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SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

METRO RAIL PROJECT

**MINIMUM OPERABLE SEGMENT - 1
PROJECT INFORMATION BOOK**

SEPTEMBER 1986

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PROJECT DESCRIPTION

The Metro Rail System is an 18-mile rail rapid transit line planned by the Southern California Rapid Transit District (SCRTD) from downtown Los Angeles to the San Fernando Valley. This line is planned to be the core element of a regional rail rapid transit system. In addition to the planned 18-mile line, two future extensions of the Metro Rail System have been identified as part of the regional rail rapid transit system.

The first 4 miles of the line have been identified as the initial operating segment. This initial segment, identified as MOS-1, extends from Union Station to the Wilshire/Alvarado Station over approximately 3 miles of double-track main line subway, with additional subway and surface track connecting to the Yard southeast of Union Station. It includes all Yard and Shop facilities planned for the 18-mile system with the exception of part of the Yard storage tracks, which will be installed as warranted by system extension and fleet expansion.

The MOS-1 line has five stations. The main line route begins at Union Station, northeast of the Los Angeles Civic Center; and runs through the central business district, terminating on the west side at the Wilshire/Alvarado Station. The rail line is entirely in subway with line segments constructed by tunnel boring machines and stations and crossovers excavated by cut-and-cover construction techniques. Three double crossovers are included in the subway portion of MOS-1, one at each side of Union Station and one at the east end of the Wilshire/Alvarado Station.

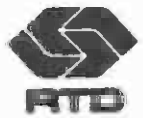
SCRTD has prepared this project information book for potential contractors and suppliers for the District's Metro Rail System. The information is subject to change as design progresses.

The preparation of this document 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, the State of California, and the Los Angeles County Transportation Commission.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

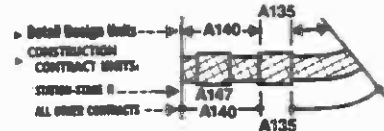
MINIMUM OPERABLE SEGMENT-1

NOVEMBER 1984

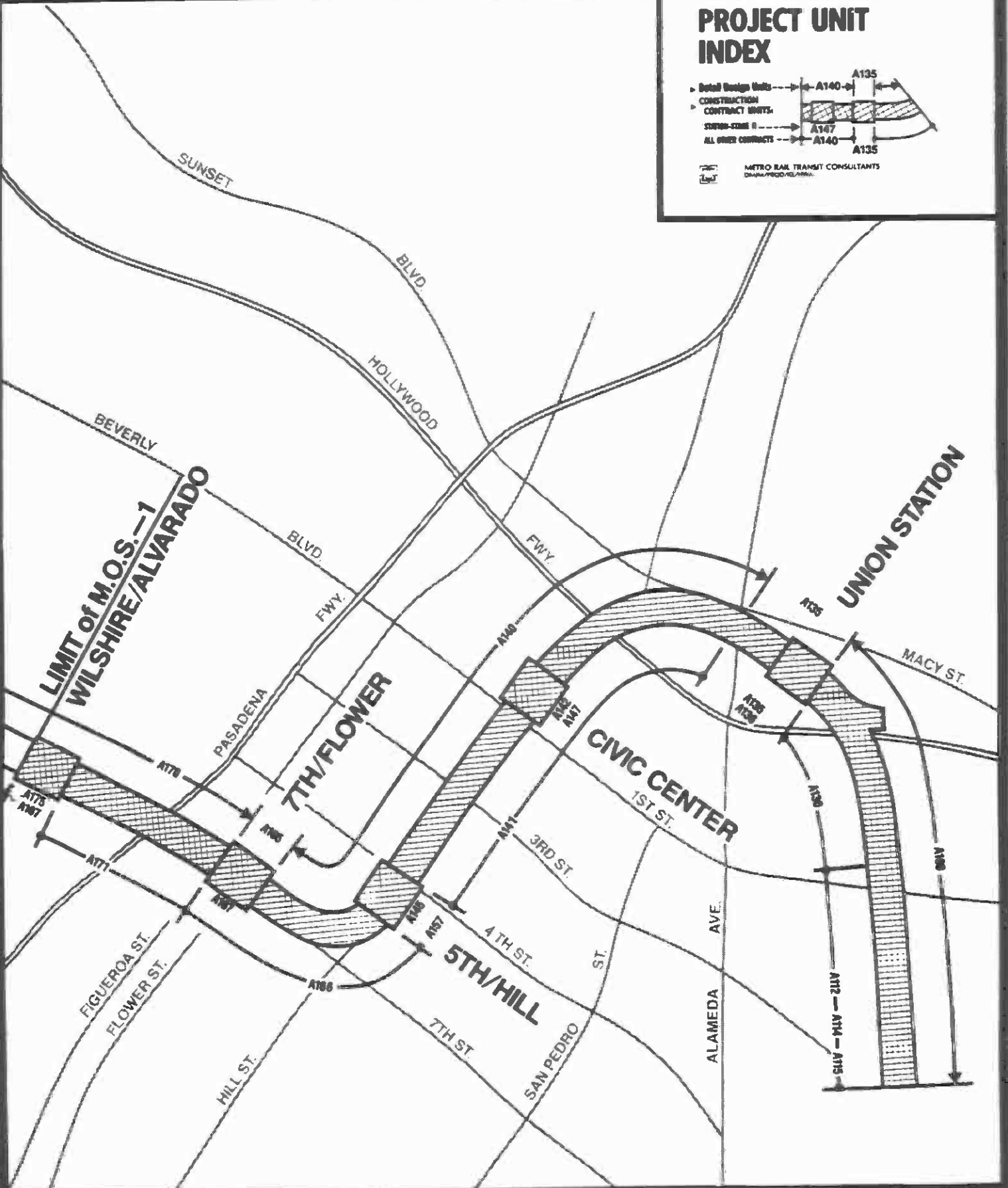


METRO RAIL PROJECT

PROJECT UNIT INDEX



METRO RAIL TRANSIT CONSULTANTS
DANA/PROO/ALVARADO



DISADVANTAGED/WOMEN BUSINESS ENTERPRISES

It is the policy of the Southern California Rapid Transit District and the United States Department of Transportation that disadvantaged and women's business enterprises (DBE/WBE), as defined in the Federal Regulations 49CFR Part 23, shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with federal funds.

To be responsive, a bidder must meet the DBE/WBE goals set forth in the bid documents or, if the goals are not met, full documentation evidencing good faith efforts to meet the goals must be submitted with the bid.

INDEX

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1	DEFINITIONS FOR FACILITIES CONSTRUCTION	Page 1
2	MAJOR CONTRACT UNIT DESCRIPTIONS	Pages 2 thru 9
3	GEOLOGY	Pages 10 thru 18
4	SITE PLAN	Pages 19 thru 24
5	STANDARD TUNNEL DRAWINGS	Pages 25 thru 31

DEFINITIONS FOR FACILITIES CONSTRUCTION

Station Stage I construction generally includes all civil and structural construction plus embedded items for installation of architectural finishes, embedded mechanical items, and electrical conduits, unless specifically included elsewhere. Other items of work include but are not limited to the following:

Demolition, site clearing, underpinning, dewatering, excavation support systems, decking, instrumentation, excavation, backfill, pavement, sidewalks, curbs, pavement markings, signs, traffic signals, maintenance of traffic, fencing, maintenance of utilities, utility relocation, storm drainage, sanitary lines, embedded electric and telephone lines, tunnels and tunnel liners, structural concrete, structural steel, reinforcing steel, waterproofing, emergency access exterior doors, ventilation shaft gratings at street level, interior walls, and sleeves through walls for future conduit work.

Station Stage II construction includes all architectural work, civil site work, landscaping, and mechanical and electrical work except those items embedded in Stage I construction, unless specifically included elsewhere. Other items of work include but are not limited to the following:

Irrigation systems, tree wells, landscape benches, topsoil, seedings, trees, shrubs, exterior slab on grade concrete, granite, unit masonry, stainless steel and aluminum assemblies, metal fabrication, steel stairs, ladders, railing, interior gratings and floor plates, custom sheet metal, carpentry, sprayed-on fire proofing, fillers, gaskets, sealants, doors and frames, overhead coiling grilles, finish hardware, glazing, furring and lathing, floor and wall tiles, acoustical panels, coatings, painting, identifying devices, telephone enclosures, toilet accessories, and ash and waste receptacles. Also included is all plumbing and mechanical work, and all electrical work including portions of the systems installation work which are identified in the facilities contract scopes of work.

METRO RAIL PROJECT

MINIMUM OPERABLE SEGMENT (M.O.S.-1)

YARD AND UNION STATION THROUGH WILSHIRE/ALVARADO STATION

Construction Contract Unit	Length in Feet or Area	Contract Type	Contract Scope	Location/ Stationing (From-To)
A-111		Sitework	Reconstruct curbs, gutters, and limited resurfacing along Santa Fe Ave.	
A-112	20 acres 186,000 sq ft of building floor area	Yard and Shops	Construction of Main Shop Building and Yard Control Tower, and Central Control Facility. Construction also includes demolition/maintenance of existing structures, trackwork within the building area, underground utilities work.	
A-115	35 acres	Yard	At-grade construction of the train storage yard. Includes demolition of existing facilities, rough grading, drainage work, relocation of utilities, and installation of conduit/duct banks for all future systems contracts.	
A-116		Fencing	Install security fencing and gates around First Street Yard complex.	
A-117	100 poles	Lighting	Install yard lighting at First Street Yard.	
A-118	2.5 acres	Landscaping	Install sprinkler system and landscaping around Main Shop and Maintenance-of-Way Building.	
A-121	50,800 sq ft	Shop	Alterations and improvements to existing Santa Fe Freight Building, 300 Santa Fe Avenue, Los Angeles, California, for Maintenance-of-Way Shop function, including development of adjacent site and underground utilities.	

METRO RAIL PROJECT

MINIMUM OPERABLE SEGMENT (M.O.S.-1)

YARD AND UNION STATION THROUGH WILSHIRE/ALVARADO STATION

Construction Contract Unit	Length in Feet or Area	Contract Type	Contract Scope	Location/ Stationing (From-To)
A-130	4.5 acres 1700 ft 1000 ft	Yard Yard Lead Main Line Car Wash	Main line, yard lead, and yard portion north of First Street and east of Union Station, and provisions for east extension (El Monte). Cut-and-cover construction of yard leads including demolition, grading, retaining walls, traction power substation complete, major modification of underground storm drain, underpinning of existing freeway, installation and rerouting of utilities, and restoration. Construction of passenger vehicle car wash.	91 + 59 101 + 37 84 + 41 101 + 37
A-133		Baggage Handling	Construct replacement baggage handling facility for Amtrak patrons of Union Station.	Existing Union Station
A-135	9080 ft.	Station and Crossover Stage I	Stage I construction of Union Station and a portion of the double crossover structure west of station, except for the last 83 feet, including all civil and structural construction (shell), plus embedded items for installation of architectural finishes, embedded mechanical items, and electrical conduits.	101 + 41 111 + 23
A-136	1089 ft	Station and Crossover Stage II	Union Station and west crossover Stage II construction, including all architectural, mechanical, and electrical work except those items embedded in Stage I construction.	101 + 37 112 + 30
A-138	25,000 sq yards	Sitework	Curbs, gutters, sidewalks, and paving at east end of Union Station.	

METRO RAIL PROJECT

MINIMUM OPERABLE SEGMENT (M.O.S.-1)

YARD AND UNION STATION THROUGH WILSHIRE/ALVARADO STATION

Construction Contract Unit	Length in Feet or Area	Contract Type	Contract Scope	Location/ Stationing (From-To)
A-139	2 acres	Land-scaping	Sprinklers and landscaping at Union Station.	
A-141	5900 ft	Line Section	<p>Construction of that portion of the line beginning in the last 83 feet of the crossover west of Union Station, proceeding beneath Macy Street and Sunset Blvd., deviating at Spring Street, crossing under Broadway, and continuing under Hill Street just north of Santa Ana Freeway. Line continues through Civic Center Station to the 5th/Hill Station.</p> <p>Stage I construction of Civic Center Station with a traction power substation; including all civil and structural construction (shell), the embedment of all required architectural and mechanical items as well as electrical conduits. Also includes design, installation, and maintenance of excavation support system, relocation of sewer and storm water lines, and support in place of all other utilities.</p>	<p>111 + 23 169 + 91</p> <p>146 + 47 152 + 17</p>
A-145	850 ft	Station Stage I	Stage I construction of 5th/Hill Station with an auxiliary power substation; including all civil and structural construction (shell), the relocation of all sewer and storm water lines,	169 + 91 178 + 22

METRO RAIL PROJECT

MINIMUM OPERABLE SEGMENT (M.O.S.-1)

YARD AND UNION STATION THROUGH WILSHIRE/ALVARADO STATION

Construction Contract Unit	Length in Feet or Area	Contract Type	Contract Scope	Location/ Stationing (From-To)
A-146	2100 ft	Line Section	and the support in place of all other utilities. This contract also includes the embedment of all required architectural and mechanical items, as well as electrical conduits. Construction of that portion of the line beginning just south of 5th/Hill Station, turning west under 7th Street to 7th/Flower Station.	178 + 22 199 + 22
A-147	570 ft	Station Stage II	Stage II construction of Civic Center Station; includes all architectural, landscaping, mechanical, electrical, and restoration work except for those items embedded in Stage I construction.	146 + 47 152 + 17
A-149	1000 ft	Utility Services	Remove and modify existing vaults and basements, and relocate building utility services at 5th/Hill Station.	
A-157	850 ft	Station Stage II	Stage II construction of 5th/Hill Station; includes all architectural, landscaping, mechanical, electrical, and restoration work except for those items embedded in Stage I construction.	169 + 91 178 + 22
A-161	1500 ft	Utility Services	Relocate building services and utility runs which may be in conflict with temporary street decking or with the permanent station structures, including the LRT sections.	

METRO RAIL PROJECT

MINIMUM OPERABLE SEGMENT (M.O.S.-1)

YARD AND UNION STATION THROUGH WILSHIRE/ALVARADO STATION

Construction Contract Unit	Length in Feet or Area	Contract Type	Contract Scope	Location/ Stationing (From-To)
A-165	MRT 670 ft LRT 1000 ft	Station Stage I	Stage I construction of the integrated LRT/MRT 7th/Flower Station; including all civil and structural construction (shell), the relocation of all sewer and storm water lines, and the support in place of all other utilities. This contract also includes the embedment of all required architectural and mechanical items, as well as electrical conduits. Contract does not include the west entrance and traction power substation shell and portions of the east entrance, provided by others.	199 + 22 205 + 84 LRT 4 + 25+/- 14 + 21+/-
A-167	MRT 670 ft LRT 1000 ft	Station Stage II	Stage II construction of integrated LRT/MRT 7th/Flower Station; including all architectural, civil sitework, landscaping, mechanical, electrical, and restoration work except for those items embedded in Stage I construction. Contract includes finish for the west entrance and traction power substation, and east entrance.	199 + 22 205 + 84 MRT LRT 4 + 25 14 + 21
A-171	4960 ft	Line Section	Excavation of the easterly 100 ft of the Wilshire/Alvarado double crossover structure, and construction of the tunnels to the 7th and Flower Station.	205 + 84 255 + 43
A-175	876 ft	Station Stage I	Stage I construction of Wilshire/Alvarado Station (including double crossover) and a traction power substation; including all civil and structural construction (shell), the relocation of all sewer	255 + 43 264 + 19

METRO RAIL PROJECT

MINIMUM OPERABLE SEGMENT (M.O.S.-1)

YARD AND UNION STATION THROUGH WILSHIRE/ALVARADO STATION

Construction Contract Unit	Length in Feet or Area	Contract Type	Contract Scope	Location/ Stationing (From-To)
A-185		Sitework	and storm water lines, and the support in place of all other utilities. This contract also includes the embedment of all required architectural and mechanical items, as well as electrical conduits. Excavation of the easterly 100 ft of the double crossover is not included.	
A-186		Land-scaping	Sitework, including kiss-and-ride facility, bus drop-off facility, entry plaza, curbs, gutters, and sidewalks.	254 + 54 264 + 19
A-187	965 ft	Station Stage II	Installation of sprinklers and landscaping at station site.	254 + 54 264 + 19
			Stage II construction Wilshire/Alvarado Station with a traction power substation and double crossover just east of station, including all architectural, mechanical, and electrical work except for those items embedded in Stage I construction.	

PHASE I - CONSTRUCTION CONTRACT UNIT LIST AND RANGE VALUE, AND BID SCHEDULE*

<u>Project No.</u>	<u>Project</u>	<u>(\$ in 1000's)</u>	<u>Date</u>
A-111	Santa Fe Avenue Restoration	145 - 180	April, 1989
A-112	Main Shop Building and Yard Service Area	18,700 - 23,400	February, 1987
A-115	Yard Storage Area	7,700 - 9,400	April, 1987
A-116	Yard Site Security Fencing	260 - 320	May, 1988
A-117	Yard Site Lighting	730 - 880	February, 1988
A-118	Yard Site Landscaping	380 - 460	January, 1989
A-121	Maintenance-of-Way Building	1,460 - 1,800	September, 1986
A-130	Yard Leads and Transfer Zone	64,300 - 78,500	October, 1986
A-133	Union Station Replacement Baggage Handling Facilities	1,180 - 1,460	December, 1987
A-135	Union Station, Stage I	38,600 - 48,200	October, 1986
A-136	Union Station, Stage II	11,600 - 14,300	December, 1988
A-138	Union Station Sitework	830 - 1,020	December, 1989
A-139	Union Station Site Landscaping	210 - 260	January, 1991
A-141	Line Section, Union Station to 5th/Hill Station; Civic Center Station, Stage I; Civic Center Excavation Support and Utility Relocation	75,400 - 93,400	September, 1986
A-145	5th/Hill Station, Stage I	39,100 - 47,300	April, 1987
A-146	Tunnel from 5th/Hill Station to 7th/Flower Station	22,200 - 27,000	February, 1987
A-147	Civic Center Station, Stage II	12,400 - 15,000	April, 1989
A-149	Vaults Relocation, 5th/Hill Station	3,500 - 4,300	August, 1986
A-157	5th/Hill Station, Stage II	10,800 - 13,400	March, 1989

PHASE I - CONSTRUCTION CONTRACT UNIT LIST AND RANGE VALUE, AND BID SCHEDULE*
 (Contd)

<u>Project No.</u>	<u>Project</u>	<u>(\$ in 1000's)</u>	<u>Date</u>
A-161	7th/Flower Station Utility Relocations	1,700 - 2,100	September, 1986
A-165	7th/Flower Station, Stage I	40,000 - 50,000	January, 1987
A-167	7th/Flower Station, Stage II	14,000 - 18,000	May, 1988
A-171	Line Section, 7th/Flower to Wilshire/Alvarado	44,900 - 54,300	September, 1986
A-175	Wilshire/Alvarado Station, Stage I	26,700 - 32,600	December, 1986
A-185	Wilshire/Alvarado Station Sitework	650 - 800	December, 1989
A-186	Wilshire/Alvarado Station Site Landscaping	100 - 120	December, 1989
A-187	Wilshire/Alvarado Station, Stage II	7,500 - 9,300	February, 1989

*Changes in design, scope, and construction restraints may alter the range of value.

MOS-1

DETAILED STRATIGRAPHIC DESCRIPTIONS
EXCERPTED FROM PRELIMINARY GEOTECHNICAL REPORT OF
NOVEMBER, 1981

PROJECT STRATIGRAPHY

Geologic Formations

The Metro rail alignment will encounter several geologic formations from downtown Los Angeles to North Hollywood. These materials are listed below in order of increasing age:

Young Alluvium	(Qa1)	Silt, sand, gravel, and boulders; chiefly unconsolidated (loose) and granular
Old Alluvium	(Qa1o)	Clay, silt, sand, and gravel; chiefly consolidated (stiff) and fine-grained
Fernando Formation	(Tf)	Claystone, siltstone, sandstone; chiefly soft, stratified siltstone; local hard sandstone beds
Puente Formation	(Tp)	Claystone, siltstone, sandstone; chiefly soft, stratified siltstone; local hard sandstone beds

Geologic Formations Subdivided into Geologic Units

The geologic formations have been subdivided into geologic units, because there are different physical properties within the formations.

Soft-Ground Tunneling

- A₁ YOUNG ALLUVIUM (Granular); includes clean sands, silty sands, gravelly sands, sandy gravels, and locally contains cobbles and boulders. Primarily dense, but ranges from loose to very dense
- A₂ YOUNG ALLUVIUM (Fine-Grained); includes clays, clayey silts, sandy silts, sandy clays, clayey sands. Primarily stiff, but ranges from soft to very stiff.
- A₃ OLD ALLUVIUM (Granular); includes clean sands, silty sands, gravelly sands, and sandy gravels. Primarily dense, but ranges from medium to very dense, containing more cohesive material than A₁.

- A₄ OLD ALLUVIUM (Fine-Grained); includes clays, clayey silts, sandy silts, sandy clays, and clayey sands. Primarily stiff, but ranges from medium to hard; contains more cohesive material than A₂.
- C FERNANDO AND PUENTE FORMATIONS; claystone, siltstone, and sandstone; thinly to thickly bedded. Primarily low hardness, weak to moderately strong, but locally contains hard, thin sandstone beds.

Soils Density and Consistency Terms

The following correlation of density/consistency terms with standard penetration information is used to describe all soil materials (Peck and others, 1974):

<u>Sands</u>		<u>Clays</u>	
<u>Number of Blows per ft, N</u>	<u>Relative Density</u>	<u>Number of Blows per ft, N</u>	<u>Consistency</u>
		Below 2	Very Soft
0 - 4	Very Loose	2 - 4	Soft
4 - 10	Loose	4 - 8	Medium (Firm)
10 - 30	Medium	8 - 15	Stiff
30 - 50	Dense	15 - 30	Very Stiff
Over 50	Very Dense	Over 30	Hard

A₁ - Young Alluvium (Granular)

Young Alluvium, designated A₁, of Holocene age is a relatively modern (in terms of geologic time), granular material deposited in swift streams. Some important characteristics are:

- Material: Clean sands and gravels, but includes silty sands, gravelly sands, sandy gravels, cobbles and boulders.
- Compactness: Primarily dense, but ranges from loose to very dense; relatively cohesionless compared to Old Alluvium Unit A₃.
- Bouldery Ground: Contains occasional boulders in the ancestral Los Angeles River channels, up to 2 ft diameter; boulders observed at the surface, prior to lining the Los Angeles River at the Macy Street crossing, were reported to be 4 ft diameter. The presence of boulders and cobbles is noted in the boring logs. However, boulders

were noted only where encountered; their absence, therefore, cannot be assumed where not noted, especially near the Los Angeles River. The possibility of undetected irregular-shaped lenses of large and small boulders and cobbles should be assumed.

A₂ - Young Alluvium (Fine-Grained)

Young Alluvium, designated A₂, of Holocene age is a relatively modern stream deposit, but differs from A₁ by being predominantly fine-grained and deposited in relatively "quiet" water. These deposits occur near the surface of the proposed Metro Rail alignment; irregular-shaped lenses of A₂ interfinger with A₁. Some important characteristics are:

- Material: Clayey silts and sandy silts, but includes clays, sandy clays, and clayey sands.
- Consistency: Primarily stiff, but ranges from soft to very stiff.
- Non-Bouldery Ground: Boulders were not encountered in the borings. However, their absence cannot be completely assured, because A₂ is associated with flood plain deposits that are judged to have had boulder-size carrying capacity during past floods.

A₃ - Old Alluvium (Granular)

Old Alluvium, designated A₃, of Pleistocene age is a granular material deposited in relatively swift water, but differs from A₁ in that it contains more cohesive material. These deposits occur as irregular-shaped lenses. Some important characteristics are:

- Material: Silty sands, but includes clean sands, gravelly sands, and sandy gravels.
- Compactness: Primarily dense, but ranges from medium to very dense.
- Non-Bouldery Ground: Boulders were not encountered in the borings. However, these are relatively swift water deposits judged capable of carrying boulder-sized material. The quantity of boulders is believed to be less than in A₁.

A₄ - Old Alluvium (Fine-Grained)

Old Alluvium, designated A₄, of Pleistocene age is a fine-grained material deposited in relatively "quiet" water, but differs from A₂ in that it contains more cohesive material. These deposits are widespread. Some important characteristics are:

Material: Clayey silts and sandy silts, but includes clays, sandy clays, and clayey sands.

Consistency: Primarily stiff, but ranges from medium to hard.

Non-Bouldery Ground: Boulders were not encountered in the borings. Only a few scattered boulders are believed present, because of the distant downstream location from the Santa Monica Mountains; i.e., reduced carrying capacity of streams and relatively "quiet water deposition."

C - Fernando Formation

The Fernando Formation of Pliocene age consists of well stratified claystone and siltstone with interbeds of sandstone. The Fernando Formation conformably overlies the Puente Formation. The lithologic contact between the Fernando Formation and Puente Formation is gradational and difficult to locate accurately, whether in the subsurface or on the surface, because the composition of the materials is similar. The Fernando Formation wraps around the Puente Formation at the eastern end of the Los Angeles Anticline and rises to the surface in the downtown Los Angeles area. The proposed Metro Rail alignment will encounter the Fernando Formation. Some important characteristics are:

Material: Claystone, siltstone, and sandstone, mostly thinly bedded.

Bedding Attitudes: Based on limited surface exposures, combined with the fact the Metro Rail alignment parallels the south flank of the Los Angeles Anticline, bedding is judged to trend northwesterly with attendant southwesterly dips ranging from 5° to 60°. Thus, the beds would dip unsupported into near-vertical, southerly-facing excavations. The trend of bedding would cross the alignment at about 45°, thus individual beds could follow the alignment several hundreds of feet.

Hardness: Low hardness, weak to moderately strong. Locally contains hard sandstone beds ranging from less than 1 inch to 3 feet in thickness. Hard beds are estimated to comprise less than 1% of the Formation; estimated unconfined compressive strength may exceed 15,000 psi.

Slaking: The clayey beds air-slake (deteriorate 1 to 6 inches into the excavated surface) within a day or two when exposed in surface excavations. Therefore, clayey beds are judged to air-slake in either cut-and-cover line segment excavations or in tunnel excavations when subjected to high

volume ventilation air flow (for gassy reaches). Additional deterioration of the tunnel invert is considered likely if the clayey beds are exposed to wetting and continuous construction traffic.

Petroliferous: Contains oil in the Salt Lake Oil Field.

C - Puente Formation

The Puente Formation of upper Miocene age consists of well stratified claystone and siltstone with interbeds of sandstone. The Puente Formation ranges from thinly to thickly bedded. Field observations indicate that the bedding has been contorted and deformed as the result of slumping and sliding, contemporaneous with deposition. These contorted beds, which are commonly associated with coarse-grained pebbly sandstone layers, suggest that the deposition of these coarser sediments may have initiated slumping in the previously deposited siltstone beds. The thin-bedded sequence occurs in Chavez Ravine (Dodger Stadium); the thicker sequence of sandstone and interbedded siltstone of the Puente Formation is exposed on the north flank of the Los Angeles Anticline along Glendale Boulevard. Some important characteristics are:

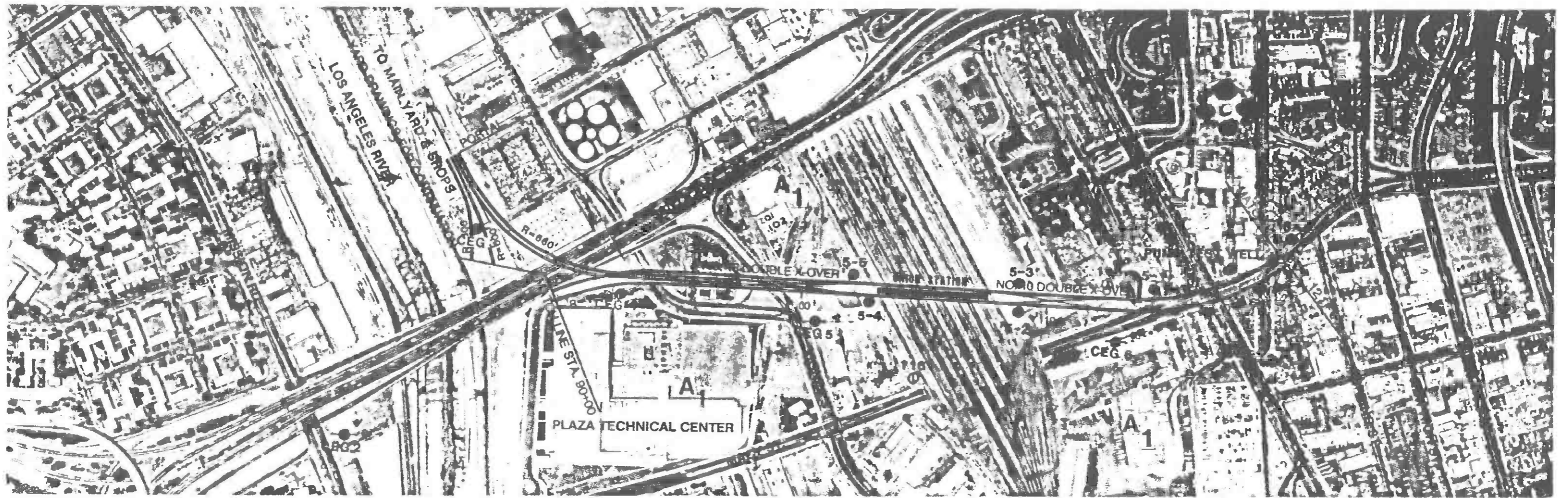
Material: Thick bedded sequence of claystone, siltstone, and sandstone. The major difference between the Puente Formation and Fernando Formation is that the Puente Formation:

- (a) exhibits consistently thicker beds;
- (b) contains a larger quantity of hard sandstone beds ranging from less than 1 inch to 3 feet in thickness, and
- (c) contains more clay-sized particles.

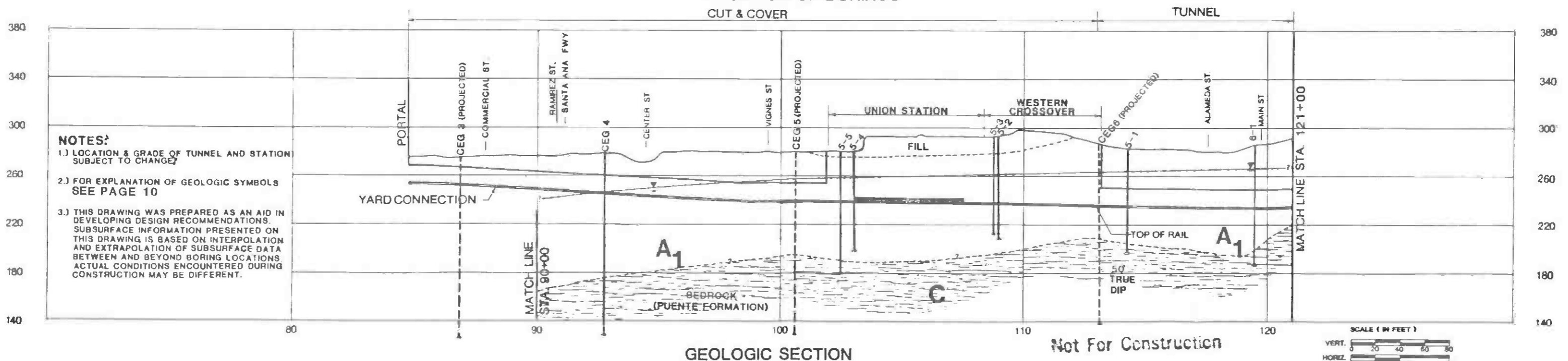
Hardness: Low hardness and weak to moderately strong. Locally contains hard sandstone beds ranging in thickness from less than 1 inch to 3 feet. Hard beds are estimated to comprise less than 2% of the formation; the estimated unconfined compressive strength may exceed 15,000 psi.

Slaking: Tends to air-slake in surface excavations, slightly more than the Fernando Formation because of more clay content. The formation is judged to air-slake in either cut-and-cover line segment excavations or in tunnel segments when subjected to high volume ventilation air flow (for gassy reaches).

Petroliferous: Contains oil, tar, and gas.



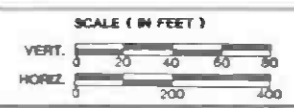
LOCATION OF BORINGS
CUT & COVER



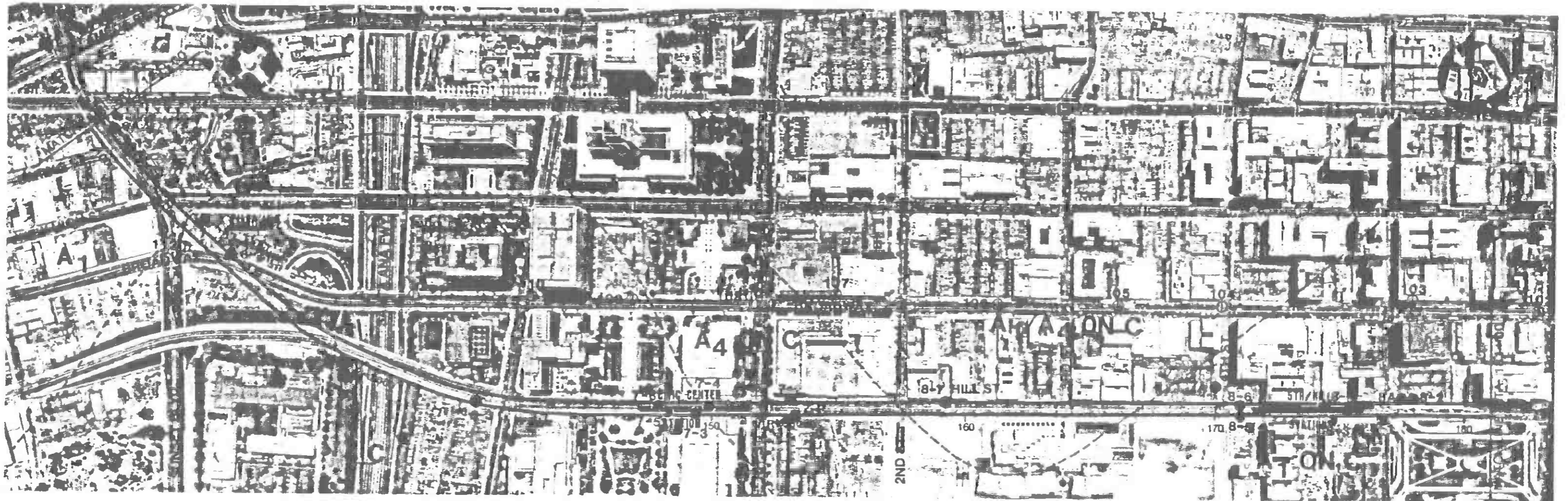
- NOTES:**
- 1.) LOCATION & GRADE OF TUNNEL AND STATION SUBJECT TO CHANGE
 - 2.) FOR EXPLANATION OF GEOLOGIC SYMBOLS SEE PAGE 10
 - 3.) THIS DRAWING WAS PREPARED AS AN AID IN DEVELOPING DESIGN RECOMMENDATIONS. SUBSURFACE INFORMATION PRESENTED ON THIS DRAWING IS BASED ON INTERPOLATION AND EXTRAPOLATION OF SUBSURFACE DATA BETWEEN AND BEYOND BORING LOCATIONS. ACTUAL CONDITIONS ENCOUNTERED DURING CONSTRUCTION MAY BE DIFFERENT.

GEOLOGIC SECTION

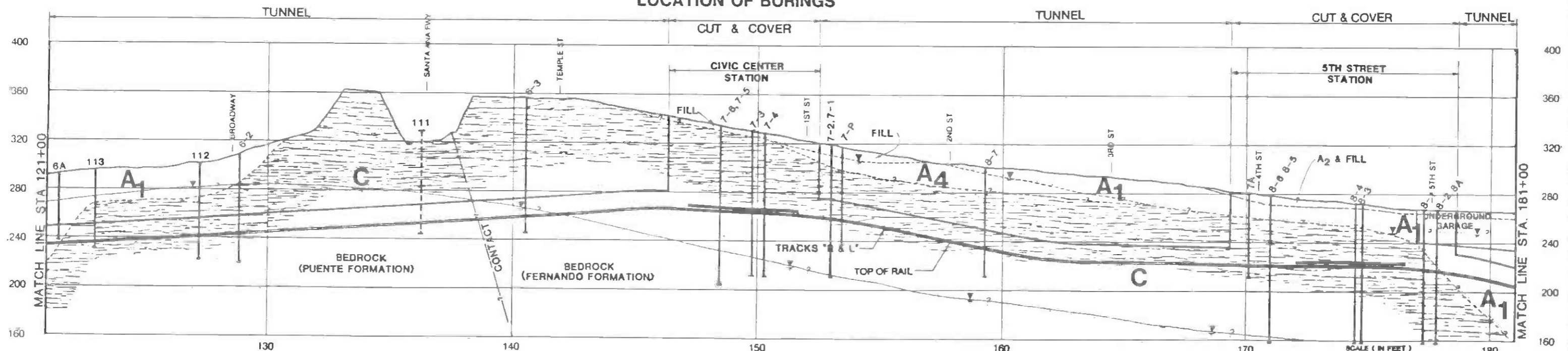
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THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U. S. DEPARTMENT OF TRANSPORTATION, URBAN MASS TRANSPORTATION ADMINISTRATION, UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED, AND IN PART BY THE TAXES OF 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 General Geotechnical Consultants Submitted <i>R. P. ...</i> Date <i>2-21-83</i>	DESIGN UNIT A140 LOCATION OF BORINGS AND GEOLOGIC SECTION	PROJECT NO. A-140 DRAWING NO. K-001 SCALE AS SHOWN SHEET NO. 413
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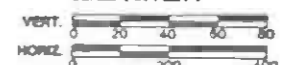


LOCATION OF BORINGS



GEOLOGIC SECTION

Not For Construction



REV.	DATE	BY	SUB.	APP.	DESCRIPTION

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**



CCI/ESA/GRC
General Geotechnical Consultants

Submitted *R. Al. Price* Date *12-21-89*

DMJM/PBOD/KE/HWA
A JOINT VENTURE
GENERAL CONSULTANTS

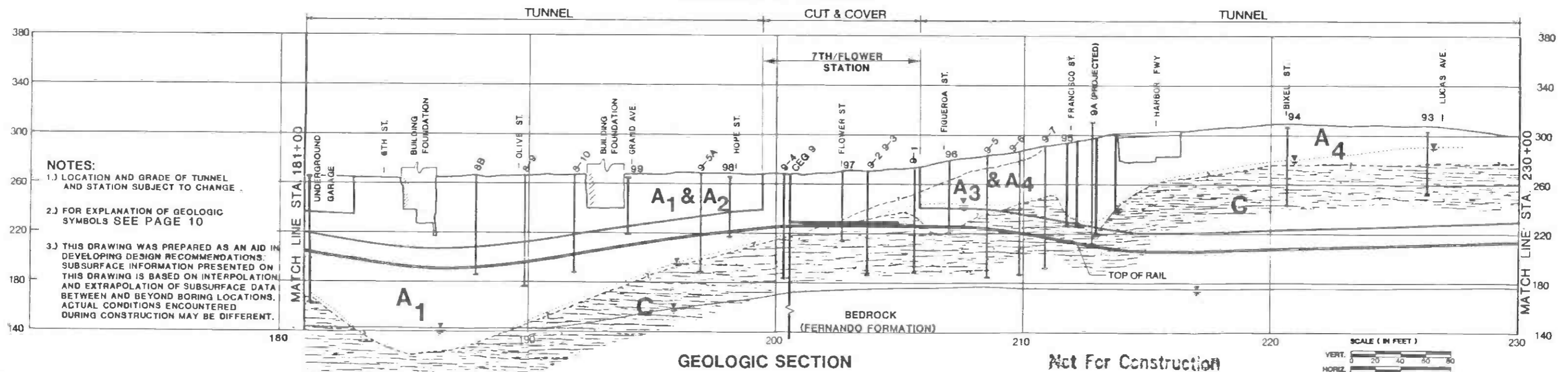
APPROVED _____

**DESIGN UNIT A140
LOCATION OF BORINGS
AND
GEOLOGIC SECTION**

PROJECT NO.	A-140
DRAWING NO.	K-002
SCALE	AS SHOWN
SHEET NO.	414



LOCATION OF BORINGS




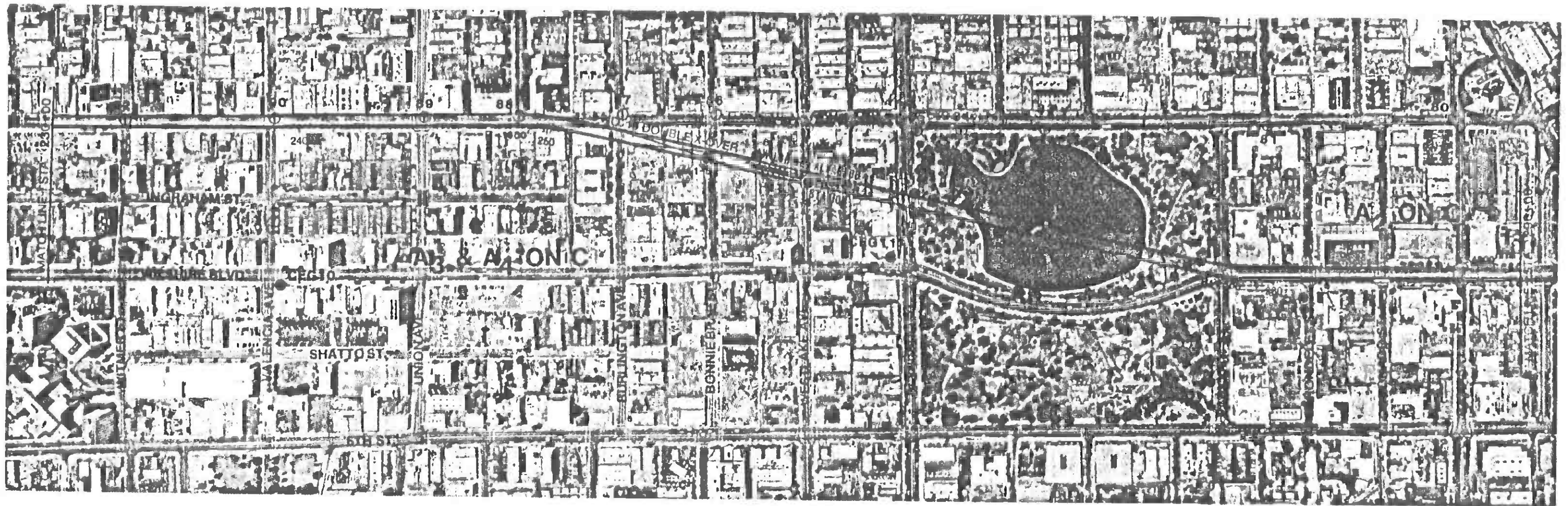
GEOLOGIC SECTION

Not For Construction

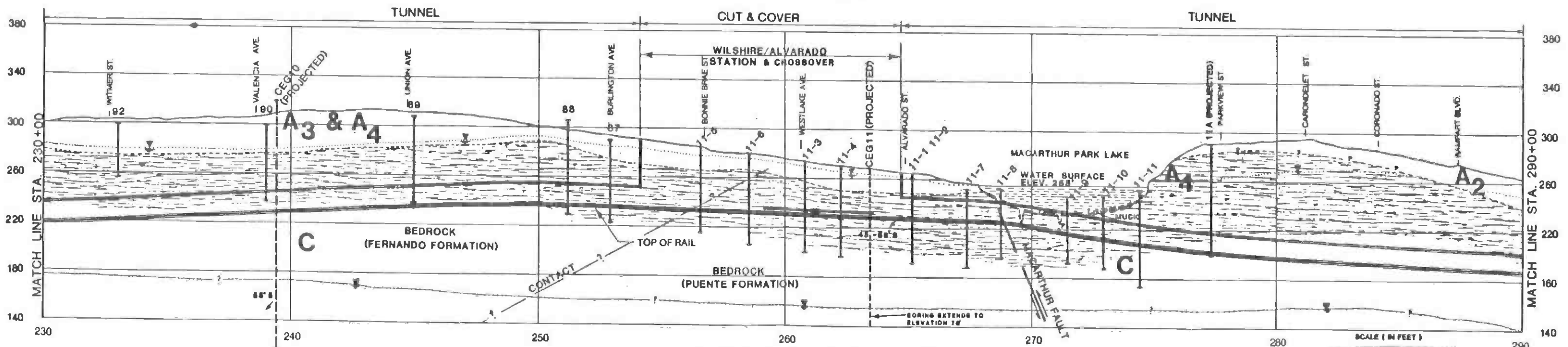


- NOTES:
- 1.) LOCATION AND GRADE OF TUNNEL AND STATION SUBJECT TO CHANGE.
 - 2.) FOR EXPLANATION OF GEOLOGIC SYMBOLS SEE PAGE 10
 - 3.) THIS DRAWING WAS PREPARED AS AN AID IN DEVELOPING DESIGN RECOMMENDATIONS. SUBSURFACE INFORMATION PRESENTED ON THIS DRAWING IS BASED ON INTERPOLATION AND EXTRAPOLATION OF SUBSURFACE DATA BETWEEN AND BEYOND BORING LOCATIONS. ACTUAL CONDITIONS ENCOUNTERED DURING CONSTRUCTION MAY BE DIFFERENT.

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 		DESIGN UNIT A140 LOCATION OF BORINGS AND GEOLOGIC SECTION		PROJECT NO. A-140																												
				CCI/ESA/GRC General Geotechnical Consultants Submitted: R.M. Prida Date: 10/21/98		DMJM/PBOD/KE/HWA GENERAL CONSULTANTS APPROVED		DRAWING NO. K-003 REV.		SCALE AS SHOWN																												
<table border="1"> <thead> <tr> <th>REV.</th> <th>DATE</th> <th>BY</th> <th>SUB.</th> <th>APP.</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>				REV.	DATE	BY	SUB.	APP.	DESCRIPTION																													SHEET NO. 415
REV.	DATE	BY	SUB.	APP.	DESCRIPTION																																	



LOCATION OF BORINGS



GEOLOGIC SECTION

Not For 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.											
REV.	DATE	BY	SUB.	APP.	DESCRIPTION	REV.	DATE	BY	SUB.	APP.	DESCRIPTION

DESIGNED BY	
DRAWN BY	
CHECKED BY	
IN CHARGE	
DATE	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT



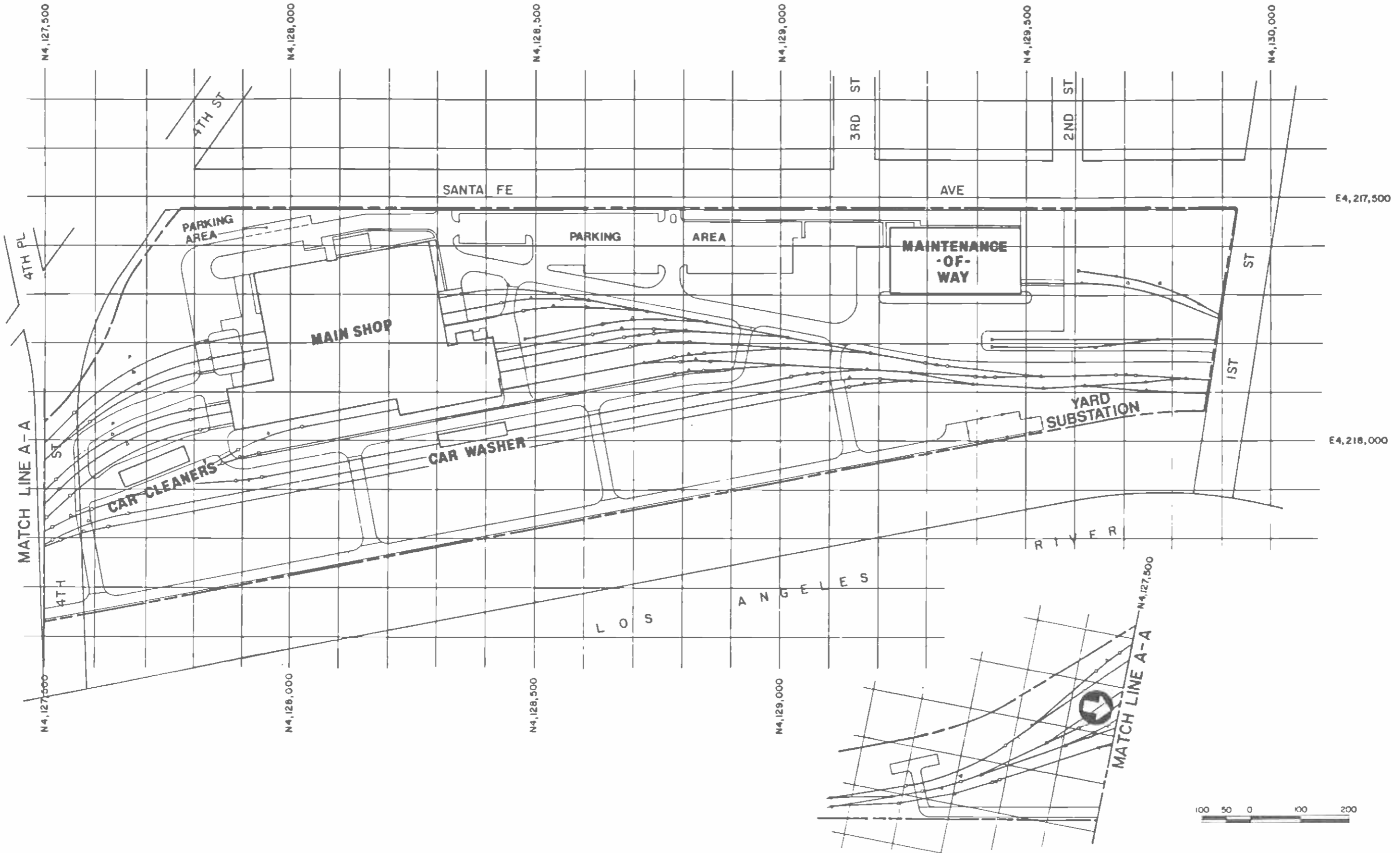


General Geotechnical Consultants
 General Consultants

Submitted *[Signature]* Date 12-11-85 APPROVED _____

DESIGN UNIT A170
LOCATION OF BORINGS
AND GEOLOGIC SECTION

PROJECT NO. CA-170
 DRAWING NO. S-002-8
 SCALE AS SHOWN
 SHEET NO. 178



REV	DATE	BY	SUB	APP	DESCRIPTION

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. Leclair


DRAWN BY
Ed. Roman

CHECKED BY

IN CHARGE

DATE

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT



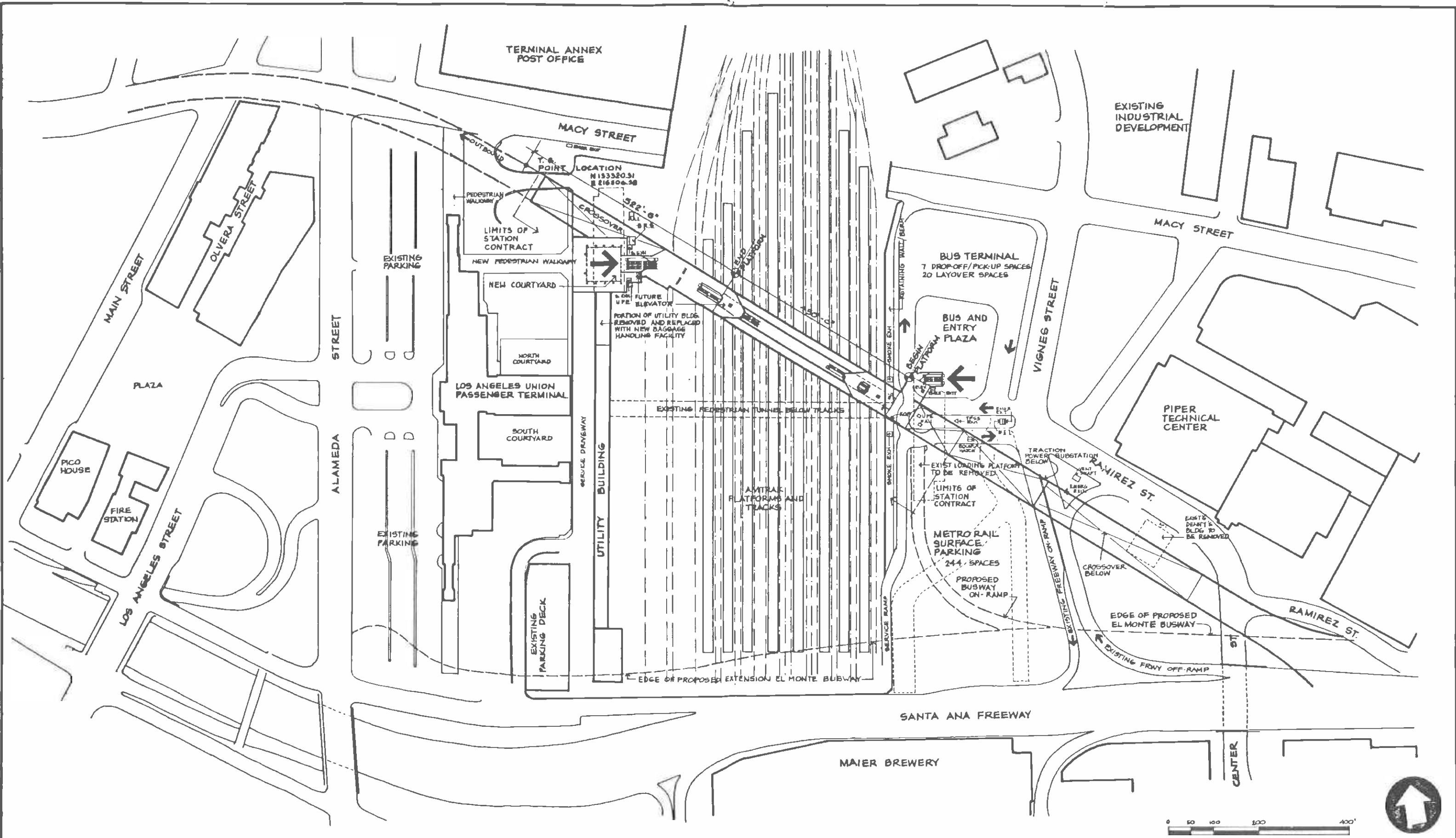
DMJM/PBQD/KE/HWA
GENERAL CONSULTANTS

SUBMITTED _____ APPROVED _____

LA CBD TO NORTH HOLLYWOOD
TRACKWORK INSTALLATION

CONTRACTOR'S STAGING AREA
SHEET 1

CONTRACT NO	A610
DRAWING NO	T-105
SCALE	1" = 100'
SHEET NO	6



REV.	DATE	BY	SUB.	APP.	DESCRIPTION

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.

REV.	DATE	BY	SUB.	APP.	DESCRIPTION
A	10/20/84	KL	J.W.		MATCHES AND GRATES REVISED; PEDESTRIAN EXTENDED, VIGNES ST (MACYS) WIDENED.
					2 ESCALATORS DEFERRED; REPLACED WITH STAIRS.

DESIGNED BY
N.R.T.C.


DRAWN BY
K. LIM

CHECKED BY
J. WILEY

IN CHARGE
H. KIVETT

DATE
7 SEPT 84

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT



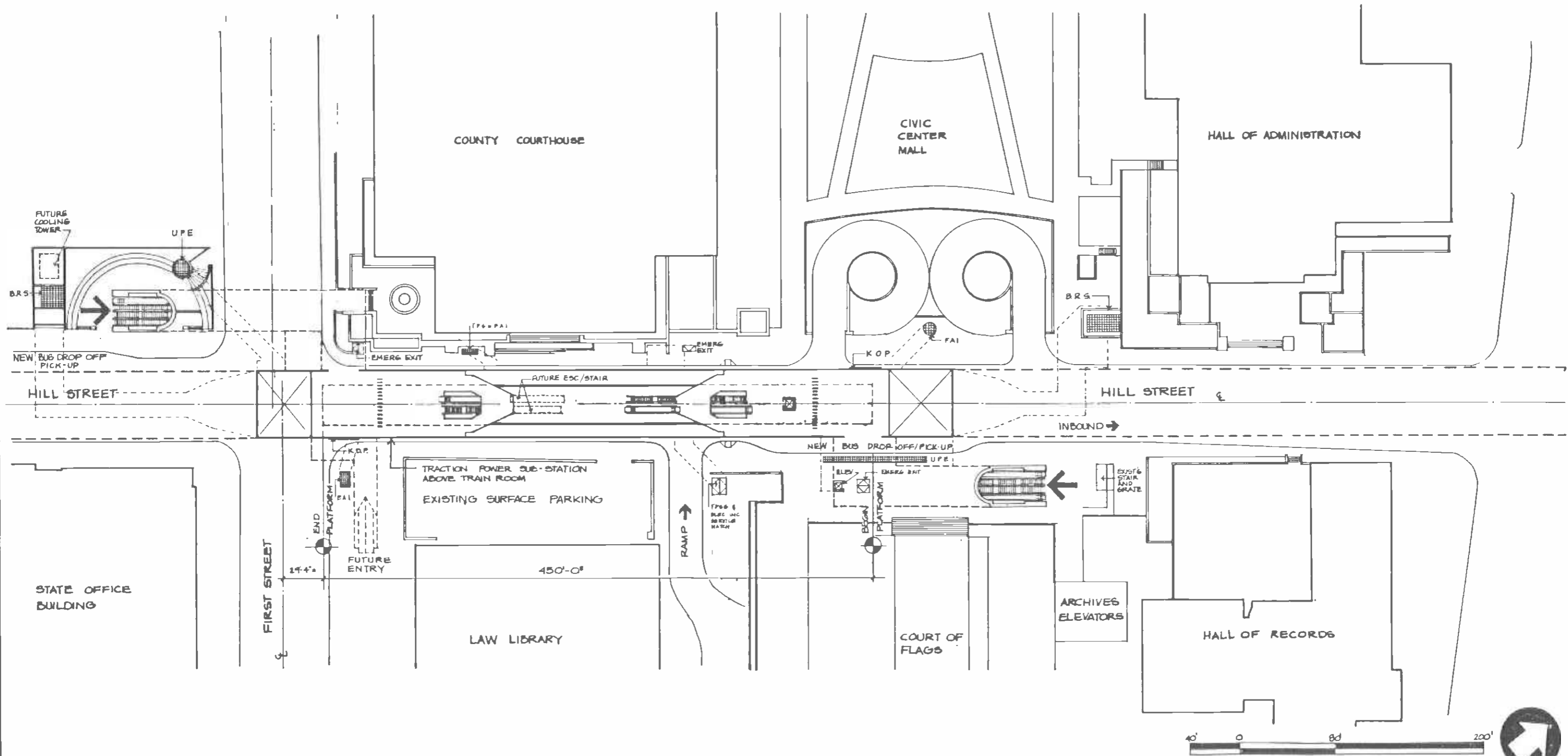
DMJM/PBQD/KE/HWA
GENERAL CONSULTANTS

APPROVED: *[Signature]*

UNION STATION
SITE PLAN

MILESTONE 10 - REVISED

CONTRACT NO.	A-135
DRAWING NO.	REV.
SCALE	1" = 100'
SHEET NO.	1 OF 19



REV	DATE	BY	SUB.	APP.	DESCRIPTION
A	1/18/85	AV	JW		ENTRANCE DETAILED PER S.D. PLANS. EMERG EXIT RELOCATED HANDICAP RAMP RELOCATED.

REV	DATE	BY	SUB.	APP.	DESCRIPTION
POST MILESTONE 10 - REV					2 ESCALATORS DEFERRED & REPLACED BY STAIR; STAIR REFERRED; ANCILLARY ROOMS REVISED; ENTRANCE SHIFTED WESTWARD; END MEZZANINES SHIFTED AND DEVICES RELOCATED.

DESIGNED BY MRTC.
DRAWN BY M. POINDEXTER
CHECKED BY J. WILEY
IN CHARGE R. KIVETT
DATE 7 SEPT 84

**SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT**

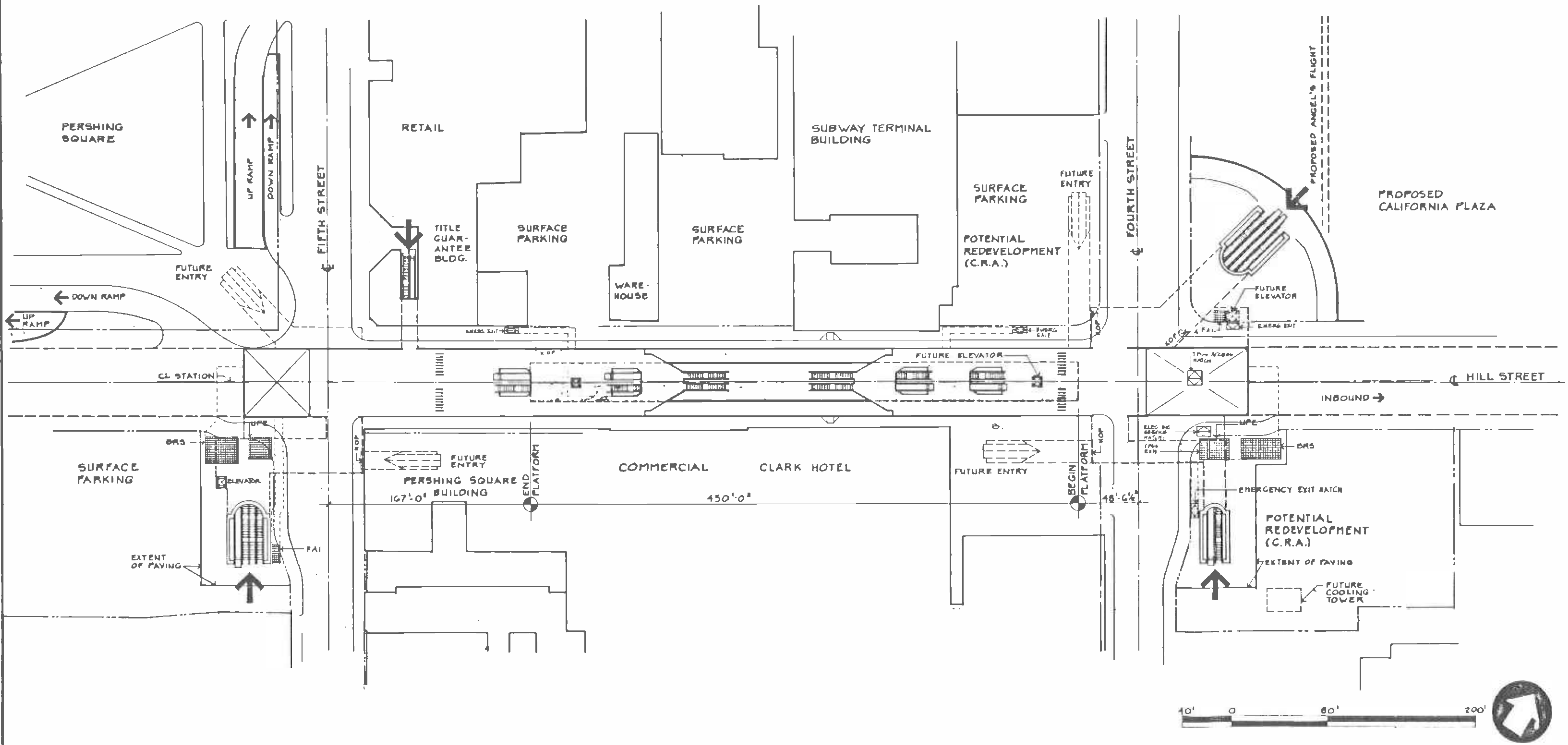
DMJM/PBOD/KE/HWA
GENERAL CONSULTANTS

SUBMITTED *[Signature]* APPROVED *[Signature]*

**CIVIC CENTER STATION
SITE PLAN**

MILESTONE 10 - REVISED

CONTRACT NO. A-140
DRAWING NO. REV.
SCALE 1" = 40'
SHEET NO. 2 OF 19



REV	DATE	BY	SUB	APP	DESCRIPTION
A	1/15/84	AV	JN		EMER'S BLDG. REVISED
					ENTRIES DETAIL FOR SEATTLE DESIGNER FOR
					STREET WIDENING AT 4th & 5th ENTRIES & UP-HILL NEW EMERG. EXITS ADDED

REV.	DATE	BY	SUB	APP.	DESCRIPTION
					SOUTHWEST ENTRY SHIFTED ONE BAY NORTH. NORTHWEST ENTRY REORIENTED. PLATFORM SHIFTED 80' NORTHWARD. ANCILLARY ROOMS REVISED. 2 ESC. DEFERRED & REPLACED W/ STAIRS.

DESIGNED BY
M.R.T.C.
DRAWN BY
BK
CHECKED BY
J WILEY
IN CHARGE
HKIVETT
DATE
7 SEPT 84

**SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT**

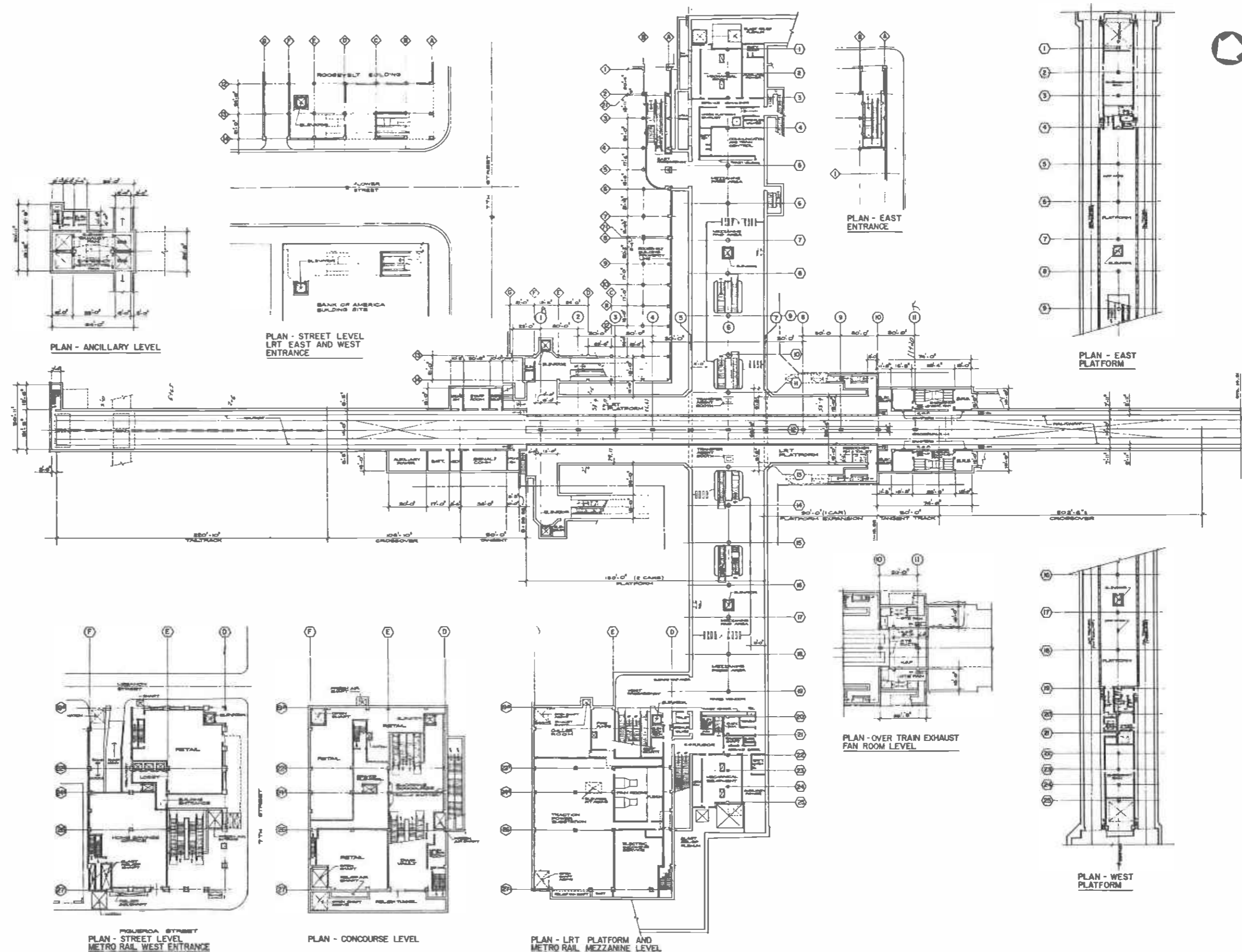
DMJM/PBOD/KE/HWA
A JOINT VENTURE
GENERAL CONSULTANTS

SUBMITTED *H. Kivett*
APPROVED *[Signature]*

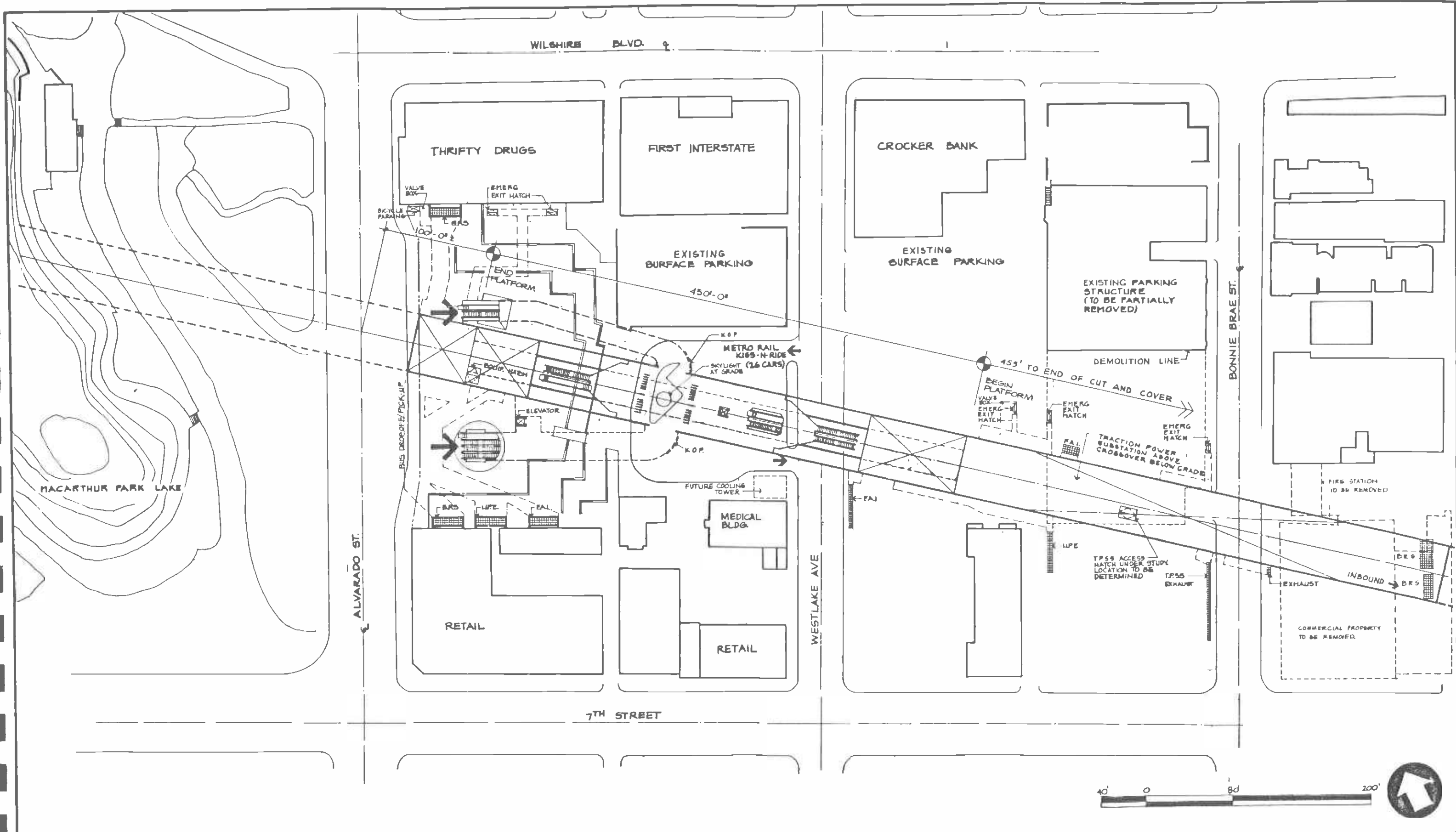
**5TH / HILL STATION
SITE PLAN**

MILESTONE 10 - REVISED

CONTRACT NO. A-140	REV.
DRAWING NO.	
SCALE 1" = 40'	
SHEET NO. 3 OF 19	



LOS ANGELES COUNTY TRANSPORTATION COMMISSION The Long Beach-Los Angeles Rail Transit Project METRO RAIL TRANSIT CONSULTANTS Siskiyotti Collaborative Rail Consultants		SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT COMPOSITE INTEGRATED FACILITY PLANS		1" = 30'-0"
19 DEC 08	19 DEC 08	19 DEC 08	19 DEC 08	19 DEC 08



REV.	DATE	BY	SUB.	APP.	DESCRIPTION

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DESIGNED BY
MRTC

DRAWN BY
M. POINDESTER

CHECKED BY
J. WILEY

IN CHARGE
H. KIVETT

DATE
7 SEPT. '84

POST MILESTONES 10 REV. 1
A' 1/14/84 K. LIM
SKYLIGHT ADDED SURFACE HATCHES REVISED
BUS SURFACE STREETS ADDED ENTRY REV PER S. PLAN
2 ESCALATORS ON FERRISBO (REPLACED HATCHES)

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

DMJM/PBQD/KE/HWA
GENERAL CONSULTANTS

APPROVED *[Signature]*

WILSHIRE/ALVARADO STATION
SITE PLAN
MILESTONE 10 - REVISED

CONTRACT NO.
A-170

DRAWING NO. REV.

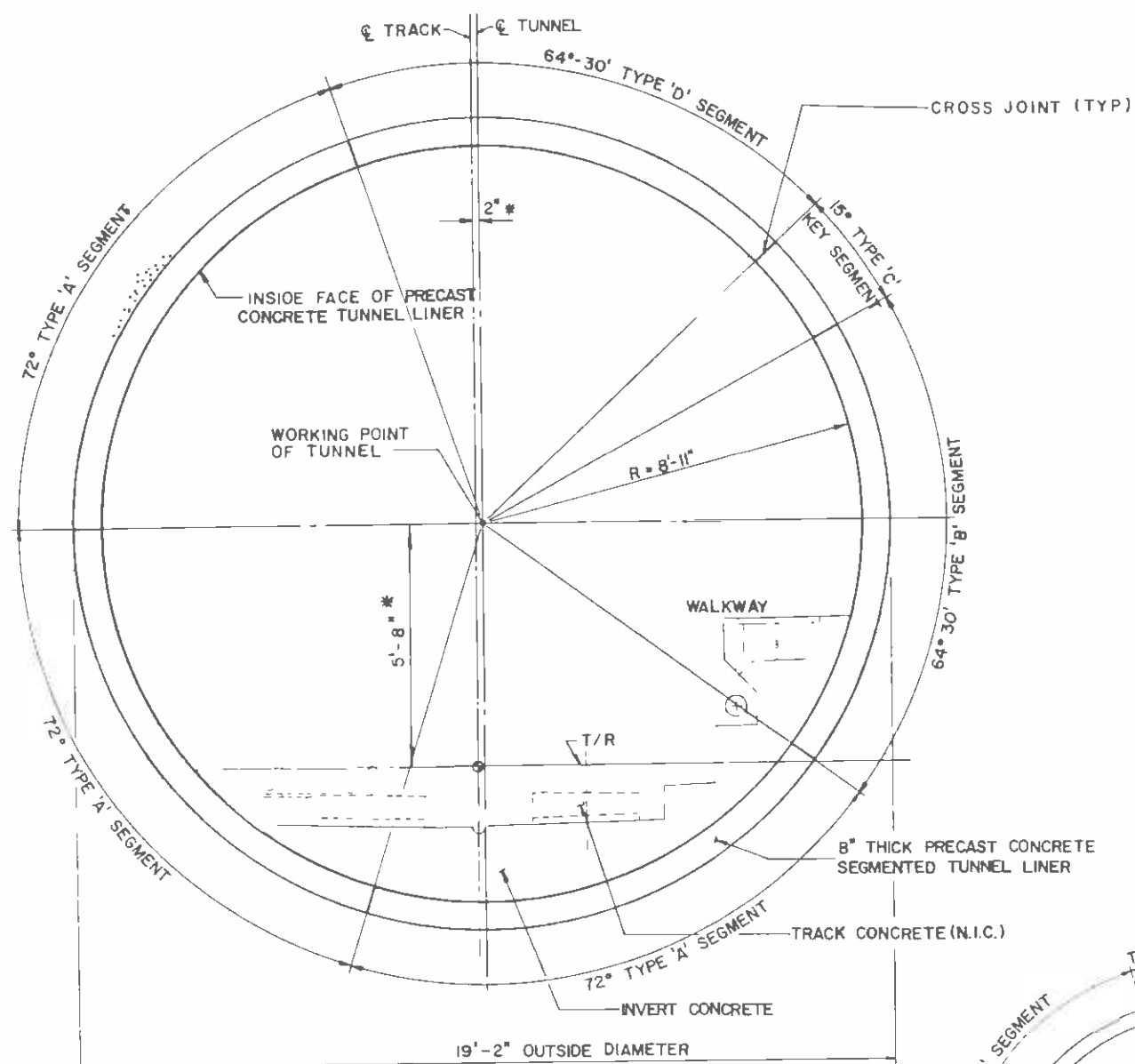
SCALE
1" = 40'

SHEET NO.
5 OF 19

9

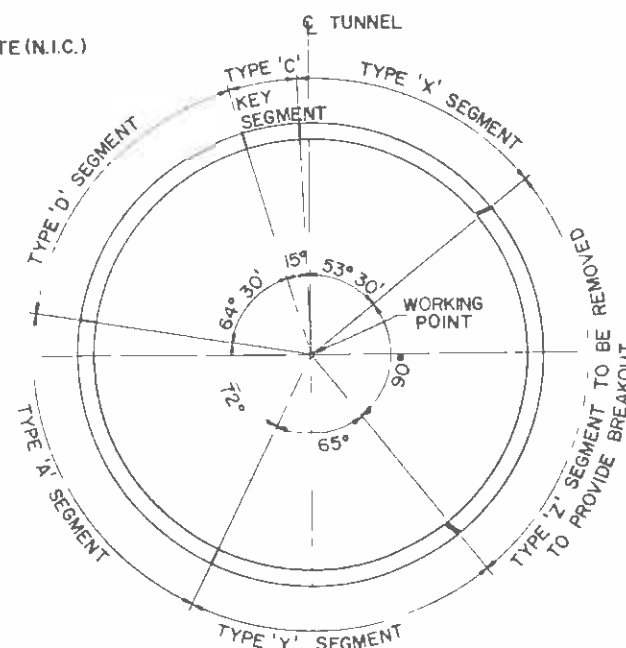
GENERAL NOTES

- 1 ALL DESIGNS ARE BASED ON THE FOLLOWING :
 - A. REINFORCED CONCRETE - 1983 EDITION OF THE AMERICAN CONCRETE INSTITUTE'S "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE (ACI 318-B3)."
 - B. STRUCTURAL STEEL - 1980 EIGHT EDITION OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION'S "SPECIFICATIONS FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS " (AISC SPECIFICATIONS).
 - C. WELDING - 1979 EDITION OF THE AMERICAN WELDING SOCIETY'S "STRUCTURAL WELDING CODE - REINFORCING STEEL" (ANSI/AWS D1.4 - 79). AND STRUCTURAL WELDING CODE FOR STEEL (ANSI/AWS D1.1-1983)
- 2 DESIGN STRENGTHS:
 - A. PRECAST CONCRETE $f'_c = 6,500$ psi. AT 28 DAYS
 - B. REINFORCING STEEL - ASTM A-615 GRADE 60 $F_y = 60,000$ psi.
 - C. STRUCTURAL STEEL - ASTM A-36 $F_y = 36,000$ psi.
 - D. ALL STRUCTURAL BOLTS SHALL BE ASTM A307 GRADE 'A' AND THE STRESSES SHALL BE AS SPECIFIED BY AISC SPECIFICATION.
 - E. CAST-IN-PLACE CONCRETE $f'_c = 4000$ psi AT 28 DAYS.
- 3 ALL CEMENT SHALL BE TYPE V HIGH SULFATE RESISTANT.
- 4 THE CONCRETE RINGS ARE DESIGNED FOR THE PRESSURE OF 20-125 TON JACKS UNIFORMLY SPACED WITH JACK SHOES CAPABLE OF DELIVERING THE LOAD OF EACH JACK SO THAT IT IS UNIFORMLY DISTRIBUTED OVER A CIRCUMFERENTIAL LENGTH OF 30 INCHES APPLIED WITH ITS RESULTANT CENTER OF FORCE WITHIN A RADIAL RANGE OF 3 1/2 INCHES TO 4 3/4 INCHES FROM THE OUTSIDE FACE OF THE SEGMENTS.
- 5 CROSS JOINTS IN ADJACENT RINGS SHALL BE STAGGERED EXCEPT AT BREAKOUTS
- 6 INSERTS, ANCHORS, DOWELS, AND ACCESSORIES: STEEL, ASTM A36, HOT DIPPED GALVANIZED, ASTM A123
- 7 GASKETS FOR LINERS SHALL BE PREFORMED GASKETS -
- 8 GASKET ADHESIVE SHALL BE AS RECOMMENDED BY GASKET MANUFACTURER
- 9 PROVIDE METHANE RESISTANT MEMBRANE ON OUTSIDE SURFACE OF PRECAST CONCRETE SEGMENTS.
- 10 GROUT PLUGS SHALL BE ASTM A126, CLASS B.
- 11 ALL BOLTS AND NUTS SHALL BE ASTM A307 GRADE 'A' HOT DIPPED GALVANIZED ASTM A123
- 12 ALL WASHERS SHALL BE ASTM A36, HOT DIPPED GALVANIZED.
- 13 GROMMETS SHALL BE POLYMERIZED PLASTIC.
- 14 HANDLING AND STORAGE SHALL BE GOVERNED AS FOLLOWS:
 - a) A MINIMUM OF FOUR BOLT HOLES MUST BE ENGAGED WITH FULL DEPTH PINS WHEN HANDLING SEGMENTS FROM BOLT HOLES.
 - b) A MINIMUM OF TWO GROUT PIPES MUST BE ENGAGED WHEN HANDLING SEGMENTS FROM GROUT PIPES.
 - c) SPECIAL THREADED EYE BOLTS MUST BE USED WHEN HANDLING SEGMENTS FROM GROUT PIPES, ENGAGED THE FULL GROUT PIPE THREAD LENGTH.
 - d) SEGMENTS MAY NOT BE HANDLED FROM GROUT PIPES DURING SEGMENT ERECTION.
 - e) DUNNAGE IS REQUIRED TO PREVENT SEGMENT CONTACT WITH SUPPORT SURFACES AND WITH EACH OTHER.
- 15 REINFORCING STEEL IN PRECAST CONCRETE SEGMENTS WITH THE EXCEPTION OF TYPE 'Z' SEGMENTS SHALL BE EPOXY COATED
- 16 EPOXY COATED REINFORCING STEEL SHALL BE TIED INTO CAGES, SUFFICIENTLY RIGID TO BE PLACED INTO SEGMENT FORMS. TIE WIRE SHALL BE COMPATIBLE WITH, AND NOT DAMAGE, EPOXY COATING.



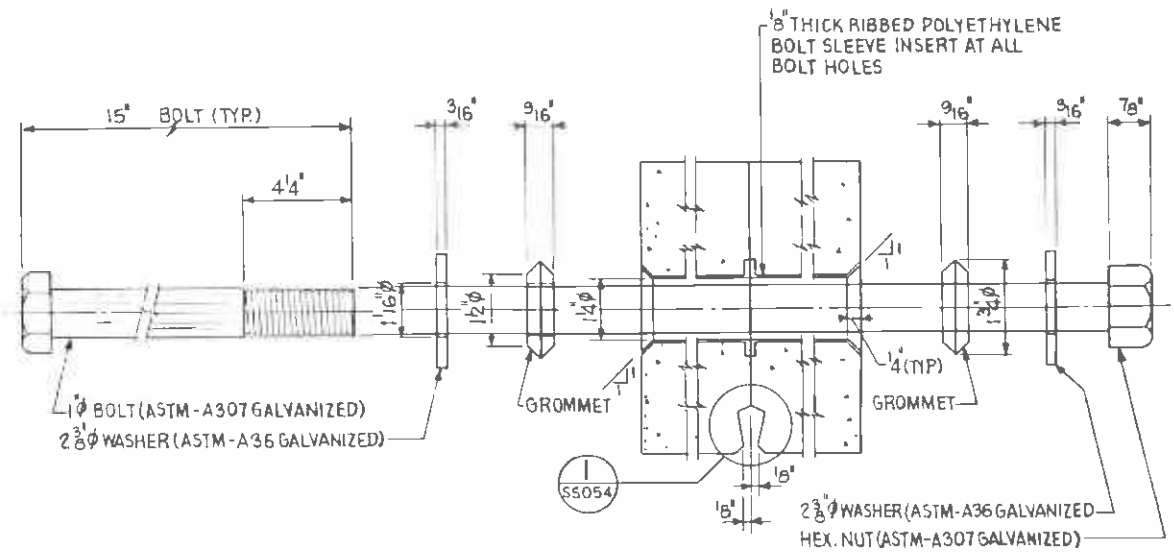
TYPICAL SECTION
SCALE 1/2" = 1'-0"

* TANGENT ALIGNMENT ONLY

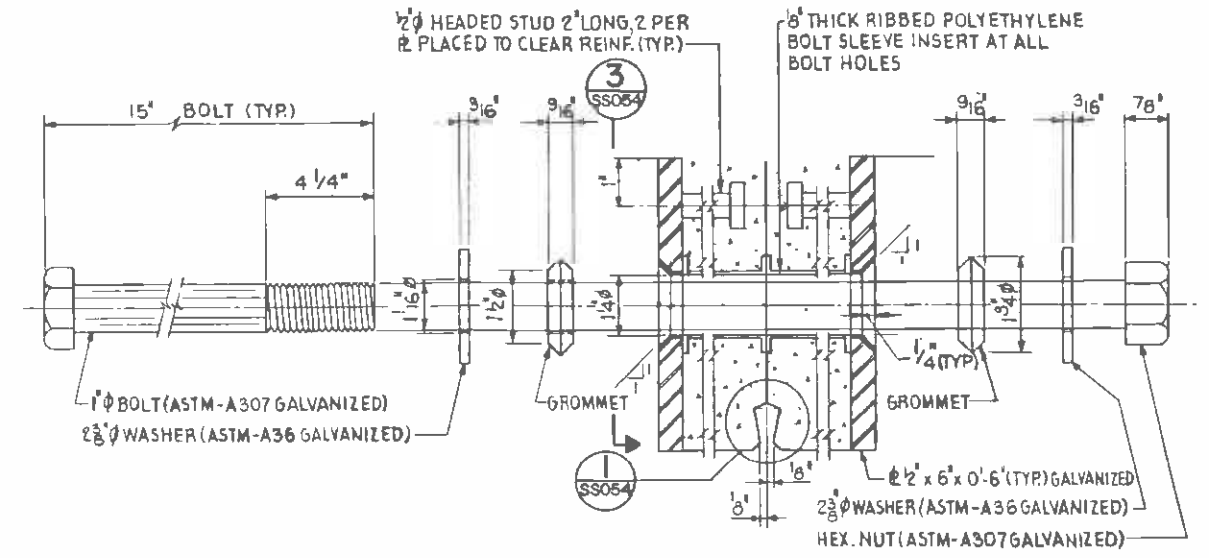


TUNNEL LINER SEGMENTS AT CROSS PASSAGE
(BEFORE BREAKOUT)
SCALE 1/4" = 1'-0"

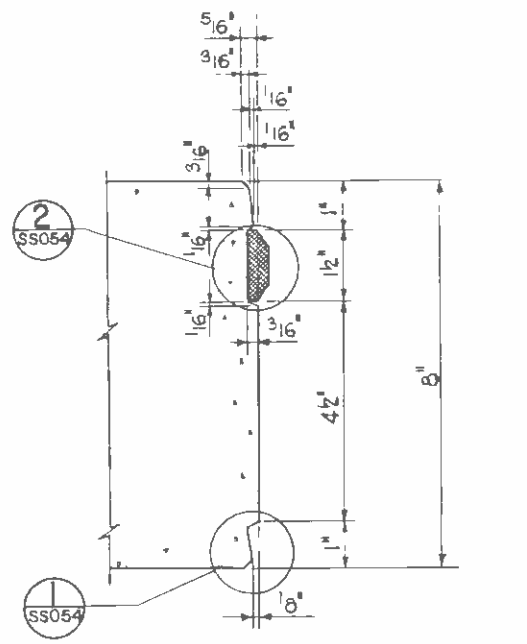
THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U.S. DEPARTMENT OF TRANSPORTATION, URBAN MASS TRANSPORTATION ADMINISTRATION, UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA.					DESIGNED BY <i>A.P. Dell. P.E.</i> DRAWN BY <i>A. Crui</i> CHECKED BY <i>C.P. Yu</i> IN CHARGE <i>D. J. Miller</i> DATE 8/15/03		SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT 		STRUCTURAL STANDARD TUNNEL SUBWAY PRECAST CONCRETE SEGMENTED LINERS TYPICAL SECTION & GENERAL NOTES		CONTRACT NO. DRAWING NO. SS-051A SCALE AS SHOWN SHEET NO.	
SIGNATURE ISSUE 112704					CIVIL ENGINEER STATE OF CALIFORNIA 014		DMJM/PBQD/KE/HWA A JOINT VENTURE GENERAL CONSULTANTS APPROVED: <i>D.S. Hannan</i>		REV. 0			
REV	DATE	BY	SUB	APP	DESCRIPTION	REV	DATE	BY	SUB	APP	DESCRIPTION	



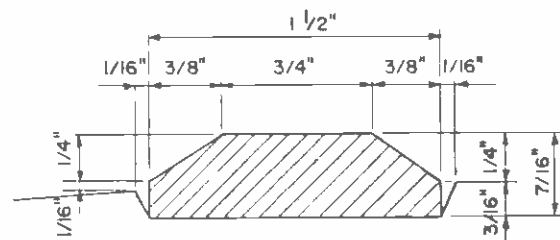
BOLT, GROMMET AND COUNTERSUNK HOLE DETAIL - A
SCALE: HALF FULL SIZE



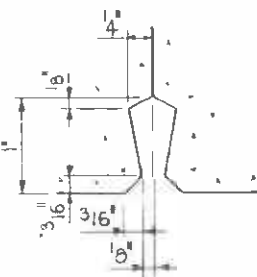
BOLT, GROMMET AND COUNTERSUNK HOLE DETAIL - B
SCALE: HALF FULL SIZE



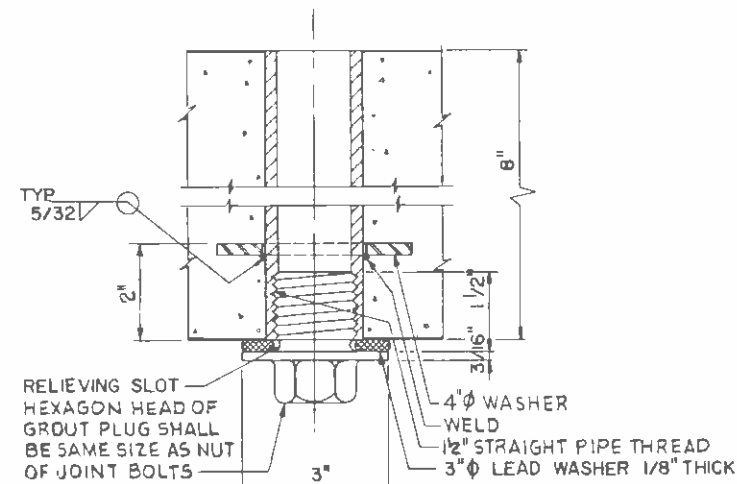
TYPICAL DETAIL AT
SEGMENT MATING SURFACES
SCALE: HALF FULL SIZE



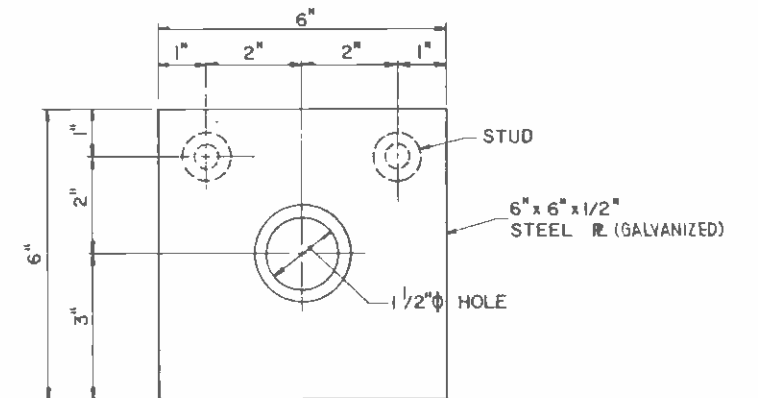
GASKET DETAIL
N. T. S.



DETAIL
SCALE: FULL SIZE



GROUT PLUG DETAIL
N. T. S.



TYPICAL STEEL PLATE DETAIL
SCALE: 1/2" = 0'-1"

NOTE: FOR COMPRESSIBILITY REQUIREMENTS
FOR GASKET SEE SPECIFICATION

NOTE: ALL GALVANIZED SURFACES SHALL BE TOUCH-UP
IN PLACE BY LIQUID OR SPRAY GALVANIZED.

REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY C.P. 72	
DRAWN BY P. Walkley	
CHECKED BY A.P. Wallace	
IN-CHARGE D.P. Wallace	
DATE 8/15/83	

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

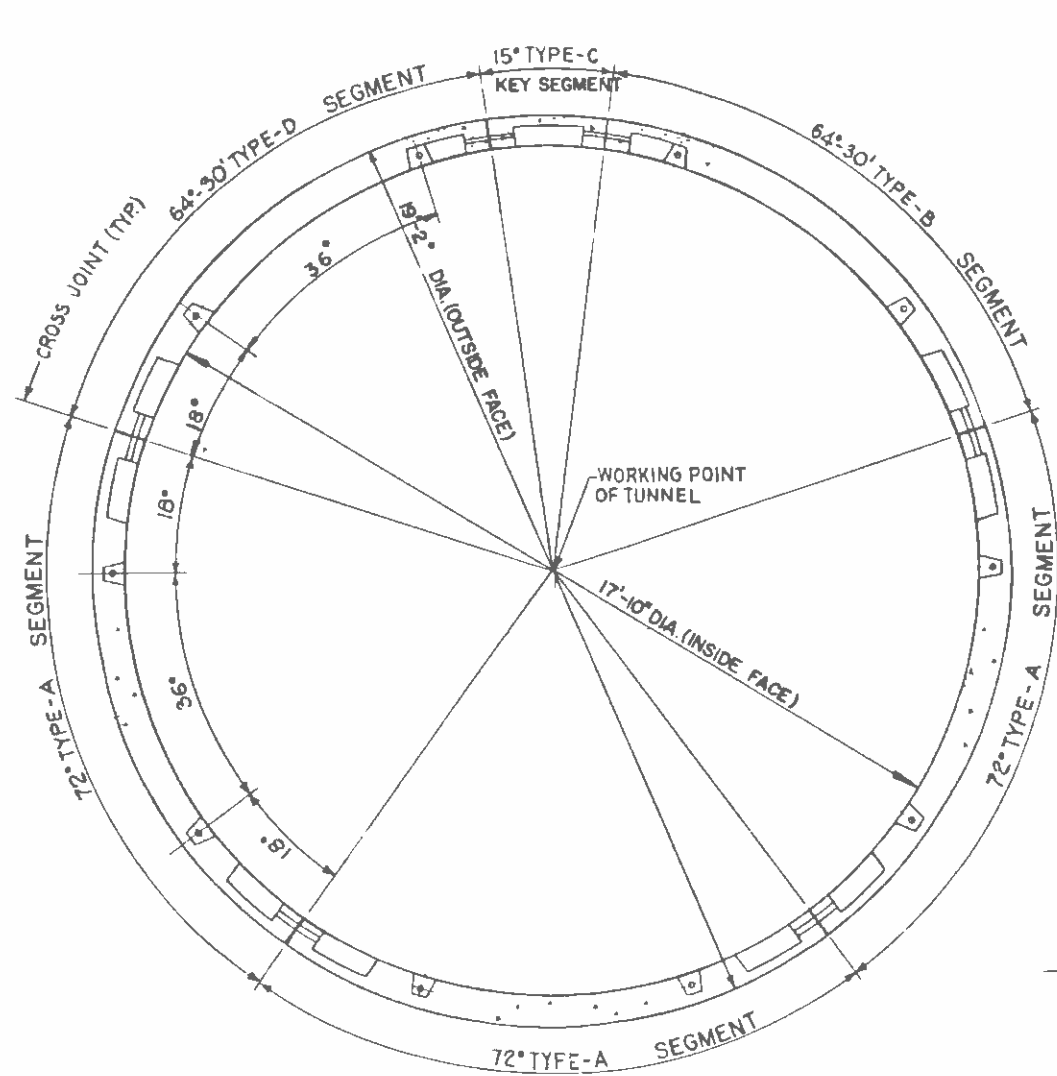
OMJM/PBQD/KE/HWA
GENERAL CONSULTANTS

APPROVED: *[Signature]*

STRUCTURAL STANDARD
TUNNEL SUBWAY

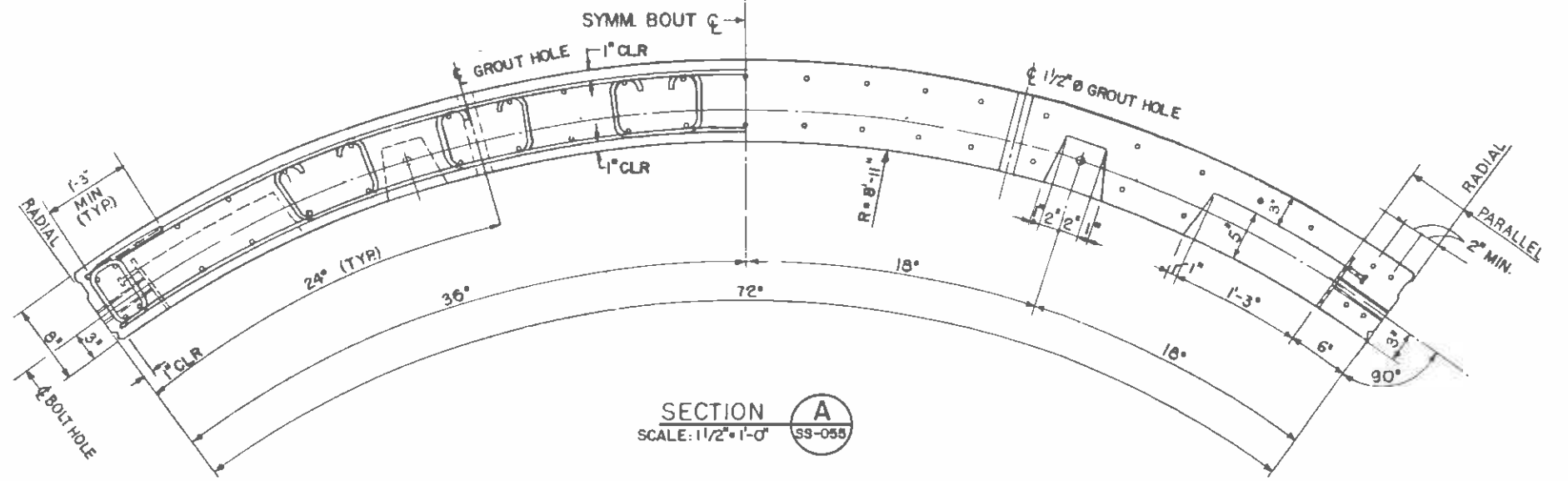
PRECAST CONCRETE SEGMENTED LINERS
MISCELLANEOUS DETAILS

CONTRACT NO.	
DRAWING NO.	SS-054A
REV.	0
SCALE	AS SHOWN
SHEET NO.	

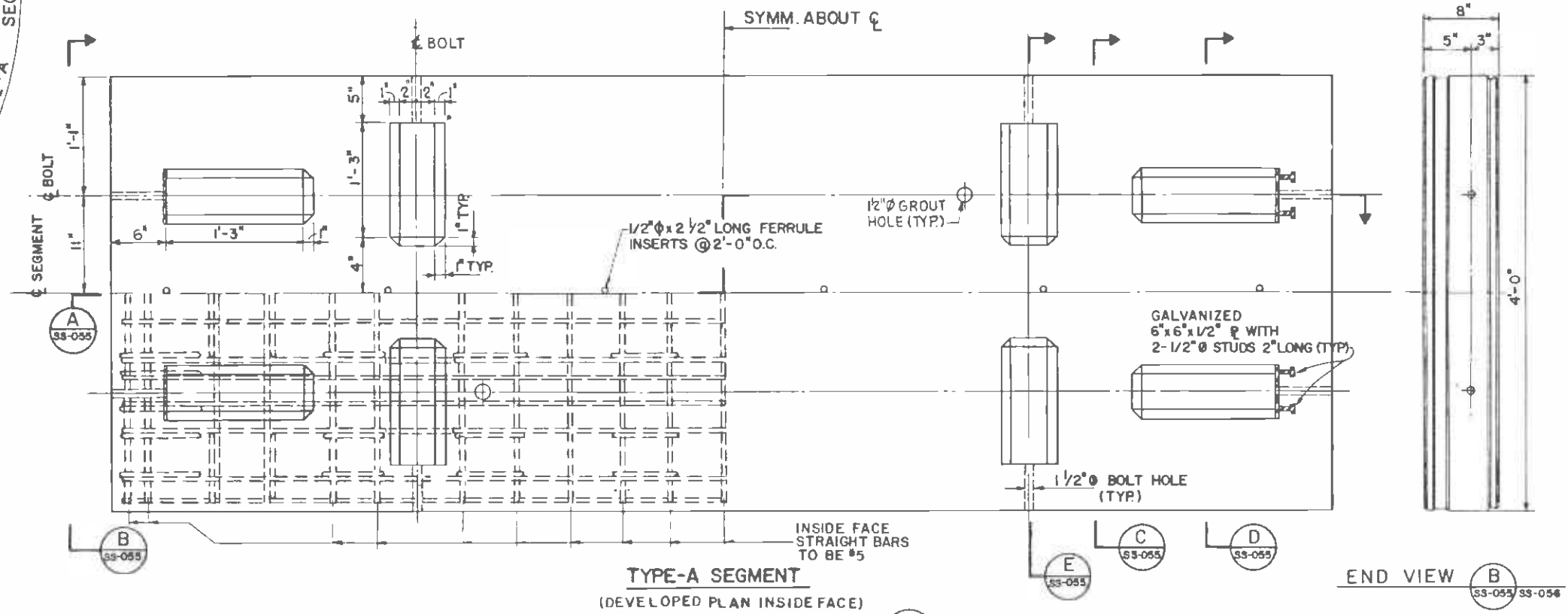


SECTION THRU TUNNEL LINER

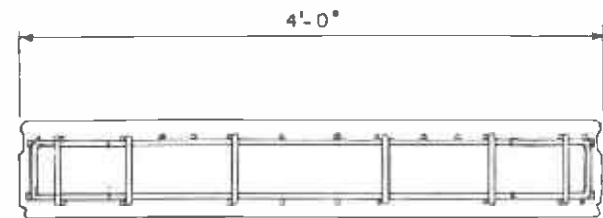
SCALE: 2"=1'-0"



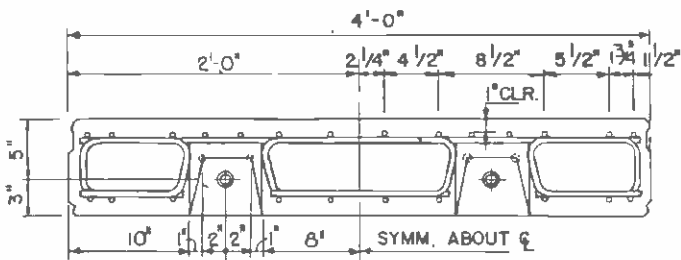
SECTION A
SCALE: 1 1/2"=1'-0"



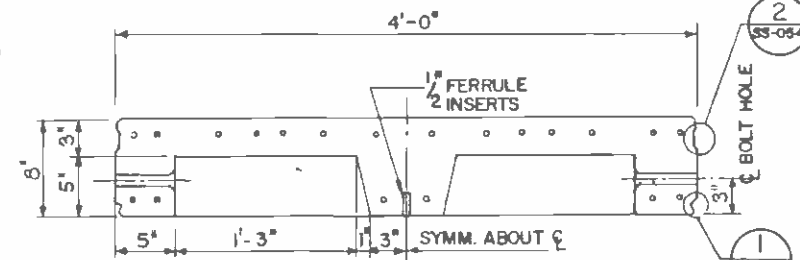
TYPE-A SEGMENT
(DEVELOPED PLAN INSIDE FACE)



SECTION C
SCALE: 1 1/2"=1'-0"



SECTION D
SCALE: 1 1/2"=1'-0"



SECTION E
SCALE: 1 1/2"=1'-0"

NOTES:

1. ALL DIMENSIONS ARE MEASURED ALONG THE INSIDE FACE.
2. ALL REINFORCING BARS SHALL BE # 4 BARS EXCEPT AS NOTED.

REV.	DATE	BY	SUB	APP	DESCRIPTION

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DESIGNED BY	J. H. Abrams				
DRAWN BY	R. H. Wilkins				
CHECKED BY	M. P. Dill. P. D.				
IN-CHARGE	D. J. Wilcox				
DATE	2/15/83				

DESIGNED BY
 DRAWN BY
 CHECKED BY
 IN-CHARGE
 DATE

J. H. Abrams
 R. H. Wilkins
 M. P. Dill. P. D.
 D. J. Wilcox
 2/15/83

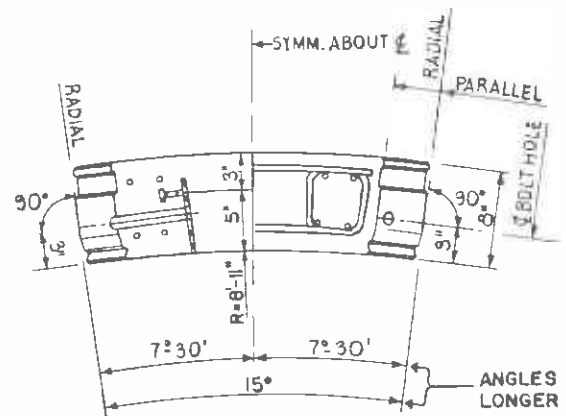
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
 METRO RAIL PROJECT

DRJM/PBQD/KE/HWA
 GENERAL CONSULTANTS

APPROVED

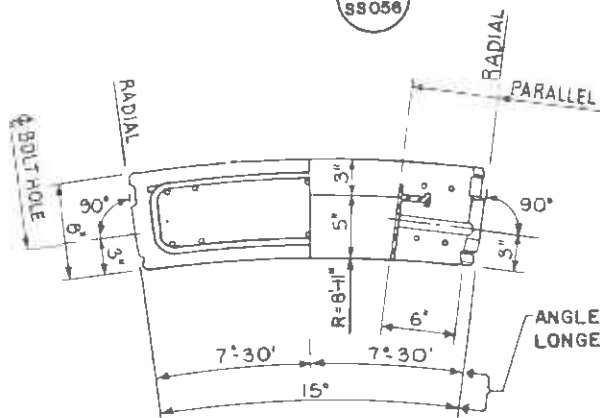
STRUCTURAL STANDARD
 TUNNEL SUBWAY
 PRECAST CONCRETE SEGMENTED LINERS
 TYPE 'A' SEGMENTS

CONTRACT NO.	
DRAWING NO.	SS-055 A
REV.	0
SCALE	AS SHOWN
SHEET NO.	



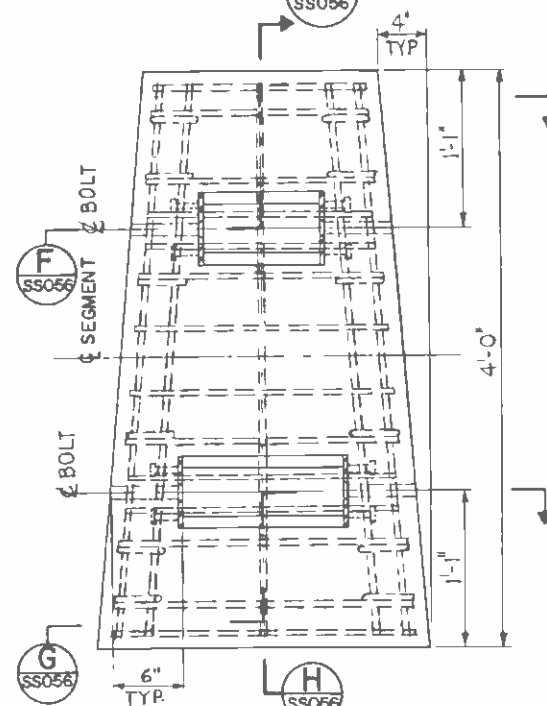
SECTION F
SS056

ANGLES ARE MEASURED AT LONGER EDGE OF SEGMENT



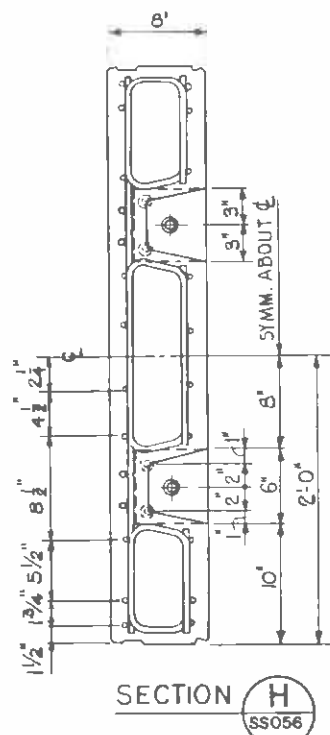
SECTION G
SS056

ANGLES ARE MEASURED AT LONGER EDGE OF SEGMENT

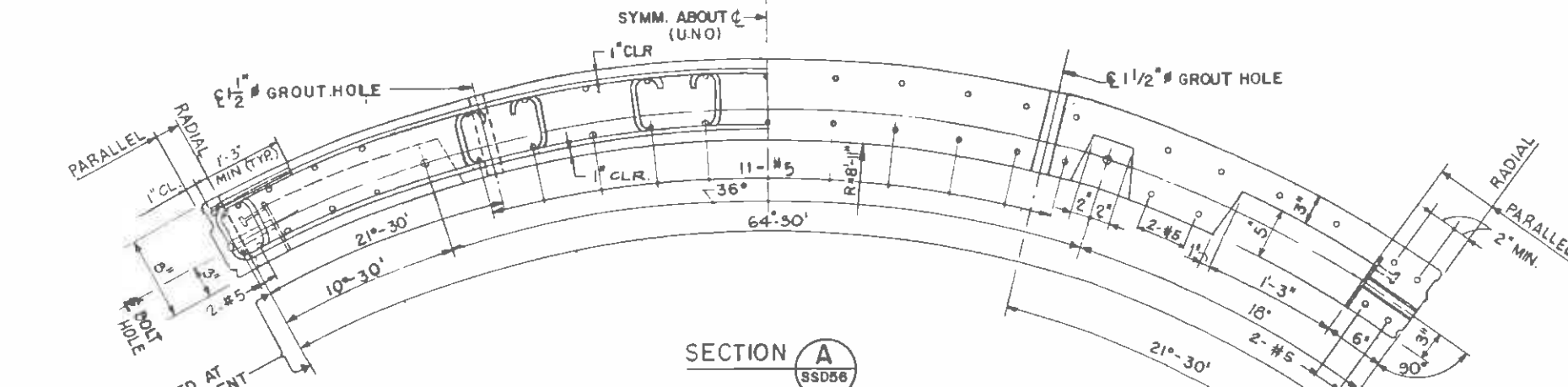


SECTION H
SS056

SEGMENT TYPE-C
(DEVELOPED PLAN INSIDE FACE)

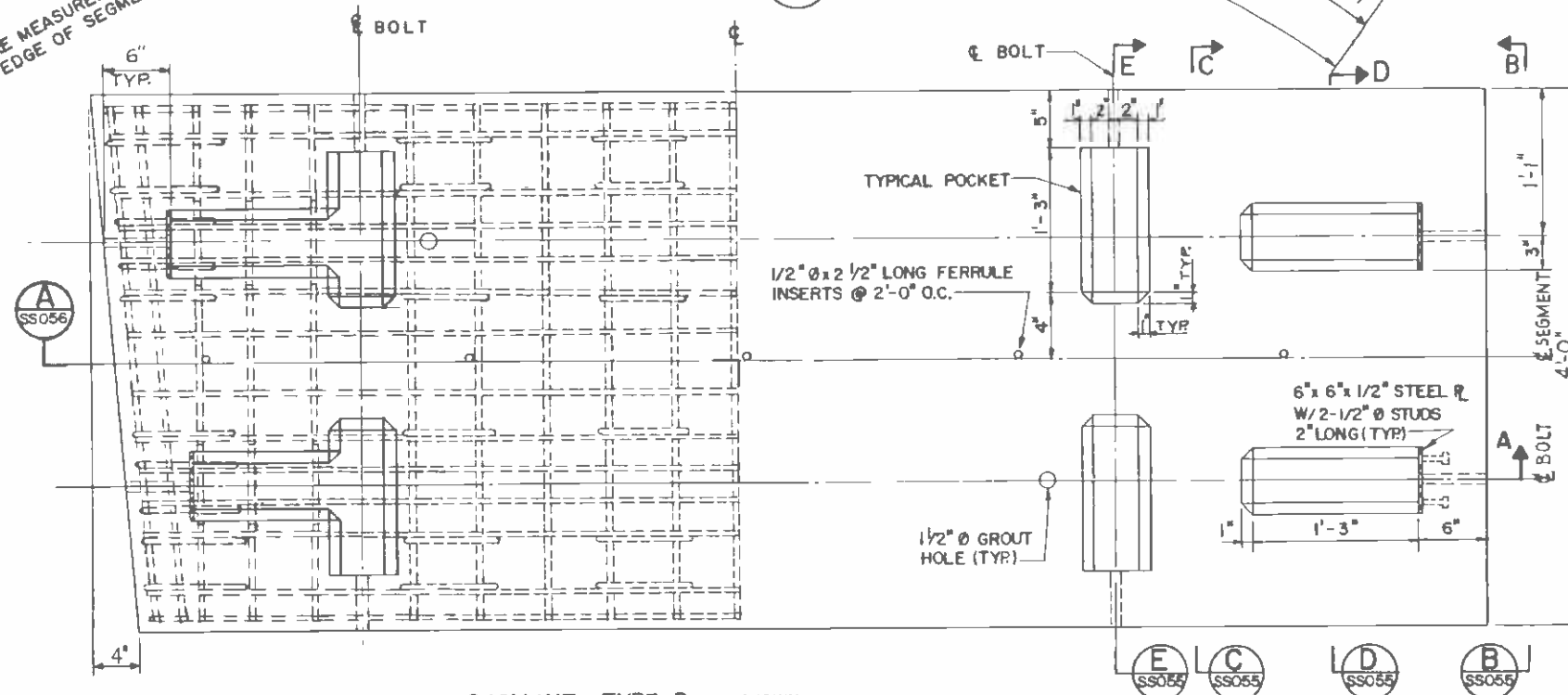


SECTION I
SS056



SECTION A
SS056

ANGLES ARE MEASURED AT SHORTER EDGE OF SEGMENT



SECTION B
SS056

SEGMENT TYPE-B, AS SHOWN
SEGMENT TYPE-D, OPPOSITE HAND & SIMILAR
(DEVELOPED PLAN INSIDE FACE)

NOTES :

1. ALL DIMENSIONS ARE MEASURED ALONG THE INSIDE FACE.
2. ALL REINFORCING BARS SHALL BE # 4 BARS U.N.O.

REV	DATE	BY	SUB	APP	DESCRIPTION

REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY
J. Haberman

DRAWN BY
P. Malkin

CHECKED BY
R. P. ...

IN-CHARGE
D. ...

DATE
01/19/03

SIGNATURE ISSUE

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

REGISTERED PROFESSIONAL ENGINEER
THOMAS R. KUESEL
C 14173
CIVIL
STATE OF CALIFORNIA

DMJM/PBQD/KE/HWA
GENERAL CONSULTANTS

SUBMITTED *Thomas R. Kuesel*

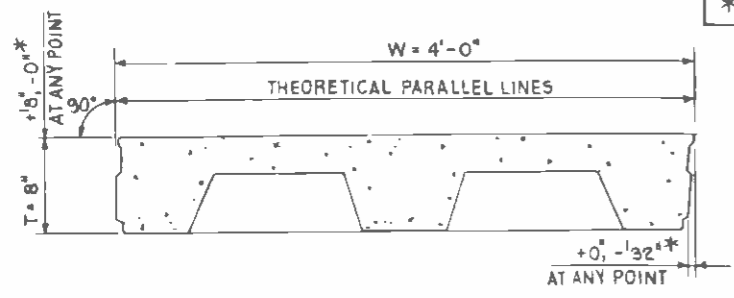
APPROVED *D. ...*

STRUCTURAL STANDARD
TUNNEL SUBWAY

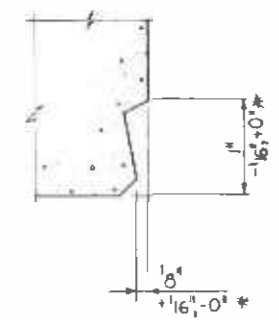
PRECAST CONCRETE SEGMENTED LINERS
TYPE 'B', 'C' & 'D' SEGMENTS

CONTRACT NO.	
DRAWING NO.	SS-056 A
REV.	0
SCALE	1/2" = 1'-0"
SHEET NO.	

* MOLD TOLERANCES



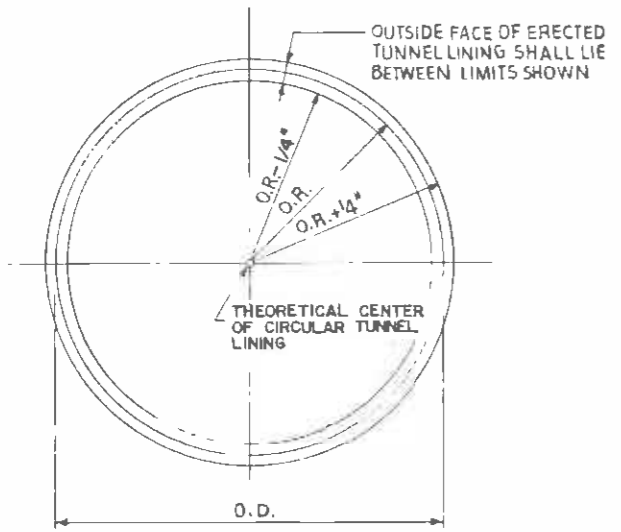
1 - WIDTH AND THICKNESS TOLERANCE



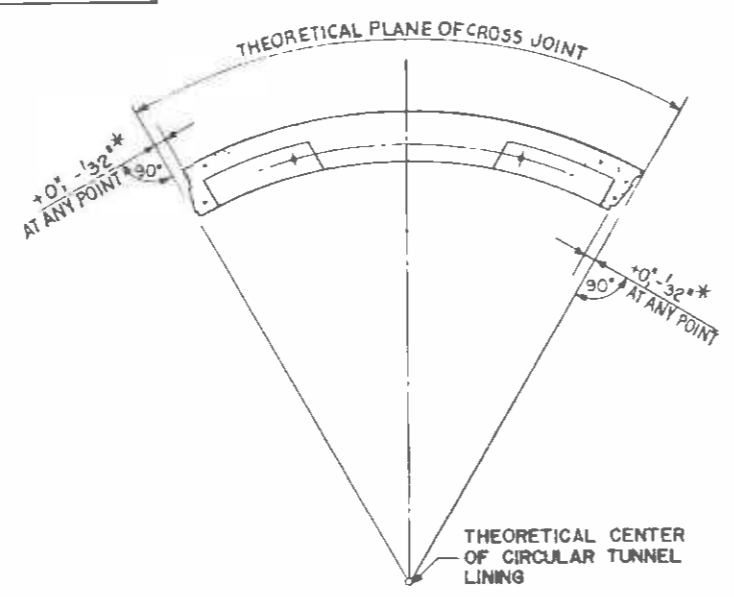
2 - CAULKING GROOVE TOLERANCE

3 - BOLT HOLE LOCATION TOLERANCE

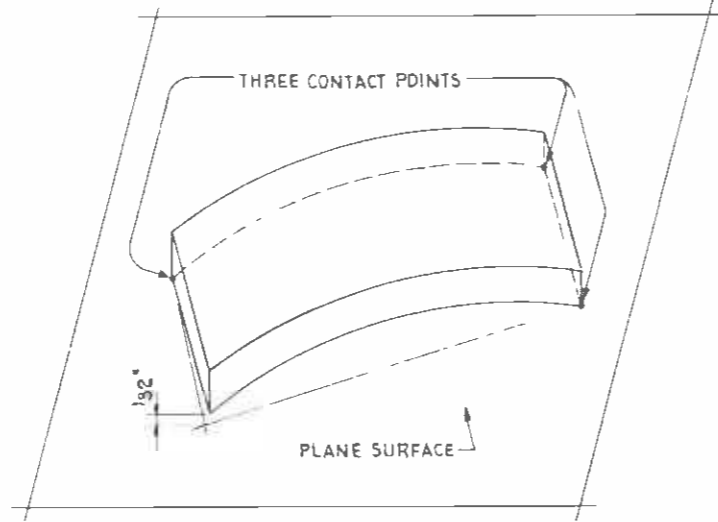
LOCATIONS OF CROSS JOINTS AND CIRCULAR TUNNEL LINING JOINTS BOLT HOLES IN EACH SEGMENT SHALL BE WITHIN $\pm 1/16$ INCH OF THEORETICAL LOCATIONS AS SHOWN.



4 - RADIUS TOLERANCE



5 - SEGMENT TOLERANCE

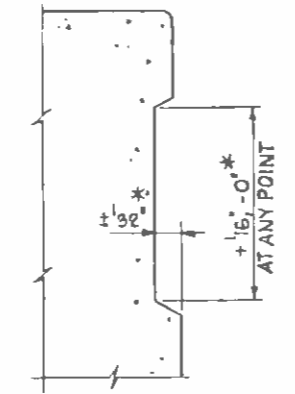


6 - WARPING TOLERANCE

LEGEND OF ABBREVIATIONS

- O.D. = THEORETICAL OUTSIDE DIAMETER OF RING
- I.D. = THEORETICAL INSIDE DIAMETER OF RING
- O.R. = THEORETICAL OUTSIDE RADIUS OF RING
- I.R. = THEORETICAL INSIDE RADIUS OF RING
- W = THEORETICAL WIDTH OF A LINER RING
- X = THEORETICAL TAPER OF A LINER RING
- D = DIAMETER
- R = RADIUS
- T = THICKNESS

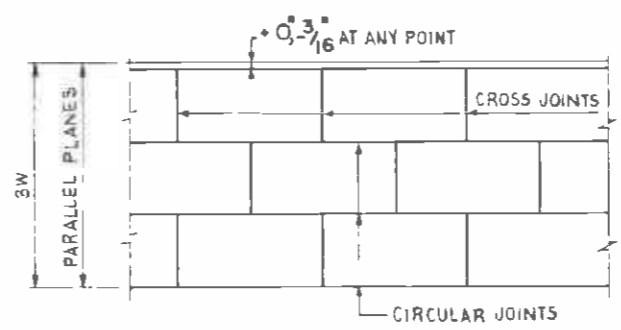
NOTE :
INFORMATION GIVEN ON THIS DRAWING IS SUPPLEMENTAL TO SPECIFICATION.



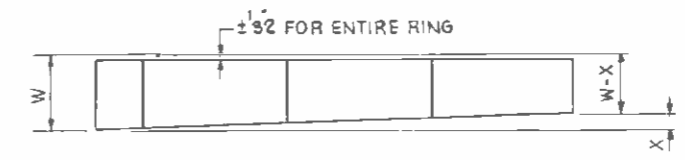
7 - GASKET GROOVE TOLERANCE

8 - CIRCUMFERENCE TOLERANCE

CIRCUMFERENCE OF OUTSIDE FACE OF ASSEMBLED RING AS MEASURED BY STEEL TAPE SHALL BE WITHIN $\pm 1/2$ INCH TO -1 INCH OF THEORETICAL OUTSIDE CIRCUMFERENCE $\pi \times O.D.$



9A - STRAIGHT RINGS

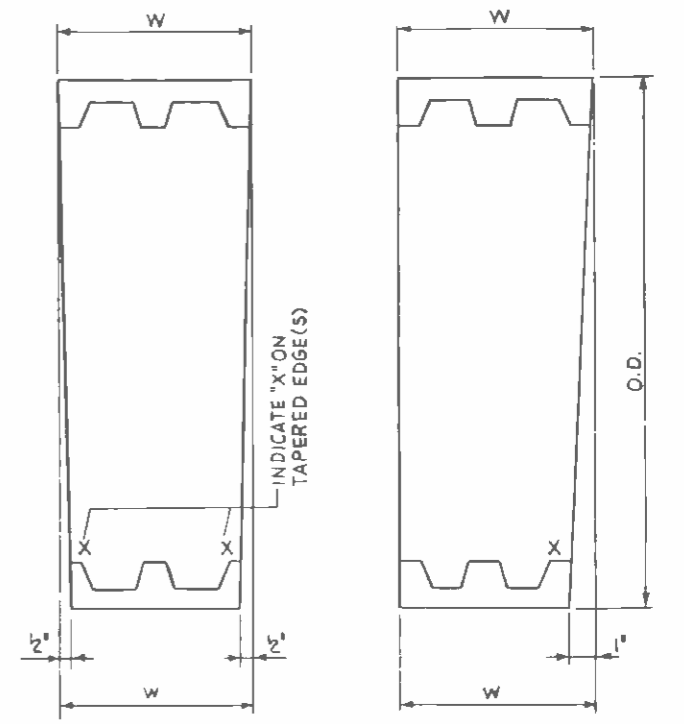


9B - TAPERED RINGS

9 - ASSEMBLED RING WIDTH TOLERANCE

10 - JOINT TOLERANCES:

ASSEMBLED RINGS WHICH SATISFY FABRICATION TOLERANCES 4, 8 & 9 SHALL NOT PERMIT INSERTION OF A FEELER GAGE GREATER THAN $1/16$ " IN ANY JOINT, EITHER LONGITUDINAL OR TRANSVERSE.



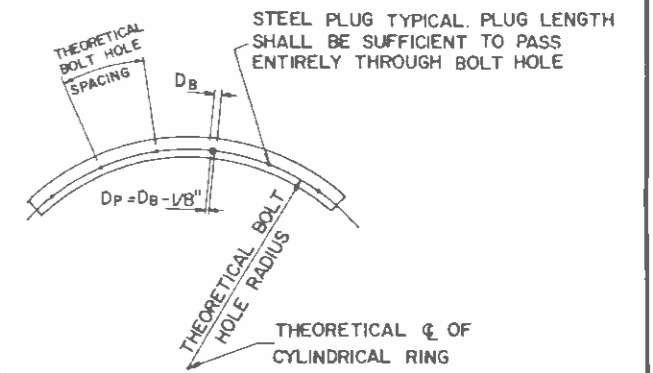
OPTION-1

OPTION-2

11 - TAPERED RINGS DETAILS

NOTE :
DETAILS SHOWN FOR TAPERED RINGS ARE INTENDED FOR USE IN CORRECTION OF MISALIGNMENT ONLY. CONTRACTOR SHALL DETERMINE THE NECESSARY TAPER TO COPE WITH HORIZONTAL OR VERTICAL CURVES AND SUBMIT DETAILS TO THE ENGINEER FOR APPROVAL.

9 - ASSEMBLED RING WIDTH TOLERANCE



NOTES:
1 - STEEL TEMPLATE FOR CHECKING BOLT HOLE SPACING & TOLERANCE. TEMPLATE FOR LONGITUDINAL JOINT SHOWN.
2 - STEEL TEMPLATES FOR LONGITUDINAL AND TRANSVERSE JOINTS SHALL BE LONGER (OR WIDER) THAN THE SEGMENT TO PROVIDE ROOM FOR 2 ADDITIONAL PLUGS (AT THE SAME SPACING). PLUGS SHALL PASS FREELY THROUGH THE BOLT HOLES IN A SEGMENT OR SEGMENTS. HOLES IN LONGITUDINAL AND TRANSVERSE JOINTS SHALL BE IN REGISTER.

12 - BOLT HOLE TOLERANCE

REV	DATE	BY	SUB	APP	DESCRIPTION

REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY
R. P. ...
DRAWN BY
P. J. ...
CHECKED BY
S. P. ...
IN-CHARGE
D. J. ...
DATE
01/15/83



SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

DMJM/PBOD/KE/HWA
GENERAL CONSULTANTS

APPROVED *D. B. A. ...*

STRUCTURAL STANDARD
TUNNEL SUBWAY

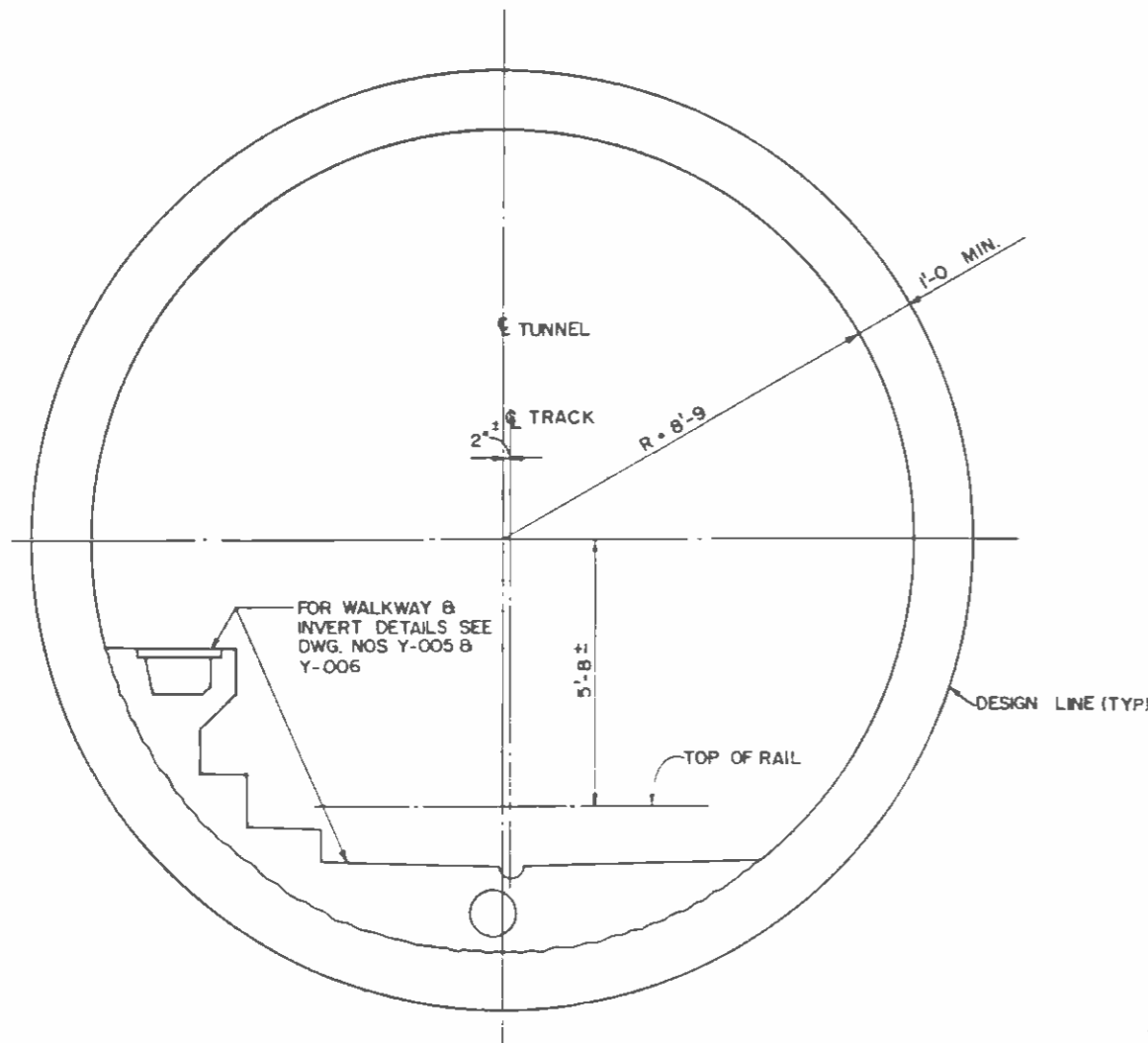
PRECAST CONCRETE SEGMENTED LINERS
LINING TOLERANCES

CONTRACT NO.	
DRAWING NO.	SS-058A
REV	0
SCALE	NOT TO SCALE
SHEET NO.	

TUNNEL GENERAL NOTES

- 1.) THESE NOTES SHALL APPLY TO DRAWINGS Y-001 THROUGH Y-025.
- 2.) DRAWINGS Y-001, Y-002 AND SS-051 SHOW TUNNEL STRUCTURES ON TANGENT ALIGNMENT. SEE Y-006 FOR OFFSETS WITHIN CURVES.
- 3.) SEE PLAN BELOW AND SPECIFICATIONS FOR PERMITTED LOCATIONS FOR EACH LINER TYPE.
- 4.) ALL CAST-IN-PLACE CONCRETE SHALL BE CLASS 4000E, UNLESS NOTED OTHERWISE.
- 5.) LOCATION OF CONSTRUCTION JOINTS SHALL BE APPROVED BY THE CONSTRUCTION MANAGER. SEE DRAWING Y-003 FOR TYPICAL TUNNEL JOINT DETAILS.
- 6.) SEE DRAWING Y-006 FOR TUNNEL CONSTRUCTION TOLERANCES.
- 7.) ALL REINFORCING SHALL BE ASTM A615 OR A706 GRADE 60.
- 8.) UNLESS OTHERWISE NOTED, MINIMUM COVER TO REINFORCING BARS SHALL BE 3" AGAINST SOIL OR ROCK AND 2" TO INTERIOR SURFACES.
- 9.) TRANSVERSE REINFORCEMENT IN LINE STRUCTURES ALONG A CURVE SHALL BE RADIAL.
- 10.) FOR REINFORCEMENT DETAILS AND GENERAL NOTES SEE DWG. S-107
- 11.) SURFACES SHOWN THUS SHALL BE INTENTIONALLY ROUGHENED WITH A MINIMUM AMPLITUDE OF 1/4 INCH.
- 12.) THE DESIGN LINE IS THE THEORETICAL LIMIT OF EXCAVATION, AS SHOWN ON THE DRAWINGS. WITH THE APPROVAL OF THE ENGINEER, CONTRACTOR MAY OVEREXCAVATE FOR THE STRUCTURES, IN WHICH CASE ANY ADDITIONAL WORK SHALL BE AT NO ADDITIONAL COST TO THE DISTRICT. THE INTERIOR OF THE STRUCTURES SHALL NOT BE ADJUSTED DUE TO OVEREXCAVATION.

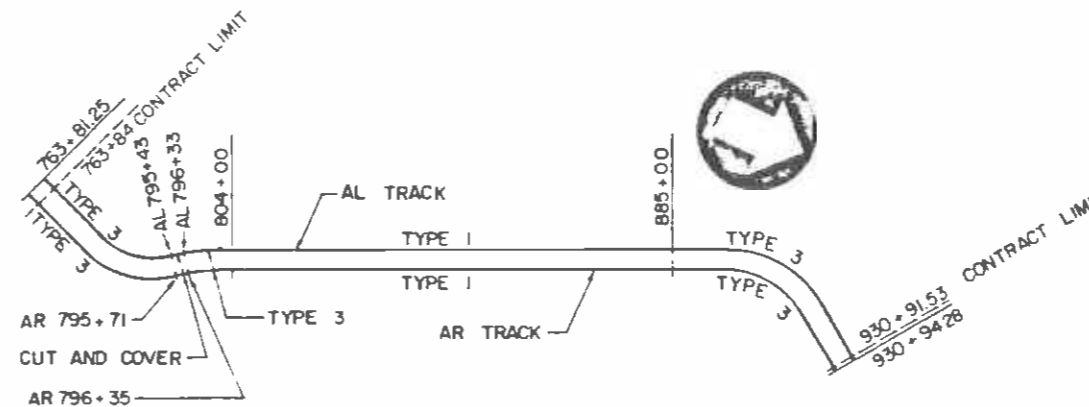
TUNNEL GENERAL NOTES AND TUNNEL LINER LIMITS SHOWN ON THIS DRAWING DO NOT NECESSARILY APPLY TO MOS-1.



TYPICAL TUNNEL SECTION
TYPE 1 LINING (UNREINFORCED)

NOTES:

- 1.) THIS LINING SHALL ONLY BE USED IN HARD ROCK. (i.e. BASALT, CONGLOMERATE, HARD SANDSTONE)
- 2.) USE TYPE 2 LINING NEAR CROSSPASSAGES. SEE DWG Y-015 FOR LIMITS



TUNNEL LINER LIMITS
NOT TO SCALE

NOTES:

- 1.) FOR CLARITY, CROSSPASSAGES AND VENT SHAFTS ARE NOT SHOWN.
- 2.) TYPE 1 LINING SHALL NOT BE USED WITHIN FAULTED OR FRACTURED ZONES. USE TYPE 3 LINING WHEN SUCH ZONES ARE ENCOUNTERED. SEE SPECIFICATIONS.
- 3.) ABOVE STATIONING REFERS TO BOTH AL & AR TRACKS. EXCEPT WHERE NOTED OTHERWISE
- 4.) PAYMENT FOR THE SHORT LINER LENGTHS OUTSIDE THE CONTRACT LIMITS WILL BE INCIDENTAL TO THE TUNNEL PAYMENT ITEMS WITHIN THE CONTRACT LIMITS.
- 5.) THE PRECAST CONCRETE SEGMENTED LININGS (DRAWINGS SS-051, SS-054, SS-055, SS-056, SS-058, SS-060, SS-073, AND SS-074) MAY BE SUBSTITUTED FOR THE LININGS SHOWN ABOVE SOUTH OF THE CUT AND COVER SECTION AND NORTH OF AR STA. 920+00 AND AL STA. 920+50.

NOTE

ARCHITECTURAL MECHANICAL AND ELECTRICAL COORDINATION INCOMPLETE

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>[Signature]</i>
REV DATE BY SUB APP DESCRIPTION		DRAWN BY <i>[Signature]</i>
REV DATE BY SUB APP DESCRIPTION		CHECKED BY <i>[Signature]</i>
REV DATE BY SUB APP DESCRIPTION		IN CHARGE <i>[Signature]</i>
REV DATE BY SUB APP DESCRIPTION		DATE 16 JAN 85

DESIGNED BY
[Signature]

DRAWN BY
[Signature]

CHECKED BY
[Signature]

IN CHARGE
[Signature]

DATE
16 JAN 85

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

TRANSIT & TUNNEL CONSULTANTS, INC.
CONSULTING ENGINEERS

DMJM/PBQD/KE/HWA
GENERAL CONSULTANTS

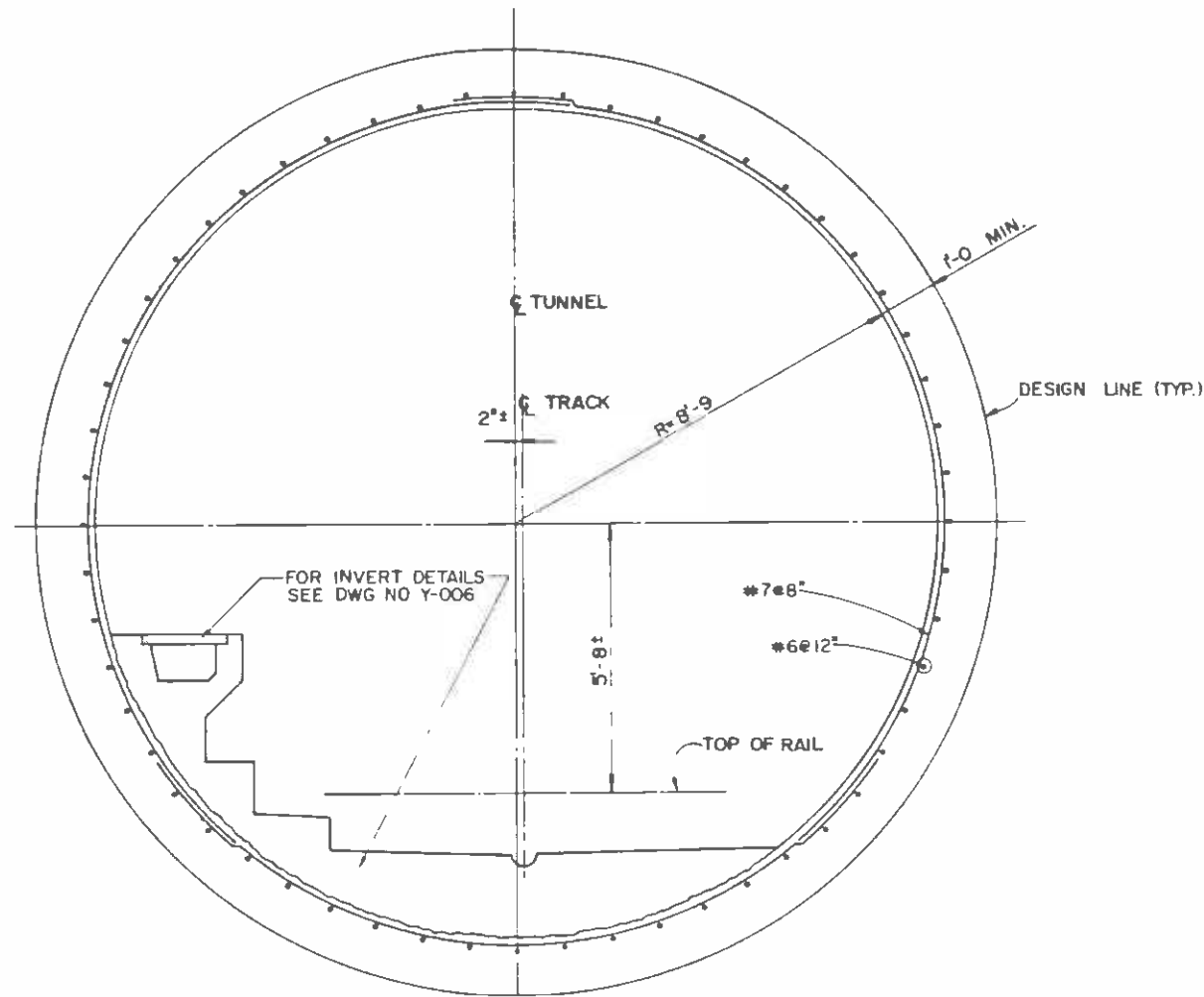
APPROVED
[Signature]

LA CBD TO NORTH HOLLYWOOD
HOLLYWOOD/CAHUENGA TO
UNIVERSAL CITY LINE SECTION
STRUCTURAL TUNNEL LINER
GENERAL NOTES AND TYPE 1

CONTRACT NO.	A410
DRAWING NO.	Y-001
SCALE	1/2" = 1'-0"
SHEET NO.	129

DRAWING 81501

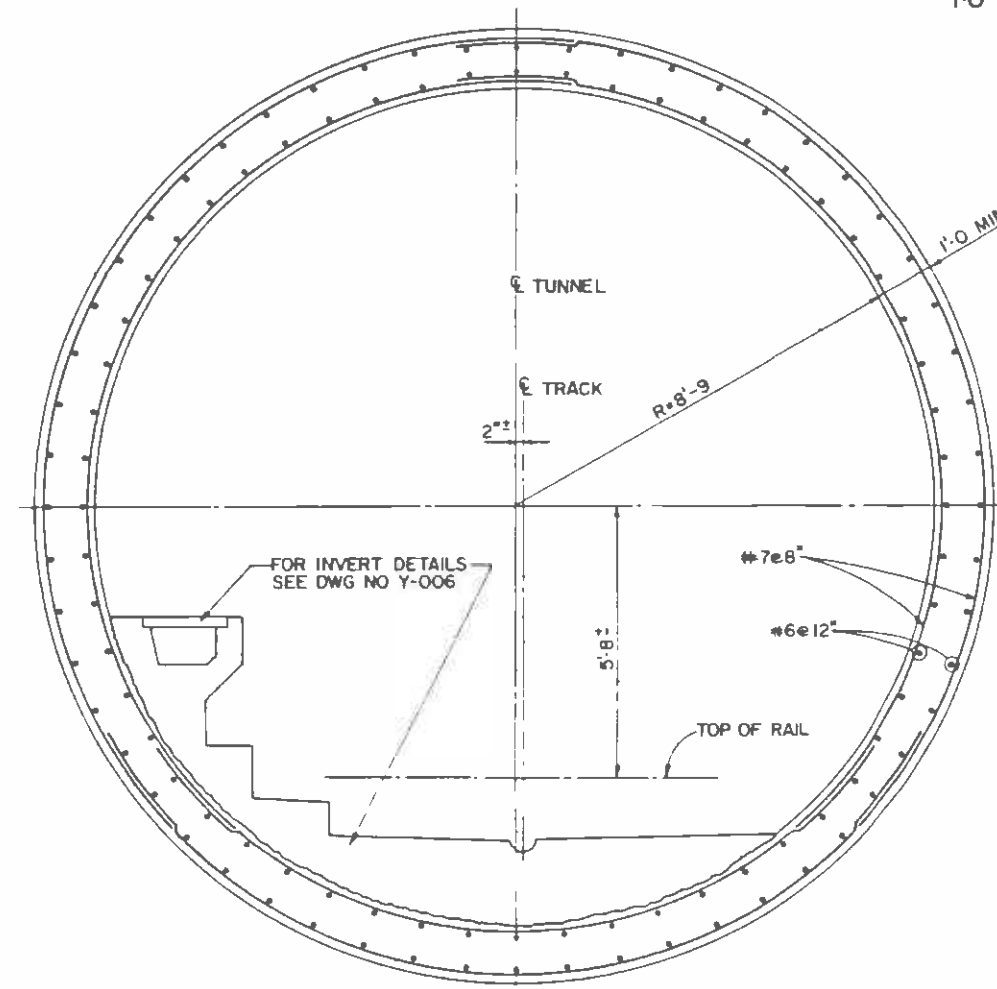
NOTES SHOWN ON THIS DRAWING
DO NOT NECESSARILY APPLY
TO MOS-1.



TYPICAL TUNNEL SECTION
TYPE 2

NOTES:

- 1) THIS LINING SHALL BE USED NEAR CROSSPASSAGES IN LENGTHS WHERE A TYPE 1 LINING WOULD BE USED OTHERWISE. SEE DRAWING Y-015 FOR LIMITS.
- 2) ANY SPLICES SHALL BE CLASS "C" OR "C-TOP" AS APPLICABLE. SPLICE LOCATIONS TO BE APPROVED BY THE CONSTRUCTION MANAGER.



TYPICAL TUNNEL SECTION
TYPE 3

NOTES:

- 1) THIS LINING MAY BE USED ANYWHERE WITHIN THE CONTRACT LIMITS.
- 2) GROUTING OF THE ROCK AROUND THE TUNNEL IS REQUIRED TO PROVIDE ADDITIONAL LATERAL SUPPORT IN FAULTED ZONES, FRACTURED ZONES AND UNDER CERTAIN OTHER CONDITIONS, SEE SPECIFICATIONS.
- 3) ANY SPLICES TO BE CLASS "C" OR "C-TOP" AS APPLICABLE. SPLICE LOCATIONS TO BE APPROVED BY THE CONSTRUCTION MANAGER.
- 4) IF STEEL RIBS ARE USED FOR PRIMARY SUPPORT, THE OUTER LAYER OF LONGITUDINAL STEEL MAY BE OMITTED. THE INNER LAYER SHALL THEN BE #6@8" LONGITUDINAL.

NOTE
ARCHITECTURAL
MECHANICAL AND
ELECTRICAL
COORDINATION
INCOMPLETE

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: *[Signature]*
DRAWN BY: *[Signature]*
CHECKED BY: *[Signature]*
IN CHARGE: *[Signature]*
DATE: 16 JAN 85



SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT



TRANSIT & TUNNEL CONSULTANTS, INC.
CONSULTING ENGINEERS

DMJM/PBQO/KE/HWA
GENERAL CONSULTANTS

SUBMITTED: *[Signature]*

APPROVED: _____

LA CBD TO NORTH HOLLYWOOD
HOLLYWOOD / CAHUENGA TO
UNIVERSAL CITY LINE SECTION
STRUCTURAL TUNNEL LINER
TYPE 2 AND TYPE 3

CONTRACT NO.	A 410
DRAWING NO.	Y-002
SCALE	1/2" = 1'-0"
SHEET NO.	130

BR/11/10/1