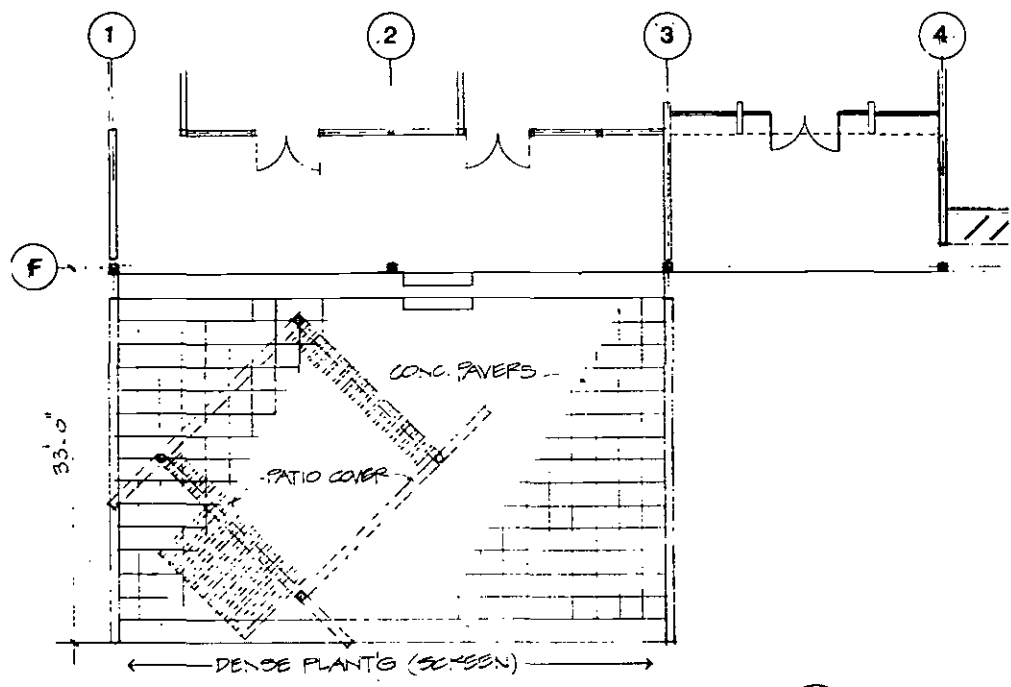
FLOOR PLAN C A-043



SECTION A A-043



SECTION B B-043



LUNCH PATIO FLOOR PLAN D A-043

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General Engineering
Consultant: Ways and Structures

SUBMITTED BY: *[Signature]*
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED: _____ Date: _____
 APPROVED: _____ Date: _____
 MANAGER / CHIEF ENGINEER

MAIN YARD AND SHOPS
TRANSPORTATION BUILDING

FIRST FLOOR PLAN
AND BUILDING SECTIONS

CONTRACT NO. A-100
 DRAWING NO. AP-16AAB-A-043(O)
 SCALE 1/8"=1'-0"
 SHEET NO. A-043 102 OF 173

S&I shop will be provided by underfloor pits. Repair of vandalism, removal of graffiti, or replacement of damaged seats or broken glass can be done during a regularly scheduled S&I event.

The S&I shop shall occupy a portion of the ground floor and shall be rail-accessible from both ends of the vehicle shops. It shall be a rectangular high bay and contain three tracks each with a minimum length of 6 vehicles (Maximum system train length). Each vehicle position will contain a pit with adequate lighting electrical and compressed air outlets for operating tools and lubrication equipment.

7.6.2 Heavy Repair Shop

The purpose of the heavy repair shop is to perform vehicle over-hauls, major corrective maintenance, unscheduled replacement of undercar equipment including trucks, and accident repairs.

The Heavy Repair Shop shall occupy a portion of the ground floor of the vehicle shop, and shall be rail-accessible from both ends. The shop will be a rectangular high bay, and will contain two tracks, each having two positions for dependent pairs, each of which will contain underfloor car body and truck lifts. In-floor turntables and associated trackways will provide for movement of transit vehicle trucks to the truck shop. The shop shall be capable of accommodating the vehicle included in the composite dynamic outline Figure 8-6.

7.6.3 Component Repair Shops

The component repair shops will provide support on a systemwide basis, in the scheduled servicing and overhaul, as well as unscheduled repair of failures or other damage to equipment items removed from the various passenger vehicle subsystems as well as those associated with wayside and fixed plant functions including automatic train control, fare collection, communications, traction power, and station equipment.

Components and other equipment items will be brought to the appropriate shop and area from the passenger vehicle repair bays, from the maintenance-of-way shops, from the wayside of mobile crews, and from other component repair of support shops where larger assemblies are disassembled. As appropriate, some items may be routed through the parts cleaning facility.

7.6.3.1 Electronics Shop

The electronics shop will have systemwide responsibility for repair and overhaul of various electronics equipment at the part, component, and assembly level, pertinent to such equipment systems as passenger vehicle propulsion, on-board automatic train control, door control, friction brake control, destination signs, and other electronics. Wayside equipment responsibilities include communications, wayside automatic train control, fare collection, and station equipment.

The electronics shop shall be a large enclosed area, containing:

- Individual work stations at benches
- Open areas with fixtures for placing large assemblies to be repaired.
- A "shielded room" for radio repair.
- A receiving area for processing incoming items
- A secure storage area for high theft-risk items and spare parts.

7.6.3.2 Electrical Equipment Shop

The electrical equipment shop will have systemwide responsibility for repair and overhaul of various electrical (non-electronic) equipment as in passenger vehicle, automatic train control, fare collection, and wayside systems.

Tasks in this shop will include tear-down and assembly of various equipment, replacement of sub-components and parts, bearing replacement, turning of armatures and testing and other actions requiring use of hand-tools, soldering, and wiring.

The electrical equipment shop shall be a large open area, containing:

- Individual work stations at benches
- Open areas with holding jigs and fixtures for large equipment items
- An overhead bridge crane for handling large items
- An open area near the entrance for processing items to be repaired

7.6.3.3 Air Brake Shop

The air brake shop will have responsibility for the passenger vehicle air brake systems and other systemwide pneumatic equipment. Other equipment may include suspension leveling valves, coupler air valves, shop and maintenance-of-way air compressors, and associated air-operated equipment.

The air brake shop shall contain specific areas for working various types of equipment, some of which will require a highly clean environment. Areas will include space for a component test-rack, which will require compressed air at passenger vehicle operating pressure and an electrical power supply.

7.6.3.4 Air-Conditioning Shop

The air-conditioning shop will have responsibility for passenger vehicle and other air-conditioning system components.

The air-conditioning shop shall consist of an enclosed area containing areas arranged for work on specific types of equipment. Shop placement, layout, and furnishings will be conducive to maintaining a clean working environment.

7.6.3.5 Support Shops

The various support shops shall be provided that can perform specialized maintenance services to the heavy repair, S&I, component repair, and maintenance of way shops. In addition, some support shops will provide direct maintenance and repair of various equipment items.

Equipment items to be repaired as well as the shop equipment to be used will consist of relatively large and heavy items that will require appropriate materials handling capabilities.

The support shops are identified and described as follows:

Wheel Truing and Grinding Facilities - The wheel truing facility will be used to maintain the correct profile and surface of passenger vehicle car wheel treads and flanges, the proper dimensional relationships of wheel diameters on the same axles, trucks, and vehicles, and to remove surface irregularities such as "flat spots".

The wheel-truing and wheel-grinding equipment shall be located in a single track within the heavy repair shop. This track shall be rail-accessible from either end of the shop.

Truck Shop - The truck shop will be used to repair and overhaul passenger vehicle trucks. Trucks will be removed in the heavy repair shop and rolled via turntables and associated trackways to the truck shop, where they will be placed either into a work station or holding area.

The truck shop shall be an essentially open high-bay shop. Work stations will consist of locations and fixtures for placing trucks above the floor to provide all-around work access. Space shall be provided for storage of additional trucks, placement of employee tool carts, and storage of large replacement parts and special tools. The shop floor, except at the work stations and truck storage area, shall be configured to permit the movement of materials handling vehicles. An overhead crane will be required, capable of lifting, moving, and placing complete trucks or components. The shop should be located adjacent to the wheel shop and the machine shop. The overhead crane should extend into the wheel shop. A steam cleaning booth shall be installed.

Wheel Shop - The wheel shop will be used to perform all required wheel, axle and related tasks. This will include dismounting and pressing wheels, bearings, and drive gears from and onto axles; boring wheels and machining axles for proper fit; replacing journal bearings and drive gears; and inspecting these components.

The wheel shop shall be an essentially open area, containing the various items of shop equipment and required materials handling equipment. The wheel shop should have access to the wheel truing facility and access to the truck shop. Outside access will be required for pick-up and delivery of work train wheels and axles. The work stations will consist of the various items of shop equipment.

Machine Shop - This shop will provide general purpose metal working capabilities for non-routine requirements in support of passenger vehicle and maintenance-of-way activities. In addition, some fabrication work will be performed for shop or equipment improvements, and for producing prototype or other test items.

The machine shop shall be an open area with various items of machine tools installed such as lathes, mills and drills. The shop

floor and layout shall accommodate lift-trucks and other materials handling vehicles.

Battery Shop - The battery shop will be used to service and maintain large batteries, for passenger vehicle and wayside utilization. Servicing will include cleaning, testing, and charging the batteries. Some minor repairs will be performed.

The battery shop will be a closed area, preferably adjacent to an exterior wall for proper ventilation, with shipping and receiving through a wall entrance. Safe storage facilities for battery fluids shall be provided. Batteries will be stored and charged on tiered racks. An electrically powered lift cart will be used for moving batteries.

Welding Shop - The welding shop will be used to provide various types of welding capabilities for mostly non-routine requirements, in support of passenger vehicle and maintenance-of-way activities. Capabilities will include both shop welding and portable welding equipment.

The welding shop shall be an enclosed area with restricted access, preferably adjacent to an exterior wall and entrance, for purposes of access and ventilation. Access for materials pick-up and delivery should be available through an exterior and interior entry. The welding shop should be in close proximity to the machine shop.

Work stations shall be comprised of work benches and heavy duty tables for placing items being worked.

The shop floor shall be capable of supporting lift trucks or other materials-handling vehicles, and shall be drained. A jib-type crane will be required.

Sheet Metal Shop - The sheet metal shop will be used to provide capabilities in repairing and fabricating various sheet metal items and assemblies including equipment boxes and lockers, hatch covers, side doors, and various other items such as enclosures and signs. In addition, passenger vehicle glazing replacements will be staged from the Sheet Metal Shop, as will car body repairs requiring metal-working capability.

The sheet metal shop shall be an enclosed area containing various work stations and shop equipment including various size breaks, punch machines, drill presses, shears, and various specialized hand tools. Storage racks, lockers, and bins will be required for items awaiting repair, spare parts, tools and hardware, and material stocks.

Upholstery Shop - The upholstery shop will be used to repair various upholstery and trim items, primarily related to passenger vehicle activities. The shop may provide similar support for other system elements, as may be required.

The upholstery shop shall be an enclosed facility containing work stations that will include industrial type sewing machines or other equipment appropriate for joining upholstery materials used.

Paint Shop and Parts Cleaning Area - The paint shop and parts cleaning area will be used to perform minor painting of various passenger vehicle and other equipment items, plus such tasks as sign and other graphics preparation. Typical items to be painted will include electrical equipment cabinets, equipment racks, hatches and gavers, gearbox cases, and motor housing.

In addition to painting, parts cleaning will be done in this area, in support of the various component and support shops. Items to be cleaned will range from large items, such as passenger vehicle traction motors, to smaller parts such as frames, boxes, housing,

etc., that will require specialized cleaning, and possibly blasting tanks. Items will be sent from other shops to be cleaned and painted as part of the equipment overhaul requirements.

The shop shall be divided into two separate areas. The paint portion shall be enclosed and contain the required health and environmental protection features as well as paint spraying apparatus, powered by the shop compressed air system. Fixtures for holding materials during painting as well as for storing various paints and thinners shall be provided. The parts cleaning area will be adjacent to an exterior wall and extend through the wall onto a paved outdoor apron having some degree of cover. This outdoor apron will be used to clean the large items. The cleaning shop and apron shall be drained. Fixtures for storing various cleaning supplies and equipment will be required.

7.6.4 Systemwide Stores

The purpose of the stores is to provide:

- Storage, handling, and issue of spare parts, assemblies, consumable materials, and repairable components.
- Shipping and receiving of various items to and from contractors, and scrap or surplus materials to salvage disposition.
- Accounting and control of District materials for purposes of inventory control, maintenance of required stock levels, control of costs, materials location tracking, and warranty management.

The system wide store shall be a large, enclosed area containing storage racks for large and palletized materials; shelves for small items, loose or packaged; bins for small items in bulk and special fixtures for irregularly shaped items, or those not readily placed in standard fixtures.

The racks shall be arranged for high-stacking. Hand-operated power lift devices as well as lift trucks shall be used to place and remove materials. Aisle-ways shall be provided, compatible with the materials-handling equipment.

A cage or other type of secure storage area shall be provided for small, high-value or theft-susceptible items.

Office accommodations and an area for administrative personnel and files, reference materials, and possibly a computer terminal shall be provided.

A loading dock and materials receiving area will be required. Access from these areas to the store will be controlled.

An issue counter, accessible from the shop areas, shall be provided with space and facilities for forms preparation, parts catalog review, and for clerks and files.

A tool room securable, with storage cabinets and shelves, and an issue counter, separate from the main issue counter will be required.

7.6.5 Maintenance-of-Way Shops

The maintenance-of-way shops shall be a separate facility comprised of support shops for maintenance and repair of equipment items removed from wayside systems; maintenance equipment, including rubber tired vehicles and auxiliary rail vehicles. A headquarters facility will be required, housing management and administration of the various on-line, mobile, maintenance forces including:

- Track and special trackwork
- Traction power substations and distribution system
- Wayside automatic train control, signaling, and communications

- Buildings and structures maintenance, including stations, tunnels, and support systems
- Fare collection equipment
- Grounds and roadways
- Janitorial services

The maintenance-of-way shops will be generally of multi-purpose configuration, dealing with non-routine tasks and equipment unique to the fixed plant, that are not suitable for repair at the main shop. Examples of such tasks and equipment items are:

- Assembly and repair of special trackwork items
- Initial disassembly of large items such as switch machines, prior to routing of electrical equipment to the main shop's component repair units.
- Repair of various motor vehicles, auxiliary rail vehicles, and servicing of equipment mounted on these vehicles.
- Repair of building and structure-related items including carpentry, glazing, repair of various fixtures, sign-painting, and fabrication of various items.

The shops shall be high-bay, of generally open layout, with high capacity flooring capable of supporting large loaded motor trucks and the equipment that may be placed on and removed from them. The support shops shall be equipped with an overhead bridge-type crane. The support shops will consist of the following areas:

- A general repair area, containing work benches, parts racks, shelves and bins, space for employee tool carts, and necessary shop tools and equipment.

- A vehicle repair area, containing service lifts, servicing equipment, tire and wheel servicing equipment, and tune-up equipment. There shall be a single track into the shop from the yard complex, and equipment for minor repair of auxiliary vehicles. Servicing equipment for locomotives will be provided outside shop.
- An enclosed carpentry shop, containing work tables, work benches, carpentry shop tools and equipment, and storage space and facilities for tools, hardware, and supplies.
- An electrical repair shop [To Be Determined]
- An enclosed fare collection equipment maintenance section, containing work benches, tools, test equipment, spare parts and materials storage.
- An administrative area, arranged to reflect the organization of the maintenance-of-way unit, containing offices for management and supervisory personnel, areas for clerical and administrative personnel files, and, possibly, a computer terminal and a communications center with telephone and radio equipment for contacting, controlling, and dispatching mobile crews. Employee facilities will be required.
- Employee facilities including men's and women's restrooms, shower facilities, locker room and a first aid room.
- A loading dock for placing and removing tools and removed and repair equipment items into light trucks and vans.
- A satellite store and tool room will be provided under the control of the main store, equipped similarly to the main store, on a smaller scale.

- A paved outdoor work area where large items of trackwork may be placed and repaired.

7.6.6 Blow-Down Facility

The purpose of this facility is to perform light undercar cleaning of passenger vehicles, by use of compressed air, prior to the vehicles being brought into the shop. This cleaning or "Blow-down," is performed in order to remove accumulated grime, dirt, dust, and other foreign matter from the undercar equipment in order to protect the equipment and to facilitate undercar maintenance actions.

The blow-down facility will consist of a single track, accessible from both ends of the shop and shop leads, and will contain a pit, proportioned for this purpose. The blow-down pit will be readily accessible from the passenger vehicle shops, and will have a shelter and air-treatment equipment.

7.6.7 Fire Protection

Sprinkler system shall be installed in all areas of enclosed structures.

Automatic fire detection systems shall be installed in each facility except where automatic sprinklers are installed.

A met standpipe system shall be installed throughout the maintenance-of-way vehicle maintenance facility, including mezzanine & upper floor areas. Portable fire extinguishers shall be installed throughout all maintenance facilities buildings.

7.7 ADMINISTRATIVE AND SUPERVISION SPACE REQUIREMENTS

Provisions shall be made for accommodation of personnel who will be headquartered at this facility. Space shall be provided within the main shop complex based upon the following assumptions:

Office accommodations and space for clerical support will be required for at least:

- A Maintenance departmental manager
- A passenger vehicle maintenance manager
- A Maintenance planning and control manager
- A Quality assurance/control manager
- A Maintenance engineering manager
- Maintenance planning and control
Estimate = 6 employees in communications center, and data-processing center with a computer and related equipment.
- Quality assurance/control -
Estimate = 5 employees, files.
- Maintenance engineering
Estimate = 4 employees, drafting table(s), work tables, storage cabinets and small library.
- Other
Central files and conference room.

8.0 SUBSYSTEMS

This section identifies and describes major subsystems of the Initial Segment of the Metro Rail Project. The description includes functions, features, performance levels and interface requirements for each subsystem elements.

8.1 PASSENGER VEHICLE

The Passenger Vehicle shall be an electrically powered, steel wheeled vehicle, supported on two 2-axle trucks. The minimum train size shall be a dependent pair of cars, identified as an A-car and B-car with quick-disconnect coupling. Each car shall have a cab at one end so that the pair, when coupled together, can operate in either direction. Also, one pair can operate with another pair. The maximum consist will be 6 cars. The passenger vehicle general arrangement is shown in figure 8-1.

8.1.1 Capacity and Dimensions

The passenger Vehicle will have the following capacity and dimensional characteristics:

Number of Seats	TBD
Average standing room	3.3 ft. ² /passenger
Normal Full Capacity	170 passengers
Standing passengers	TBD
Crush Load Capacity	280 passengers
Length of Car-Over coupler pulling faces	75'-0"
Length of Car-Over Anticlimbers	74'3" to 74'9"
Distance Center to Center of Trucks	52'0" to 54'0" $\pm 0.25"$

Width over Thresholds	10'4" $+0 - 0.125"$
Width in any Plane	10'6" $+0 - 0.375"$
Height Floor from Top of Rail	44-3/4" (New Wheels)
Height Roof from Top of Rail	12'0" (New Wheels)
Height Top Clearance point from Top of Rail	12'6" (Max)
Height Anticlimber from Top of Rail	42-1/2" to 43-1/2" $\pm 0.50"$
Height Ceiling from Floor (Min.)	6'8"
Under Car Clearance from Top of Rail (Min.) (Car Mounted Equipment)	2.5" (Fully worn Wheels)
Doors, Side	TBD per side
Door, Side-Width Opening	48" to 54" $\pm 0.125"$
Door, Side-Height Opening	6'3" to 6'7" $\pm 0.125"$
Doors, End	1 each end
Door, End - Width	28" to 34" $\pm 0.125"$
Door, End - Height	6'3" to 6'7" $\pm 0.125"$
Truck Wheel Base (Max)	7' 6" ± 0.125
Wheel Gage	4' 8-1/2"
Wheel Diameter (New)	28"-34" $0 + 0.125$
Wheel Diameter (Worn)	26"-32"
Maximum Wear Allowance	2" (in the diameter)
Weight - AWO Empty (include ATC Eqpt.)	75,000 - 80,000 lbs.
Weight - AW1 Seated (TBD passengers at 154 lbs. each)	TBD - TBD lbs.
Weight - AW2 Normal Full (170 Passengers at 154 lbs. each)	101,180 - 106,180 lbs.
Weight - AW3 Crush (280 passengers at 154 lbs. each)	118,120 - 123,120 lbs.

8.1.2 Performance

The passenger vehicle will provide the following performance level when configured as a dependent pair:

Speed

Continuous speed on 1.0% adverse grade 70 mph.

Acceleration

Tractive effort response shall be as shown on Figure 8-2 adjusted as follows for all car weights AWO through AW2:

Initial full rate	3.0 mph/sec
Maximum tractive effort deviation	$\pm 10\%$
Average tractive effort deviation over 5-sec interval	$\pm 7\%$

Deceleration

Tractive effort to produce blended brake rates as shown in figure 8-2 as follows for a vehicle with passenger loads up to AW3:

Nominal full rate (70 to 0 mph)	3.0 mph/sec
Open-00p emergency rate (70 to 0 mph)	3.0 mph/sec
Maximum tractive effort deviation	$\pm 10\%$ of full rate
Average tractive effort deviation over any 5-sec period	$\pm 7\%$ of full rate

Jerk Limit

Maximum allowable Jerk requirements under normal acceleration or deceleration 2.0 mph/sec/sec $\pm 10\%$

Wheel Spin-Slide

Spin-slide efficiency above 6% adhesion and 4 mph in braking (see figure 8-3)	80%
In propulsion	60%

Route Performance

Run the initial segment of the Metro Rail Project with all station stops (30 second average dwell at all stations) in 31.5 minutes without exceeding the thermal ratings of the propulsion and friction brake systems. Energy consumption will not exceed [TBD] kw/car-mile. Car weight to be AW2.

Horizontal Curves Negotiating Capabilities

Main Line Minimum Radius	490 feet
Yard, Switch	#6 turnout ([TBD] radius)

Vertical Curves Negotiating Capabilities

Crest or Sag Radius	[TBD] feet
---------------------	------------

Interior Noise Levels Limitations

Stationary	65 dBA
30 mph	68 dBA
60 mph	72 dBA

Wayside Noise

All auxiliaries operating simultaneously. Car stationary (noise measured at 50 ft. from track center line)	60 dBA
--	--------

Car Stationary (measured at 15 ft. from track center line). Each auxiliary operating alone.	65 dBA
---	--------

30 mph - 50 ft. from track center line	73 dBA
60 mph - 50 ft. from track center line	82 dBA

with which the passengers or the operator can come in contact shall not exceed the following values.

Displacement, peak-to-peak	0.10 in
Acceleration, peak value	0.01 g below 20 Hz
Velocity, peak value	0.03 in/sec above 20 Hz

Ride Quality

At any steady car speed up to 70 mph on level tangent track, acceleration of car floor in the vertical and lateral axes shall not exceed limits shown on Figure 8-4.

Measurements shall be made using 1/3 octave bands, and limitations shown on Figure 8-4 at center of each 1/3 octave band shall apply.

Average vibration level during any 10-sec period shall not exceed the values shown on Figure 8-4.

During any slow or rapid linear acceleration or deceleration, or at switches or crossovers, maximum car floor structure acceleration shall not exceed 0.15 g in any direction when recorded to include frequencies of from 1 to 30 Hz.

Towing

Under manual operation, reduced speed and AW3 conditions, the propulsion system shall be capable of pushing or towing a similarly built and loaded dead car (free wheeling, propulsion system cut-out). When part of a train, the collective propulsion systems of the train shall be capable of pushing or towing a similar sized and loaded dead train. Such pushing or towing shall be fully controlled with respect to braking and traction efforts.

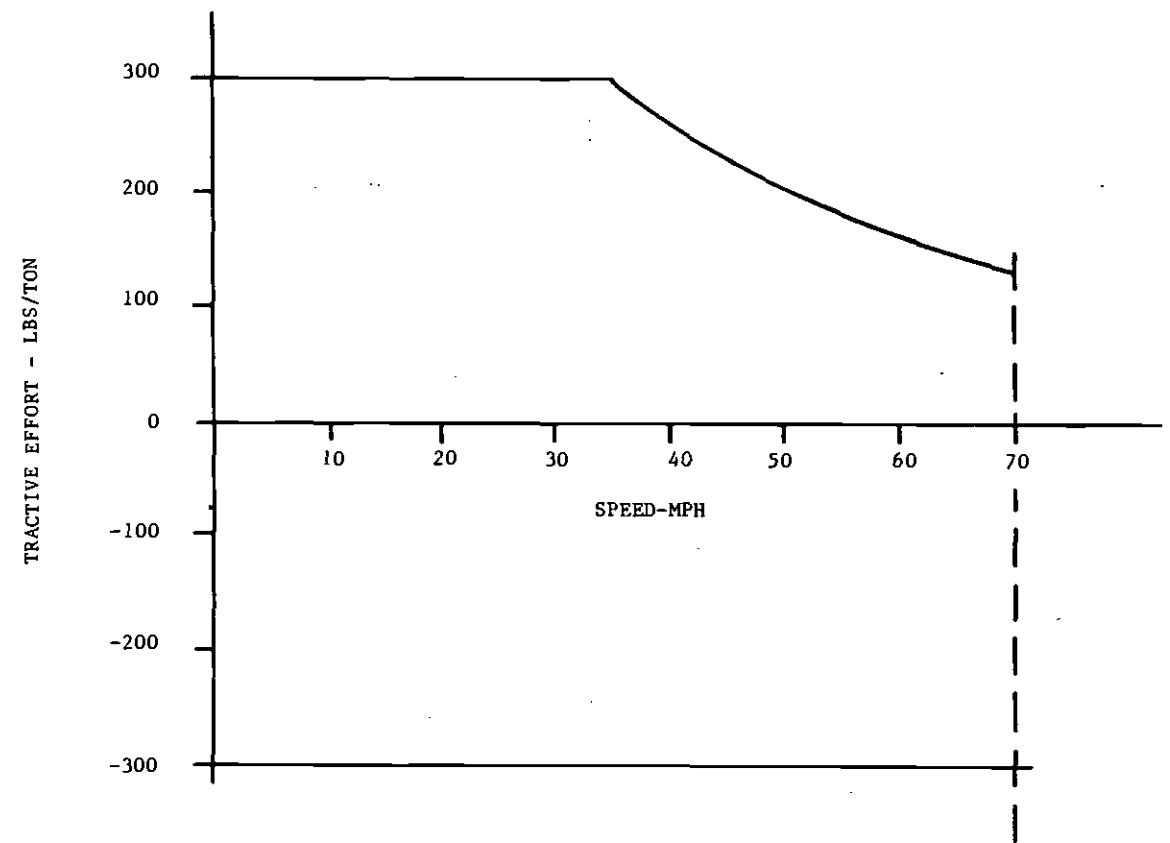
Vibration

With the car stationary and with each individual auxiliary unit operating at rated capacity and with all auxiliary operating simultaneously, the vertical or horizontal vibrations of the floor, walls, seat frames, or any surface

Figure 8-1
Passenger Vehicle General Arrangement

[To Be Determined]

FIGURE 8-2
TRACTIVE EFFORT RESPONSE DIAGRAM



8.1.3 Passenger Vehicle Features

8.1.3.1 Car Body

The car body will constitute the enclosure that will house the passengers during their trip and will provide the structure necessary to resist various normal and abnormal loads and forces. Figures 8-5 shows cab and elevations and body cross sections, and Figure 8-6 shows the dynamic outline. The car body will also provide attachment points for various Passenger Vehicle subsystems. The car body will include the basic structure, doors, door frames and tracks, anticlimbers, collision posts, end underframe/draft sill, ventilation ducts, interior/cab equipment enclosures, seats, interior surface finishes, window and equipment mounting points. The car body will be fabricated from stainless steel alloy. The car ends will be of either metal or fiberglass with metal back-up structure. Thermal and acoustical insulation will be used as necessary to meet the temperature and noise limitations.

8.1.3.2 Car Interior

An operator cab shall be located at the F-end of each car of dependent pairs. The operator cab shall utilize the full width of the car. The operators console and seat will be on the left side of the car. The control console shall house the master controller and all of the controls and indicators needed for operation and supervision of the train in either automatic or manual mode. Cab side windows shall be sliding type, which shall be held securely in open and closed positions by means of latch. The cab door shall be a sliding or plug type door which shall close off the whole cab end to passengers. The door shall have a window in the top half. Car side and side door windows shall be integral units, fixed type, tinted and designed to resist impacts. Each end door shall have window installed. All exterior doors, except end doors shall be sliding bi-parting doors which fully retract into adjacent side wall pockets upon opening. The F-end and R-end doors

shall be single leaf, sliding or plug type doors of metal-faced construction utilizing material consistent with the car exterior. The door seals shall be designed to exclude all weather elements experienced during operation.

Intercar passageway between R-end of a dependent pair and adjacent F-ends shall be designed to give a safe passage between cars. Vertical hand grab (full length of door) will be located adjacent to door opening on the same side of the handle.

Seats will be cantilevered from the walls to provide a clear floor area for cleaning. Seats will be cushioned and contoured to provide passenger comfort and safety. Vandal resistant materials will be used.

Stanchions and handrails shall be positioned throughout the car with an average spacing equal to the armspan of a 5th percentile female. Vertical stanchions and handholds on seat backs will be used. Overhead horizontal railings and hanging straps/handholds shall not be used.

FIGURE 8-3
SPIN-SLIDE EFFICIENCY

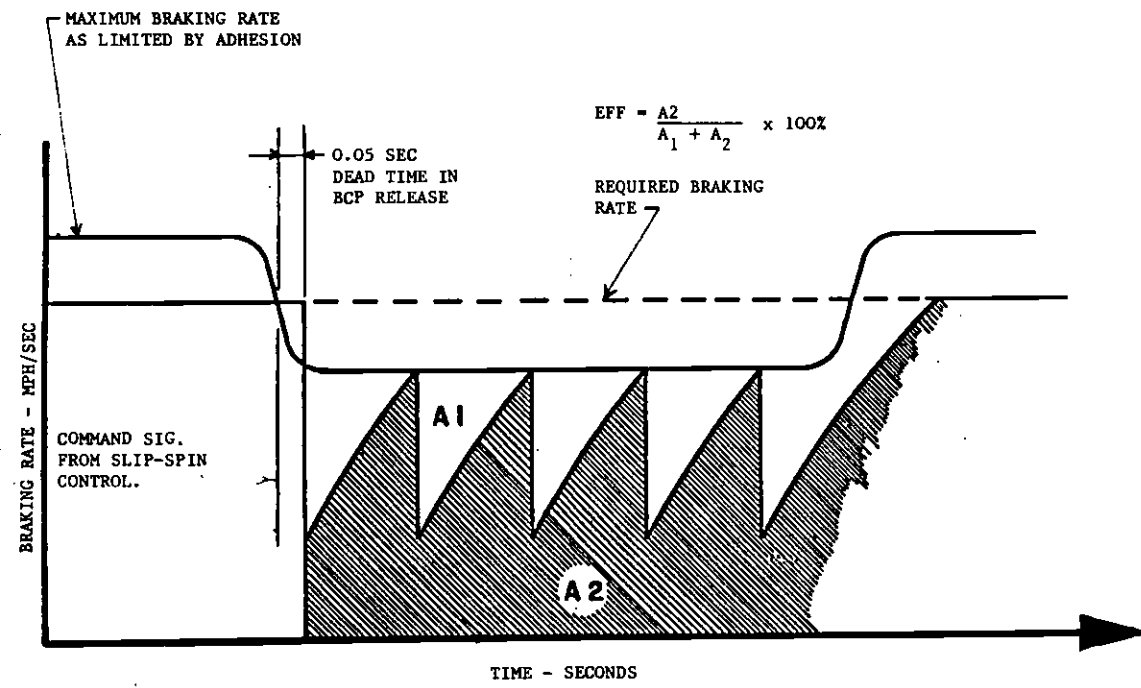


Figure 8-4
RIDE CRITERIA

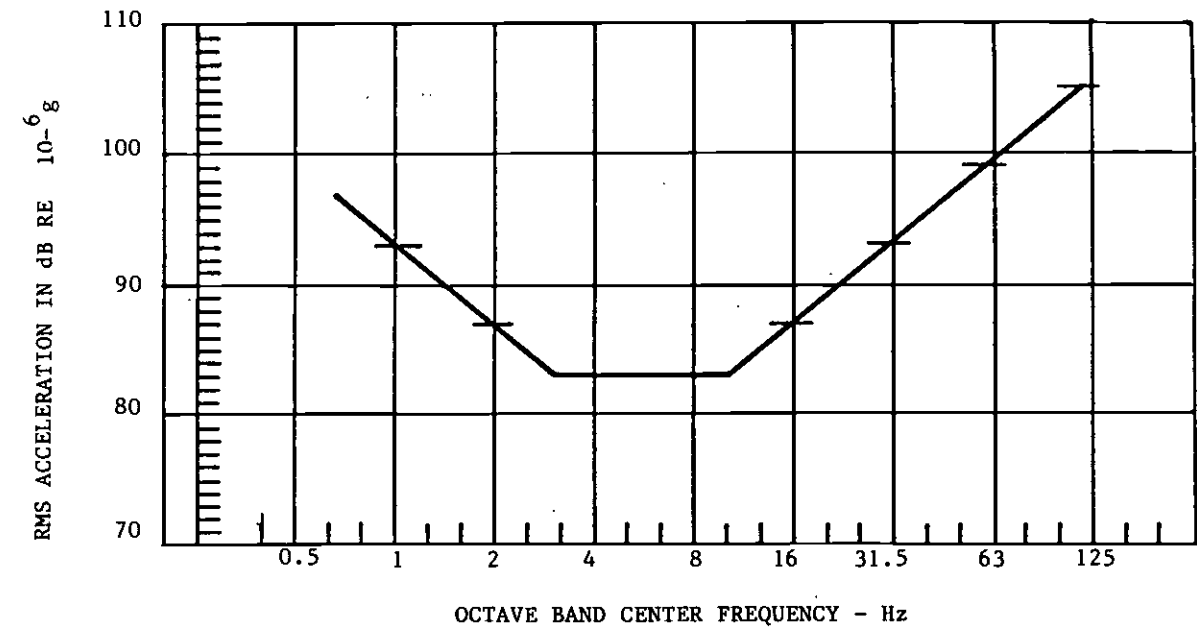
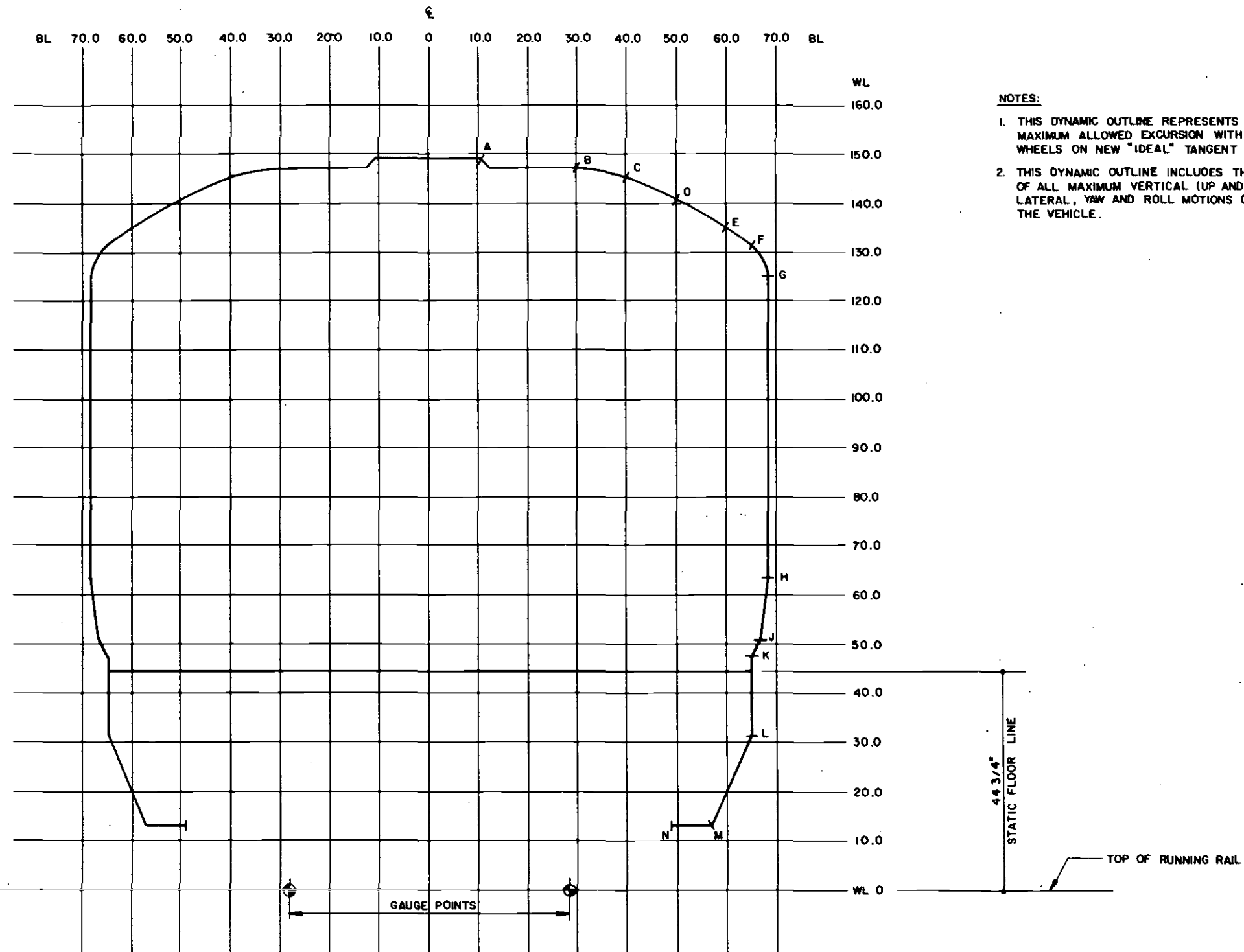


Figure 8-5
Passenger Vehicle Cab End Elevation
and Body Cross Section

[To Be Determined]

OUTLINE COORDINATES		
POINT	BL	WL
A	10.5	149.25
B	30.0	147.25
C	40.0	145.5
D	50.0	141.0
E	60.0	135.35
F	65.25	131.5
G	68.5	125.0
H	68.5	63.5
J	66.75	51.0
K	65.0	47.5
L	65.0	31.0
M	57.25	13.0
N	48.5	13.0

ALL DIMENSIONS IN INCHES
 BL = BUTT LINE - DISTANCE FROM VEHICLE CENTERLINE
 WL = WATER LINE - DISTANCE FROM TOP OF RUNNING RAIL



- NOTES:
1. THIS DYNAMIC OUTLINE REPRESENTS THE MAXIMUM ALLOWED EXCURSION WITH NEW WHEELS ON NEW "IDEAL" TANGENT TRACK.
 2. THIS DYNAMIC OUTLINE INCLUDES THE SUM OF ALL MAXIMUM VERTICAL (UP AND DOWN), LATERAL, YAW AND ROLL MOTIONS OF THE VEHICLE.

THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U. S. DEPARTMENT OF TRANSPORTATION, URBAN MASS TRANSPORTATION ADMINISTRATION, UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA.				DESIGNED BY <i>R. H. Vega</i> DRAWN BY <i>R. H. Vega</i> CHECKED BY <i>R. J. Redd</i> IN CHARGE <i>R. J. Redd</i> DATE		SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT KAISER ENGINEERS (CALIFORNIA) CORPORATION SUBMITTED _____		 OMJM/PBOD/KE/HWA GENERAL CONSULTANTS APPROVED _____		PASSENGER VEHICLE MAXIMUM DYNAMIC OUTLINE		CONTRACT NO. DRAWING NO. A SCALE 1" = 1'-0" SHEET NO.	
REV.	DATE	BY	SUB.	APP.	DESCRIPTION	REV.	DATE	BY	SUB.	APP.	DESCRIPTION		

Figure 8-6
 Passenger Vehicle Dynamic Outline

8.1.3.3 Couplers, Draft Gear and Draw Bars

This subsystem will include the draft gear, mechanical coupler with integral pneumatic coupler, electrical coupler, coupler control unit and train line looping switches. The couplers, draft gear and draw bars will provide the means to physically and functionally join one car to another so that they will operate as a train. The F-end coupler shall be of the tightlock hook type and shall allow fully automatic mechanical, electrical, and pneumatic coupling and uncoupling between units. The trainlines shall interface with the automatic electric coupler at the F-end of each car by means of a flexible multiconductor cable. A manually actuated mechanical coupler with draft gear shall be installed at each R-end. Pneumatic connections shall be made automatically at the coupler head, and Jumper cables with quick-disconnect fittings shall provide continuity between R-ends of each dependent pair. All electrical cables shall be designed to break at the interface to avoid displacement of hoses and cables in the event of unintentional uncouplings. Pneumatic pipes shall be permanently connected to the automatically and manually operated couplers at the F- and R-ends of each car. Pneumatic continuity between cars shall be achieved automatically upon coupling. The air lines shall be capable of being disconnected without mechanically uncoupling the cars.

An anchor casting shall be provided for the attachment of the coupler-draft gear assembly to the car underframe. The draft gear shall be provided at each end of each car to carry coupler loads to the carbody via the anchor casting and its attachment to the draft sill. The draft gear shall be of the double acting, rubber cushion, pre-loading type capable of absorbing shock both in buff and in draft. The draft gear shall be provided with an automatic release mechanism to provide emergency disconnect during severe end impacts.

8.1.3.4 Door Operation and Controls

Each vehicle shall have TBD doors per side for passenger entrance and exit movement between platform and car. Each doorway shall contain sliding doors of bi-parting panel type with two panels per door, opening from center wall. Each of the bi-parting side door panels shall be operated by its own operating mechanism.

Door control signals shall be trainlined so that all doors on each side of train may be operated (opened and closed) automatically by automatic train control system or manually by train operator.

Emergency by-pass controls shall be provided, using sealed switches. Each door leaf/operator combination shall incorporate an obstruction sensing feature and a manual release feature. The obstruction sensing shall be sensitive enough to detect a one-inch diameter object (equivalent to a small wrist). The manual release feature shall allow a door panel to be pushed back 1-1/2 inches. The door control circuit shall retard the door closing cycle when an obstruction is met. Each door leaf shall have its own door operator that shall function independent of its mating unit. The door operator shall be electrically powered. An audible door warning shall be sounded inside the vehicle before the doors close. One set of doors on each side in each car shall have an internal and external manual emergency release.

8.1.3.5 Heating, Ventilation and Air Conditioning

The subsystem components shall be completely installed on the car being served. It shall be constant circulation type with the subsystem arrangement having a single unitized package containing the mixing plenum, filters, fan, cooling circuit and duct heater.

Heating shall be provided by electric resistance heaters operating on primary voltage. Cooling shall be accomplished by electromechanical simple vapor cycle equipment consisting of condensing unit with compressor, fan cooled condenser, refrigerant filter/dryer and refrigerant receiver; evaporator unit with expansion valve, evaporator coils, fan and drain fan, interconnecting and drain piping; and controls.

Air movement within the car and outside air drawn into the subsystem shall be accomplished by resiliently mounted, direct driven fans supplied as a part of the evaporator unit.

8.1.3.6 Lighting

The passenger vehicle lighting provision shall be as follows:

- Interior - The interior lights shall be fluorescent type. Power shall be provided from the low voltage supply available at low voltage circuit breaker. Lighting shall not be on less than three circuits with one circuit supplying fixtures near the side and end doors for emergency lighting. The light level inside the car shall be an average of 30 to 40 foot-candles at the reading plane.
- Emergency - Emergency lights shall be provided to illuminate the doorways and to provide safe levels of illumination throughout the car for at least one hour. Emergency lights shall be powered from the emergency bus.
- Exterior - Exterior lights shall consist of headlight (high and low beams), tail lights and exterior indicator lights. Headlights shall be illuminated only at the operators' end of the train. The tail lights will serve as marker lights and shall be illuminated when the car is configured to be the tail car of a train.

8.1.3.7 Auxiliary Electrical

The AC auxiliary electrical apparatus on-board the passenger vehicle includes all electrical apparatus, components, panels, wiring, connectors, etc. except those included in the ATC or communications systems. The AC auxiliary electric configuration utilizes an inverter or motor-alternator which feeds regulated AC power to the AC motors for major power items, and a low-voltage power supply operating from the primary power source.

The AC auxiliary apparatus operating on nominal 120/208 VAC shall include the loads for air conditioning fans, air-conditioning compressor and propulsion blower. The low-voltage power supply operating on 36.5 ± 5 VDC will include loads for lighting, ATC, propulsion control, brake control, public address communications apparatus, vehicle-wayside communications apparatus, door control, operator cab monitor and control panels, and air conditioning controls.

The air compressor and car heating elements shall be powered off the 750 VDC traction power system.

Each B-car shall be equipped with nickel cadmium batteries of sufficient capacity to meet the load requirements for a dependent pair of cars, including that of trainline control for the maximum number of cars in a train, to permit the train to operate normally for a period of at least one hour without the charging supply.

8.1.3.8 Propulsion

Each car unit of propulsion equipment shall include:

- Chopper control power conditioning apparatus
- Four motors, complete with gear units, lubricant, suspension, and flexible couplings.

- A single-pole, double-throw knife switch shall be located in an accessible undercar position to disconnect connector power from all carborne systems. The switch shall be positioned so that it cannot close by gravity.
- A main fuse and line switch shall be provided in the traction power circuit capable of interrupting maximum fault currents to protect traction power circuits, with remote resetting.
- Propulsion status indicators shall be located at the operator auxiliary control and indicator panel as follows:
 - Propulsion -- dead car
 - Loss of dynamic braking
 - Failure of the line breaker to open
- The propulsion apparatus shall provide power to all axles by means of an electric motor for each axle. The motors may be either self-ventilated or forced-ventilated. The motors shall be resiliently mounted to the truck frame. Coupling to the axles shall be through gear units directly connected to the motor with a resilient attachment to enter the axles or the motors. Parallel reduction drives shall be used. All speed sensors shall be mounted on the gear units.
- Ground brushes shall be provided on the gear units or at other appropriate locations to shunt maximum traction return currents around the anti-friction bearings to the axle groundbrush and slip-rings.
- Propulsion motor control circuitry, solid state modulation devices, blowers, and brake grids shall be mounted undercar. Propulsion control logic assemblies may be located in the cab.

- A line filter shall protect the wayside supply and car propulsion apparatus from unwanted transients.

8.1.3.9 Propulsion and Braking Control

The chopper control power conditioning apparatus shall respond to signals from:

- Automatic train control system or the operator manual controls, limited to authorized speed by signals from wayside apparatus.
- Speed sensors which provide the actual feedback from the wheel slip/slide protection system to insure maximum wheel/rail adhesion.
- Mode switch which control the automatic/manual commands.
- Internal feedback circuits in the acceleration and braking systems.

The power conditioning apparatus will adjust the tractive effort in response to load-weight signals, blend friction with electric braking, provide spin-slide control, and produce the commanded tractive effort. Car retardation shall be accomplished by a coordinated effort of dynamic and regenerative electric braking. The propulsion apparatus shall regenerate the maximum energy that the contract rail can accept, and shall dissipate unaccepted energy as heat in the resistor grids or friction brakes. When the line is receptive, regenerative braking shall take priority over dynamic braking.

Electric braking shall be the primary braking mode, with friction brakes taking over at near zero speeds and during emergency stops.

8.1.3.10 Trucks and Suspension

The trucks and suspension will include the wheels, axles, springs, bearings, leveling valves, articulation and structure necessary to guide the vehicle along the rails and provide a smooth ride. This subsystem

will also provide mounting and interface provisions for the traction motors, gear boxes, friction brake and power collection equipment.

Trucks frames shall be either cast low-alloy nickel steel or fabricated welded steel construction. Each car will be supported on two four-wheeled, roller bearing equipped, swivelled trucks, on each of which will be mounted two traction motors. The suspension apparatus shall include primary springs at the journal boxes, air springs at the truck and carbody interface, and load levellers. In the event of air pressure loss in one spring, simultaneous deflation of the air springs on both sides of the truck shall result. The air springs shall be backed by elastomeric stops to support the carbody in the event of air spring failure. The car will operate safely at all speeds with any or all air springs inoperative or deflated. A loadweighing apparatus will automatically maintain car floor height at a level of 3/4" above the nominal station platform height up to and including AW3.

8.1.3.11 Friction Brakes

Friction brakes will be provided on each car. The friction brakes will apply retarding force to discs mounted on each axle assembly by means of brake pads. The friction brake will provide the following primary functions:

- A continuously variable service brake which will supplement the electrical braking effort.
- A fail-safe emergency brake.
- A parking brake.

The service friction brake will be controlled in conjunction with the propulsion apparatus including blending, slip/slide protection, speed taper, jerk limiting and load weighing functions. The friction brake effort will be controlled on a per-car basis, except for slip/slide protection which will be controlled on a per-truck basis.

Friction brake subsystem control will be fail-safe to the extent that no single failure or combination of common mode or common cause failures, will result in less than 50 percent of emergency braking effort per car being available.

An emergency brake application will result from at least any one of the following conditions:

- Depressing the emergency stop pushbutton on the operator's control console.
- Track trip activation.
- Command from the ATC brake assurance apparatus
- Failure in the brake subsystem.
- Train break-in-two.
- Loss of main air reservoir pressure below 75 percent of nominal.
- Command from the ATC rollback apparatus

Each operator's console will be equipped with the following friction brake subsystem indicators:

- A "Brake On" indicating light that will annunciate the activation of one or more brake units in the consist.
- A "Parking Brake On" annunciator light that indicates that all parking brakes on the consist are applied.
- A dual-needle air pressure gauge that displays brake cylinder and brake pipe pressure on that car.
- An indicating light for the "Cut-Out-Valve" when activated to cut-out service brakes but not emergency brakes.

8.1.3.12 Operators Controls and Displays

The operator controls and displays subsystem shall facilitate the manual operation of the train or allow the operator to supervise and monitor the automatic operation of the train.

Major controls to be provided to the operator will include:

- Operating Cab selection
- Operating Mode Select (ATO, Manual)
- Master Controller
- Emergency Brake
- Side door Open/Close
- Side door interlock by-pass (sealed)
- ATP by-pass (sealed)
- Coupler Controls
- Performance Limit
- Train Radio Control
- Lights
- Wipers
- Horn.
- Train Identification Selector

The following conditions or system failures/malfunctions shall be detected, annunciated and displayed to the operator:

- Authorized Speed Limit
- Actual Speed
- P-Signal
- Air Pressure (Main Reservoir and Brake Cylinder)
- ATP By-pass Indication
- Train Identification and Destination
- Performance Limit-on
- Train Equipment Fault Indication
- Doors Open/Closed Indication.
- Power/Propulsion Failures/Malfunctions
- Program Stop
- ATP and ATO Failures/Malfunctions
- Activation of Critical Cutouts and Bypasses
- Improper Berthing at Station Platform
- Heater/Air-conditioning thermal overload

8.1.3.13 Communications

The car-mounted communications equipment shall be capable of transmitting and receiving undistorted, clear, intelligible voice and data communications.

Passenger vehicle communication apparatus shall provide the following functions:

- The Public Address (PA) apparatus shall enable train operators to make public address announcements to all passengers on the train from the operating cab.
- The PA apparatus in all cars shall be automatically connected, when cars are coupled, to form a single operating system.
- Switching shall be provided to permit patch-in transmission from Central Control into the PA system.
- The Inter-communications (IC) service shall be designed for maximum intelligibility to permit passengers to communicate from certain locations with the operator in the operating cab. The passengers' IC panel shall be equipped with a loudspeaker press-to-talk switch for signalling the operator. A microphone shall be located on the operator's console and a loudspeaker shall be located on the side wall of the cab. The IC service shall also have the capability for signaling and communication between cabs of vehicles on a train.
- The 8-channel train radio with automatic call capability shall be installed in the cab. One speaker shall be provided in each cab dedicated to continuous radio reception when the handset is "on-hook" and resting in its cradle. The microphone on the operator's console shall be used for radio transmissions.

- Communication Control Unit (CCU) shall be in an integrated control unit installed in each console in the operator cab of each car and will serve to coordinate all carborne communications. One microphone shall serve all modes of communication from the cab console. A communication mode selection and control panel shall be provided.

Power shall be applied when the operator's console keyswitch is placed in the ON position. The CCU shall interface with and provide controls to the following equipment:

- Public Address
- Passenger Intercom
- Cab-to-Cab Intercom
- Space radio

8.1.3.14 Passenger Vehicle ATC

Passenger vehicle ATC requirements are defined in Section 8.2. The following are typical ATC functions:

- Vehicle ATP. The ATP apparatus shall receive and decode wayside-generated speed limit signals provide overspeed protection, prevent train operator from opening doors unless the train is berthed in a station, prevent train movement when doors are open, and provide protection against rollback, or unintentional train movement.
- Vehicle ATO. The ATO apparatus shall perform automatic speed regulation, actual speed indication, and programmed station stop.
- Vehicle ATS. The ATS apparatus shall provide automatic train identification, and train length information to the wayside via a train-to-wayside communication link. It shall provide for transmission to the train information for performance level adjustment and control of station dwell time.

8.2 AUTOMATIC TRAIN CONTROL

The Automatic Train Control (ATC) system shall provide three major functions: Automatic Train Protection (ATP); Automatic Train Operation (ATO); and Automatic Train Supervision (ATS). These functions will be used to enforce train safety, control train movements, and direct train operations on the mainline, and in the yards. The ATP function shall provide for safe train operation, with the ATO and ATS functions entirely subordinate to the ATP function. ATP, ATO and ATS functions shall be coordinated in the design of mainline, vehicle, yard, and Central Control equipment.

The ATC system shall provide three functions defined as follows:

ATP. The ATP shall assure and maintain safe train operation under all conditions. The ATO and the ATS functions shall be entirely subordinate to the ATP function. No subsystem malfunction or component failure shall result in unsafe train operations. The ATP function shall provide broken rail detection, train detection, safe train separation, speed limit enforcement, route security through interlockings, control of traffic direction, prevention of train start-up when doors are open, prevention of vehicle door operation at stations when a train is in motion and prevention of train rollback.

ATO. The ATO shall perform operating mode control, speed regulation, and programmed station stopping.

ATS. The ATS shall monitor train operation and provide controls and indications, automatic routing, vehicle performance modification, and automatic dispatching necessary to maintain intended traffic patterns and minimize the effects of train delays on the operating schedule.

8.2.1 ATC Equipment Configuration

The ATC System shall consist of equipment located along the mainline wayside, in ATC equipment rooms in or near stations, and on terminal station platforms; in Central Control; in passenger vehicles; and in the yards and yard control equipment rooms. Central Control will communicate with other equipment locations via the DTS and Communications Systems, and Data Transmission System (DTS).

The ATC equipment, described in the following sections, shall provide the ATC functions of ATP, ATO, and ATS:

8.2.1.1 Wayside Equipment

The wayside ATC equipment shall perform, ATP, ATO, and ATS function, as specified below:

Wayside ATP. The wayside ATP apparatus shall perform the functions of:

- Detecting the presence, on any portion of the track, of a train having worst-case shunt characteristics
- Detecting auxiliary vehicles, on any portion of the track.
- Generating and transmitting safe speed limits to all trains
- Detecting a broken rail on any portion of the mainline
- Separating trains by at least a safe braking distance
- Controlling the direction of traffic on a given section of track
- Verifying safe train berthing within station platform limits.

Wayside ATO. The wayside ATO apparatus shall provide the function of programmed control of the train speed during entry into stations for station stopping, by providing accurate location information to the vehicle ATC equipment.

Wayside ATS Apparatus. The wayside ATS apparatus shall perform the functions of:

- Train identification and train tracking
- Control of signs at stations indicating train destination, boarding location, and dwell time
- Automatic route control at terminals
- Controlling of the train dispatch and station dwell timing
- Programmed modification of train speed and acceleration, for energy management and schedule recovery.

Wayside equipment as specified below shall be located along and between the tracks. Other equipment shall be located in the ATC equipment rooms. Equipment located along the tracks shall include:

- Track circuit, and cab signal transmission apparatus, and impedance bonds,
- Track switch machines, switch circuit controllers, and locks; fixed wayside signals at all interlocking entrances; and mechanical trip stop apparatus to enforce signal protection,
- Programmed station stop apparatus; train start and next train out signals; and stopping position signs,

- Train to wayside, and wayside to train communication apparatus,

Equipment located along the tracks will be controlled by equipment in the ATC equipment rooms. Equipment in these rooms shall consist of:

- Track circuit and cab signal transmitters and receivers, and speed limit selection circuits
- Interlocking relay logic, control equipment for switch machines, fixed signals, and train stops, and local manual control panels
- Train berthing and door enable equipment, programmed station stop equipment, and automatic dispatch equipment
- Automatic route control equipment at terminal stations.

In addition, a terminal supervisor's panel shall be located at each terminal.

8.2.1.2. Central Control Equipment

Central control ATC equipment shall be located in the Central Control facility. It shall interface to wayside equipment via the DTS, and to passenger vehicle ATC equipment via the train radio. The Central Control ATC equipment shall consist of the following:

System Status Display. The system status display shall provide a dynamic representation of the condition of the ATC system and the traction power contact rail. The display shall be used to monitor the operation of trains by the central operators. The display shall provide the following indications:

- Track occupancies, at stations, interlockings, and for at least every 1000 feet of track between stations
- Route alignment and traffic direction
- Identification of trains in Emergency Manual (ATP Cutout) Mode, and of sections of track with reduced speed orders in effect.
- Power status of contact rail segments.

The display shall be operated by the Central Control Computer system.

Train Control Console. Identical train control consoles shall be provided for each train control dispatcher and supervisor personnel. Each train control console shall be designed to be operated from a seated position and shall include a cathode ray tube display unit, a special-function keyboard, and a communications panel.

Each train control console shall provide controls for the following functions:

- Route selection and switch control, as permitted by the ATP function
- Transfer of control to or from interlocking local control and terminal supervisor's panels
- Control of station stopping mode, modification of dwell signal, and control of train performance levels
- Selection of mode and control of dispatching at terminals, including selection among resident dispatch schedules

- Acknowledgment of alarms displayed at the train control console and on the system status display.

The control actions entered at the train control console shall be transmitted by the Central Control computer system to wayside equipment via the DTS.

Each train control console shall provide the following indications:

- Track occupancy indications, with train identification for each occupancy
- Route alignment and traffic direction; approach locking limits; switch correspondence during auxiliary switch operations; and fixed signal aspects
- Requests for transfer of control to local control or supervisor's panels
- Mode and status of terminal dispatch equipment and trains
- System and subsystem alarms

The operator shall be able to select whether the display indicates the entire system, or a detailed view of a portion of the system.

Central Control Computer System. The Central Control Computer (CCC) System shall operate the system status display and train control consoles, and shall interface to the wayside ATC equipment via the DTS. The CCC shall also interface to the Traction Power System, the Communications System, and the ventilation system and the Management Information System, to receive information on equipment status, and provide summary information on the ATC system.

The CCC shall consist of at least two computers, with associated disc, tape, terminal, and printer peripherals. The two computers shall be arranged so that one computer is normally providing the ATC system functions and the second is providing a backup capability. The second computer shall also be usable for simulation or program development. The design shall provide for rapid connection of the second computer to the ATC system in case of failure in the first computer.

8.2.1.3 Passenger Vehicle ATC Equipment

Passenger vehicle ATC equipment shall provide the following functions:

Vehicle ATP. The vehicle ATP apparatus shall perform safety-related functions whenever the train is operating in ATO mode or MTO mode, including all MTO submodes. It shall:

- Provide a cab signal, or visual indication of the ATP speed limit, in the train operator's cab, and provide overspeed protection to command a service brake application whenever the train exceeds the safe speed limit.
- Provide brake assurance by commanding an emergency brake application whenever safe deceleration is not confirmed after an ATP brake command or a deadman brake command.
- Prevent the train operator from opening doors unless the train is berthed in a station, at zero speed, and then permit door operation only on the side facing the station platform; and prevent train movement when the doors are open.
- Provide protection against rollback, or unintentional train movement

Vehicle ATO. The vehicle ATO apparatus shall:

- Establish the operating mode of the train in response to the settings of the controls on the train operator's console;
- Perform automatic speed regulation by commanding the propulsion and brake equipment when the train is operating in the ATO mode.
- Perform the programmed station stopping function during operation in ATO mode, unless the train operator or wayside ATS equipment commands a station runthrough.
- Provide a speedometer signal during operation in any mode.

Vehicle ATS. The vehicle ATS apparatus shall provide for the manual insertion of a train performance level adjustment while the train is operating in ATO mode, to enable modification of operating speed or acceleration rate. The vehicle ATS apparatus shall provide for receipt of performance modification commands from the wayside ATS. The performance levels shall be as shown in the following table:

<u>Performance Level</u>	<u>Percent of Command Speed</u>	<u>Percent of Normal Acceleration</u>	<u>Function</u>
1	100	100	For recovery from a system anomaly and headway adjustment (decrease);
2	90	100	For normal operations;
3	75	100	For headway adjustment (increase) and energy conservation;
4	50	50	For headway adjustment (increase) and energy conservation;
5	25	50	For restrictive ATO under abnormal circumstances

The vehicle ATS apparatus shall communicate operator-entered train identify, destination, and status information to wayside ATS apparatus. The vehicle ATS apparatus shall permit the operator to cancel a station stop.

The vehicle shall correctly respond to cab signals of nominal strength, and shall not respond to interference signals generated by cross-talk or propulsion equipment.

The vehicle ATC shall interface to the vehicle radio, for reception of the ATP Cutout enable, transmission of the ATP Cutout alarm, and transmission of the train run number to identify voice communications and cutout status.

8.2.1.4. Yard ATC Equipment

The yard ATC equipment shall consist of the following:

Track Circuits. Track circuits shall be provided for train detection throughout the yard. The track circuits shall be:

- Mainline type on transfer and lead tracks
- Power frequency type at interlockings
- Non-vital, single-rail type on storage and shop access tracks

Interlocking. Track switch machines and detectors, dwarf signals at all interlocking entrances, and vital interlocking relay circuits with route, approach, traffic, and detector locking shall be provided within the yard.

Grade Crossing Gates. Crossing gates shall be provided at all grade crossings

Wash Facility Signals. Dwarf signals will be provided at each entrance to the vehicle wash facility to protect vehicles within the Wash Facility

Yard Control Tower. The train control panel shall provide a dynamic representation of the condition of the yard ATC system and the traction power contact rail. The yard train control panel shall be used to monitor and control the operation of trains.

The train control panel shall provide controls for the following functions:

- Entrance/exit route initiation
- Acknowledgement of yard ATC alarms
- Emergency release for the vehicle wash facility signals and for crossing gates

The train control panel shall provide the following indications:

- Occupancy of transfer tracks, interlockings, and storage tracks
- Status of routes and traffic direction, fixed signal aspects, switch correspondence, locking limit approaches, and storage switch positions
- Status of grade crossing apparatus
- Power status of contact rail segments
- Alarm indications.

8.2.2. Operational Constraints

In design and implementation of the ATC system for the Starter Line, the following operational constraints and assumptions shall apply:

- Each train shall be controlled by a train operator during all train operations.
- Controls on the train operator's console shall enable selection of one of two active modes of operation, and three submodes, as follows:
 - Automatic (ATO) mode: Automatic train operation with automatic train protection. ATO shall be the normal mode for mainline operations.
 - Manual (MTO) mode: Manual train operation with automatic train protection, under operator control. In addition, MTO shall have three additional submodes:
 - Stop and Proceed submode. Limited automatic train protection at reduced speeds, when no command speed is received by the vehicle ATC.
 - Wash submode. Limited automatic train protection and reduced automatic speed regulation.
 - Hostling submode. Limited automatic train protection for reverse operation.

An ATP Cutout function shall be provided as an emergency means of moving a train which is disabled due to ATP failure. To use this function, the ATC must receive an enabling signal via train radio from Central Control, or the operator must activate a sealed cutout switch.

- The ATC system shall provide for gradual degradation of service, depending upon the severity of abnormal operating conditions or equipment failures. Full service at minimum headway shall be possible in either ATO or MTO mode.
- Train operations in the reverse direction of traffic shall be performed with vehicles in the ATO or MTO mode, up to the commanded speed limit.
- Interlockings at locations other than the ends of the lines shall enable the system to allow trains to turn back or operate on a single track.
- Train locations and movements throughout the mainline shall be displayed and manually monitored at Central Control, to determine whether trains are operating on schedule within acceptable limits.
- All movements of trains between yard tracks and mainline tracks shall be coordinated by Yard Control and Central Control.
- At stations, door operation shall be manually controlled, with ATP interlocks. Door control enable of right or left doors shall be accomplished by a wayside-to-train transmission which shall occur when the train is within the limits of the station platform and shall indicate platform location to the right or left side of the train. The right or left side doors shall be manually opened, provided the proper door control enable command is received.
- Train operators shall control the station dwell time, based on the ATC dwell signal indication.

8.2.3. Performance Requirements

The ATC system shall meet the following performance requirements:

- Use of the maximum allowable speeds consistent with headway requirements, at a minimum design headway of 90 seconds, to allow for a scheduled minimum headway of 120 seconds.
- Reverse running with ATP protection on either track, with following move capability, with programmed station stopping in both directions.
- Manual entry of trains into mainline service, with ATP protection, from any station, terminal, or yard.
- At interlockings, the capability of aligning any route, controlling traffic, and performing local switching from either Central Control or the local control panel. Transfer of control to the local panel shall normally be allowed only with authorization from Central Control.
- Central display of information relative to train operations, including the position of trains, route alignment, traffic direction, slow order indications, and traction power contact rail status.
- Central control from a train control console of all functions for each mainline interlocking, and display of all indications and trouble alarms necessary for controlling the interlocking functions.
- Automatic routing at terminal station interlockings for normal train operation.

The block system shall be designed for a 90 second headway, using a minimum number of blocks to achieve the specified headway at the maximum attainable speeds, constrained by civil speed limits and track conditions. Safe braking distance shall be the primary criterion in determining the length of the blocks. Safe braking distance shall be determined on the basis of dependable wheel-to-rail adhesion and shall include the cumulative reaction time of all communications, control, and

braking apparatus. Safe braking distance shall be computed with the use of the specified constant service braking rate for all speeds below 50 mph and a linearly decreasing rate for 50 mph and above. The effect of track grade on the braking rate shall be included in the design of the block system.

The system shall operate with a maximum train length of six vehicles. The station blocks shall be designed to provide safe door opening interlocks with trains of up to six vehicles.

Full cab signaling shall be provided for the reverse direction of traffic. Block boundaries established for the normal direction of traffic shall be used for the reverse direction of traffic whenever possible.

8.2.4. Fail-safe Design and System Safety

The ATC system shall always maintain the system in a safe state. The ATC system shall be designed to absolutely ensure that any malfunction affecting safety will cause the system to revert to a state known to be safe. The design shall incorporate into the ATP apparatus all functions of the ATC system which affect safety. The following design criteria shall apply:

- ATP shall be designed to be fail-safe, independent of other ATC functions.
- The equipment shall be designed and constructed so that no single failure or multiple failures from a single cause can cause a train to respond unsafely. Failures which affect train safety shall be self-annunciating or self-detecting. Annunciation of failures which affect safety shall be by fail-safe means, or by stopping the train or by imposing a speed limit that is known to be safe. Failures that are not self-detecting shall not cause unsafe conditions. No combination of non-self-detecting failures shall cause an unsafe condition.

The ATC system shall conform to the safety recommendations of American Railway Signaling Principles and Practices of the Association of American Railroads, and to the relevant requirements of the California Public Utilities Commission.

8.2.5. Fail-Operational Design

The ATC system shall be designed to ensure that, to the greatest practicable extent, any first failure shall result in the system continuing to be capable of performing its design function.

The capability will be provided by:

- Modes which permit failed equipment to be safely bypassed.
- Redundant subsystems, as in the Central Control Computer subsystem, and provision of redundant elements or components.
- Distributed control capability, as in the local Interlocking Control Panels.

8.2.6. ATC Maintenance

Maintenance and test provisions for the ATC shall be made to support:

- Periodic demonstration of ATC equipment safety
- Rapid troubleshooting of central, wayside or vehicle ATC equipment to the level of the failed Lowest Replaceable Unit (LRU)
- Cost-effective repair of failed LRUs in a maintenance shop.

Test equipment and procedures shall be provided for digital and analog electronics, computers, and software. Built-in test and diagnostic capabilities shall be provided to support safety demonstration, in-service restoration of equipment, and repair of failed LRUs.

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- Periodic demonstration of ATC equipment safety
- Rapid troubleshooting of central, wayside or vehicle ATC equipment to the level of the failed Lowest Replaceable Unit (LRU)
- Cost-effective repair of failed LRUs in a maintenance shop.

Test equipment and procedures shall be provided for digital and analog electronics, computers, and software. Built-in test and diagnostic capabilities shall be provided to support safety demonstration, in-service restoration of equipment, and repair of failed LRUs.

8.3 COMMUNICATIONS

The communications system shall provide specified voice, video and data communication capabilities for the people who use, operate, maintain, supervise, and protect the Metro Rail system, and for the equipment which comprises it. The communications system shall consist of private voice, video, and data circuits linking Central Control with stations, passenger vehicles, and other areas within the Metro Rail system, and with the public telephone network. These functions shall be provided by nine basic communications network elements: radio, telephone, public address, fire and security, closed circuit television, intercom, and the data and cable transmission equipment, and Central Control Computer.

The communications system shall provide the following:

- ° Timely, safe and convenient transfer of information between operating personnel and equipment shall permit orderly system operations and fast, well-informed responses to service disruptions or incidents. The system shall provide for tactical communications for emergency response organizations.
- ° A visible indication of the surveillance and communications measures of the patron security apparatus in the passenger stations and vehicles.
- ° Access to the sequence of events of an occurrence, by operations, security and maintenance management through the communications system data collection, storage, and retrieval equipment.

The communications system equipment will be distributed in Metro Rail Central Control, passenger stations, passenger and auxiliary vehicles, yards, shops, equipment rooms and other structures to provide these functions.

8.3.1 Communication System Services

The communications system shall consist of the following services.

8.3.1.1 Radio Service

The radio service shall provide two-way duplex voice communication over six channels for train operations, yard operations, test and start-up operations, maintenance operations, security and emergency communications. The radio service shall also include equipment to support two future channels for expanded operations and maintenance areas. Digital data shall be transmitted from passenger vehicle to Central Control for train identification, and for mode control and indication. The radio service shall also provide one-way voice and tone signaling communication to operations and maintenance personnel. Portable radios shall be provided for mobile staff.

The radio service shall also provide repeaters for the city and county Fire Department radio channels, as described in the Fire and Security Service section.

8.3.1.2 Telephone Service

The telephone service shall consist of a private automatic branch exchange (PABX) which will provide an administrative telephone service (ATEL), an emergency telephone service (ETEL), a fire telephone service (FTEL) and a maintenance telephone service (MTEL). The telephone switching equipment shall use solid-state components and single party telephones for ATEL, ETEL, and FTEL at Central Control, yards, shops, stations, and other specified locations.

The emergency telephones (ETEL) shall be wall-mounted telephone sets with armored cables, located at the ends of passenger station platforms, on emergency management panels in traction power, ATC, communications and ventilation equipment rooms, and at traction power trip

station boxes along the wayside. Emergency telephones will ring, alarm, and will be connected to the emergency telephone on the communications console at Central Control. ETEL used at Trip stations and EMPs will be separately annunciated at Central Control. ETEL circuits shall be monitored for correct operation. Except in public areas, telephone instruments shall provide access to all telephone services.

Public pay telephones will be installed at passenger stations and other specified locations.

Maintenance telephone jacks will be located at all train control equipment locations along the wayside, as well as other designated locations.

The fire telephone system (FTEL) shall provide party line communication for tactical emergency operations within a local area of the system. Jacks will be provided at each Emergency Trip Station, Fire Department inlet connection, hose outlet connection (except hose cabinets in stations), Emergency Management Panel, and other Fire Department Command Posts. FTEL circuits will run from each station to the two adjoining stations.

8.3.1.3 Public Address Service

The public address service (PA) shall have three elements. Each element shall have control consoles, amplifiers, and speakers required to provide intelligible one-way voice communication. The PA elements shall be:

Station PA. Each passenger station shall be equipped to provide public address service. Control of the passenger station PA apparatus shall be provided at the Patron Assistance Area and at the emergency management panel in each station, and at the communications and console at Central Control.

Central Control shall have a continuous track voice recorder/player, connected to the PA service, capable of playing a five-minute prerecorded message.

Yards and Shops PA. The public address service in yard and shop facilities shall be an integral part of the intercom/paging service. Control of the PA shall be provided at Maintenance Control and at each intercom point by switching to the paging service as described in section 8.3.1.6.

Vehicle PA. The vehicle PA shall enable train operators to make announcements to all passengers on the train from the operating cab. The vehicle PA equipment in all cars shall be automatically connected when cars are coupled to form a single train PA system. The vehicle communications equipment shall allow radio messages from Central Control to be connected into the vehicle PA.

8.3.1.4. Fire and Security Service

The fire and security service shall consist of the fire and security logic control equipment, emergency management panels, fire and intrusion detectors, and radio repeater stations. The fire and security logic control equipment, shall be located in each passenger station, yard and shop area, and Central Control, shall monitor and control the fire and security subsystem. Displays and controls for the logic control equipment shall be provided on the emergency management panel.

The emergency management panel, located in the free area of the passenger stations, shall serve fire department personnel fighting a fire in a Metro Rail System station and track side areas. This panel shall have displays, connections, and controls for the logic control equipment, FTEL, ETEL, ATEL, and a PA system microphone at the station locations.

Radio repeater stations shall rebroadcast the LA City Fire Department and LA County Fire Department radio channels to provide two-way communications between their personnel when in the Metro Rail System tunnels and stations.

8.3.1.5. Closed Circuit Television Service

The CCTV service shall consist of television cameras, lenses, markers, sequencers, splitters, and television monitors for surveillance of passenger stations. These CCTV signals from each passenger station shall also be transmitted to Central Control for continuous monitoring. Provision shall be made for video tape recording CCTV images.

Where specified, station cameras shall be fitted with pan, tilt, and zoom functions, which shall be remotely controllable from Central Control's surveillance room.

8.3.1.6. Intercom Service

The intercom service shall have three elements. Each element shall have hand or headsets, microphones, speakers, preamplifiers, amplifiers, signalling and cabling to provide two-way communication within fixed facilities and on passenger trains. The intercom elements shall be:

Station Intercom. An intercom service shall be provided within each station. The service shall provide for hands-free communication between a patron in a passenger station and the Central Control. Remote intercom units shall be installed at each elevator entrance within the station, within elevator cabs, in the fare collection area, and outside restrooms. To initiate a call, the calling party shall depress a momentary signalling switch. This shall sound an audible annunciator and illuminate an indicator in Central Control corresponding to the calling remote unit. The communication center attendant shall connect the remote unit to the

master intercom unit. All required push-to-talk and disconnect functions shall be performed by the communication center attendant.

Yards and Shops Intercom. An intercom/paging service shall be provided within the train storage yard and maintenance shop area. Loudspeakers shall be placed throughout the service area. Intercom stations shall be located in the yard at every light standard, in the shops at major service areas and in key staff offices and facilities in the shops. The intercom/paging service shall provide area voice paging and also intercommunication between any two intercom stations. The paging function shall be initiated by activating any intercom station (e.g., by lifting a handset) and depressing a 'page' button. The message shall be relayed through all loudspeakers. When the person responding activates any other intercom station, the intercom function shall automatically silence all loudspeakers and provide for direct two-way communications between the two intercom stations. Indications such as lights and a busy signal shall be provided at all other intercom stations to indicate that party line is in use.

Passenger Vehicle Intercom. An intercom service shall be provided within each passenger vehicle. Trainline interfacing shall be provided so that a remote intercom unit within any vehicle of a consist can be connected to the master intercom unit within the activated operator's cab of the lead vehicle of the consist. The service shall provide hands free communication between train passengers and the train operator within the operator's cab. To initiate a call the passenger at the remote intercom unit shall depress a momentary signalling switch. This shall activate an alarm at the operator's cab intercom center. The train operator shall then connect the remote unit to the master intercom unit and perform all push-to-talk and disconnect functions.

In addition, the master intercom unit in the lead cab shall be connected to all other master intercom units within the train. Intercab communications shall be initiated similar to the passenger area-to-cab communication. The microphone in the train operator's cab shall be used for intercom, public address, and radio communications.

8.3.1.7 Data Transmission Service

The Data Transmission Service (DTS) shall provide for the transmission of indications and alarms between the remote equipment locations and Central Control. All transmissions shall be through the cable transmission service. The DTS transmissions shall include:

- Traction power alarm, indication, and control signals
- ATC alarm, indication, and control signals
- Mechanical equipment and auxiliary power alarms
- Fire alarm signals
- Tunnel ventilation alarm, indication, and control signals
- Security and intrusion alarms
- Communications alarms
- CCTV control signals
- Electrical and mechanical system status indications and alarms such as fire, gas and earthquake detectors.

Data shall be transmitted in full duplex, bit-serial fashion, under control of the DTS central station and the Central Control computer. Error-detecting or error-correcting codes shall be used.

8.3.1.8 Cable Transmission Service

The Cable Transmission Service (CTS) shall be the backbone of the communications subsystem. The following signals, communications and data shall be transmitted through the CTS:

- Telephone services
- Remote public address operation
- DTS
- Radio signals for satellite transmitter/receiver operation
- Closed circuit television
- Specified remote controls

The CTS shall be composed of remote multiplex units interfacing the information sources with a fiber optic multi-cable transmission service. The multi-cable transmission service shall link together the following locations with remote multiplex units at each location:

- Central Control train control and communications room (TC & C Room)
- Station TC & C Room
- Yard Control TC & C Room
- Maintenance Control
- Traction Power Substations

The carrier mode shall be digital with a capability of operating at a bit rate capable of transmitting the type and quality of data and signals required of the service without impeding the operation of the Metro Rail System. CTS service shall have a performance equivalent to that of a completely hardwired service.

The remote multiplexer digital apparatus shall provide voice grade channels for telephone, remote public address and radio audio.

The CTS shall provide two redundant channels. Failure of one channel's transmission line or repeater shall cause the remote multiplex unit to switch to the other transmission link, and shall cause a communications alarm to be provided at Central Control.

8.3.2. Communications System Functional Centers

The communications system will be used in five major functional centers in the Metro Rail system. These functional centers, shown in the Function Block Diagram Figure 8-7, will be:

- Central Control
- Passenger Stations
- Passenger Trains
- Yards and Shops
- Maintenance Control

The communications system shall provide the specified services between these functional centers.

The communications requirements at the functional centers are specified in the following sections.

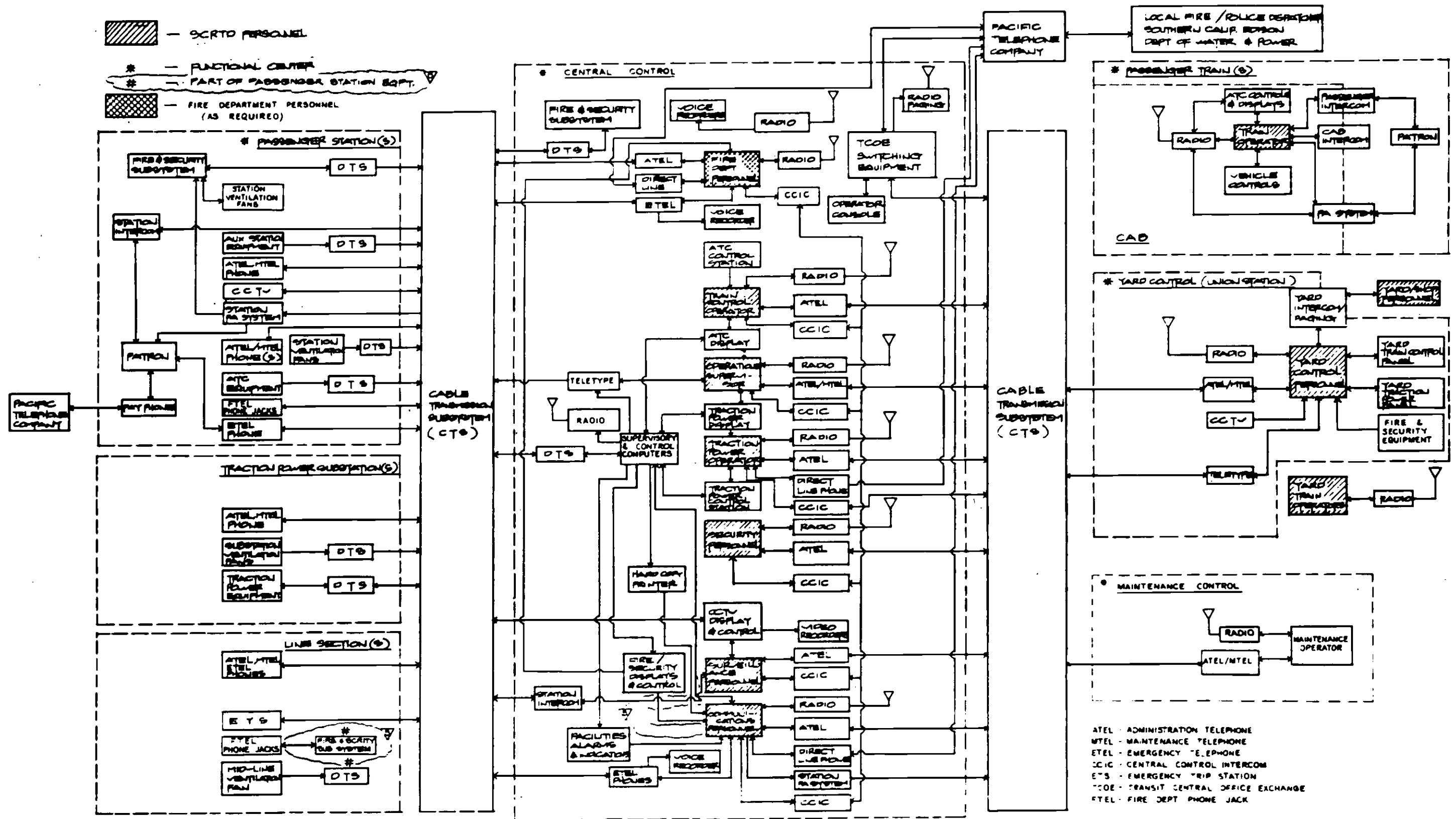
8.3.2.1. Central Control Communication

Central Control will be the nerve center of the System and as such, will be the focus of system operation. It shall contain displays, controls, consoles, communications equipment, and operating personnel. It will be staffed continuously during revenue service and as required during other hours. Upon detection of a failure or emergency condition affecting System operation, Central Control personnel will implement corrective action to restore or maintain Metro Rail System operation. Displays, controls, and communications equipment shall be centered at this location for automatic train control supervision, traction power supervision, systemwide communications, and surveillance and security.

Central Control will be divided into the following areas: operations center, surveillance and transit police center, data processing room, and communications equipment room.

Operations Center Communication. The operations center shall contain status displays and controls for the automatic train control system, traction power system, and ventilation system. The operating personnel will coordinate all activities within the operations room which affect revenue service operation from control consoles. Each display and control console shall be equipped with radio, telephone (ATEL), and intercom communications, and each display and control console shall be able to make public address announcements to a selected train or all trains in revenue service. Data communications to central control shall be provided from field locations for automatic train control, traction power, and ventilation systems monitoring. Metro Rail personnel based at this center will include a traction power operator, a train control operator, and a supervisor's console operator.

Communication Center. Within Central Control, the communications center shall contain status displays for facilities alarms and indications, fare collection displays and controls, fire/security displays and control, a supervisory computer hard copy printer, voice recorder and a communications console. The communications console shall be equipped with radio, telephone (ATEL, ETEL, and MTEL), station public address, and intercom. The console shall be capable of making public address announcements in each or all passenger stations to passenger trains, and within Central Control. Direct line communications to local fire, police, and emergency service shall be provided to coordinate their activities. An emergency telephone display shall be provided to indicate where the emergency call originated. A separate ETEL line shall be provided for Emergency Management Panel calls. A voice recorder shall be activated to record all ETEL communications. The intercoms shall be able to communicate directly with the assistance intercoms in each of the stations when the stations are unattended or the station attendant is unable to answer a call.



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SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT



COMMUNICATIONS DIRECTIVE DRAWINGS
GENERAL FUNCTIONAL ARRANGEMENT
DIAGRAM

CONTRACT NO.	
DRAWING NO.	ED-032
SCALE	NO SCALE
SHEET NO.	

Figure 8-7
 Communications System General Functional Arrangement

Surveillance and Transit Police Center Communication. The surveillance and transit police area shall contain video monitors, with three monitors per passenger station, and a surveillance console. Each video monitor shall show sequenced images from the passenger stations. The surveillance console shall have the capability to stop the sequencing and display the scene from only one camera. A video recorder shall be provided to record selected video information. The surveillance console shall be equipped with a radio controller, and a telephone set (ATEL/E TEL), and shall be equipped with intercom (CCIC). The surveillance and transit police area shall also contain the security supervisor's desk equipped with radio, telephone set (ATEL/E TEL) and intercom communications to direct all Metro Rail security forces. The radio shall include two transit police and six Metro Rail channels.

Communications Equipment Room. The communications equipment room shall contain the CTS equipment, the DTS equipment, the telephone exchange, radio base station(s), fire and security auxiliary equipment, power amplifiers, and other communications auxiliary equipment.

8.3.2.2 Passenger Station Communication

Patrons will enter and exit the Metro Rail System through the passenger stations. It will be divided into, at least, the following: public free and paid areas, train control and communications (TC & C) room, public equipment telephone room, a traction power substation at specified locations, ancillary areas, and other equipment rooms.

Station Agent Panel. The Patron Assistance Area shall contain, behind a secured panel an ETEL/ATEL/MTEL telephone, a PA system microphone for making public address announcements, a remote annunciation panel, and a manual fire alarm station, as well as the control panel for the fare collection equipment.

TC & C Room(s). The train control and communications room shall contain automatic train control equipment and communications equipment for the following: CTS, DTS, CCTV, station intercom system, fire and security, station public address, and associated components. Telephones (E TEL/ATEL/MTEL/FTEL) shall be provided in these rooms.

Public Areas. The public areas of a passenger station shall contain CCTV cameras for surveillance, PA speakers, ETEL telephone sets located on the station platform, emergency management panel(s), station intercom to allow patrons to communicate with Central Control, and pay telephones.

Ancillary Areas. Telephones (E TEL/ATEL/MTEL/FTEL) and clocks shall be provided in the ancillary areas of the passenger station such as mechanical rooms, vent shafts, power substations, as specified.

Telephone Company Room. This room will contain Pacific Telephone Company cable termination and electronic peripherals for pay telephones located throughout the public area.

8.3.2.3 Passenger Train Communication

Passenger trains will consist of multiple cars connected together to operate for revenue service with a train operator's cab at the head end, and patrons located throughout the train. Displays, controls, and communications equipment shall be located in the cab to monitor and control train movement, control opening and closing of doors, communicate with Central Control, and communicate with patrons when required.

Train Operator's Cab. The cab shall contain ATC and other displays and controls and a micro phone and communications control panel for operating the train radio, the train public address system, the patron intercom and cab-to-cab intercom for communications to other cabs in the train.

Patron Area. The patron area shall contain public address speakers for announcements from the train operator or from Central Control via the radio system. Patron intercom units shall be provided for emergency communications between patrons and the train operator.

8.3.2.4 Yard Control Communication

The yard and shop will be in the vicinity of Union Station. Yard Control will consist of the following areas: yard operations; communications and train control equipment room.

Yard Operation. Displays, controls, and communications equipment shall be located at the yard operations room to monitor and coordinate trains entering or exiting the yard, and also to monitor and coordinate train movement within the yard. The yard operations shall contain displays and controls for the yard ATC and traction power system, a radio remote controller, telephone (ETEL/A TEL/MTEL), and yard intercom/paging systems, and a high speed printer for Central Control communication. The yard intercom/paging system shall permit call and talk to yard/shop personnel within the yard and shop area.

Communications and Train Control Room. This room shall contain equipment for the CTS, yard ATC system, radio base station (for the yard), and yard intercom/paging system. A yard radio tower and antenna shall be included to cover the yard and shop areas.

Yard and Shop Area. The yard and shop area shall contain ETEL instruments MTEL jacks, and yard intercom/paging stations.

8.3.2.5 Maintenance Control Communication

All Metro Rail System maintenance will be coordinated from Maintenance Control, which will consist of a console for radio, and a telephone (ATEL/ETEL/MTEL/FTTEL).

8.3.2.6 Fire and Security Communications

Fire and Life Safety. The fire and life safety subsystem shall consist of sensors, a data gathering panel and control unit, emergency management panel(s), displays, indicators, controls, and wiring.

Annunciation for the gas and seismic alarms, fire alarms, and security subsystems shall be integrated and displayed on one panel at Central Control. Specified functions throughout the stations and associated midline vents shall be annunciated. The fire department shall be notified automatically when any fire safety annunciation occurs. All indications and alarms shall be sent to Central Control. Ventilation functions shall be controlled from Central Control from Emergency Management Panels, and at the fan controllers.

Security. The security subsystem shall consist of specified door and gate security alarms. Bypass switches at specified doors will be provided. All indications and alarms shall also be sent to Central Control. The security system shall also include recording surveillance cameras to monitor fare card dispensing equipment.

Fire Department Communications. The Emergency Management Panel shall contain a supervised communications network at each underground station consisting of telephones (FTTEL, ETEL, and ATEL) and station PA. The fire department communications subsystem shall consist of control stations, telephone subsystems, annunciator panels, function switches, radio repeaters and antenna and supervision circuitry for a complete operational system. Fire phone jacks shall be located along the tunnels. A lossy line antenna shall provide a continuous radio communication link between fire fighters and the Emergency Management Panel.

8.4 POWER SYSTEMS

The power subsystem shall consist of all electrical and mechanical devices required to energize the Initial Segment of the Metro Rail Project.

8.4.1 Power Sources

Power will be taken primarily from the Los Angeles Department of Water and Power, and possibly from the Southern California Edison Company. Edison will provide power at 16KV and the Los Angeles Department of Water and Power will provide power at 34.5KV.

The utility companies shall provide two redundant, three-phase, 60 hertz incoming power circuits to each traction power substation. Each circuit shall have sufficient capacity to supply the substation maximum power demand.

8.4.2 Traction Power Substations

Traction power substation shall distribute power to the total system including the vehicles.

The traction power substation shall supply rectified (DC) power at a nominal 750 volts to the vehicles via a contact rail through collector shoes attached to the vehicles.

The traction power substations shall operate unmanned. Each traction power substation shall be provided with a local equipment status annunciator (alarm) panel. The annunciator panel shall annunciate trouble locally and, through a supervisory control interface terminal cabinet, remotely at Central Control.

The rating of traction power substations shall be in accordance with the power requirements of the trains as demanded by the operating schedule during maximum traffic periods, and within limits of the permissible

maximum voltage drops and acceptable current capacity of the contact rail. The basis for substation ratings for the Metro Rail starter line will be peak period operation with six cars/train at 2 minute headways. A typical substation will be rated 5 MW, 34.5KV primary. Substations shall be capable of supplying the peak current for starting and accelerating of 6-car trains operating at 2-minute headways. During normal operation with all substations in service, substation spacing shall allow simultaneous starting at full performance of two six-car trains at any passenger station and at reduced performance midway between substations. With any one traction power substation out of service, the remainder of the substations shall be capable of maintaining train operations.

8.4.2.1 Substation Spacing

The Metro Rail starter line will require 19 traction power substations as shown in Figures 5-22 and 5-23. Sixteen of the 19 traction power substations will be located at or near the passenger stations. One traction power substation will be located in the train yard, one in the main shop and one will be located approximately midway between the Universal City Station and the Hollywood Bowl Station.

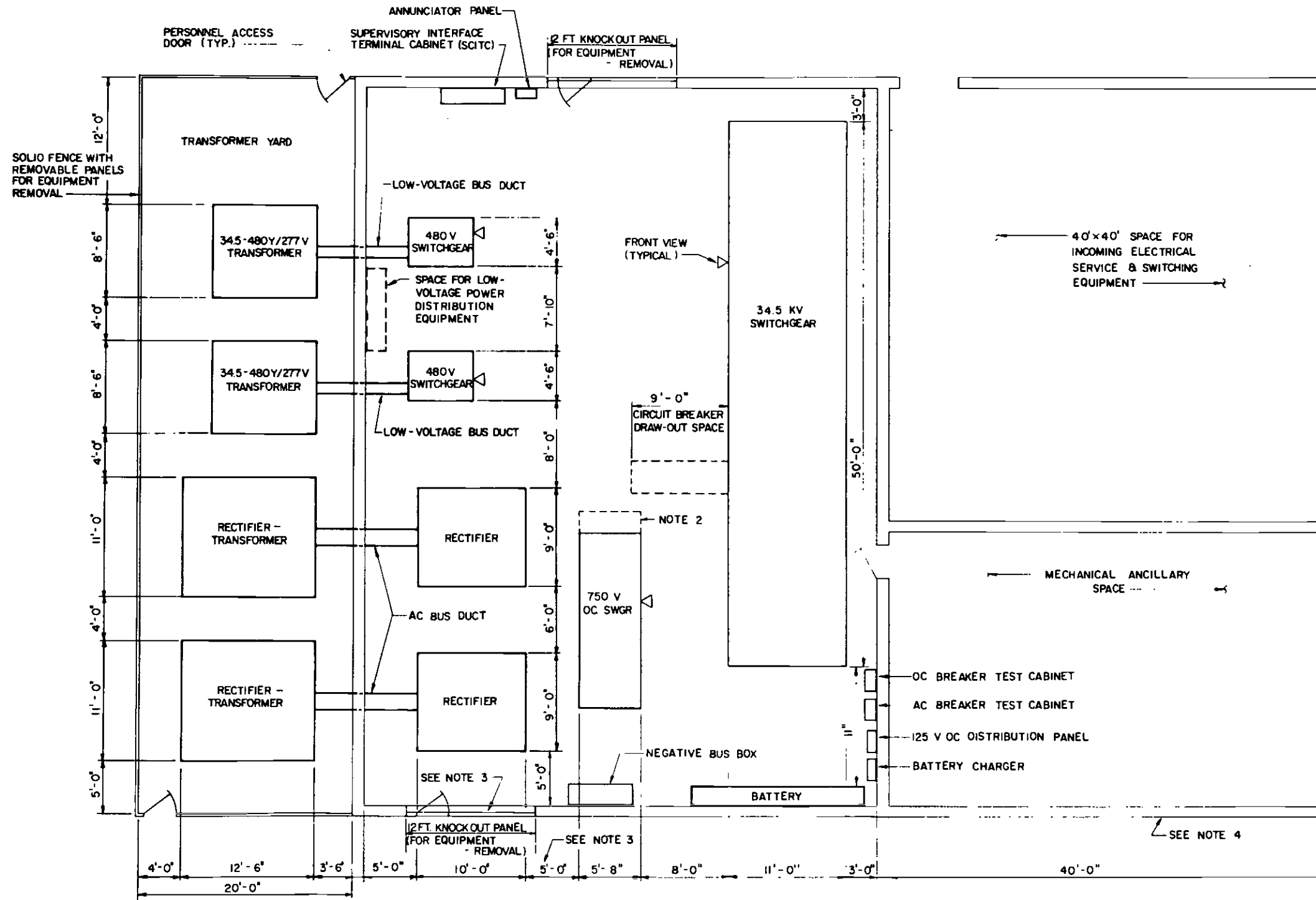
8.4.2.2 Substation Requirements

The equipment within the traction power substation will include unitized transformer-rectifier assemblies, AC and DC switchgear, interconnecting bus ducts, controls, and other ancillary equipment for the supply of vehicle power to the contact rail.

A typical traction power substation equipment layout is shown in Figure 8-8 for at grade and Figure 8-9 for below grade substation.

Each substation shall include:

- Power Utility Service



NOTES :

1. EQUIPMENT OUTLINES ARE SHOWN FOR SPACE ALLOCATION ONLY. ACTUAL EQUIPMENT DIMENSIONS WILL VARY WITHIN THESE OUTLINES.
2. DIMENSIONS OF D.C. SWITCHGEAR WILL INCREASE 2'-0" FOR STATIONS WITH POCKET TRACKS.
3. WHERE SECOND KNOCK-OUT PANEL IS NOT USED, SPACE BETWEEN O.C. SWITCHGEAR AND RECTIFIERS MUST BE INCREASED TO 12 FEET, WITH CORRESPONDING INCREASE IN BUILDING DIMENSION.
4. SUBSTATION BUILDING WALL SHALL FACE TOWARD PASSENGER STATION.
5. CONDUIT STUB-UP LOCATIONS ARE PRELIMINARY.

THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U. S. DEPARTMENT OF TRANSPORTATION, URBAN MASS TRANSPORTATION ADMINISTRATION, UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA					
DESIGNED BY	J. Bauer				
DRAWN BY	Y. G. Olf				
CHECKED BY	I. SHAFIR				
IN CHARGE	P.M. Burger				
DATE					
REV.	DATE	BY	SUB.	APP.	DESCRIPTION
1					GENERAL REVISION
2					INITIAL ISSUE

DESIGNED BY
J. Bauer
 DRAWN BY
Y. G. Olf
 CHECKED BY
I. SHAFIR
 IN CHARGE
P.M. Burger
 DATE

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

KAISER ENGINEERS (CALIFORNIA) CORPORATION

DMJM/PBOD/KE/HWA
 GENERAL CONSULTANTS

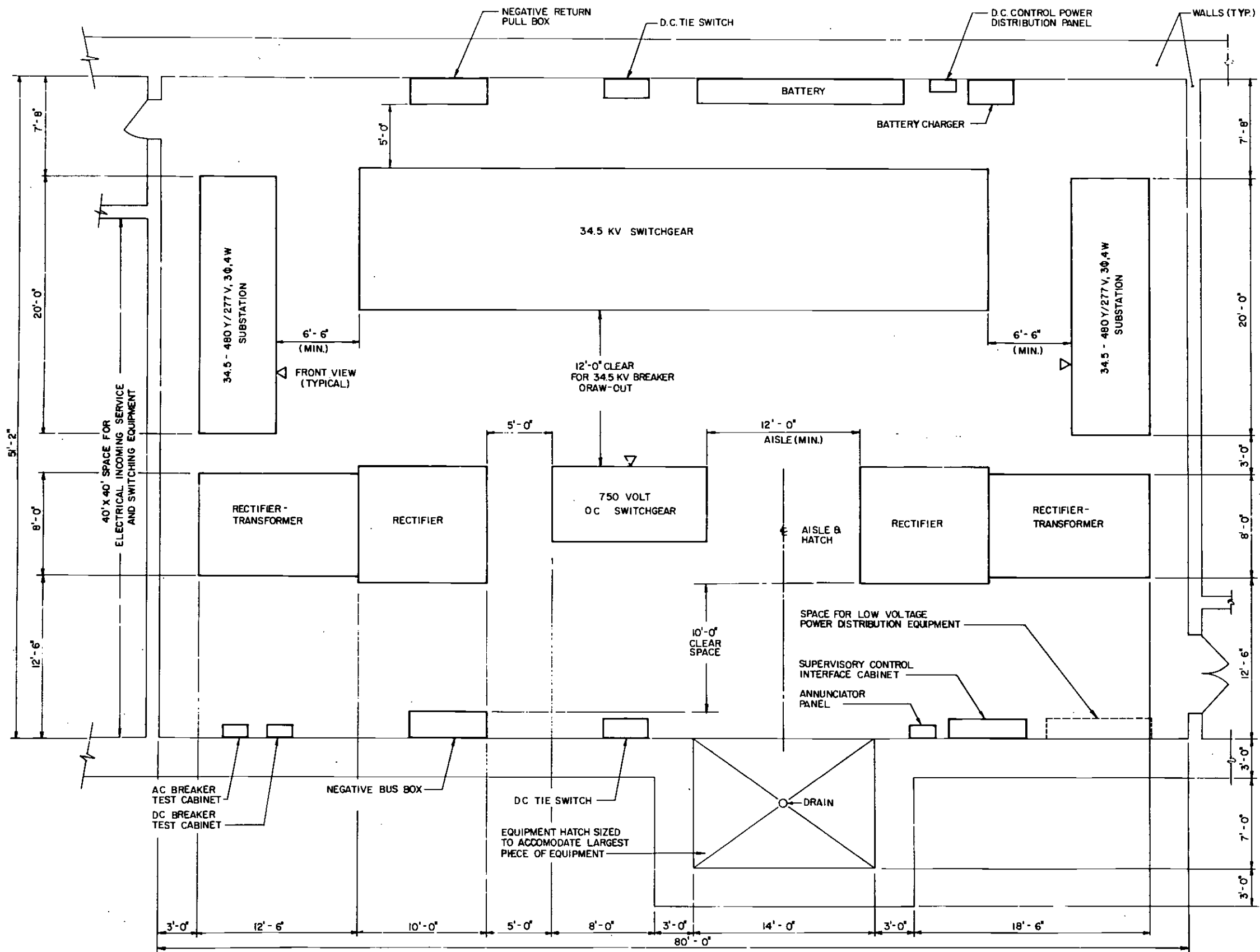
SUBMITTED

APPROVED

TRACTION POWER SUBSTATION
EQUIPMENT LAYOUT-AT GRADE

CONTRACT NO.	
DRAWING NO.	ED-014
REV.	B
SCALE	3/16" = 1'-0"
SHEET NO.	

Figure 8-8
Traction Power Substation Equipment



- NOTES:**
1. EQUIPMENT OUTLINES ARE SHOWN FOR SPACE ALLOCATION ONLY. ACTUAL EQUIPMENT DIMENSIONS WILL VARY WITHIN THESE OUTLINES.
 2. DIMENSIONS OF O.C. SWITCHGEAR WILL INCREASE 2'-0" FOR STATIONS WITH POCKET TRACKS.

REV.	DATE	BY	SUB.	APP.	DESCRIPTION
1	7/4/00	R.A.			INITIAL ISSUE
2	8/24/00	A.B.			GENERAL REVISION

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DESIGNED BY
R. Bassin
DRAWN BY
V. S. OIP
CHECKED BY
I. SHAFIR
IN CHARGE
RMB
DATE

**SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT**

KAISER ENGINEERS (CALIFORNIA) CORPORATION

OMJM/PBQO/KE/HWA
A JOINT VENTURE
GENERAL CONSULTANTS

RTD

**TRACTION POWER SUBSTATION
EQUIPMENT LAYOUT-BELOW GRADE**

CONTRACT NO.	
DRAWING NO. ED-015	REV. B
SCALE 1/4" = 1'-0"	
SHEET NO.	

Figure 8-9
Traction Power Substation Equipment Layout—Below Grade

A space of 40 ft. x 40 ft. x 18 ft. high, shall be allocated in each traction power substation for the utility company service equipment, including primary switching apparatus, potential transformers, current transformers, lightning arresters, controls, and metering devices. This space shall be secured for use solely by utility company personnel.

° High-Voltage Ac Switchgear

The high-voltage AC switchgear will receive power from the utility company service equipment and will distribute it to the traction power conversion equipment. The AC switchgear assembly will also provide the means for metering and controlling the distributed AC power.

The switchgear assembly shall consist of high-voltage circuit breakers or load-break fused disconnect switches, which will be electrically operated.

All necessary protective relays and meters shall be provided to protect and monitor the traction power conversion equipment, and Metro Rail personnel.

° AC to DC Conversion Equipment

Two sets of AC to DC conversion equipment shall be provided at each traction power substation to convert high-voltage, 3-phase, 60 hertz AC power to 750 volts DC (nominal) power, for transit vehicle traction and auxiliary power.

Each set of conversion equipment shall be composed of a rectifier transformer and a rectifier, designed as a package unit. Each power conversion unit shall meet the loading requirements consistent with the American Public Transit Association (APTA) guidelines and those specified in the

National Electrical Manufacturers Association (NEMA) Standard RI-9, for extra-heavy-duty traction service.

The AC to DC conversion equipment shall be composed of the following elements:

- Rectifier Transformer. Each rectifier transformer shall be a 3-phase, 3-winding, metal-enclosed, ventilated dry-type (if indoor or oil-filled if outdoor) unit, suitable for extra-heavy-duty traction service. The transformers shall be designed for either indoor or outdoor service, consistent with the locations of the traction power substations at or below street level. Each transformer shall have 2 low-voltage windings, which will be connected to the power conversion rectifier by an AC busway.
- Rectifier. The rectifiers shall be of the silicon diode-type, contained in a free-standing enclosure, and air-cooled by natural convection. The rectifiers shall be designed for extra heavy-duty traction service, with 750 VDC nominal output using 12-pulse double-wye rectification.

° DC Switchgear

The DC switchgear shall be composed of rectifier cathode (positive current) circuit breakers and wayside distribution feeder circuit breakers. Each rectifier cathode breaker, shall electrically connect the positive DC current output from one transformer-rectifier conversion unit, to the DC switchgear bus. Each feeder breaker will electrically connect a section of the wayside distribution subsystem to the DC bus.

- Control Power Supply and Distribution

A dedicated control power supply shall be provided at each traction power substation and gap-breaker station, to provide 125 VDC control power for the operation of all switching equipment and associated protective, control and indicating devices.

The 125 VDC control power supply shall be composed of the following elements:

- Battery. The battery shall be designed for switchgear service with nickel-cadmium or lead-acid type cells, producing a nominal voltage of 125 VDC.
- Battery Charger. The battery charger shall be of the silicon controlled rectifier, constant-voltage type, convection cooled, and rated according to the battery capacity.
- Dc Distribution Panel. The panel will distribute the necessary DC control power required by the electrical equipment. It shall be a general purpose, surface-mounted unit, equipped with a main incoming molded-case circuit breaker, a sufficient number of molded-case branch circuit breakers, and provisions for future additional breakers.

- Negative Bus Box

One negative bus box shall be installed at each traction power substation. The bus box will provide a common termination point for negative current return cables from the wayside impedance bonds to the negative terminal of the traction power rectifiers, and for any utility drainage cables required for stray current mitigation (corrosion control).

- Substation AC and DC Busways

Busways (ducts) shall be used to connect equipment such as the rectifier-transformer to the rectifier, and the rectifier to the DC switchgear. They shall be of either copper or aluminum and capable of carrying continuously rated current and overloads, without exceeding the maximum allowable temperature rise.

- Local Annunciator Panel

Each traction power substation shall be provided with a local equipment status annunciator (alarm) panel. The annunciator panel will annunciate trouble locally and, through the supervisory control interface terminal cabinet (SCITC), remotely at Central Control via the DTS.

- Supervisory Control Interface Terminal Cabinet (SCITC)

A terminal cabinet shall be provided at each traction power substation to be used as an interface point, to interconnect the DTS to the traction power system equipment.

8.4.3 Auxiliary Power

The substations shall supply AC power for the operations of various electrical and mechanical systems including:

- Lighting
- Heating, ventilating and air-conditioning equipment
- Escalators, elevators, and other mechanical equipment
- Fare collection equipment
- Communications systems
- Train control equipment

- Emergency power systems
- Illuminated signs
- Clocks and alarm systems
- Television and public address systems
- Sump pumps
- Tunnel fans and dampers
- Yard & shop services
- Wayside structures

Incoming electric service for each passenger station shall be terminated in an AC switchboard located in an electric equipment room within the station. The switchboard shall include feeder breakers for distribution to normal and emergency buses.

The electrical equipment room shall include space for the emergency power supply, switchboards for normal and emergency loads, panelboards for lighting and general power distribution, and all necessary dry type transformers.

A separate battery room shall be provided to house the emergency battery. The battery shall have sufficient capacity to carry the full uninterruptible power supply (UPS) emergency load continuously for 15 minutes after utility supplied power failure.

A battery charger shall be provided with adequate capacity to supply the DC load and charge the battery.

8.4.4 Wayside Distribution

The wayside distribution subsystem will complete the DC power circuit between the traction power substation and rail vehicle onboard equipment. This subsystem shall be composed of the elements described below.

8.4.4.1 Third Rail and Associated Hardware

The third rail shall be of bimetallic construction, fabricated of aluminum with steel stainless steel cap, and bonded together by pressure applied through bolts or equivalent methods.

The continuity of the third rail will be broken at traction power substations and any required gapbreaker stations to provide definitive (localized) sections. Adjoining third rail sections will be separated by a gap dimensioned so that it can be bridged by the front and rear current-collecting shoes of a vehicle. Sufficient protection shall be provided to prevent a previously deenergized section of third rail from being reenergized by a vehicle accidentally connecting it to an adjoining live third rail section. Third rail sections shall be composed of rail lengths (approximately 40 foot long) joined together by means of splice joint assemblies. Jumper cables shall provide electrical continuity at all locations where it is necessary to have separations in the third rail and across rail expansion joints. Jumper cables shall have an electrical conductivity equal to, or higher than, the conductivity of the third rail. Rail anchors shall be provided at 1,000 foot maximum intervals, with expansion joints installed midway between anchor points.

8.4.4.2 Support Insulators

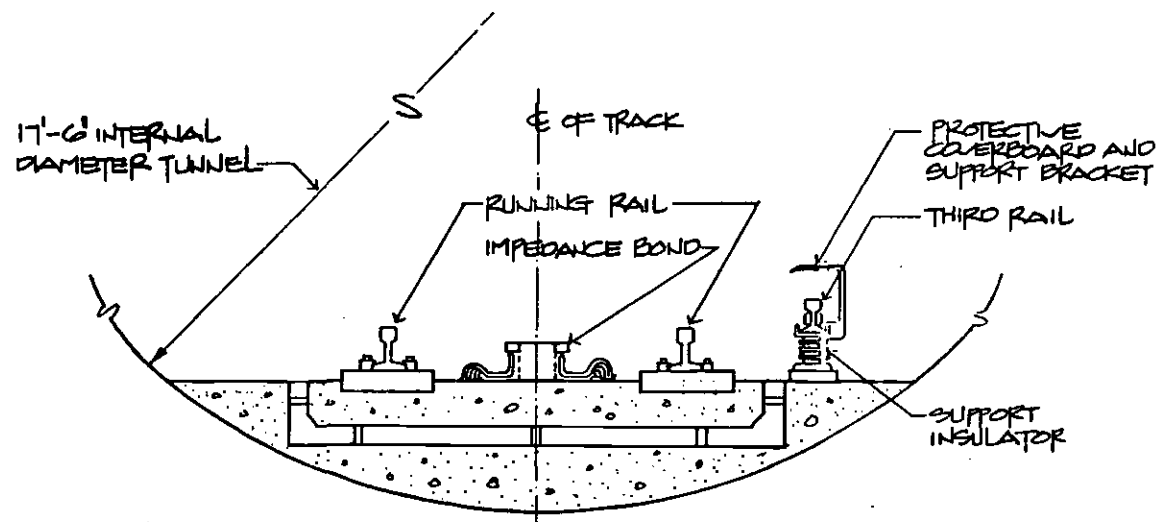
The third rail shall be supported at approximately 10-foot intervals by post-type insulators of either wet-process-type porcelain or fiberglass. The relative position of the third rail to the rail track and the configuration of the support insulators shall be as shown on Figure 8-10, Single Track Arrangement.

8.4.4.3 Protective Coverboard and Associated Hardware

A protective coverboard shall be provided over the third rail to protect passengers and Metro Rail personnel from accidental contact with the energized third rail. The coverboard will also protect the rail from foreign objects that might fall or be thrown onto it.

Figure 8-10

SINGLE TRACK ARRANGEMENT



The coverboard shall be made of a non-combustible, non-conductive material, be designed to provide protection against electrical hazard and shall be of a bright "safety" color.

8.4.5 Current Collectors

The current collector is used to transfer electrical energy from the contact rail to the traction main power terminals of the passenger vehicle. It shall consist of a contact shoe that slides along the contact rail, associated springs or other devices to maintain suitable contact pressure of the shoe on the contact rail, and shunt wires to carry current from the shoe to the current collector fuse terminals. The collector assembly shall be mounted on the passenger vehicle unsprung truck frame.

The collector assembly shall be compatible with the contact rail wear surface; shall be sacrificial to the contact rail, and shall resist welding to the contact rail.

The current collector assembly shall also result in the collector shoe tracking the contact rail with a minimum of sparking, bounce, and arcing, and shall demonstrate a minimum of shoe bounce when running on to and off of the contact rail at speeds of zero to 75 MPH (110 feet per second) for the end approaches specified.

8.4.6 Running Rails

The running rails for mainline operation shall be approximately 115 pounds per yard RE section, AREA Specifications, 1962. The rails shall have a resistance of not more than 12 times that of copper having 10.8 ohms resistance per circular mil foot.

Both running rails of each track shall serve as negative conductors except in special rail sections. Rail shall be welded in continuous

lengths. At locations requiring insulated joints, the traction power DC continuity of negative rails shall be maintained by use of impedance bonds.

Running rails shall be cross-bonded for traction power equalization through impedance bonds at maximum intervals of 2000 feet, particularly in the maximum acceleration area for trains leaving stations. Where automatic train control impedance bonds occur within the spacing interval, these bonds may be utilized for traction power cross-bonding, with additional traction power cross-bonding spacing adjusted to conform. Running rails shall be insulated from roadbed and insulated track fasteners shall be used.

8.4.7 Mainline Sections

Circuit breakers shall be installed to provide isolation of contact rail sections or zones. Each circuit breaker shall be equipped for automatic trip operation on a current "magnitude of increment or rate of rise" basis, or other apparatus to positively distinguish between heavy loads and faults, with a load sensing automatic reclosure feature.

In addition, all circuit breakers controlling power zones shall normally be operated remotely from Central Control by means of the DTS. Local controls shall be provided to permit local manual operation of all circuit breakers within substations and breaker rooms. Circuit breakers used as sectionalizing or tie breakers shall be of identical rating and construction to those used as substation DC feeder breakers.

8.4.8 DC Power Cables

DC traction power cables features are as follows.

- ° All DC traction power cables connected to the contact rail shall be extra-flexible, stranded, non-shielded copper conductors.

- ° The traction power cables connecting the DC feeder breakers or tie breakers to the contact rail, and from the running rails to the negative bus shall be sized to accept maximum overload currents and a temperature rise not to exceed safe insulation design limits of the cables, based on a minimum insulation life of 20 years.
- ° The cables shall have sufficient conductivity to maintain traction power voltage levels within the limits defined, confining the major voltage drop to contact and running rails, rather than permitting excessive voltage drop in the connecting cables.
- ° Cables grouped in trenches or duct areas of substations, and all cables exposed in vertical shafts, shall be treated with a suitable flameproofing application, or shall be provided with barriers against propagation of flame.
- ° Negative cable conductivity equivalent to or greater than the running rail conductivity per track shall be provided between the substation negative bus and the connection to each pair of running rails.

8.5 FARE COLLECTION

The fare collection system on the SCRTD Metro Rail shall be an automatic barrier system with fare gates located at station entrances and exits to check patron's machine-readable tickets or passes to ensure that the proper fare is paid. To assist patrons in paying the fare, ticket vendors, transfer dispensers and add-fare machines will also be located in the station. The system will provide the capability to handle flat, and zone fares. Transfer from bus and light rail to Metro Rail and from Metro Rail to bus and light rail will be accommodated.

8.5.1 Fare Structure

The SCRTD Metro Rail fare structure will be integrated with the bus system and light rail fare structure, incorporating most of its major

elements. The fare structure shall consist of the following fare elements.

- Single Trip Tickets - Patrons making a single trip on Metro Rail shall purchase a ticket from a ticket vendor at the origin station. The ticket shall be encoded with information for entry and exit through the fare gates. The patron will insert the ticket in an entry fare gate console, proceed through the fare gate and retrieve the ticket for use on exit. To exit, the patron will insert the ticket in an exit fare gate console and proceed through the fare gate. The ticket will not be returned.
- Round-Trip Tickets - Patrons making a round-trip on a particular day can purchase a round-trip ticket from station ticket vendors. The patron will insert the ticket in an entry fare gate console, proceed through the fare gate and retrieve the ticket for use on exit. On exit in the initial direction of the round-trip, the fare gate will print the time and date on the ticket and return it to the patrons. In the return directions, the ticket will be used in the fare gate for entry and exit.
- Monthly or Biweekly Pass - Patrons using the bus, light rail and Metro Rail on a regular basis can purchase a pass at an RTD sales outlet. The pass will be valid for a specified time period and specific station continuations. The patron will insert the pass into an entry fare gate console at the origin station, proceed through the fare gate and retrieve the pass. At the destination, the patron will insert the same pass into an exit fare gate console, proceed through the fare gate and then retrieve the pass for future use.

The pass will permit entry onto a bus when displayed to the bus operator. It will also be valid for riding light rail.

- Multi-Trip Tickets - Patrons will purchase the multi-trip tickets from RTD sales outlets. The ticket will be good for travel on Metro Rail, the bus and light rail system, until the value of the ticket (i.e. total dollar value or number of trips) has been expended. On Metro Rail the patron will insert the purchased ticket into a fare gate console when both entering and exiting a station. The ticket will be returned to the patron with each use. When there is no remaining value on the ticket the exit gate will capture the ticket.

The multi-trip ticket shall be a fare medium if appropriate equipment are installed on the SCRTD buses and at any future light rail stations or vehicles.

- Reduced-Fare, Monthly Pass - Patrons eligible for reduced-fare travel will purchase special passes at RTD sales outlets. The pass will be valid for a specified time period. Use of the reduced-fare media will follow the same procedures as that of the monthly pass.
- Reduced-fare, Multitrip Tickets or Single-Trip Tickets - Patrons eligible for reduced-fare travel will be able to purchase reduced fare tickets at RTD sales outlets. Use of the reduced-fare media will follow the same procedure as that of the regular-fare media.
- Bus-to-Rail Transfer. Patrons making single trips that begin with a bus ride will obtain a machine-readable bus-to-rail transfer card from the bus operator when boarding the bus. The transferring patron will insert the transfer card into the ticket vendor when purchasing a Metro Rail ticket to receive credit for fare paid on the bus. The remaining steps are the same as the single trip tickets.
- Light Rail-to-Rail Transfer. Methods for accommodating transfers between rail lines are under study. Presently use of a station agent to accept transfers at a designated Metro Rail transfer station is under consideration.

- Rail-to-Bus and Rail-to-Light Rail Transfer. Patrons wishing to transfer from Metro Rail to a bus or light rail vehicle will press a transfer button on the ticket vendor when purchasing a ticket and inserting the proper fare. The patrons will follow the same steps as with single trip tickets. The exit fare gate shall, however, print the time and date on the ticket and return it to the patron. The patron will give the ticket to the bus operator when boarding the bus, or hold the ticket in the event of inspection on the light rail line.
- Employee Pass/ID. At least one fare gate in each array will be equipped with a swipe reader to read encoded employee ID and release the gate for entry and exit.

8.5.2. Fare Collection System Equipment

The following equipment will comprise the Metro Rail fare collection system and provide the fare structure and functions noted above. The fare collection system will accommodate system expansion without requiring major modification.

8.5.2.1 Fare Gates

The fare gates shall be used to separate the "free" and "paid" areas of the station. The fare gates shall control passage to and from the paid area by checking the ticket or pass of each passenger to ensure that it is valid for either entry or exit. To check ticket or pass validity, the fare gate shall be capable of reading and reencoding magnetic data on each ticket or pass. In the entry direction, the fare gate shall identify the type of ticket and determine:

- Single Trip Ticket
 - proper RTD ticket
 - station validity ticket
 - time of day validity

- Round-trip ticket
 - proper RTD ticket
 - station validity
 - date validity
 - time of day validity (reduced fare, and off-peak)
 - proper entry/exit sequence
- Monthly or Biweekly Pass
 - proper RTD ticket
 - station validity
 - date validity
 - time of day validity (reduced fare only)
 - proper entry/exit sequence
 - passback control; time/date/station/direction of last use
- Multi-trip Ticket (stated value)
 - proper RTD ticket
 - minimal ticket value
 - time of day validity (reduced fare only)
 - proper entry/exit sequence
- Employee Pass
 - pass validity
 - passback control (certain passes exempted from this restriction)

In the exit direction, the fare gate shall identify the type of ticket and determine:

- Single-Trip Ticket
 - proper RTD ticket
 - station validity
 - proper entry/exit sequence
 - travel time validity
 - print transfer information

- Round-Trip Ticket
 - proper RTD ticket
 - station validity
 - proper entry/level sequence
 - travel time validity
 - print transfer information for initial direction
- Multitrip Ticket
 - proper RTD ticket
 - fare due
 - remaining value of ticket
 - proper entry/exit sequence
 - travel time validity
- Monthly or biweekly pass
 - proper RTD pass
 - station validity
 - proper entry/exit sequence
 - passback control
 - travel time validity
- Employee Pass
 - pass validity
 - passback control (certain passes exempted)

In the entry direction, the fare gate shall be capable of rejecting selected tickets or passes not valid for use at that time of day or date, or for entry at specific stations.

In the exit direction, the fare gate shall be capable of capturing tickets with no remaining value, while returning unexpended multi-trip tickets and passes to the patrons. If the patron has paid for rail-to-bus transfer the fare gate shall print the time, date and station on the single trip ticket and return it to the patron.

Fare gates shall be capable of displaying a message to the patron. On entry, the message shall direct the patron to see the station attendant or use the passenger-assistance phone if the ticket or pass is rejected; if the ticket or pass is valid the message shall direct the patron to proceed through the gate.

On exit the message shall direct the patron to see the station attendant or use the passenger-assistance phone if the ticket or pass is rejected; if, however, the only problem is that additional fare is required, the message shall direct the patron to the add-fare machine. If the ticket or pass is valid, the message shall direct the patron to proceed. The exit fare gate shall display the remaining ticket value to the ticket-holder when multi-trip ticket is used.

Each fare gate shall have self-diagnostic capabilities and shall automatically shut down when disabled. On command, the fare gate shall indicate the nature of malfunction to assist in troubleshooting. In addition, each fare gate shall respond to commands by remote control, including:

- permit entry and exit
- permit entry only
- permit exit only
- do not permit entry or exit (out of service)
- permit free entry and exit
- ignore time codes (for travel time validity) and accept off-peak fares
- observe time codes
- ignore entry/exit sequence code
- observe entry/exit sequence code

Each fare gate shall display an appropriate message indicating whether or not passage through the gate is possible. Any change in status - whether automatic or by command - shall be transmitted to Central

Control. Remote control shall be possible from Central Control and from a fare collection control panel located on the wall near the fare gate array.

Each fare gate shall be capable of electronically transmitting the following:

- The entry direction:
 - location identification
 - running totals of the number of patrons admitted through the fare gate by fare type.
- The exit direction:
 - location identification
 - running totals of the number of patrons admitted through the fare gate by fare type and station of origin.

At each mezzanine, one regular fare gate shall have an ability to interpret and transmit to Central Control the data encoded on an inserted ticket. The data will also be displayed on the fare gate. This fare gate will be used to assist in troubleshooting a problem with a ticket. The designated fare gate shall respond to commands either locally or from Central Control to accept the ticket for passage.

8.5.2.2 Handicapped Gates

Handicapped gates shall be provided for semi-ambulatory and non-ambulatory patrons who are unable to negotiate the regular fare gate, such as those patrons confined to wheelchairs or using crutches or walkers.

A handicapped gate shall be located in line with the regular fare gates at every location having elevator access to the street and to the platform.

The handicapped gate will normally be closed to passage in either direction. The gate shall release automatically upon insertion into the fare gate console of a valid ticket or pass, so that the patron may push it open. The gate shall close automatically once the patron has cleared the aisle.

A panic release bar shall be placed on the gate to release it for emergency exit.

Ticket and pass verification capabilities shall be the same as those of the regular fare gate. Self-diagnostics, remote control and data transmission shall also be the same as those of the regular fare gate.

It shall be possible to program the handicapped gate to accept only handicapped and employee passes and tickets.

Each handicapped gate shall have an ability to interpret and transmit to Central Control and the station attendant booth the data encoded on an inserted ticket. The handicapped gate shall respond to commands from Central Control or the station agent to accept the ticket for passage.

8.5.2.3 Ticket Vendors

Ticket vendors shall be located in the free area of every station. Ticket vendors shall permit patrons to purchase a single-trip or round-trip ticket to a selected station. The vendor shall dispense magnetically-encoded tickets that can be read and reencoded by the fare gates. The ticket vendor shall sell one ticket for each completed purchase. When purchasing a single-trip or round-trip ticket, the proper fare shall be displayed. The fare displayed shall decrease to zero as the balance of the fare is deposited.

The vendor shall accept valid U.S. 5 cents, 10 cents, 25 cents and one dollar Susan B. Anthony coins, rejecting all other foreign objects. Change in U.S. coins shall be given, if appropriate, along with the

ticket at the completion of the purchase. The currency deposited shall be escrowed until completion of the purchase. The ticket value shall be printed on the ticket by the vendor.

The ticket vendor shall be capable of accepting and reading bus-to-rail transfers and crediting the purchase with the value of the transfer. Transfers shall be checked for validity including date and time of day.

The ticket vendor shall be capable of encoding tickets to permit their use as a transfer from rail to bus. By pressing a transfer button on the vendor, the patron will indicate a desire to transfer. The fare displayed may include the transfer charge.

Tickets dispensed by the ticket vendors shall be encoded with the following information.

- RTD security code
- Ticket type
- Valid stations or zones
- Initiation of entry/exit code
- Transfer code (transfer, no transfer)

The ticket vendor shall be capable of automatically adjusting fare levels for single-trip tickets between those for peak and off-peak periods, if a peak/off-peak fare differential is implemented. A display on the face of the ticket vendor shall indicate which fare is currently in effect.

Each ticket vendor shall have self-diagnostic capabilities, and shall automatically shut down when disabled. Self-diagnostics shall include display of a message indicating the nature of a unit failure.

Each ticket vendor shall also respond to commands by remote control from the station fare collection control panel and Central Control. Commands shall include:

- Go out of service
- Go into service
- Display "does not accept transfers"
- Display "does not make change"

Any change in status whether automatic or by command shall be transmitted to Central Control in real time. Each vendor shall be equipped with an intrusion alarm.

Each ticket vendor shall be capable of electronically transmitting running totals of the following:

- Number of tickets purchased by station destination and ticket type
- Amount of revenue collected
- Amount of change dispensed
- Number of transfers accepted.

Money and media in the ticket vendor shall not be readily accessible when the vendor is opened for routine maintenance and simple repairs. Money shall not be accessible when revenue is being removed from the ticket vendor and change supply is being replenished. Capacity of the money vault and change hoppers shall be such that revenue servicing is not required more than once a day. A message shall be transmitted to Central Control in real time when the vendor door or money-handling compartments are opened or relocked.

8.5.2.4 Add-Fare Machines

Add-fare machines shall be located in the paid area of each station mezzanine. The add-fare machines shall permit patrons to pay additional fare if the ticket or pass is not valid for exit at the desired station. The machines shall be capable of reading, interpreting and reencoding magnetic data on a ticket or pass. The machines shall determine the additional fare that the patron must pay prior to exiting and display the amount to the patron.

The add-fare machine shall accept valid U.S. 5 cents, 10 cents, 25 cents and Susan B. Anthony one dollar coins in payment for the fare due. As currency is inserted, the add-fare machine shall decrement the amount displayed to show the remaining balance. Once the fare due has been paid in full, the add-fare machine shall re-encode the ticket or pass for exit at that station. If overpayment is made, the add-fare machine shall give change. The add-fare machine shall be capable of calculating the fare due for peak and off-peak fare levels and for each fare element.

Each add-fare machine shall have self-diagnostic capabilities and shall automatically shut down when disabled. Self-diagnostics shall include display of a message indicating the nature of failure. Each add-fare machine shall also respond to commands by remote control to go out of service. Any change in status - whether automatic or by command - shall be transmitted to Central Control. The add-fare machine shall be equipped with an intrusion alarm.

Each add-fare machine shall be capable of transmitting running totals of the following:

- Number of transactions completed by ticket type.
- Amount of revenue collected.

Money and media shall not be readily accessible when the add-fare door is opened for routine maintenance and simple repairs. A message shall be transmitted to the Central Control in real time if either the add-fare door or its currency or media compartments are opened.

Money shall not be accessible when revenue is being moved from the add-fare machines. Capacity of the money vault shall be such that revenue servicing is not required more than twice per week.

8.5.2.5 Bill Changer

Bill-changers shall be located in both the free and paid areas of each station. Bill-changers will provide change to patrons in exchange for paper currency or coin. The bill-changers shall accept \$1 and \$5 bills and provide change in \$1 coins.

Each bill-changer shall have self-diagnostic capabilities and shall automatically shut down when disabled or out of change. A key switch on each unit shall permit it to be taken out of service or placed in service.

The bill-changers shall keep running totals of money banked/change given.

Capacity of bill-changers shall be such that revenue servicing is not required more than once per day. Bills will be stacked by the bill-changer.

A message in real time shall be transmitted to Central Control when the bill changer door is opened or relocked. Unauthorized entry shall result in local alarm.

8.5.2.6 Ticket Encoder

Ticket encoders shall be located in a central location where stock is kept and distributed. Ticket encoders shall encode any tickets or passes that are to be pre-encoded with pertinent data for use in fare gates. Each ticket encoder shall record the number of encoded media by ticket type and display this information so that it is readily visible. A running total of tickets encoded shall be displayed as well. The ticket encoder shall be safeguarded against unauthorized use.

8.5.2.7 Revenue Carts

Revenue carts shall be used to transport ticket stock and money between the fare collection equipment located in the station and centrally-located revenue processing facility. The carts will transport ticket media to the ticket vendors and coins to the ticket vendors and add-fare machines for the change dispensers. The carts will also be used to transport bills and coins from all money accepting fare collection equipment in the stations and expended (captured) tickets and transfers from the fare gates and ticket vendors. The carts shall be hand-push type.

Enroute between station equipment and the revenue processing facility, the revenue carts will be:

- Moved through the handicapped gate;
- Rolled onto station elevators and escalators;
- Transported by vault truck.

The revenue cart and station fare collection equipment shall accommodate coin and currency transfer without requiring that revenue personnel handle money at the stations.

8.5.2.8 Station Fare Collection Control Panel and Central Control Equipment

The equipment in Central Control will monitor and control the status of fare collection equipment located in the station and shall be able to interpret the data encoded on a ticket or pass to diagnose a ticket problem.

The equipment located in Central Control shall permit the operator to interpret the code on a patron's ticket or pass when it is inserted in a designated fare gate. The equipment shall also permit the operator to

command fare gate to accept the ticket for passage. The same capability shall be provided on the fare gate itself for use by a station agent. A fare collection control panel shall also be provided to permit a station agent to control the status of fare collection equipment.

8.5.3 Fare Collection System Facilities

The following facilities will serve to house and support the fare collection system equipment and their components:

8.5.3.1 Revenue Processing Facility

The existing central counting facility at RTD Division 2 shall house equipment to receive, sort, count, bag, tag and ship all revenue received from both the bus operating divisions and the station fare collection equipment. High speed ticket encoding equipment shall be housed in either a separate location or an addition to the central counting facility.

8.5.3.2 Fare Collection Maintenance Shop

The equipment maintenance shop shall contain work benches, test equipment, tools, spare parts and material stores and supervisory offices. The equipment shall be used to repair, overhaul, and test all automatic fare collection equipment, and their components.

8.6 AUXILIARY VEHICLES

The auxiliary vehicles shall encompass all non-passenger rail vehicles necessary for the maintenance and operation of the Metro Rail starter line.

The starter line auxiliary vehicles shall include self-propelled and trailer equipment for tunnel cleaning and maintenance, replacing track, rerailing vehicles, emergency water pumping, emergency power, bulk material and equipment transport, and the towing of disabled vehicles unable to be towed by another self-propelled vehicle.

8.6.1 Auxiliary Vehicles Functional Description

The auxiliary vehicles shall perform the following functions:

- Maintenance of the tunnel surfaces. The tunnel cleaning apparatus shall be capable of removing soil, oil, grease, brake shoe material, rail material, and other contaminants from the surface of the tunnel.
- Maintenance of the tunnel roadbed. The roadbed cleaning apparatus shall be capable of removing loose brake shoe material, rail material, dust and litter from around the running rail, rail ties, third rail and other surface obstacles.
- Maintenance of the tunnel apparatus. Auxiliary vehicle equipment shall be provided to enable maintenance of tunnel appurtenances including running rail, contact rail, ties, lighting, electrical cabling and piping.
- Rerailing of revenue and auxiliary vehicles. Equipment shall be provided to rerail a passenger or auxiliary vehicle within the tunnel or yard areas. This apparatus shall be capable of rerailing the vehicle without the use of traction power provided by the third rail.
- Emergency water pumping. Equipment shall be provided to evacuate liquids from the tunnel in the event of a sump pump failure. This equipment shall be provided with a selfpowered prime mover.
- Emergency power generation. Equipment shall be provided to furnish emergency station electrical power in the event of a failure of the primary electrical service and stationary standby power supplies. The generator shall provide power for one station with a self-powered, nonelectrical prime mover. The generator shall be transported on a flat car to the station platform. The generator shall be able to be unloaded from the flat car and function on site.
- Bulk material and equipment transport. Auxiliary vehicle equipment shall be provided to transport bulk materials, including rail and ties, and repair for HVAC, fare collection, elevators, and escalators, and other apparatus requiring transport through the tunnel. Transport of bulk material and apparatus includes provisions for the movement of objects too heavy or cumbersome to be moved by people without assistance from mechanical devices.
- Towing of disabled vehicles. A self-powered auxiliary locomotive shall be provided for the removal of disabled passenger or other types of rail vehicles, for towing special purpose trains and vehicles, and for usage at the yards. The towing of vehicles may be either in the tunnel or at grade. The equipment shall be capable of connecting to the vehicles through their normal coupling mechanism.
- Station maintenance. Auxiliary vehicle equipment shall be provided to supplement any maintenance apparatus required for the stations, that is either physically unable to be stored in the stations or uneconomical to be stored in every station.

The auxiliary vehicles fleet whose functions require operation during revenue service shall be capable of movement along the mainline without interfering with revenue service operations.

The auxiliary vehicles shall be multi-functional, and shall minimize repetitive functions of maintenance personnel. All auxiliary vehicles shall be fully detectable and continuously protected by the ATC system.

8.6.2 Auxiliary Vehicles Features

The following sections describe the basic features of all auxiliary vehicles.

8.6.2.1 Dimensions

The auxiliary vehicles shall have the following dimensional characteristics:

- The height of auxiliary vehicles, with new wheels shall not exceed 12 feet from the top of the rail to the top of the roof. The dynamic profile of the auxiliary vehicle shall not exceed the passenger vehicle dynamic profile.
- The height of auxiliary vehicles with new wheels, from the top of the rail to the top of the anti-climber, shall match that of the passenger vehicle.
- The maximum carbody width in any plane shall not exceed 10 feet - 4 inches.
- Basic track gauge will be 4 feet - 8-1/2 inches.

8.6.2.2 Couplers, Draft Gear and Draw Bars

Auxiliary vehicles shall be provided with couplers, drawbars and draft-gear to mate with those provided with the passenger vehicle. All auxiliary vehicles shall be provided with full-width anti-climbers.

8.6.2.3 Auxiliary Electrical

The power pick-up system shall be third rail. The third rail shoe shall be spring-loaded, overriding type, and shall be compatible with, and sacrificial to, the contact rail. All circuits shall be individually protected by over-current devices.

The vehicle design shall insure that the vehicle electrical, electronic, and communications apparatus shall operate in the vehicle environment without suffering or causing harmful interference because of electromagnetic radiation or response.

8.6.2.4 Trucks and Suspension

The trucks and suspension apparatus shall consist of all truck components from the rail up to the body bolster including any suspension apparatus rigidly mounted to the carbody. The trucks and suspension shall be as follows:

- Each car shall be supported on two four-wheeled, roller-bearing equipped, swiveling trucks.
- All truck parts, except wheels and contact shoes, shall clear the plane of the top of the rails by not less than 2.5 inches under conditions of maximum wear, primary spring deflection and elastomer creep over maximum curves as well as on tangent track.

A truck safety mechanism shall be designed to provide a connection between the carbody and truck such that the trucks shall be raised with the carbody unless intentionally detached.

8.6.2.5 ATC

The vehicle-borne ATC apparatus shall provide the following automatic train protection (ATP) functions:

- Train manual mode operation.
- Receive and decode wayside-generated speed limit signals.
- Provide overspeed protection.
- Indicate speed limit, actual speed and overspeed conditions.

8.6.2.6 Communications

All auxiliary vehicles shall have communications apparatus capable of transmitting and receiving undistorted, clear, noise free voice, train-wayside radio communications compatible with apparatus provided in the passenger vehicle.

8.6.3 Auxiliary Vehicles Equipment

The following vehicles and equipment comprise the auxiliary vehicles system and provide the functions noted above.

8.6.3.1 Diesel Locomotive

The Diesel Locomotive shall perform activities such as removal of disabled passenger vehicles from any point on the mainline and for towing of trailer auxiliary vehicles.

The Locomotive's primary power source shall be diesel engine directly connected to a DC shunt-wound motor.

The Locomotive will provide the following performance level:

- Capability of pulling work trains or passenger vehicles of up to 480,000 lbs trailing load (six car train) on a combined grade of four percent and track radius of 1000 ft. at a minimum continuous speed of four miles per hour on unsanded track.
- Capability of pulling trains of up to 480,000 lbs trailing load on level tangent track at speeds of up to 25 miles per hour. Maximum speed shall be 50 miles per hour.
- Capability of sustained operation at a speed of two miles per hour without detrimental effects on a four percent grade with 480,000 lbs trailing load.
- Minimum drawbar pull starting of 30,000 lbs.
- Minimum drawbar pull at 25 mph of ___ lbs.
- The average acceleration rate shall not exceed 3 mphps.
- Full service deceleration rate of 2.75 mphps nominal.
- Emergency deceleration rate of 3.0 mphps.
- Noise Emissions: The locomotive shall meet the following noise emission standards:

	@100 ft
Idle	70 dBA
All other throttle settings	87 dBA
Move at any speed	90 dBA

Noise levels in the cab shall not exceed 90 dBA under any operating conditions.

The locomotive physical characteristics shall be as follows:

Type	Diesel-electric
Weight	50 tons \pm 2%
Width	120 in maximum
Height	144 in maximum (including roof mounted attachments)
Length	42 ft. 0 in maximum
Top of rail to centerline of coupler	26 in to 30-1/2 in
Wheel diameter	36 in to 40 in
Wheel base of trucks	6 ft. 0 in to 7 ft. 6 in.
Center to center of trucks	19 ft. 0 in to 22 ft. 0 in
Minimum wheel wear	2-1/2 in (diameter)
Engine horsepower (gross)	Total 335 hp minimum at 2,100 rpm
Transmission	4 R.R. type motors with double reduction gear drive
Alternator	50 amps min, 37-1/2 volts
Air compressor	2 @ 72 cfm
Fuel capacity	400 gallons min.
Battery	250-cell, 32 volt, 270 ampere hour, nickel-cadmium type

8.6.3.2 Hi-Rail Car Mover

The hi-rail car mover shall be provided to switch passenger vehicles from one repair track to another, retrieve damaged or inoperable vehicles from the mainline, and powering the work train on line. The hi-rail car mover shall be capable of pulling a 6-car train (empty) on 4% maximum vertical grade. It shall be self-propelled and capable of operating on rapid transit type railroad track, roadways, and rough terrain. The hi-rail car mover shall have the following characteristics:

- Diesel type engine
- Four-wheel drive
- Pneumatic-tired wheels
- Hydraulically retractable rail steel wheels
- 12-volt electrical system
- Maximum self-propelled speed of 50 mph
- Wheels and axles to provide shunting capabilities
- As an option, features will be included to provide the crane discussed in section 8.6.3.6 as part of the hi-rail car mover rather than a separate vehicle.

8.6.3.3 Flat Cars

Flat cars will be operated in trains pulled by the diesel locomotive or rail car mover. The flat cars shall have the following characteristics:

Length Over End Sills	50-60 ft
Length Over End Strikers	*
Length Over Pulling Face of Couplers	*
Truck Centers	*
Truck Wheel Base	*
Body Center Plate Height	25-1/2 in
Coupler Height	To mate passenger vehicle
Width Over Side Sills	9 ft 4 in (nominal)
Width Over Deck (including stake pockets)	10 ft 4 in (maximum)
Deck Height	3 ft 8 in (nominal)
Wheel Diameter	33 in (nominal)
Journal Size	5-1/2 ft x 10 in fixed

Maximum Axle Load	20,000 lb per axle maximum
Gross Rail Load	80,000 lb maximum
Estimate Empty Weight	40,000 - 50,000 lb
Estimated Load Limit	30,000 - 40,000 lb
Bearings	AAR-approved roller bearings shall be provided

*Commensurate with acceptable length

The wheels and axles shall provide shunting capabilities consistent with ATC train detection requirements.

8.6.3.4 Rerailing Equipment

The rerailing equipment will be transported to the required location on a flat car pulled by a locomotive or rail car mover.

The vehicle rerailing apparatus shall have the following capabilities.

- The vehicle rerailing apparatus shall be capable of rerailing a passenger vehicle with AWO load or an auxiliary vehicle within a subway tunnel, within a passenger station, or within the yard.
- The outrigger cylinders shall be capable of being positioned and able to lift a passenger or auxiliary vehicle at the jacking pads furnished with the vehicle.
- The rerailing carriage shall be capable of compensating for the vehicle's arc in the rerailing process.
- The control of the vehicle movement along the traverse beam and the control of the outrigger cylinders shall be from a central point at least 20 feet from the vehicle. This control shall be capable of being accomplished by a single person.

8.6.3.5 Emergency Pump Apparatus

Auxiliary pumping apparatus shall augment the capacity of the tunnel sump pumps during emergencies and in cases when the combined action of the installed sump pumps is not sufficient to evacuate water at the required rate.

The auxiliary pumping apparatus shall be transported on a flat car pulled by diesel locomotive or rail car mover. The apparatus shall be able to function from on-board the flat car and shall be able to be unloaded from the vehicle and function on site.

Features of the auxiliary pump apparatus are:

- The auxiliary pump apparatus shall be capable of pumping water from the deepest point in the tunnel system to the surface. The Pump shall be rated at 500 gallons per minute at a total discharge head of 200 feet. It shall be able to function at maximum capacity for a period of four hours without refueling.
- The pump shall be self-priming, and the impeller designed to accommodate solids of up to 2 inches in diameter. Minimum suction lift shall be 10 feet.
- The pump shall be equipped with a hose of sufficient length to reach the surface from any point on the system.

8.6.3.6 Hi-Rail Mobile Crane

The hi-rail mobile crane shall perform activities such as wayside and yard maintenance, and powering the work train on line. The hi-rail mobile crane shall be capable of operating on a 4% maximum vertical grade. The machine shall be self-propelled and capable of operating on rapid transit type railroad track, roadways, and rough terrain.

The hi-rail mobile crane shall have the following characteristics:

- Diesel type engine
- Four-wheel drive
- Pneumatic-tired wheels
- 12-volt electrical system
- Maximum self-propelled speed of 50 mph
- Wheels and axles to provide shunting capabilities consistent with ATC train detection requirements
- The crane shall be installed on the vehicle and shall have the following characteristics:
 - Lift capacity 8,000 to 10,000 lbs.
 - Boom extension 6 to 9 ft.
 - Boom operation by hydraulic system.
 - Boom rotation 180° minimum.
 - Boom swing time (180°) approximately 4 seconds.
 - Boom vertical reach to operate within the tunnel outline.
- The hi-rail mobile crane shall have interface features to add the following equipment:
 - 20-ft boom extension
 - 20,000-lb winch

- 150-cfm air compressor
- Hydraulic lift platform with 10,000-lb capacity

8.6.3.7 Tunnel Washing and Vacuum System

The tunnel washing train shall be formed of a coupled pair of flat cars on unmotored trucks operating as a team, pulled by a diesel-electric locomotive. The first car shall be equipped for use as a washer, and the second car shall be equipped for use as a vacuum.

The washer car shall have the following features:

- Operator's cab.
- Water spray arch.
- Water tank.
- High pressure water heating system.
- Detergent tank.

The vacuum shall have the following features:

- Vacuum unit.
- Diesel-powered electric generator set.
- Water tank.
- Air compressor.
- Tool boxes.

8.6.3.8 Rail Grinder System

The rail grinder system shall be provided to grind rail on all sections of the Metro Rail system to eliminate rail corrugations, remove rail end batter, and equalize welds. The rail grinding system shall be a self-propelled system consisting of propulsion control cars, grinding car containing water reservoirs and a crew car. The propulsion control car shall provide power, including tractive power for the entire system.

The rail grinding shall be suitable to grind 115 lb/yd RE rail. Grinding speed shall be at an average of 1.5 mph, and grinding motor rotation, not to exceed 3,600 rpm, shall produce .005 to .010 inch removal of rail surface per pass and operate within the maximum wear tolerance as shown in the following chart:

<u>RAIL WEAR TOLERANCE</u>	Maximum	Maximum
	<u>Headwear</u>	<u>Sidewear</u>
Running Rail, Mainline	1/2 in	3/8 in
Running Rail, Yard Storage and Designated Utility Tracks	1/2 in	5/8 in
Guard Rail	1/2 in	3/8 in

8.6.4 Interfaces With Other Elements

Interfaces between auxiliary vehicles and other system elements are as follows:

- Automatic Train Control - All auxiliary vehicles shall be fully detected and continuously protected by the ATC system.
- Auxiliary Power - The emergency power generation apparatus shall be fully compatible with the stations electrical service.

- Communications - Radio communications will be required between most auxiliary vehicles and the wayside, Maintenance Control, and Central Control.
- Passenger Vehicles - Draft gear, jacks, outriggers, and other rerailling apparatus shall be compatible with the passenger vehicle.
- Traction Power - Auxiliary vehicles propelled by third rail power shall have propulsion and braking equipment fully compatible with the traction power system. Regenerative braking shall not be required on auxiliary vehicles.
- Yards and Shops - The yards and shops shall have adequate facilities and equipment to store, maintain, and repair all auxiliary vehicles.