OCTOBER 1967

PRELIMINARY REPORT

TO THE

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

KAISER ENGINEERS / DANIEL, MANN, JOHNSON, & MENDENHALL

ARCHITECTS AND ENGINEERS

A JOINT VENTURE

KAISER ENGINEERS / **DMJM**
DIVISION OF KAISER INDUSTRIES CORPORATION
DANIEL, MANN, JOHNSON, & MENDENHALL
A JOINT VENTURE

September 15, 1967

Board of Directors
Southern California Rapid Transit District
1060 South Broadway
Los Angeles, California 90015

Attention: Mr. A. J. Eyraud, Jr., President

Gentlemen:

Submitted herewith is the Preliminary Report for the development of a mass rapid transit system in the four corridors selected by the Southern California Rapid Transit District as the initial phase of an overall transit plan for the Los Angeles metropolitan area. This report defines the selected routes and station locations, describes facilities and system concepts and sets forth preliminary estimates of construction costs.

Reflected in the report is our primary assignment of route planning which resulted in establishing routes, alignments and station locations. In this process we have worked closely with the technical staffs of the communities and agencies directly affected by the transit system. Concurrently, conceptual design of the required facilities and operational systems was developed for a comparative cost analysis. In addition to cost, we have carefully considered other factors such as transportation service and community impact in the route selection process.

The planning estimates of cost for the selected routes were developed based on a schedule starting with the passage of a Bond issue in November 1968, and terminating with the completion of the project in 1975. Trends of escalation, as well as the preliminary nature of the engineering, were considered in the preparation of these estimates.

Our subsequent efforts will be devoted to the finalization of route alignments and station locations following further conferences with all affected communities and public agencies, together with the further development of preliminary engineering and a final cost estimate for the recommended routes.

We wish to express our sincere appreciation to members of the Board of Directors of the Southern California Rapid Transit District, its outstanding staff members and to the many representatives of the various community governing bodies and public agencies for the full cooperation and support offered throughout the course of study.

Very truly yours,

KAISER ENGINEERS

Louis H. Oppenheim
Vice President and General Manager

DANIEL, MANN, JOHNSON, & MENDENHALL

Irvan F. Mendenhall
President

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INTRODUCTION

The Joint Venture of Kaiser Engineers and Daniel, Mann, Johnson, and Mendenhall, under contract to the Southern California Rapid Transit District, has been charged with the responsibility of carrying out the route planning and preliminary engineering for the development of a rapid transit system in Los Angeles County, California. The proposed system is planned to serve the initial four transit corridors selected by the District and referred to as the Wilshire Corridor, San Fernando Valley Corridor, San Gabriel Valley Corridor and the Long Beach Corridor.

The Scope of Work essentially consists of two parts, the first of which is the preparation of this Preliminary Report which defines selected routes and station locations, describes facilities and system concepts, and sets forth preliminary estimates of construction cost. This report will be submitted by the District to all interested communities to obtain their views and comments. Upon receipt of this information, the Final Report will be prepared to include recommended routes and station locations, facilities and systems design and cost estimates.

Of primary importance to this effort have been continuing conferences with the appropriate local governing bodies and other agencies in order to coordinate transit planning with any master or general plan in the affected areas. As a result, the various alternative routes and station locations under consideration have been reviewed with these agencies to obtain their views and desires and to permit them to relate the effect of the proposed system to their goals and objectives.

This program will lead to the development of a mass rapid transit plan intended to be the initial phase of an overall transit program. It will allow the District to submit a proposition for financing construction of the initial phase to the electorate by November 1968.

TRANSIT PLANNING OBJECTIVES

The introduction of a new mode of public transportation to provide an optimum alternative travel choice and therefore a greater mobility for residents of a modern urban area, demands clearly defined objectives. Each step must be coordinated and integrated with the present and future planning goals of all the various communities involved in order to insure that the new system will be an essential element of, and will make a significant contribution to, a total comprehensive transportation system for the entire region.

With this in mind, the primary objectives for the planning effort to date for the Los Angeles metropolitan area have included the following:

> Plan a system of rapid transit which can provide the best possible return for the community investment in terms of travel speed, capacity, dependability and efficiency,
>
> Select routes and alignments most compatible with trip requirements of the majority of the commuting public for the present and projected into the future,
>
> Coordinate the selected routes, alignments and facilities design with community planning goals to insure compatibility of transit with current and future development of the area,
>
> Select and define the most technologically advanced yet available trunkline system of public mass rapid transit which, in combination with secondary distribution systems, can offer an optimum alternative choice to other modes of transportation,
>
> Perform sufficient preliminary engineering to arrive at a valid estimate of capital cost as well as operation and maintenance expense.

Photographed by Pacific Air Industries

SUMMARY OF THE REPORT

The proposed rapid transit system has been developed as a significant part of an overall master transportation plan for the region to complement and supplement other modes of public transportation, both currently available and projected for the future. It will provide high capacity, high speed, peak load service between primary residential and employment centers: the San Gabriel Valley to the east, the south-central communities and Long Beach to the south, the San Fernando Valley to the north, the Wilshire and Hollywood areas and the Los Angeles Central City area. These primary areas of service and their terminal points were selected by the Southern California Rapid Transit District for study.

ROUTE PLANNING

The initial step in the route planning process was the formulation of these basic principles as a general guide:

Recognize rapid transit as a complementary and supplementary component of a total regional transportation plan,

Recognize the impact of transit on the community,

Recognize service as a primary consideration,

Recognize cost effectiveness of the system.

Following this definition of principles, an evaluation technique utilizing various social, economic and engineering factors, as well as future regional master transportation plans, was developed by which each segment of several alternative route possibilities could be rated. In terms of cost, efficiency, service and community impact, the following general alignments proved to be the most favorable and therefore were selected:

Wilshire Route—to the west generally following Wilshire Boulevard and terminating at Fairfax Avenue,

San Fernando Valley Route—to the north traversing the communities of Hollywood, North Hollywood, Van Nuys and terminating immediately west of the Van Nuys Airport on Sherman Way.

San Gabriel Valley Route—to the east generally following the San Bernardino Freeway and serving the Cities of Monterey Park, Alhambra, San Gabriel and Rosemead and terminating in the City of El Monte,

Long Beach Route—to the south traversing the cities of Vernon, Huntington Park and Compton and terminating in the City of Long Beach.

FACILITIES AND OPERATIONAL SYSTEMS

The basic configurations of the system will include subway, aerial, cut or depressed and surface or on-grade sections. Of the 62 miles for the total system, 18 miles will be in subway, 21 miles on aerial structure, 3 miles in open cut and 20 miles constructed on-grade. Approximately 5 miles of the on-grade portion will use joint right-of-way with the Division of Highways in the proposed Industrial Freeway.

The system will contain 45 stations, of which 20 will be underground and 25 above ground. In suburban areas, stations will be located at or near major surface streets to accommodate bi-modal travel with these stations providing for park-and-ride, kiss-and-ride and feeder bus operation. Twenty-two of these stations will provide a total parking capacity for approximately 20,000 automobiles.

Top speed of the vehicle will be 75 miles per hour, and the average speed of the system from the terminal stations, other than the Wilshire route, will vary from 41 to 45 miles per hour, including station dwell time. The highest average speed, approximately 45 miles per hour, will be realized on the Long Beach route because of longer station spacing. The lowest average speed will occur on the Wilshire route due to closer station spacing.

Incorporating the most modern and advanced technology available in both mechanical and styling features, the transit vehicles will transport large numbers of people quickly, safely, comfortably and economically. They will feature new innovations in sound abatement, both inside and out. Smoothness of ride will be emphasized and air conditioning provided in each car for maximum passenger comfort. The propulsion and power supply systems were selected on the basis of efficiency, safety and economy.

Automatic train control, accomplished by on-board digital computers that will electronically start and stop the train, open and close doors, and maintain safe train separation, will be employed in order to safely provide high speed, high frequency service. A central control will be installed to manage the overall train operation and to maintain a check of each train position against schedule in order to adjust it for changing

SUMMARY OF SYSTEM DATA

CORRIDOR	FROM TERMINAL TO:	NUMBER OF STATIONS BELOW GROUND	NUMBER OF STATIONS ABOVE GROUND	NUMBER OF STATIONS TOTAL	LENGTH (MILES) (STATION TO STATION)†	RUNNING‡ TIME (MIN:SEC)	AVERAGE SPEED (MPH)
WILSHIRE (INCL. CBD)	UNION STATION	13	—	13*	8.0	17:21	28
SAN FERNANDO VALLEY	WILSHIRE AND WESTERN	4	9	13	19.4	28:46	41
SAN GABRIEL VALLEY	UNION STATION	0	8	8	12.8	18:17	42
LONG BEACH	7TH AND HOPE	3	8	11	20.9	27:44	45
TOTAL		20	25	45	61.1+		

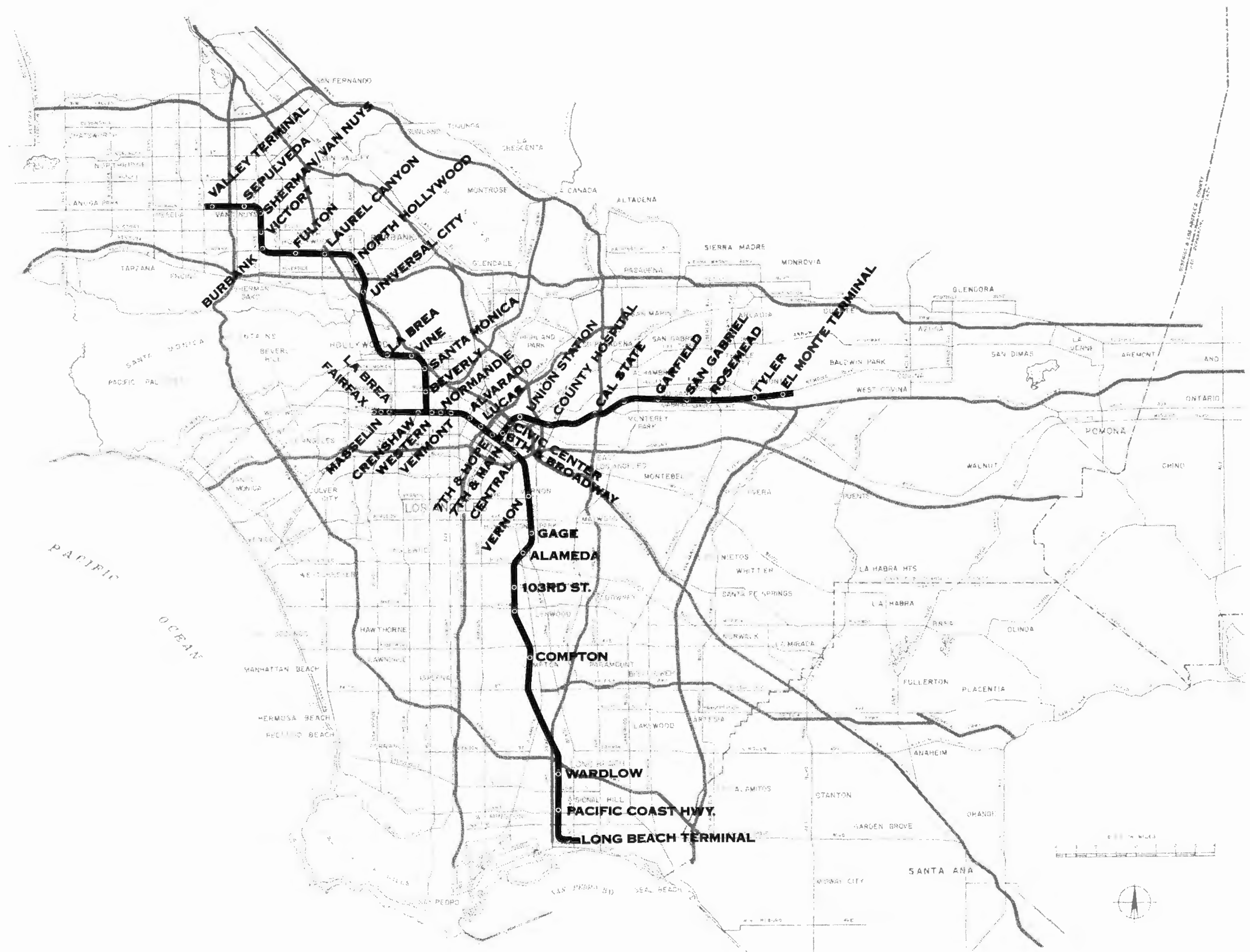
* Includes Union Station and Wilshire and Western Station.
† Length to center of station only, additional 0.9 miles at terminals for total system length of 62.0 miles.
‡ Includes 20 sec. dwell time at each station.

conditions. It will also provide train dispatching control for merging new trains into service from storage yards and withdrawing operating trains from service.

PRELIMINARY COST ESTIMATE

Planning and scheduling for the proposed program must take into consideration many factors which will influence the order and time for construction of the system. Such factors as the capacity of the construction industry, price escalation, availability of rights-of-way, etc., have to be carefully weighed to determine the most economical construction program. Based on the current projection of such factors, it is estimated that the total engineering and construction program will take a minimum of seven years to complete after commencement of final engineering design, although segments of certain lines will be operational before then.

The preliminary estimate for planning purposes for the capital cost of the program is based on starting engineering January 1969 and completing construction by the end of 1975. The total cost for the seven year program, including an allowance for escalation, is $1,373,000,000, exclusive of rights-of-way acquisition and certain other District costs.



TRANSIT ROUTES AND STATION LOCATIONS

INTERCORRIDOR TIMETABLE

WILSHIRE CORRIDOR

From	MASSELIN	LA BREA (W)	CRENSHAW	WESTERN	NORMANDIE	VERMONT	ALVARADO	LUCAS	7TH & HOPE	6TH & BROADWAY	CIVIC CENTER	UNION STATION
WILSHIRE CORRIDOR												
FAIRFAX TERMINAL	01:22	02:37	04:45	06:06	07:14	08:39	10:19	11:43	13:03	14:32	15:57	17:21
MASSELIN		01:15	03:23	04:44	05:52	07:17	08:57	10:21	11:41	13:10	14:35	15:59
LA BREA (W)			02:08	03:29	04:37	06:02	07:42	09:06	10:26	11:55	13:20	14:44
CRENSHAW				01:21	02:29	03:54	05:34	06:58	08:18	09:47	11:12	12:36
WESTERN					01:08	02:33	04:13	05:37	06:57	08:26	09:51	11:15
NORMANDIE						01:25	03:05	04:29	05:49	07:18	08:43	10:07
VERMONT							01:40	03:04	04:24	05:53	07:18	08:42
ALVARADO								01:24	02:44	04:13	05:38	07:02
LUCAS									01:20	02:49	04:14	05:38
7TH & HOPE										01:29	02:54	04:18
6TH & BROADWAY											01:25	02:49
CIVIC CENTER												01:24

SAN FERNANDO VALLEY CORRIDOR

From	BALBOA TERMINAL	SEPULVEDA	SHERMAN-VAN NUYS	VICTORY	BURBANK-VAN NUYS	FULTON	LAUREL CANYON	NORTH HOLLYWOOD	UNIVERSAL CITY	LA BREA (SFV)	VINE	SANTA MONICA	BEVERLY
WILSHIRE CORRIDOR													
FAIRFAX TERMINAL	34:52	32:32	30:52	29:08	27:22	24:55	22:37	20:32	18:02	14:22	12:24	10:27	08:49
MASSELIN	33:30	31:10	29:30	27:46	26:00	23:33	21:15	19:10	16:40	13:00	11:02	09:05	07:27
LA BREA (W)	32:15	29:55	28:15	26:31	24:45	22:18	20:00	17:55	15:25	11:45	09:47	07:50	06:12
CRENSHAW	30:07	27:47	26:07	24:23	22:37	20:10	17:52	15:47	13:17	09:37	07:39	05:42	04:04
WESTERN	28:46	26:26	24:46	23:02	21:16	18:49	16:31	14:26	11:56	08:16	06:18	04:21	02:43
NORMANDIE	29:54	27:34	25:54	24:10	22:24	19:57	17:39	15:34	13:04	09:24	07:26	05:29	03:51
VERMONT	31:19	28:59	27:19	25:35	23:49	21:22	19:04	16:59	14:29	10:49	08:51	06:54	05:16
ALVARADO	32:59	30:39	28:59	27:15	25:29	23:02	20:44	18:39	16:09	12:29	10:31	08:34	06:56
LUCAS	34:23	32:03	30:23	28:39	26:53	24:26	22:08	20:03	17:33	13:53	11:55	09:58	08:20
7TH & HOPE	35:43	33:23	31:43	29:59	28:13	25:46	23:28	21:23	18:53	15:13	13:15	11:18	09:40
6TH & BROADWAY	37:12	34:52	33:12	31:28	29:42	27:15	24:57	22:52	20:22	16:42	14:44	12:47	11:09
CIVIC CENTER	38:37	36:17	34:37	32:53	31:07	28:40	26:22	24:17	21:47	18:07	16:09	14:12	12:34
UNION STATION	40:01	37:41	36:01	34:17	32:31	30:04	27:46	25:41	23:11	19:31	17:33	15:36	13:58
SAN FERNANDO VALLEY CORRIDOR													
BALBOA TERMINAL		02:20	04:00	05:44	07:30	09:57	12:15	14:20	16:50	20:30	22:28	24:25	26:03
SEPULVEDA			01:40	03:24	05:10	07:37	09:55	12:00	14:30	18:10	20:08	22:05	23:43
SHERMAN-VAN NUYS				01:44	03:30	05:57	08:15	10:20	12:50	16:30	18:28	20:25	22:03
VICTORY					01:46	04:13	06:31	08:36	11:06	14:46	16:44	18:41	20:19
BURBANK-VAN NUYS						02:27	04:45	06:50	09:20	13:00	14:58	16:55	18:33
FULTON							02:18	04:23	06:53	10:33	12:31	14:28	16:06
LAUREL CANYON								02:05	04:35	08:15	10:13	12:10	13:48
NORTH HOLLYWOOD									02:30	06:10	08:08	10:05	11:43
UNIVERSAL CITY										03:40	05:38	07:35	09:13
LA BREA (SFV)											01:58	03:55	05:33
VINE												01:57	03:35
SANTA MONICA													01:38

SAN GABRIEL VALLEY CORRIDOR

From	EL MONTE TERMINAL	TYLER	ROSEMEAD	SAN GABRIEL	GARFIELD	FREMONT	CAL STATE	COUNTY HOSPITAL
WILSHIRE CORRIDOR								
FAIRFAX TERMINAL	35:38	34:08	32:03	29:28	27:20	24:49	22:46	19:45
MASSELIN	34:16	32:46	30:41	28:06	25:58	23:27	21:24	18:23
LA BREA (W)	33:01	31:31	29:26	26:51	24:43	22:12	20:09	17:08
CRENSHAW	30:53	29:23	27:18	24:43	22:35	20:04	18:01	15:00
WESTERN	29:32	28:02	25:57	23:22	21:14	18:43	16:40	13:39
NORMANDIE	28:24	26:54	24:49	22:14	20:06	17:35	15:32	12:31
VERMONT	26:59	25:29	23:24	20:49	18:41	16:10	14:07	11:06
ALVARADO	25:19	23:49	21:44	19:09	17:01	14:30	12:27	09:26
LUCAS	23:55	22:25	20:20	17:45	15:37	13:06	11:03	08:02
7TH & HOPE	22:35	21:05	19:00	16:25	14:17	11:46	09:43	06:42
6TH & BROADWAY	21:06	19:36	17:31	14:56	12:48	10:17	08:14	05:13
CIVIC CENTER	19:41	18:11	16:06	13:31	11:23	08:52	06:49	03:48
UNION STATION	18:17	16:47	14:42	12:07	09:59	07:28	05:25	02:24
SAN FERNANDO VALLEY CORRIDOR								
BALBOA TERMINAL	58:18	56:48	54:43	52:08	50:00	47:29	45:26	42:25
SEPULVEDA	55:58	54:28	52:23	49:48	47:40	45:09	43:06	40:05
SHERMAN-VAN NUYS	54:18	52:48	50:43	48:08	46:00	43:29	41:26	38:25
VICTORY	52:34	51:04	48:59	46:24	44:16	41:45	39:42	36:41
BURBANK-VAN NUYS	50:48	49:18	47:13	44:38	42:30	39:59	37:56	34:55
FULTON	48:21	46:51	44:46	42:11	40:03	37:32	35:29	32:28
LAUREL CANYON	46:03	44:33	42:28	39:53	37:45	35:14	33:11	30:10
NORTH HOLLYWOOD	43:58	42.28	40:23	37:48	35:40	33:09	31:06	28:05
UNIVERSAL CITY	41:28	39:58	37:53	35:18	33:10	30:39	28:36	25:35
LA BREA (SFV)	37:48	36:18	34:13	31:38	29:30	26:59	24:56	21:55
VINE	35:50	34:20	32:15	29:40	27:32	25:01	22:58	19:57
SANTA MONICA	33:53	32:23	30:18	27:43	25:35	23:04	21:01	18:00
BEVERLY	32:15	30:45	28:40	26:05	23:57	21:26	19:23	16:22
SAN GABRIEL VALLEY CORRIDOR								
EL MONTE TERMINAL		01:30	03:35	06:10	08:18	10:49	12:52	15:53
TYLER			02:05	04:40	06:48	09:19	11:22	14:23
ROSEMEAD				02:35	04:43	07:14	09:17	12:18
SAN GABRIEL					02:08	04:39	06:42	09:43
GARFIELD						02:31	04:34	07:35
FREMONT							02:03	05:04
CAL STATE								03:01

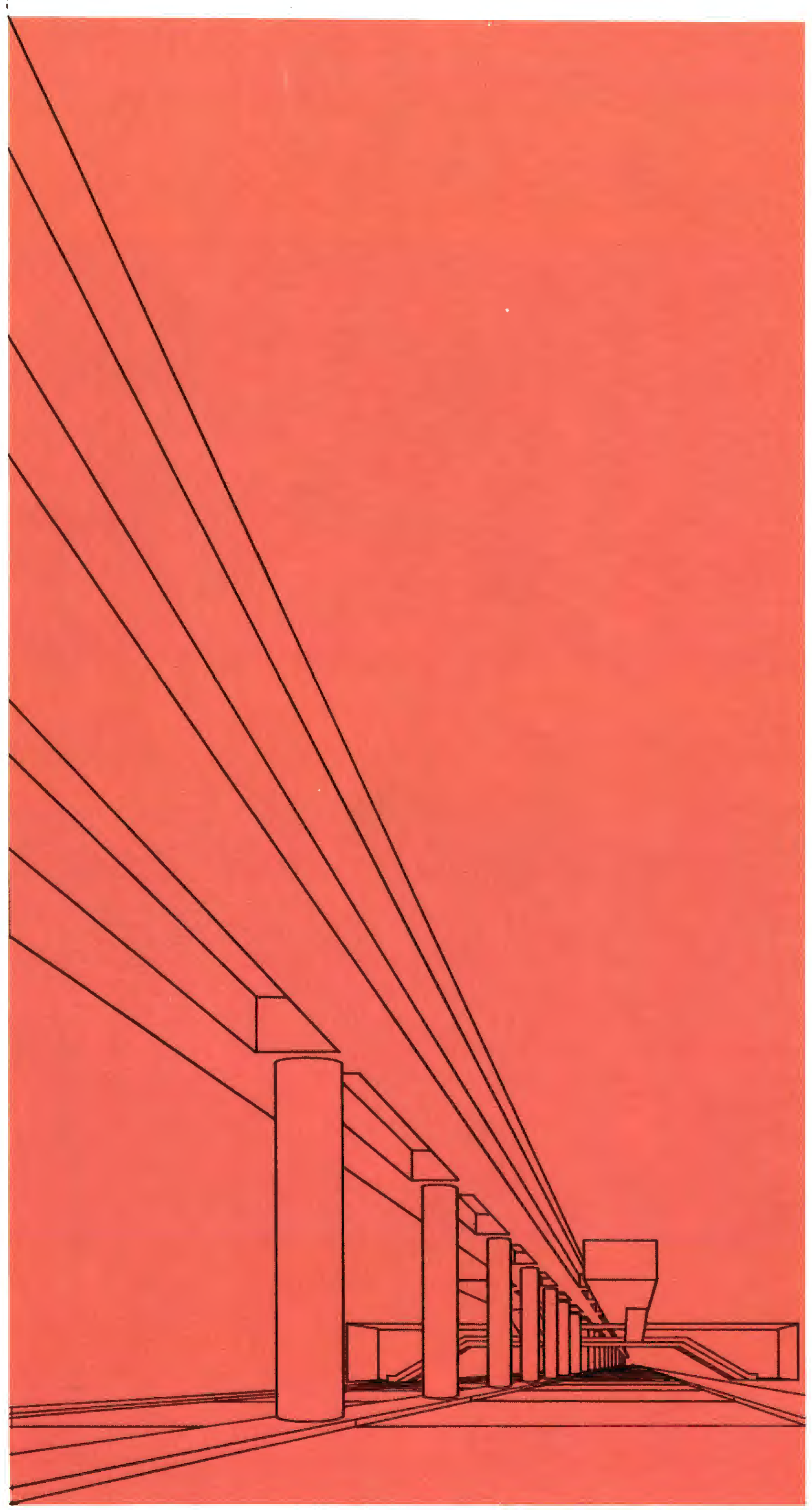
LONG BEACH CORRIDOR

From	LONG BEACH TERMINAL	PACIFIC COAST HWY.	WARDLOW	COMPTON	IMPERIAL HWY.	103RD ST.	ALAMEDA	GAGE	VERNON	7TH & CENTRAL	7TH & MAIN
WILSHIRE CORRIDOR											
FAIRFAX TERMINAL	40:47	38:25	35:51	30:10	27:19	25:19	22:55	21:14	18:55	15:55	14:22
MASSELIN	39:25	37:03	34:29	28:48	25:57	23:57	21:33	19:52	17:33	14:33	13:00
LA BREA (W)	38:10	35:48	33:14	27:33	24:42	22:42	20:18	18:37	16:18	13:18	11:45
CRENSHAW	36:02	33:40	31:06	25:25	22:34	20:34	18:10	16:29	14:10	11:10	09:37
WESTERN	34:41	32:19	29:45	24:04	21:13	19:13	16:49	15:08	12:49	09:49	08:16
NORMANDIE	33:33	31:11	28:37	22:56	20:05	18:05	15:41	14:00	11:41	08:41	07:08
VERMONT	32:08	29:46	27:12	21:31	18:40	16:40	14:16	12:35	10:16	07:16	05:43
ALVARADO	30:28	28:06	25:32	19:51	17:00	15:00	12:36	10:55	08:36	05:36	04:03
LUCAS	29:04	26:42	24:08	18:27	15:36	13:36	11:12	09:31	07:12	04:12	02:39
7TH & HOPE	27:44	25:22	22:48	17:07	14:16	12:16	09:52	08:11	05:52	02:52	01:19
6TH & BROADWAY	29:13	26:51	24:17	18:36	15:45	13:45	11:21	09:40	07:21	04:21	02:48
CIVIC CENTER	30:38	28:16	25:42	20:01	17:10	15:10	12:46	11:05	08:46	05:46	04:13
UNION STATION	32:02	29:40	27:06	21:25	18:34	16:34	14:10	12:29	10:10	07:10	05:37
SAN FERNANDO VALLEY CORRIDOR											
BALBOA TERMINAL	63:27	61:05	58:31	52:50	49:59	47:59	45:35	43:54	41:35	38:35	37:02
SEPULVEDA	61:07	58:45	56:11	50:30	47:39	45:39	43:15	51:34	39:15	36:15	34:42
SHERMAN-VAN NUYS	59:27	57:05	54:31	48:50	45:59	43:59	41:35	39:54	37:35	34:35	33:02
VICTORY	57:43	55:21	52:47	47:06	44:15	42:15	39:51	38:10	35:51	32:51	31:18
BURBANK-VAN NUYS	55:57	53:35	51:01	45:20	42:29	40:29	38:05	36:24	34:05	31:05	29:32
FULTON	53:30	51:08	48:34	42:53	40:02	38:02	35:38	33:57	31:38	28:38	27:05
LAUREL CANYON	51:12	48:50	46:16	40:35	37:44	35:44	33:20	31:39	29:20	26:20	24:47
NORTH HOLLYWOOD	49:07	46:45	44:11	38:30	35:39	33:39	31:15	29:34	27:15	24:15	22:42
UNIVERSAL CITY	46:37	44:15	41:41	36:00	33:09	31:09	28:45	27:04	24:45	21:45	20:12
LA BREA (SFV)	42:57	40:35	38:01	32:20	29:29	27:29	25:05	23:24	21:05	18:05	16:32
VINE	40:59	38:37	36:03	30:22	27:31	25:31	23:07	21:26	19:07	16:07	14:34
SANTA MONICA	39:02	36:40	34:06	28:25	25:34	23:34	21:10	19:29	17:10	14:10	12:37
BEVERLY	37:24	35:02	32:28	26:47	23:56	21:56	19:32	17:51	15:32	12:32	10:59
SAN GABRIEL VALLEY CORRIDOR											
EL MONTE TERMINAL	50:19	47:57	45:23	39:42	36:51	34:51	32:27	30:46	28:27	25:27	23:54
TYLER	48:49	46:27	43:53	38:12	35:21	33:21	30:57	29:16	26:57	23:57	22:24
ROSEMEAD	46:44	44:22	41:48	36:07	33:16	31:16	28:52	27:11	24:52	21:52	20:19
SAN GABRIEL	44:09	41:47	39:13	33:32	30:41	28:41	26:17	24:36	22:17	19:17	17:44
GARFIELD	42:01	39:39	37:05	31:24	28:33	26:33	24:09	22:28	20:09	17:09	15:36
FREMONT	39:30	37:08	34:34	28:53	26:02	24:02	21:38	19:57	17:38	14:38	13:05
CAL STATE	37:27	35:05	32:31	26:50	23:59	21:59	19:35	17:54	15:35	12:35	11:02
COUNTY HOSPITAL	34:26	32:04	29:30	23:49	20:58	18:58	16:34	14:53	12:34	09:34	08:01
LONG BEACH CORRIDOR											
LONG BEACH TERMINAL		02:22	04:56	10:37	13:28	15:28	17:52	19:33	21:52	24:52	26:25
PACIFIC COAST HWY.			02:34	08:15	11:06	13:06	15:30	17:11	19:30	22:30	24:03
WARDLOW				05:41	08:32	10:32	12:56	14:37	16:56	19:56	21:29
COMPTON					02:51	04:51	07:15	08:56	11:15	14:15	15:48
IMPERIAL HWY.						02:00	04:24	06:05	08:24	11:24	12:57
103RD ST.							02:24	04:05	06:24	09:24	10:57
ALAMEDA								01:41	04:00	07:00	08:33
GAGE									02:19	05:19	06:52
VERNON										03:00	04:33
7TH & CENTRAL											01:33

1. *Travel times do not include transfer movement.*
2. *Schedule time data has been developed by a computerized Train Simulation Program.*

ROUTE PLANNING

ROUTE PLANNING



The development of a system of mass public rapid transit in Los Angeles will introduce a new mode of travel service into an already established pattern of private and public transportation and urban development, and a new essential element into master transportation planning. As such, it must take into consideration present needs for mobility and access, existing land use and transportation systems and future regional planning, if it is to make the most significant contribution possible to total transportation service.

The definition of today's needs has been statistically established through an analysis of job and population densities, demographic characteristics and travel patterns. The needs of the immediate future are also relatively clear from the current patterns of urban concentration and development, and the long range needs, although less clearly defined, can be assessed by projecting current trends and the expressed goals and objectives of the various communities making up the urban complex.

ROUTE SELECTION PROCESS

A basic assumption in the route selection process employed in this study is that the introduction of rapid transit into the metropolitan area can represent a significant positive force affecting the future form and intensity of development and potentially contributing to the solution of social issues. It also can affect the rapidity of change. The validity of this assumption has been demonstrated in many cities throughout the world.

While transit is often referred to as a builder of cities, it is but one element of regional planning. The other elements making up the Los Angeles metropolitan area, such as land use, urban development, traffic circulation and other transportation systems, are the responsibility of numerous autonomous cities and agencies, each with its own long range goals, objectives, plans and programs. The requirement in transit planning then is to develop a system which is both compatible with these various plans, goals and objectives and which also recognizes regional influences so that the system will be integrated properly into both current and future development plans. It is also essential to recognize that the system currently proposed is the initial stage in a comprehensive system of mass public transportation, including both rapid transit and surface bus transit.

A critical element within total transportation service planning is the cost of construction and right-of-way acquisition as influenced by route location. Differing land values, topography and the influence of land use on system configuration (subway, aerial, depressed section), all relate to route location and influence total cost. The "least cost" may be neither the least expensive nor most desirable when such factors as development potential or economic benefit are considered. However, it is equally apparent that a real cost limit exists as imposed by financing limitations and repayment capacity.

Under this limitation, a challenge of rapid transit planning is the selection of those routes which will provide the most favorable balance of beneficial community development and regional service for a given investment of public funds.

OBJECTIVES

The following series of objectives helped guide the route selection process:

Transit Service

Integrate the rapid transit system with all other modes of transportation into a coordinated network to realize maximum service potential,

Provide fast, high capacity, economical and dependable public transportation on exclusive rights-of-way,

Give primary consideration to providing service to areas of employment and residential concentrations,

Penetrate the regional centers of economic concentration and provide station stops as close as possible to the ultimate destination of the passenger, Locate routes and stations within the various corridors with complete recognition of the dominant character of the area, i.e., origin or destination area.

Community Factors

Coordinate the total program of rapid transit with city and regional planning goals and programs to provide optimum public benefit,

Provide a flexible transportation framework which can adapt to changes in the regional development pattern and can be expanded as needs require,

Contribute to the reduction of traffic congestion and smog by providing an electrically-driven, high capacity rapid transit system,

Realize maximum benefits from development and construction of the system in terms of social as well as economic gain,

Preserve or enhance the character of the area traversed,

Maintain high quality in the architectural treatment of transit facilities, thereby introducing a positive urban design element.

Alternate and Complementing Transportation Modes

Provide the traveling public a choice of transportation modes which are competitive in terms of speed, service, convenience and cost in similar service areas during peak hours,

Locate transit routes and stations to minimize conflict of automobile traffic on surface arterials or freeways,

Recognize the requirement at stations for bi-modal travel and provide facilities for park-and-ride, kiss-and-ride and feeder bus operation which will be convenient to distribution arteries,

Utilize existing transportation rights-of-way where appropriate and consistent with service and planning considerations.

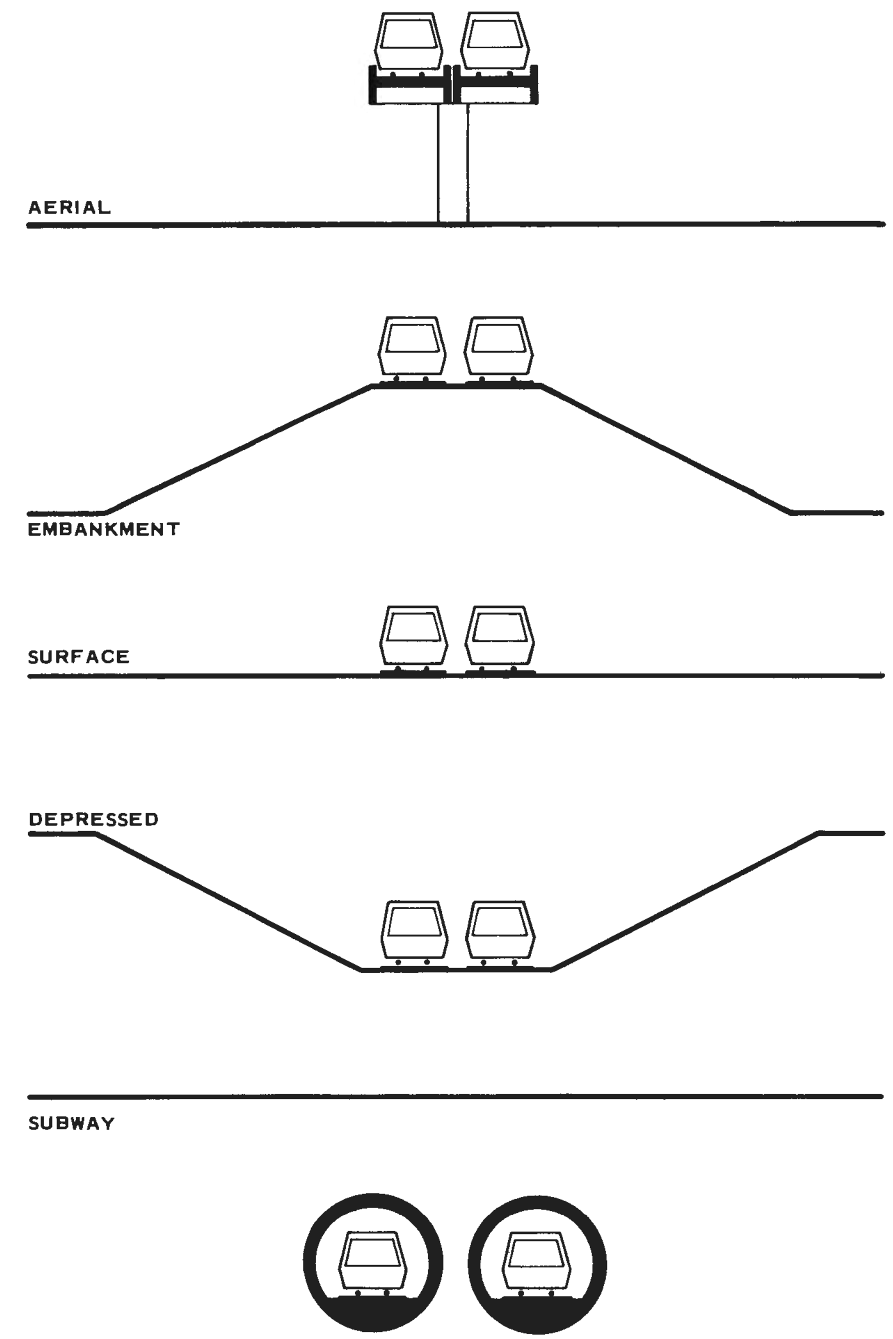
ROUTE CONFIGURATION CONSIDERATIONS

Realization of these objectives depends greatly on community acceptance of a specific route configuration such as aerial structures, fill (embankment section), surface (existing grade), cut (depressed) and subway.

Each basic configuration, or any of its variations, represents certain advantages to the community based on existing conditions. An aerial structure, for example, depending on its architectural treatment, its location and the surrounding environment, can be the most desirable of all configurations from the viewpoint of both the community and the rider. Subway, on the other hand, can be the most favorable in a high concentration area or as a solution to a topographical problem.

Another consideration in the selection process of a specific configuration is sound and its control, and special in-depth acoustical studies and evaluations are being made during this program. The studies to date have included review and analysis of potential problem areas throughout the system and have resulted in goals for use in the design and development of the system.

It has been determined that one of the better methods of acoustical control includes the use of a sound barrier wall or parapet. The sound barrier consists of a vertical wall along the trackside next to the car, extending from the roadbed to a height just above the bottom of the car side skirt at the wheels. For maximum effect, the wall would have sound absorbing material facing the car and, in effect, would reduce the sound level from all significant sources including the wheel and rail, the traction system and the auxiliary equipment.



BASIC TRANSIT CONFIGURATIONS

ROUTE EVALUATION

The locations of specific routes and stations depend on the requirements of the people to be served, the requirements and plans of adjacent communities, topographic limitations, existing development and cost. The route selection process was designed to balance these interacting factors. A key element in the total process was the continuing coordination between the consultants, the District, the affected communities and interested public agencies.

The initial step in the selection process involved a series of meetings with the affected communities to gather the most recent available data on planning and development and to obtain copies of current and long range plans. This data was organized into an analytic procedure involving economics, planning and engineering to produce a comprehensive description of each corridor. With this description as a base, several potential routes were outlined in each corridor and referred back to the communities for comments and suggestions. At the same time, a rating system was developed for the purpose of evaluating the alternate routes on the basis of both tangible and intangible factors. The results of the evaluation were translated into recommendations for each corridor and reviewed by the District, and a single route within each corridor was then selected for the purpose of this Preliminary Report and subsequent refinement.

Study Areas

The study areas involved two levels of definition. First, it was necessary to determine the significant areas of concentration, both residential and employment, within a potential service range of the transit routings. This level of study was made in a band ranging from six to eight miles wide, for a total of 520 square miles. From this analysis, alternate routes were defined which linked areas of concentration. The second level of analysis involved a narrower band of approximately one mile on either side of the selected routes.

EVALUATION FACTORS

Factors bearing on the selection of the most appropriate transit route in any particular corridor were subdivided as follows:

Tangible Factors

CONSTRUCTION AND RIGHT-OF-WAY COSTS

Estimated construction costs and property acquisition costs were developed and evaluated for each alternate route under consideration. These costs were based on route and station configurations, rights-of-way to be acquired and electrification and control system requirements.

LOCAL TAX GAIN

The potential impact on local communities was measured in terms of the increased tax revenues which might result from new developments being located near the transit stations. An area comprising approximately 160 acres around each station was evaluated in terms of its current land use and its potential redevelopment. An estimate was made of potential private development with and without transit. The net tax revenue gains were then calculated for each alternate route alignment within each corridor.

The amount of new taxable development which conceivably could take place around transit stations will vary depending on:

The Character, Age, Value and Condition of Improvements

Vacant land or land containing improvements of low value will be developed more readily as a result of rapid transit impact than those parcels already highly developed. Thus, aging neighborhoods that are ready for conversion to other uses will tend to benefit more from rapid transit in terms of new development than stable areas with substantial investment in improvements.

Property Ownership

Property around stations may be committed to public or private use precluding additional taxable development due to transit. Examples of this would include hospitals, parks, schools, cemeteries and other institutional uses.

Zoning & Covenants

Zoning controls and private covenants which restrict development on parcels in the vicinity of stations will reduce the impact of transit on the community in terms of new development.

Economic Conditions

Whether the area around a station is an existing commercial center, an industrial district, or a suburban residential neighborhood will determine to some degree the type and amount of new development that can be expected to take place. In addition, the areas through which the transit system passes are in various stages of their development cycle. The San Fernando Valley, as an example, may be expected to continue the rapid development of recent years and as a result will receive a greater impact from the insertion of a new transportation facility. Other areas having only moderate growth or more mature development will likely receive somewhat less impact from transit.

Intangible Factors

SERVICE TO ORIGIN AND DESTINATION AREAS

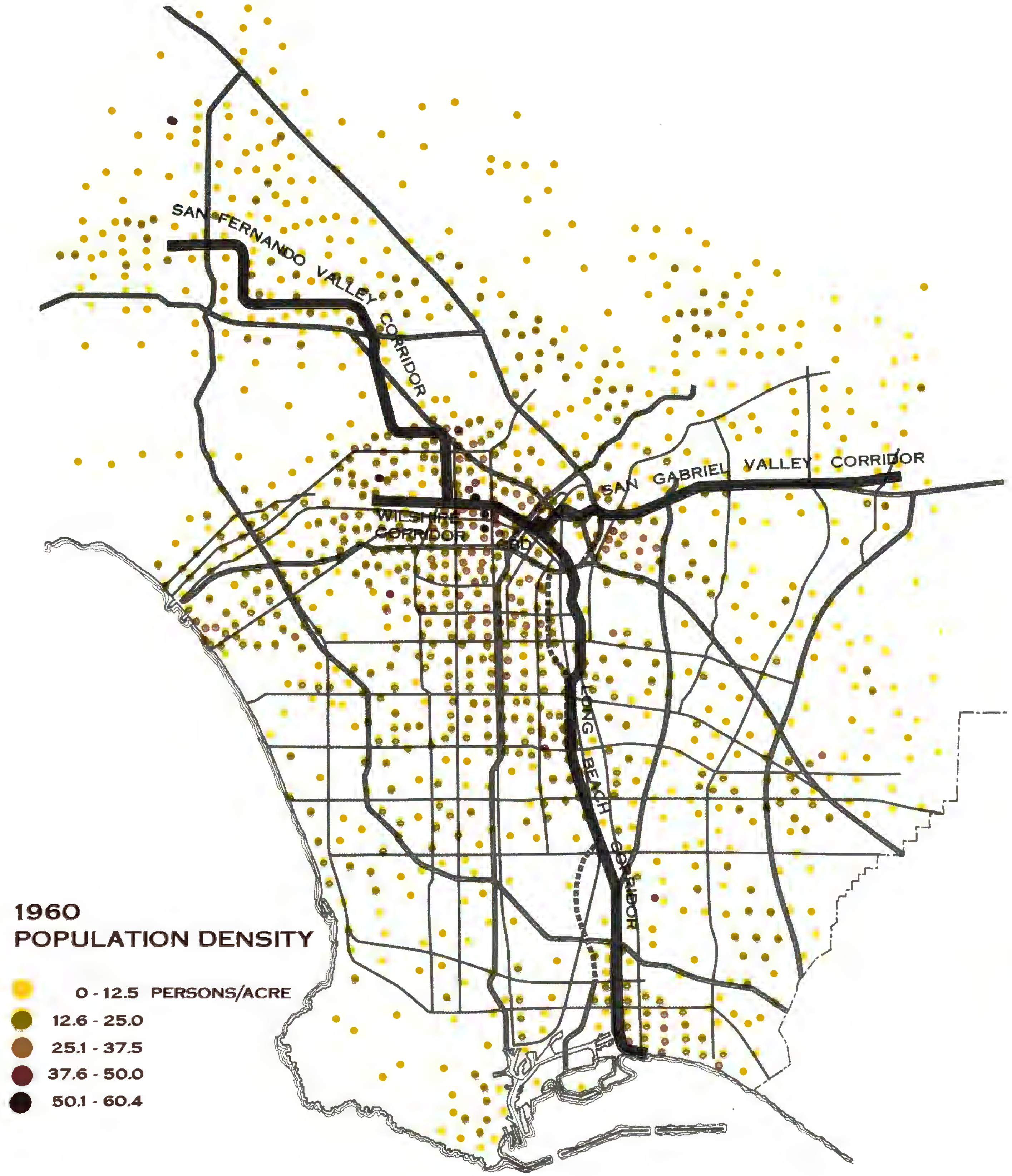
A distinct pattern has developed in the metropolitan area of Los Angeles wherein population and employment have concentrated in the central area, becoming less dense as distance from the CBD increases. Historically, this concentration in the central area has continued to increase in density while also expanding geographically. It is logical to assume that these trends will continue provided no outside restraints are imposed on the region. Population and employment density and distribution within the four corridors under study are shown on the following pages.

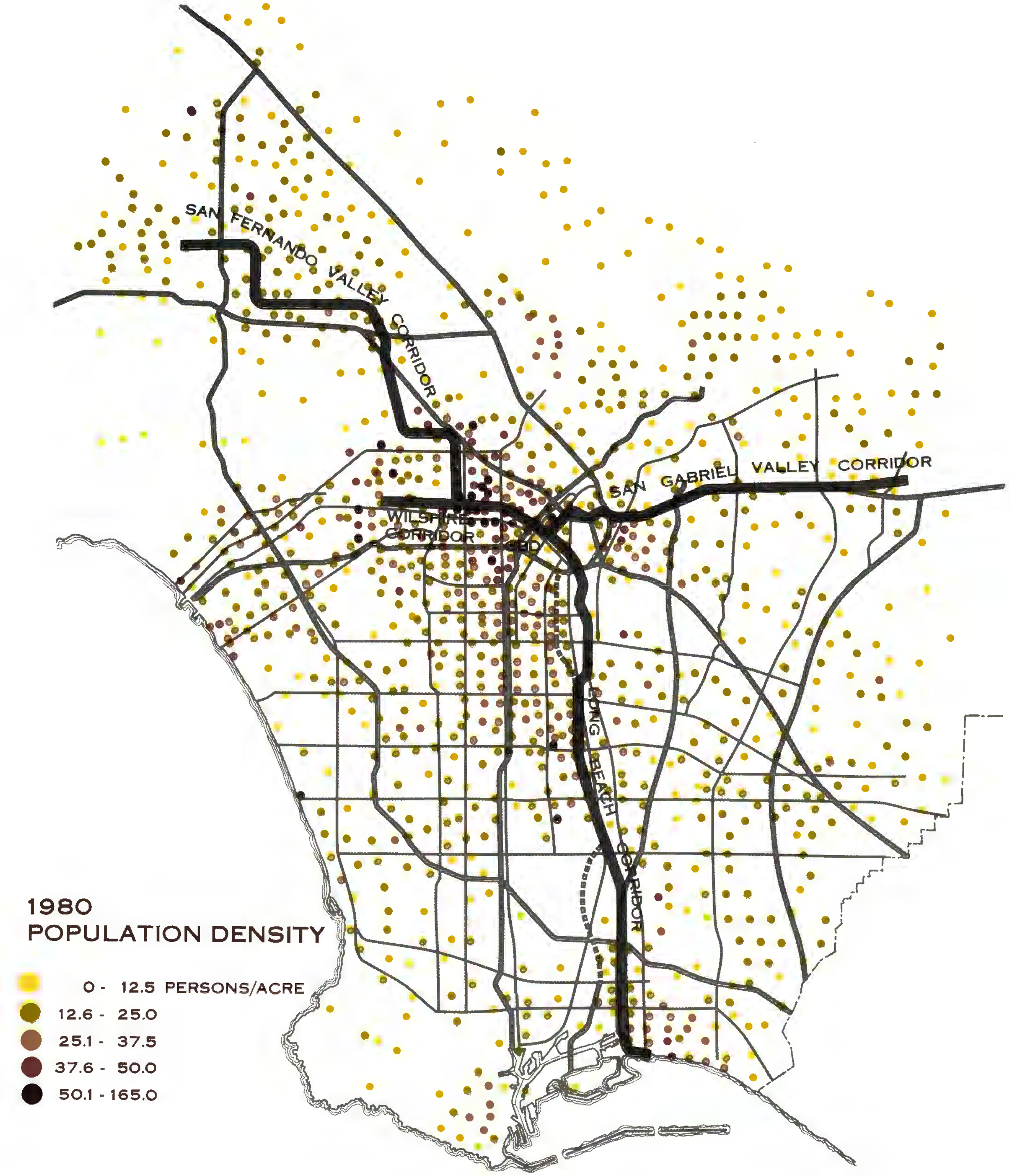
The projected population and employment patterns for 1980 indicate a trend toward relatively higher concentration for both residential and industrial areas. Labor-oriented industries will replace land-oriented industries within the corridor as the areas of concentration expand around the central core.

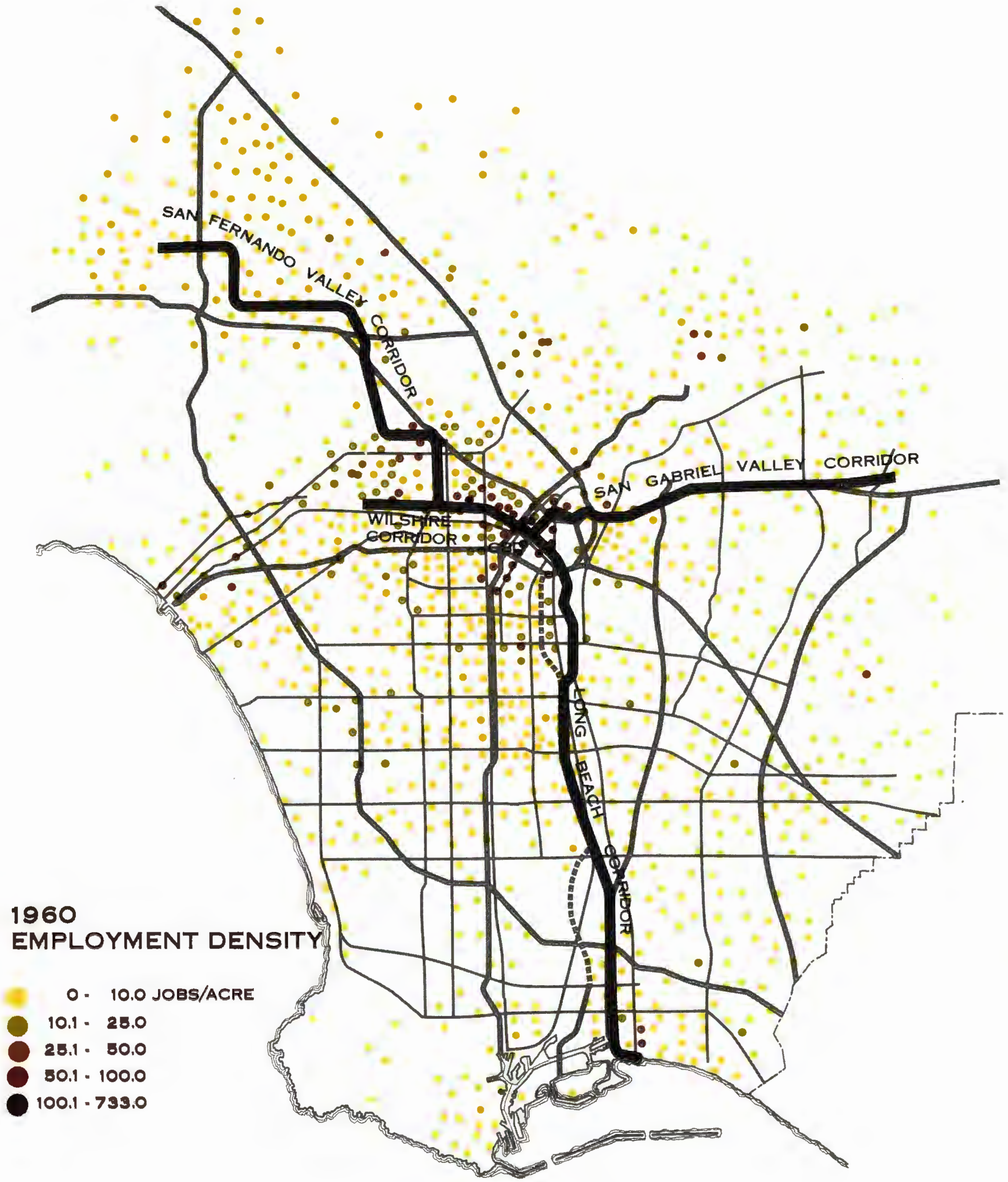
These projected distributions are reflective of LARTS[1] data and do not include the redistributive effect of transit.

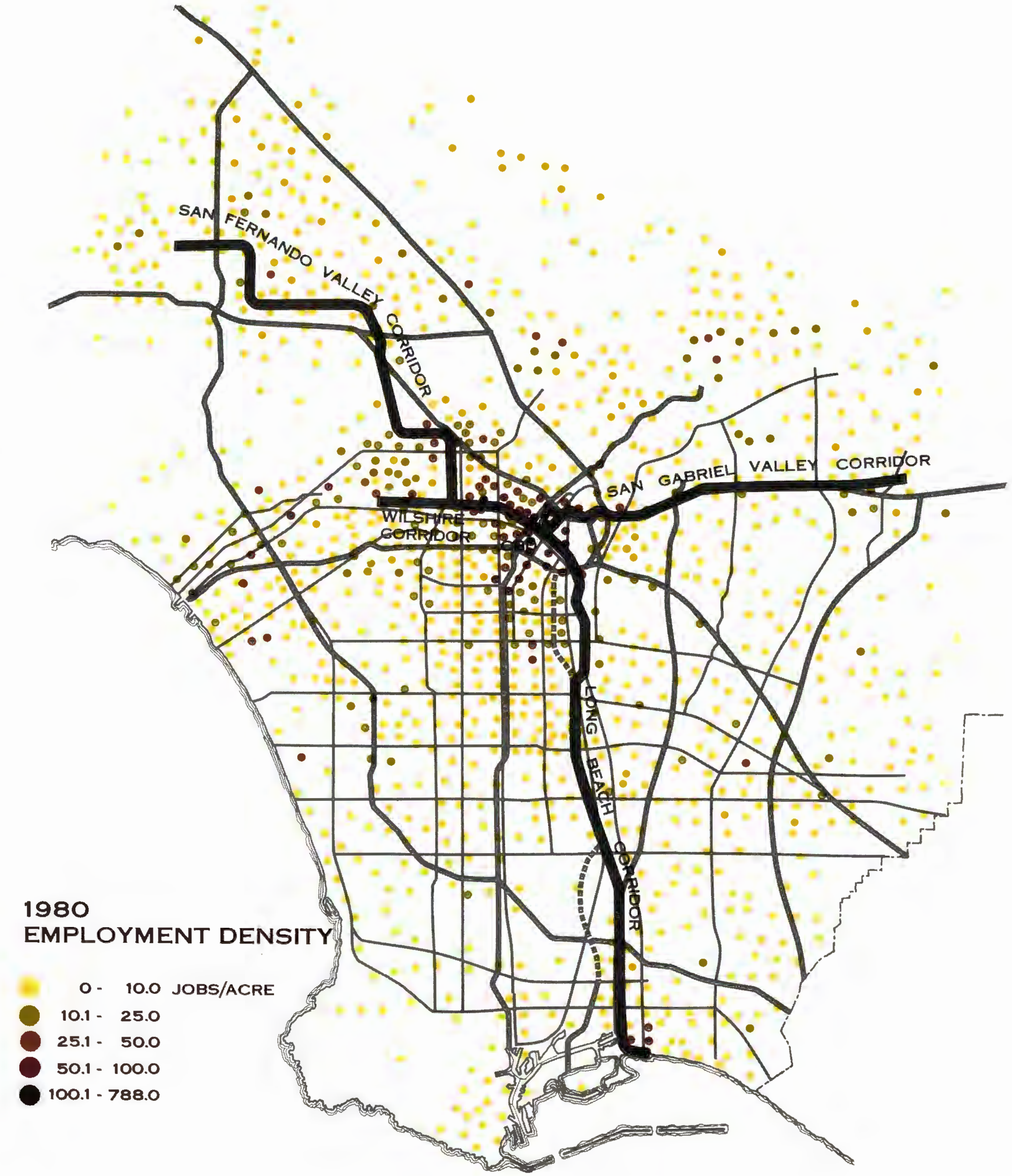
Substantial multiple residential development, together with increased commercial and employment activity, may be expected to occur around the station areas which would tend to increase the density patterns in those areas served by the transit lines.

[1] *Los Angeles Regional Transportation Study.*


SAN FERNANDO VALLEY CORRIDOR
SAN GABRIEL VALLEY CORRIDOR
WILSHIRE CORRIDOR
CBD
LONG BEACH CORRIDOR
1960
POPULATION DENSITY
0 - 12.5 PERSONS/ACRE
12.6 - 25.0
25.1 - 37.5
37.6 - 50.0
50.1 - 60.4


SAN FERNANDO VALLEY CORRIDOR
SAN GABRIEL VALLEY CORRIDOR
WILSHIRE CORRIDOR
CBD
LONG BEACH CORRIDOR
1980
POPULATION DENSITY
0 - 12.5 PERSONS/ACRE
12.6 - 25.0
25.1 - 37.5
37.6 - 50.0
50.1 - 165.0


SAN FERNANDO VALLEY CORRIDOR
SAN GABRIEL VALLEY CORRIDOR
WILSHIRE CORRIDOR
CBD
LONG BEACH CORRIDOR
1960
EMPLOYMENT DENSITY
0 - 10.0 JOBS/ACRE
10.1 - 25.0
25.1 - 50.0
50.1 - 100.0
100.1 - 733.0


SAN FERNANDO VALLEY CORRIDOR
SAN GABRIEL VALLEY CORRIDOR
WILSHIRE CORRIDOR
CBD
LONG BEACH CORRIDOR
1980
EMPLOYMENT DENSITY
0 - 10.0 JOBS/ACRE
10.1 - 25.0
25.1 - 50.0
50.1 - 100.0
100.1 - 788.0

COMMUNITY IMPACT

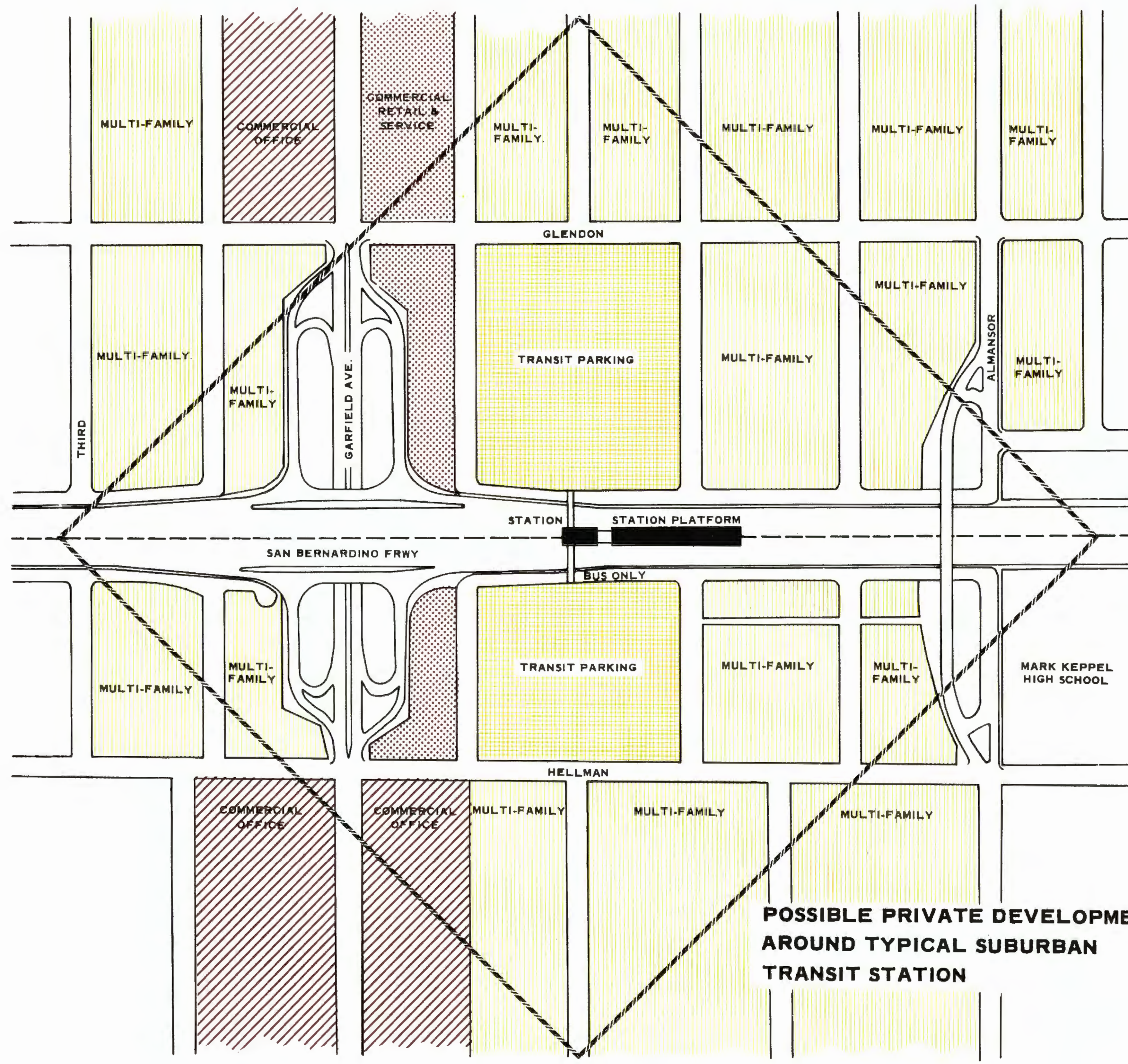
The impact patterns around suburban transit stations will be cyclical in nature. Multi-family development immediately adjacent to the station will occur first and then will gradually spread out if local zoning permits. A demand for convenience retail and personal services, and professional offices in some locations, may be created. Where sufficient trade exists or is developed as a result of the high density generated by transit location, a shopping center may be drawn into the immediate neighborhood. To the right is illustrated possible development patterns around the Garfield station, a typical suburban transit station in the San Gabriel Valley Corridor.

In order to prevent premature deterioration of a stable, single-family neighborhood, the city or local jurisdiction should institute zoning and traffic control measures. This first phase entails preservation and protection of existing development. In the second phase, land and housing values will increase and ownership will change from residential to non-residential. As economic obsolescence of the neighborhood occurs, the third phase of development will result in a transition to multi-family residential use. The fourth phase will be a complete transition to multi-family use spreading out from the transit station. The limits of this expansion can be determined by means of zoning controls.

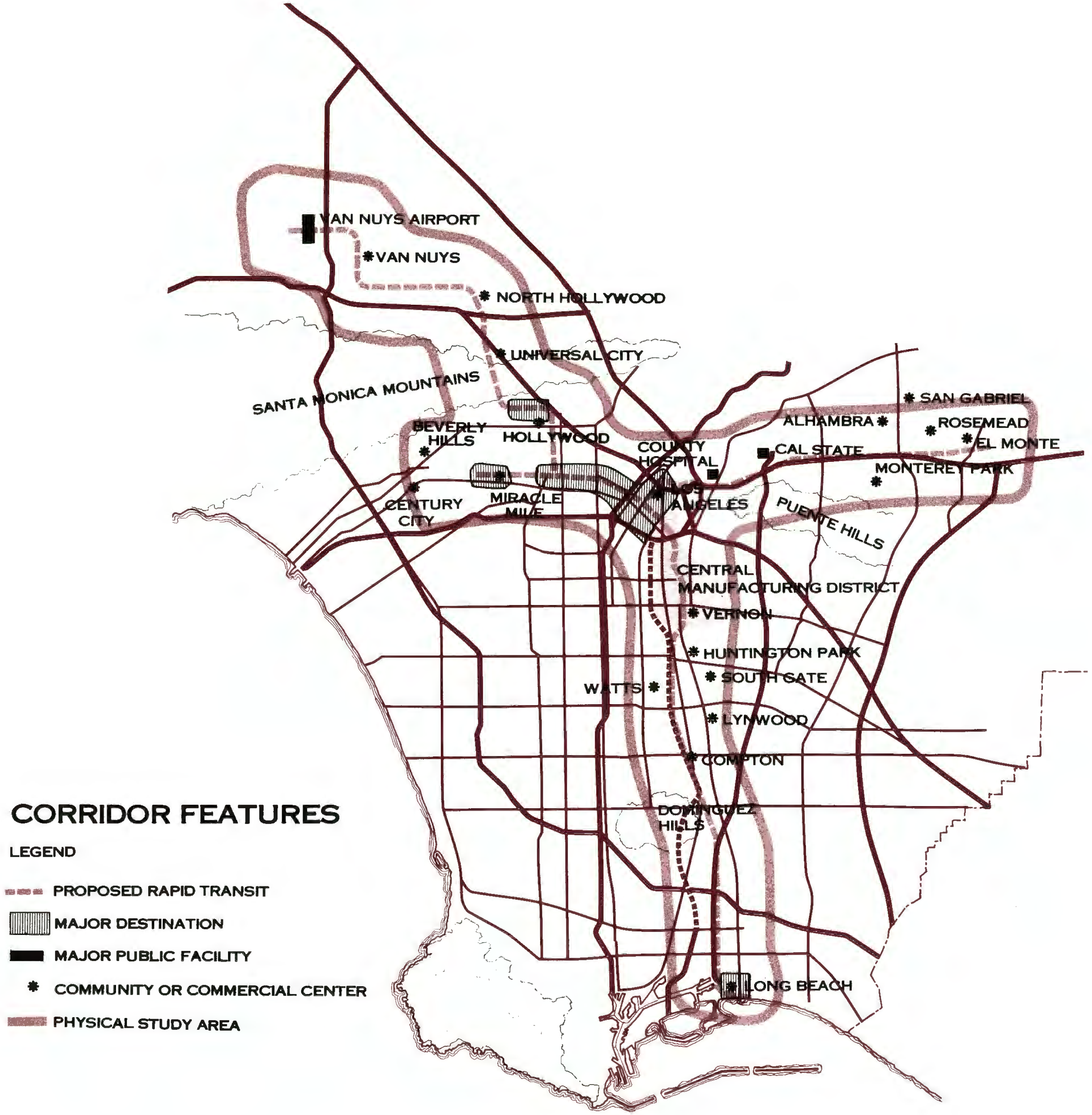
In an already deteriorating residential neighborhood, the impact of the transit facility may create regeneration and result in an area-wide renewal. Where the process of land-use regeneration is already underway, the transit station can increase and accelerate it.

The transit facility can be a tool in the revitalization effort on the part of communities in downtown areas. A station located adjacent to a strip commercial area, for example, can result in redevelopment to more productive multi-family and commercial activities. A station adjoining an existing neighborhood or regional shopping center can accelerate commercial activities. A station located in a community business district can provide increased accessibility for shoppers and serve the multi-family residential users normally located around the CBD.

The development around stations located in high intensity areas, such as the Los Angeles Central Business District, the



POSSIBLE PRIVATE DEVELOPMENT AROUND TYPICAL SUBURBAN TRANSIT STATION



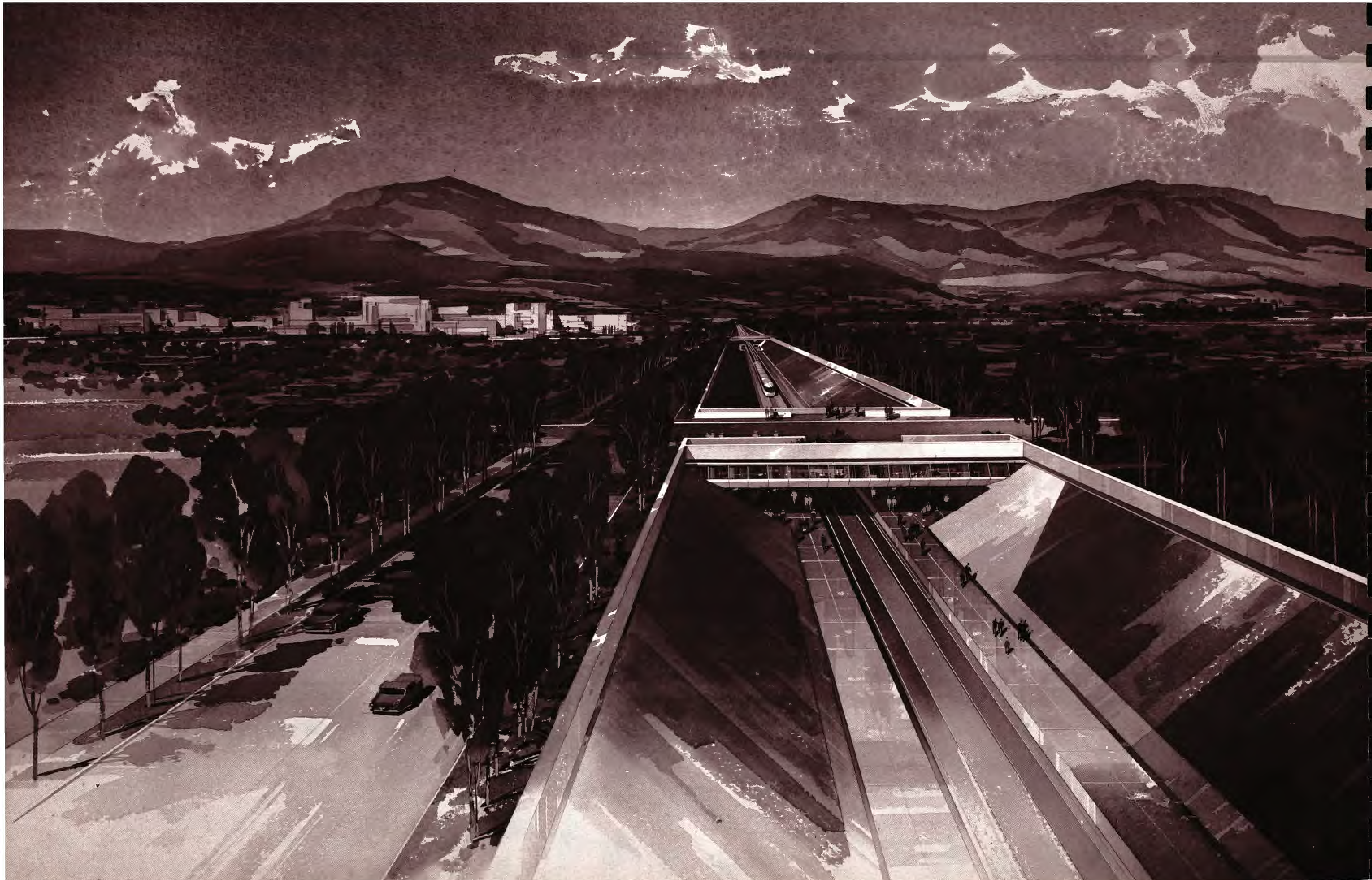
Hollywood District and Wilshire Boulevard, will vary significantly from the outlying suburban neighborhoods. These stations will typically serve as destination stations for office and commercial buildings or as origin stations for high density residential development within walking distance. Some patronage will be generated from secondary bus feeder systems and kiss-and-ride, but parking facilities will not be provided. The type of development expected to occur in high intensity areas will conform generally to existing development and to the demand patterns already existing in the market area.

The effect of rapid transit on community planning and development extends beyond the impact on properties immediately adjacent to the transit line. One such aspect of community impact is the preservation of existing stable residential neighborhoods accomplished by following existing physical barriers such as freeways, railroads, and rivers, or integrating with proposed freeways. Another strong community factor occurs where the transit system acts as a catalyst for urban renewal programs in deteriorated areas by providing greater mobility and thus increased job opportunities to persons living in low income areas who must rely heavily on public transportation.

PHYSICAL DESIGN

Transitway design factors such as horizontal and vertical curvature, length of line and height of aerial structure, were considered in the evaluation of alternate transit routes, while stations were evaluated in terms of their relationship to the arterial street system and the adequacy of the local street patterns to accommodate anticipated automobile and bus traffic. Another factor considered was the availability of adequate space for off-street parking for transit patrons.

The effect of the construction of the rapid transit facility on nearby highways, freeways and railroads was considered in terms of possible limitations or constraints to such systems now and in the future. Conversely, each alternate was considered in terms of the possibilities of providing future additional capacity to the line, of extending the line to accommodate future patronage in areas beyond the proposed terminal stations and the connection of future lines to serve additional transit corridors.



ROUTE AND STATION LOCATIONS

Below Ground Station –

ROUTE AND STATION LOCATIONS

WILSHIRE CORRIDOR

CORRIDOR DESCRIPTION

The Wilshire Corridor generally includes an area north and south of Wilshire Boulevard from Fairfax Avenue to Union Station in the Los Angeles Central Business District, and is entirely within the City of Los Angeles. The following discussion relates to the portion of the corridor outside the Los Angeles Central Business District.

The major features in the corridor are principally man-made and consist of major office and apartment structures along or immediately adjacent to Wilshire Boulevard. Freeways within the corridor include the Santa Monica, Hollywood and Harbor. The predominant natural feature is the Santa Monica Mountain Range at the northwest boundary of the corridor.

Residential development in the corridor is generally medium to high density. There are, however, pockets of high quality single-family housing in the Hancock Park and Fremont Place areas. Commercial activity is extensive with little or no industrial development.

The Wilshire Corridor is estimated to increase equally in both jobs and population through 1980. This tendency is already evident in the high density apartments and office structures locating there. The present population within the economic study area is expected to increase 42 percent by 1980, and the current employment 40 percent.

Because existing land and improvement values are extremely high, added increments due to transit will be relatively minor in proportion to the existing base.

WILSHIRE CORRIDOR (Outside Los Angeles CBD)

	ECONOMIC STUDY AREA*		
	1960	1980	% Increase
Population	750,000	1,062,000	42
Jobs	389,000	545,000	40

	WITHIN ONE MILE OF SELECTED ROUTE		
	1960	1980	% Increase
Population	181,000	288,000	59
Jobs	136,000	178,000	31

* Band approximately 6 to 8 miles wide from Union Avenue to Century City.

ROUTE DESCRIPTION

This portion of the proposed Wilshire Corridor transit route begins east of the Harbor Freeway on Seventh Street; traverses Seventh Street to Hoover Street; and Wilshire Boulevard from Vermont Avenue to Fairfax Avenue with a crossover on private right-of-way between Hoover and Vermont.

A subway is proposed for the entire Wilshire Corridor to the terminal station at Fairfax because, in an area of such extremely high property values, the costs for constructing a subway within a street are less than for a retained cut or aerial structure in private right-of-way. In addition, there would be no tax base loss to local governments. An aerial structure was not considered feasible in any street closely paralleling Wilshire Boulevard because of the narrow rights-of-way.

Several alternates to the proposed route were considered, including lines one block south and north of Wilshire Boulevard.

Wilshire Boulevard from Hoover Street west is the backbone of the Wilshire Corridor destination area because of the large portion of major stores and office buildings located immediately thereon. In addition, this specific route would provide convenient service to walk-in patrons from the medium to high density housing both north and south of Wilshire.

The Lucas and Alvarado transit stations will serve the high density residential area just west of the Los Angeles Central Business District. The major areas in the Wilshire Corridor west of the Harbor Freeway which are characterized by high-rise office and commercial and high-density residential developments include the Wilshire District and the Miracle Mile. The stations will be closely spaced within these areas to provide transit service within walking distance for the large number of persons living or working within a quarter mile of the stations.

CENTRAL BUSINESS DISTRICT

CORRIDOR DESCRIPTION

The commercial core of the Los Angeles Central Business District is generally bounded by Pico Boulevard, the Harbor Freeway, Sunset Boulevard and Main Street. It comprises headquarters and executive offices of various corporations, the financial center of the Pacific Southwest, the largest concentration of department and retail stores in the Los Angeles area and a 25-building government office complex.

With the recent construction of high rise office buildings, the Los Angeles CBD is developing an impressive skyline. The Bunker Hill Urban Renewal District will experience vigorous building activity in the near future. The 40-story Bunker Hill Square has recently been completed, and there are proposals for hotels, high-rise apartment buildings and major commercial buildings within the next five years.

WILSHIRE CORRIDOR (Los Angeles CBD)

	CENTRAL CITY*		
	1960	1980	% Increase
Population	61,400	67,800	11
Jobs	314,000	450,000	43
	COMMERCIAL CORE**		
	1960	1980	% Increase
Population	16,600	16,200	—
Jobs	209,000	301,000	44

* Area generally bounded by Union, Alameda, Sunset and Washington.
** Area generally bounded by the Harbor Freeway, Main, Sunset and Pico.

ROUTE DESCRIPTION

The proposed route for the Wilshire Corridor within the Los Angeles Central Business District is along Seventh Street from the Harbor Freeway to Broadway, in the center of Broadway to north of the Hollywood Freeway and along Macy Street to directly north of Union Station. It will include a major interchange with the Long Beach route and, for the purposes of this evaluation, a station at Main Street and Seventh Street.

A subway is recommended in the Central Business District because of high property values, intense development and narrow street rights-of-way. This configuration would be less expensive than a retained cut or a structure in private right-of-way, and any configuration other than a subway undoubtedly would be unacceptable.

The historic center of the Los Angeles Central Business District will be served by the line in subway beneath Broadway and Seventh Streets. Broadway is the main north-south street in the Central Business District and passes through the middle of the Civic Center.

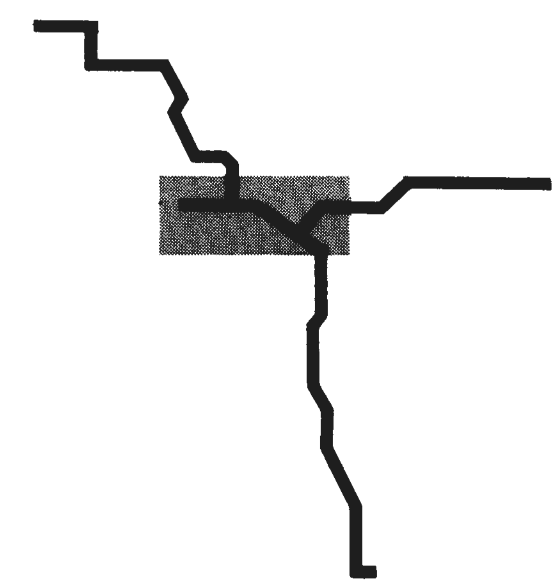
The transit station at Union Station will provide an interchange point between railway facilities and the rapid transit system. The Civic Center station will serve the large and active Civic Center complex and the north part of the commercial core. The Sixth and Broadway, Seventh and Main and Seventh and Hope stations will serve the historic CBD core, the garment district and the financial district.

LEGEND

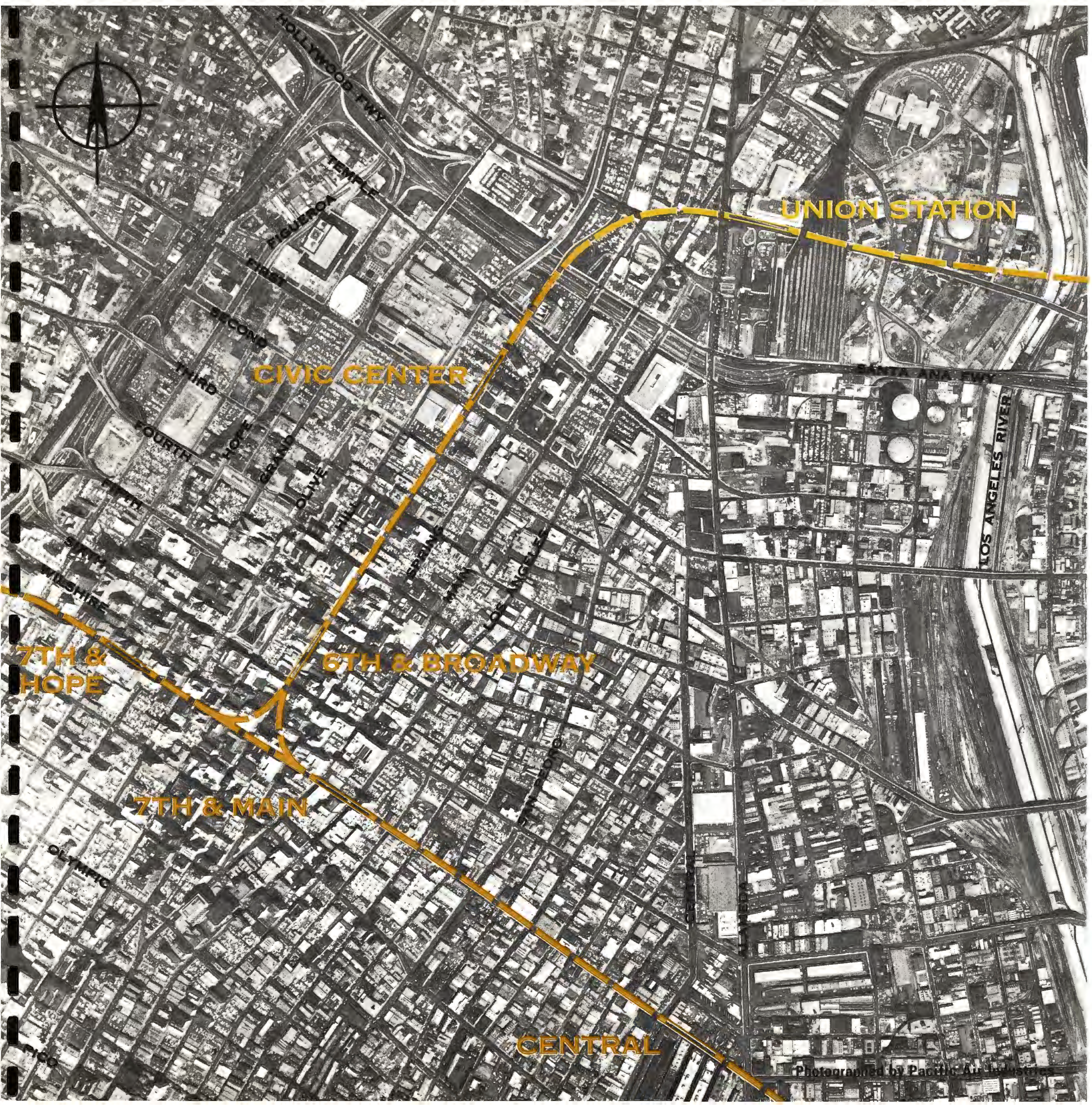
SUBWAY

OPEN CUT

SCALE 1" = 2000'



L.A. COUNTY
SANTA MONICA
SANTA MONICA
HOLLYWOOD FWY
LOS ANGELES
FAIRFAX
LA BREA
BEVERLY BLVD
BEVERLY
CBS
FAIRFAX
MASSELIN
LA BREA
CRENSHAW
WESTERN
NORMANDIE
VERMONT
ALVARADO
ALVARADO
SIXTH
MIRACLE MILE
WILSHIRE CENTER
MAC ARTHUR PARK
SEVENTH
WILSHIRE BLVD
LUCAS
OLYMPIC
WILTON PLACE
CRENSHAW
WESTERN
NORMANDIE
VERMONT
HOOVER
PICO
SANTA MONICA FWY

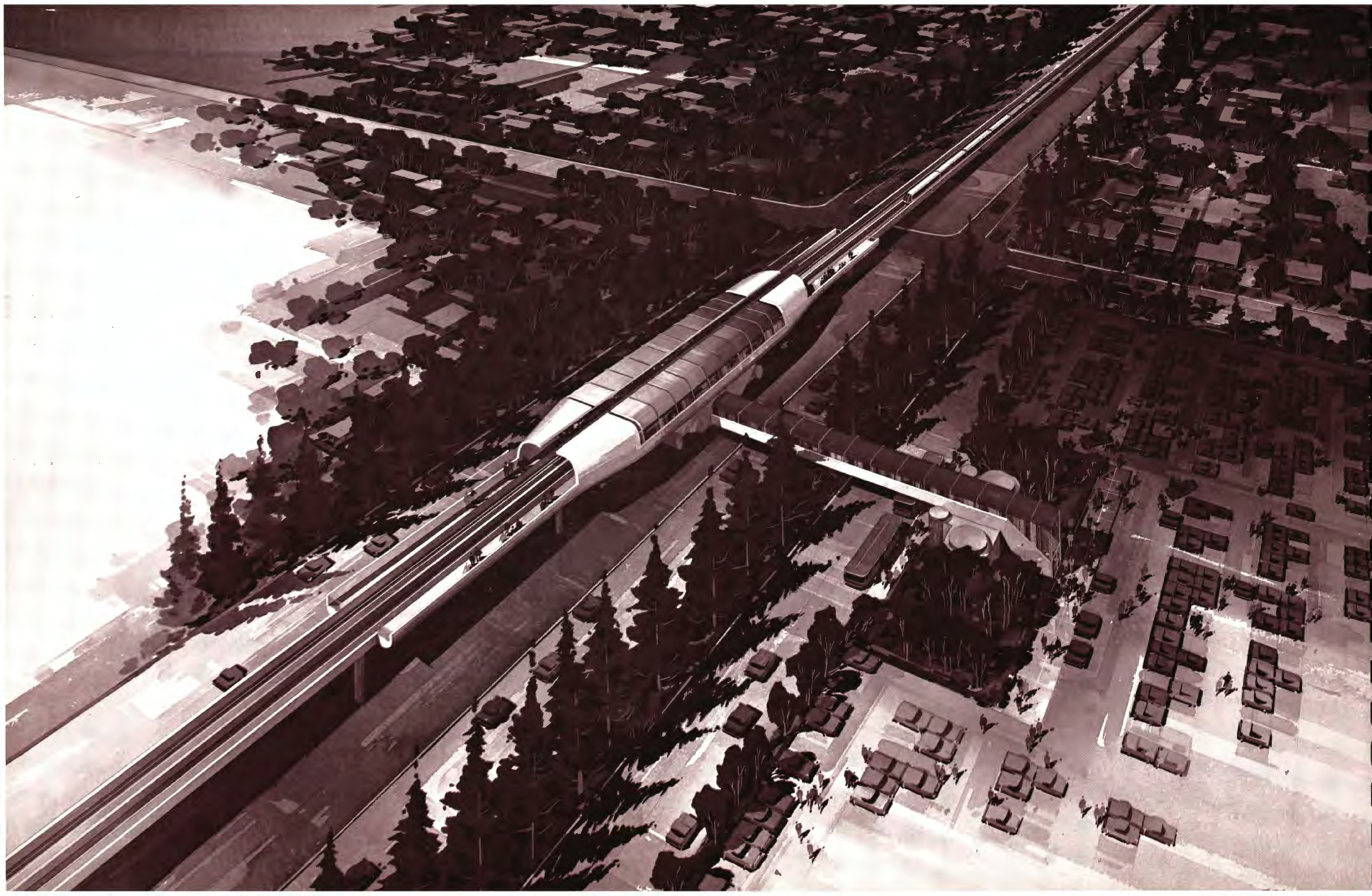


CENTRAL BUSINESS DISTRICT

SCALE 1" = 1000'

WILSHIRE CORRIDOR INTRACORRIDOR TIME TABLE

STATION	DISTANCE BETWEEN STATIONS (MILES)	ACCUMU-LATED DISTANCE (MILES)	RUNNING TIME BETWEEN STATIONS (MIN:SEC)	RUNNING TIME FROM TERMINAL (MIN:SEC)
FAIRFAX		—		—
	0.61		1m22s	
MASSELIN		0.61		1m22s
	0.49		1m15s	
LA BREA		1.10		2m37s
	1.43		2m08s	
CRENSHAW		2.53		4m45s
	0.61		1m21s	
WESTERN		3.14		6m06s
	0.35		1m08s	
NORMANDIE		3.49		7m14s
	0.66		1m25s	
VERMONT		4.15		8m39s
	0.92		1m40s	
ALVARADO		5.07		10m19s
	0.63		1m24s	
LUCAS		5.70		11m43s
	0.55		1m20s	
7TH & HOPE		6.25		13m03s
	0.49		1m29s	
6TH & BROADWAY		6.74		14m32s
	0.63		1m25s	
CIVIC CENTER		7.37		15m57s
	0.63		1m24s	
UNION STATION		8.00		17m21s



Aerial Station –
Chandler Blvd.

SAN FERNANDO VALLEY CORRIDOR

CORRIDOR DESCRIPTION

The San Fernando Valley Corridor, south of the Santa Monica Mountains, includes a part of that area bounded by Wilshire Boulevard on the south, the Hollywood Freeway on the east and Beverly Hills on the west. North of the Santa Monica Mountains it passes through the center of the San Fernando Valley to west of the Sepulveda Flood Control Basin. The corridor is entirely within the City of Los Angeles.

The predominant physical features are the Santa Monica Mountains; the Hollywood, Ventura and San Diego Freeways; a branch line of the Southern Pacific Railroad; the Van Nuys Airport west of the San Diego Freeway; and the Sepulveda Flood Control Basin.

From a land-use standpoint, the corridor is split by the Santa Monica Mountains into two distinct and different developments. On the south side there is the Hollywood area with a strong commercial core centered on Hollywood Boulevard surrounded by medium to high density housing. North of the mountains the San Fernando Valley is essentially single-family residential with multi-family development strung along arterial streets. The commercial activity in the Valley, with the exception of the Van Nuys Central Business District, is essentially in suburban shopping centers. Within the transit corridor, industry is concentrated around the Van Nuys Airport and along several branch lines of the Southern Pacific Railroad.

SAN FERNANDO VALLEY CORRIDOR

ECONOMIC STUDY AREA*	1960	1980	% Increase
Population	611,000	942,000	54
Jobs	284,000	373,000	31

WITHIN ONE MILE OF SELECTED ROUTE	1960	1980	% Increase
Population	313,000	463,000	48
Jobs	154,000	198,000	29

* Band approximately 6 to 8 miles wide from approximately Melrose Avenue north and west to White Oak Avenue in San Fernando Valley.

The San Fernando Valley Corridor economic study area is projected to closely parallel the County's growth in both population and jobs. There is little or no vacant land for expansion, therefore increases in both industry and population will result in land reuse. Residential areas will change from single-family to multiple-family, and industry within the corridor will change from land intense to labor intense development. Population is expected to increase 54 percent by 1980 and employment 31 percent.

A subway immediately north of Wilshire is planned to provide a reasonable interchange with the Wilshire line, while a landscaped cut along Wilton Place is feasible because of the predominant north-south drainage and older single-family development. A subway again will be utilized in the Hollywood area because of the intense development and high property values, and a tunnel under the Santa Monica Mountains because of topography. From Universal City to Chandler Boulevard, the space beneath the elevated structure can be used for off-street parking immediately behind the commercial development along Lankershim Boulevard. Along Chandler and Van Nuys Boulevards and Sherman Way, elevated structure is proposed because of the extreme difficulty and high expense of grade-separating the cross streets.

The construction of the Golden State and Ventura Freeways in the San Fernando Valley Corridor has caused significant value changes in the last ten years with a peak of growth activity now underway. This peaking will continue until land values approximate upper limits comparable to the Wilshire Corridor and the Central Business District. In the normal course of value trends, this peaking will be followed by a leveling off in values. However, anticipated land value increases over the next two decades will be extremely high incrementally due to the growth character.

It is estimated that the San Fernando Valley will experience the greatest local area tax gains, due to the rapid transit line, of the four corridors under study.

ROUTE DESCRIPTION

For the San Fernando Valley Corridor, the proposed rapid transit route begins west of Western Avenue on Wilshire Boulevard, generally follows Wilton Place north to the Hollywood Freeway, parallels the Hollywood Freeway on the west to halfway between Sunset and Hollywood Boulevards, goes directly west on Selma Avenue to La Brea, passes under the Santa Monica Mountains to just west of Universal City, runs parallel to Lankershim Boulevard on the east side to Chandler Boulevard, and is in the median of Chandler Boulevard, Van Nuys Boulevard and Sherman Way to its terminal in the vicinity of Balboa Boulevard. It will alternate between subway and open cut from Wilshire Boulevard to La Brea Avenue, be in tunnel to Universal City and, except for a short tunnel under the Van Nuys Airport, utilize an aerial structure from Universal City to the terminal.

The following alternate lines to the proposed route were considered. In the Hollywood District, a line was studied going north on Highland Avenue from Selma Avenue past the Hollywood Bowl and in the vicinity of the Hollywood Freeway to Universal City. An alternate to the Chandler Boulevard-Van Nuys Boulevard-Sherman Way line was a route running parallel to the Hollywood Freeway on the east to Victory Boulevard and going west along the south side of Victory Boulevard to a terminal in the vicinity of the Van Nuys Airport. An alternate was also studied following the Southern Pacific Railroad from Chandler Boulevard and Fulton Avenue to the north side of the Sepulveda Drainage Basin.

From Wilshire Boulevard to the Hollywood Freeway, Wilton Place represents a transitional area between the multi-family residential on the east and the single-family residential on the west. A location further east would result in substantially higher cost because of the need to acquire higher value property, or to construct a subway in an existing street. A location further west would tend to encroach on stable single-family residential neighborhoods.

SAN FERNANDO VALLEY ROUTE

In the Hollywood District, a line along Selma Avenue is recommended since it is midway between Hollywood and Sunset Boulevards, both of which are destination areas for workers in intensive commercial and office developments. With a station at La Brea Avenue, the transit line should develop considerable walk-in patronage from the present and planned multi-family developments to the south, west and north. The La Brea station would also be convenient to surface bus lines serving West Hollywood and Fairfax districts.

Universal City will be the north portal for the tunnel under the Santa Monica Mountains because of its importance as a destination point both for employment and tourism. The line adjacent to Lankershim serves the North Hollywood commercial area.

Chandler Boulevard is a wide arterial street leading directly west into the south end of the Van Nuys Central Business District. It is of sufficient width to accommodate a transit line on structure in the median without disturbing adjacent property, and will allow a station to be placed close to Valley College.

The Van Nuys Central Business District is a major shopping, business and governmental complex in the San Fernando Valley. This area should be served by several stations because of its length in a north-south direction and thus the selected transit line traverses Van Nuys Boulevard.

Sherman Way is similar to Chandler Boulevard in that it is wide enough to accommodate a transit line in its median without disturbing adjacent properties. A plan for a multi-family residential complex along Sherman Way has already been developed, and a transit line in the median with several stations would complement the plan. The Valley terminal at Balboa and Sherman Way will serve the Van Nuys Airport complex and provide a reasonable embarking point for transit patrons from the west because of its mid-valley location. In addition, Sherman Way provides an excellent location for a terminal station which, combined with other forms of surface transportation, would serve a wide area of the Valley.

INTRACORRIDOR TIME TABLE

STATION	DISTANCE BETWEEN STATIONS (MILES)	ACCUMULATED DISTANCE (MILES)	RUNNING TIME BETWEEN STATIONS (MIN:SEC)	RUNNING TIME FROM TERMINAL (MIN:SEC)
BALBOA		—		—
	2.03		2m20s	
SEPULVEDA		2.03		2m20s
	0.88		1m40s	
SHERMAN-VAN NUYS		2.91		4m00s
	0.93		1m44s	
VICTORY		3.84		5m44s
	0.99		1m46s	
BURBANK-VAN NUYS		4.83		7m30s
	1.71		2m27s	
FULTON		6.54		9m57s
	1.60		2m18s	
LAUREL CANYON		8.14		12m15s
	1.34		2m05s	
NORTH HOLLYWOOD		9.48		14m20s
	1.77		2m30s	
UNIVERSAL CITY		11.25		16m50s
	3.56		3m40s	
LA BREA		14.81		20m30s
	1.21		1m58s	
VINE		16.02		22m28s
	1.15		1m57s	
SANTA MONICA		17.17		24m25s
	0.85		1m38s	
BEVERLY		18.02		26m03s
	1.36		2m43s	
WESTERN (Junction)		19.38		28m46s

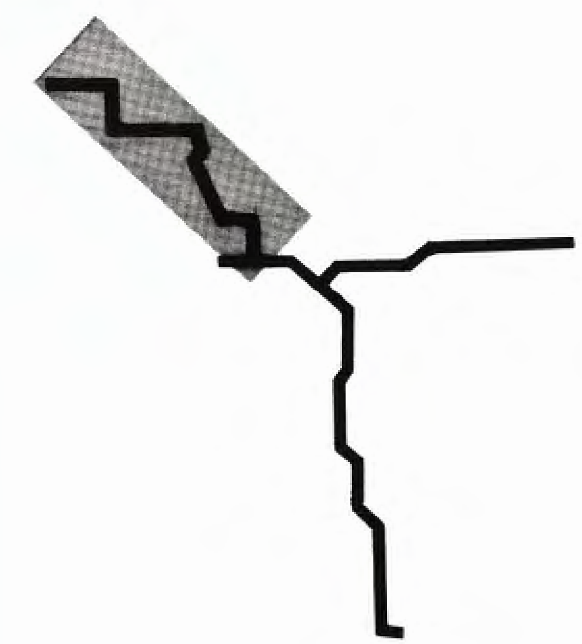
LEGEND

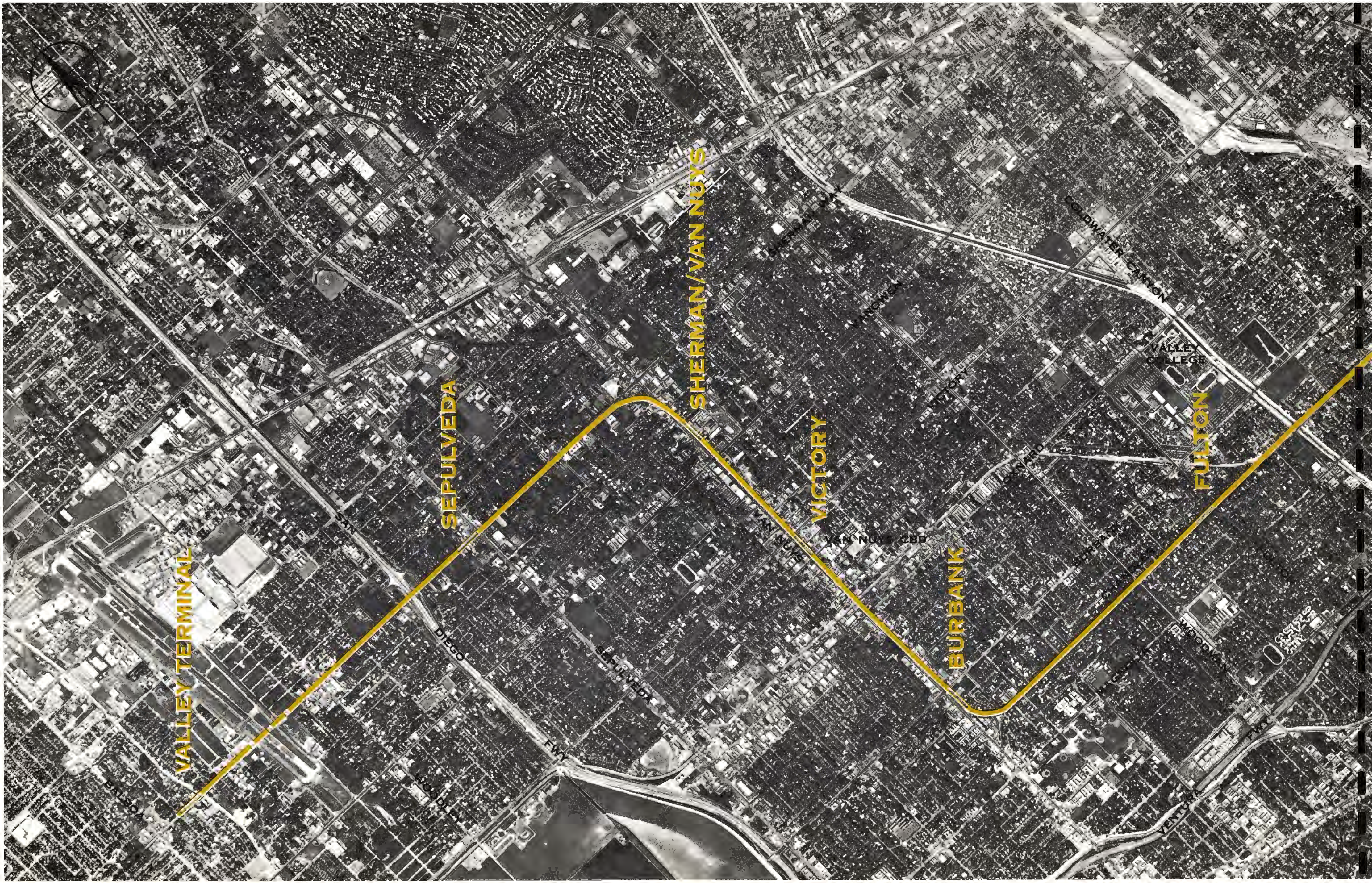
SUBWAY

OPEN CUT

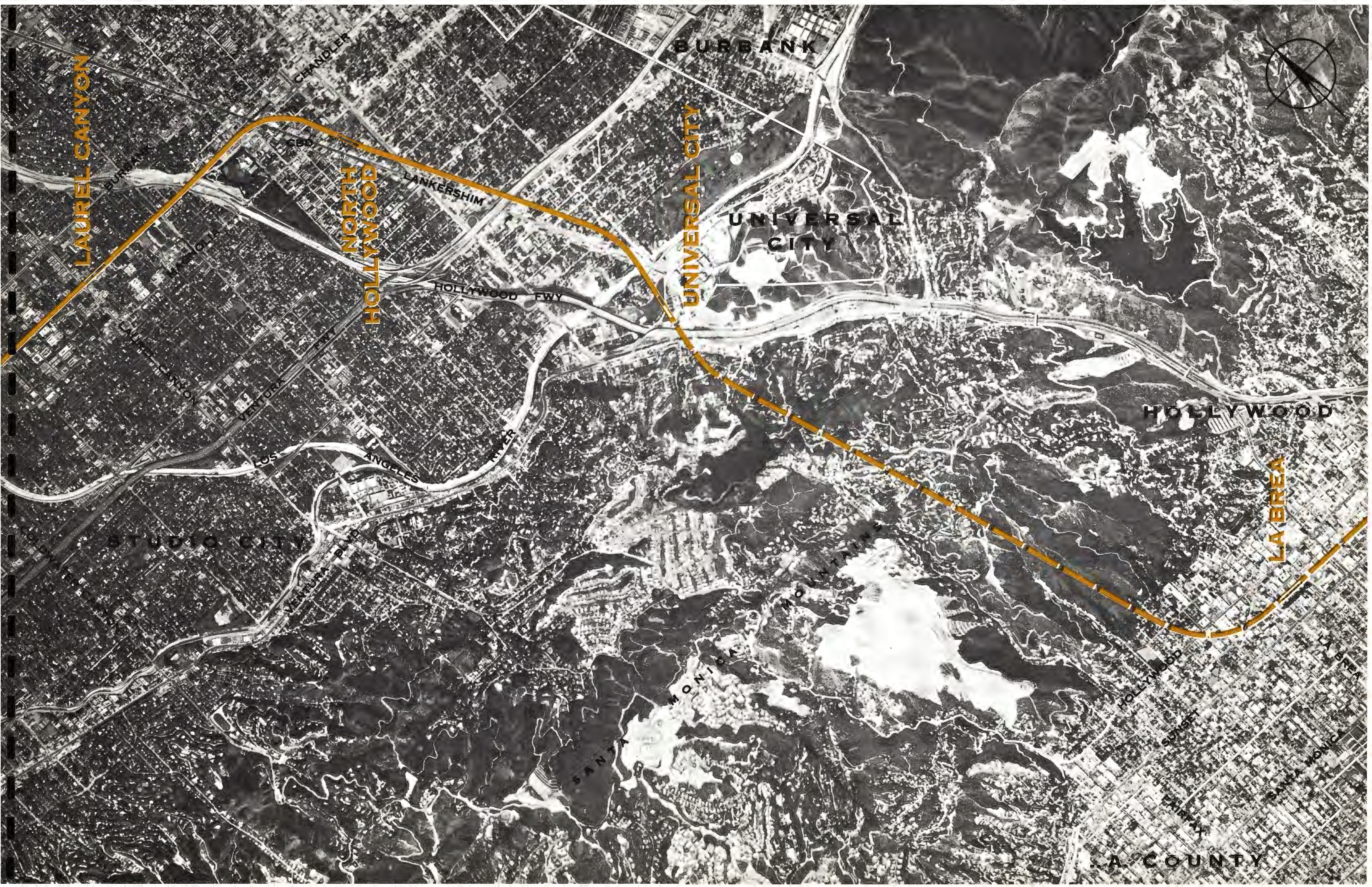
AERIAL

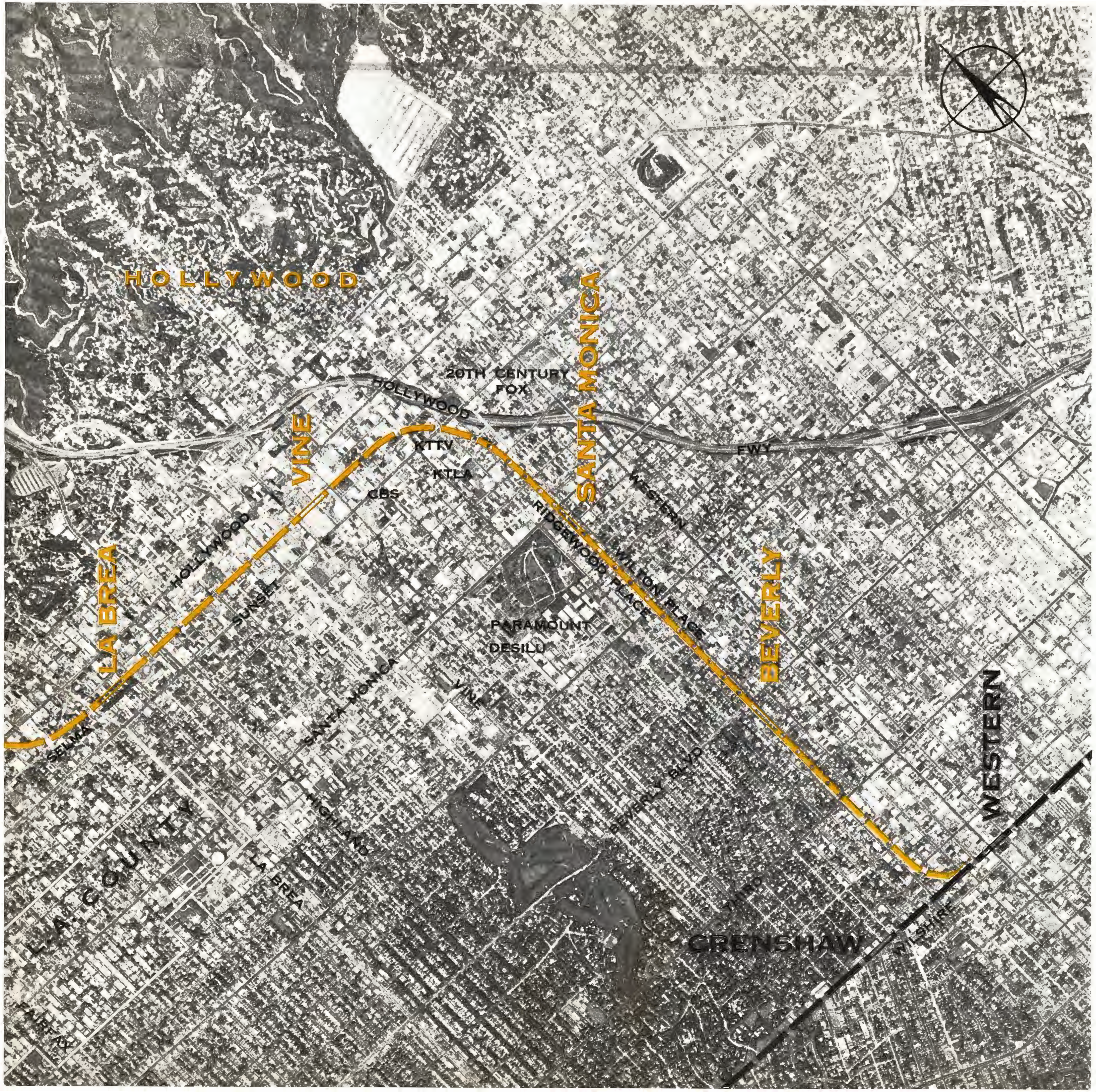
SCALE 1" = 2000'





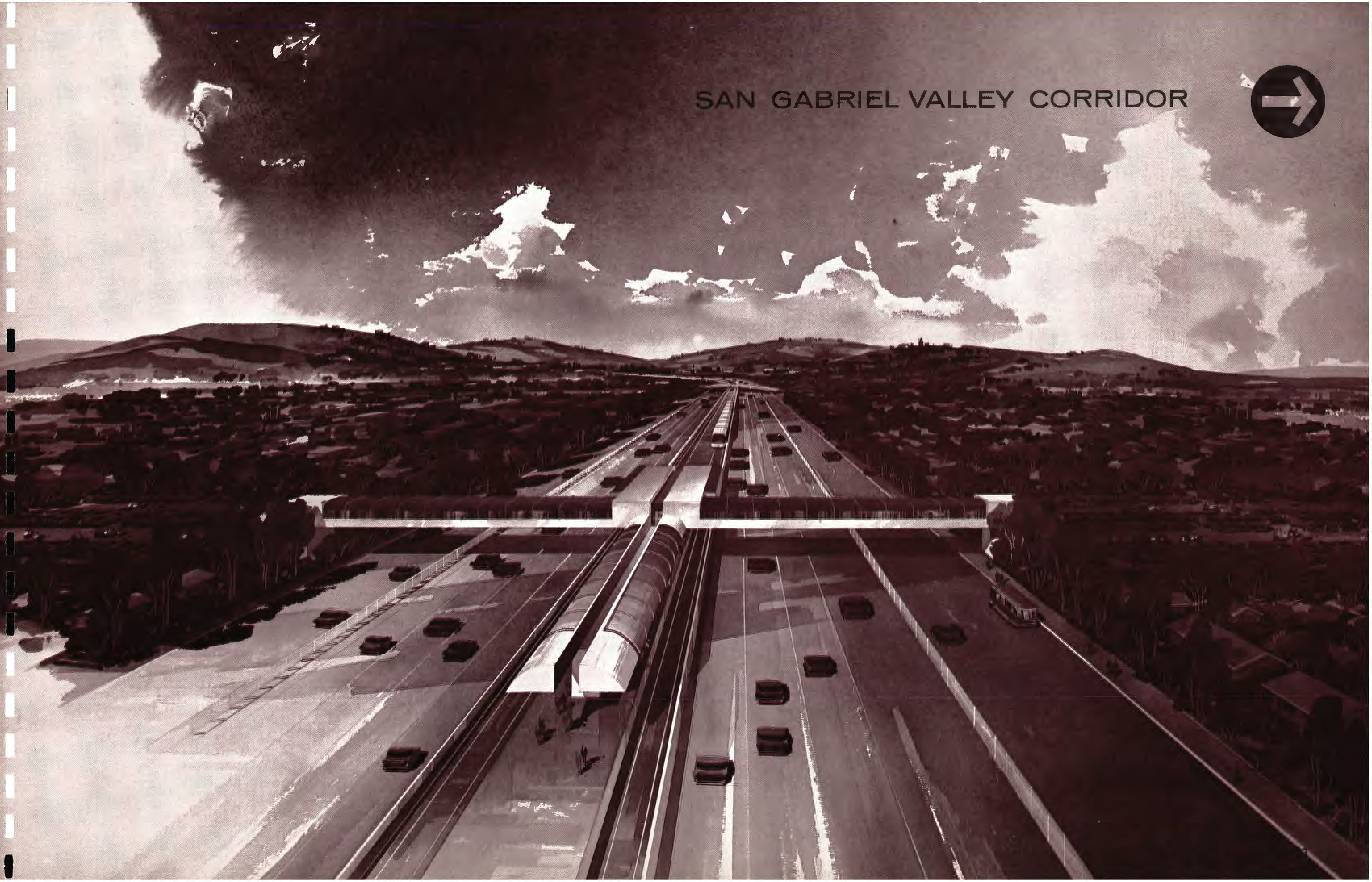
VALLEY TERMINAL
SEPULVEDA
SHERMAN/VAN NUYS
VICTORY
BURBANK
FULTON
VAN NUYS CBD
VALLEY COLLEGE
COLDWATER CANYON
DIEGO
SEPULVEDA
FWY


BURBANK
LAUREL CANYON
CHANDLER
CBD
BURBANK
LANKERSHIM
NORTH HOLLYWOOD
UNIVERSAL CITY
UNIVERSAL CITY
MAGNOLIA
HOLLYWOOD FWY
LAUREL CANYON
VENTURA FWY
LOS ANGELES RIVER
STUDIO CITY
VENTURA BLVD
SANTA MONICA MOUNTAINS
HOLLYWOOD
LA BREA
HOLLYWOOD
SUNSET
LA BREA
SANTA MONICA
FAIRFAX
L.A. COUNTY



Freeway Median Station –
San Bernardino Fwy. at Garfield Ave.

SAN GABRIEL VALLEY CORRIDOR



SAN GABRIEL VALLEY CORRIDOR

CORRIDOR DESCRIPTION

The San Gabriel Valley Corridor comprises an area one mile north and south of the San Bernardino Freeway, the San Gabriel River on the east and the Los Angeles River on the west. There are portions of six incorporated cities within the corridor: Los Angeles, Alhambra, San Gabriel, Monterey Park, Rosemead and El Monte. Unincorporated areas include portions of East Los Angeles and South San Gabriel. Important physical features in the corridor include the San Bernardino and Long Beach Freeways, the Puente Hills, the Whittier Narrows Regional Recreation Area, and the Los Angeles, Rio Hondo and San Gabriel Rivers. The Southern Pacific and Pacific Electric Railroads traverse the corridor in a general east-west direction.

The corridor is primarily single-family residential in character with multi-family districts in Alhambra, Monterey Park, East Los Angeles and El Monte. Commercial activity is centered in the community business districts in the several cities and a strip commercial development along Garvey Boulevard, Valley Boulevard and other arterials. Industrial development is located in the City of Alhambra north of Mission Road, along Monterey Pass Road in Monterey Park and in several districts in El Monte.

SAN GABRIEL VALLEY CORRIDOR

ECONOMIC STUDY AREA*	1960	1980	% Increase
Population	707,000	900,000	27
Jobs	274,000	386,000	41

WITHIN ONE MILE OF SELECTED ROUTE	1960	1980	% Increase
Population	221,000	284,000	29
Jobs	87,000	148,000	70

* Band approximately 6 to 8 miles wide from Union Station to El Monte.

The San Gabriel Valley Corridor economic study area is estimated to increase 27 percent in population by 1980, and 41 percent in jobs. To accommodate the population growth, the portions of the corridor closest to the Los Angeles Central Business District will likely continue conversion from the present single-family development to more concentrated multi-family housing. There is little vacant land available in the corridor for new residential development, therefore, population growth will result in land reuse, i.e., the replacement of existing single-family units.

That portion of the San Gabriel Valley Corridor study area east of the Long Beach Freeway contained nearly twice as many employed persons as there were total jobs in 1960. Thus, even with the projected substantial increase in employment opportunity within the study area, this corridor is not likely to achieve a balance between jobs and workers within the next 20 years, making it an export area in terms of employment and an origin area for rapid transit service.

A subway from Union Station to Mission Road is required because of the trackage configuration at Union Station and the Los Angeles River. It will be possible, however, to run at-grade from Mission Road to the Rio Hondo in the right-of-way of the Pacific Electric within the median of the San Bernardino Freeway, since the roadbed is grade separated at the present time. Aerial structures will be required where the transit line leaves the freeway in order to permit surface streets to pass under the transitway.

ROUTE DESCRIPTION

The proposed transit route for the San Gabriel Valley Corridor begins east of Alameda Street on Macy Street and generally follows Macy Street to a point east of Mission Road, follows the Pacific Electric Railroad to a point east of the Long Beach Freeway, enters the median of the San Bernardino Freeway, follows the median to Baldwin Avenue in El Monte, and follows the Pacific Electric Railroad to the terminal station just east of Peck Road. The transit facility will be in subway to a point east of Mission Road, run at-grade to Baldwin Avenue, then make a transition to aerial structure for the remaining distance to the El Monte terminal station.

Alternatives to this route included a line traveling through East Los Angeles in the vicinity of Brooklyn Avenue, and another route generally following Mission Road in the Cities of Alhambra and San Gabriel.

The selected route will utilize existing street and railroad rights-of-way for its entire length, a major portion of which is within the Pacific Electric (Southern Pacific Railroad) right-of-way in the median of the San Bernardino Freeway. This will result in minimal disruption to the community in terms of:

The maintenance of stable single-family neighborhoods,

The use of existing rights-of-way which avoids the introduction of a new barrier in the corridor and the removal of private property from the tax rolls.

The proposed transit line is the most direct route of those considered and has good horizontal and vertical alignment. Adjoining subdivision patterns are generally compatible with site design and traffic circulation around transit stations. Since a substantial portion of the line will be at-grade, there will be economies in construction, thereby reducing overall costs.

The County Hospital transit station will serve this important public institution which is a 2800-bed facility employing over 6000 persons. The Cal State station as located will adequately serve the college but will not be readily accessible to the general public due to terrain and circulation restraints. Further study of this station will be made for possible relocation or consolidation with the Fremont station.

Traveling eastward, the four stations from Fremont Avenue to Rosemead Boulevard will be an average of one and one-half miles apart and will be easily accessible from the north-south arterial street system. The location of the Garfield and Rosemead stations will conform to local community general plans. The Tyler station and the El Monte terminal will be located to permit convenient access from the north, south and east via arterial streets and freeways. The Tyler station will directly serve the El Monte Valley Mall commercial complex.

INTRACORRIDOR TIME TABLE

STATION	DISTANCE BETWEEN STATIONS (MILES)	ACCUMULATED DISTANCE (MILES)	RUNNING TIME BETWEEN STATIONS (MIN:SEC)	RUNNING TIME FROM TERMINAL (MIN:SEC)
EL MONTE		—		—
	1.07		1m30s	
TYLER		1.07		1m30s
	1.36		2m05s	
ROSEMEAD		2.43		3m35s
	1.94		2m35s	
SAN GABRIEL		4.37		6m10s
	1.44		2m08s	
GARFIELD		5.81		8m18s
	1.82		2m31s	
FREMONT		7.63		10m49s
	1.27		2m03s	
CAL STATE		8.90		12m52s
	2.29		3m01s	
COUNTY HOSPITAL		11.19		15m53s
	1.60		2m24s	
UNION STATION		12.79		18m17s

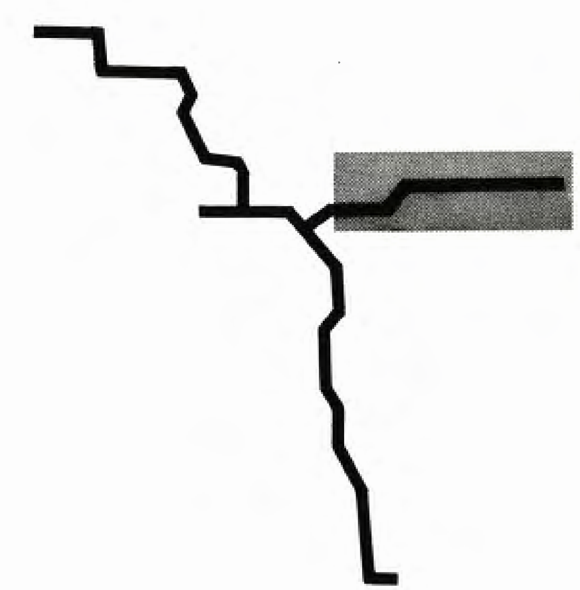
LEGEND

SUBWAY

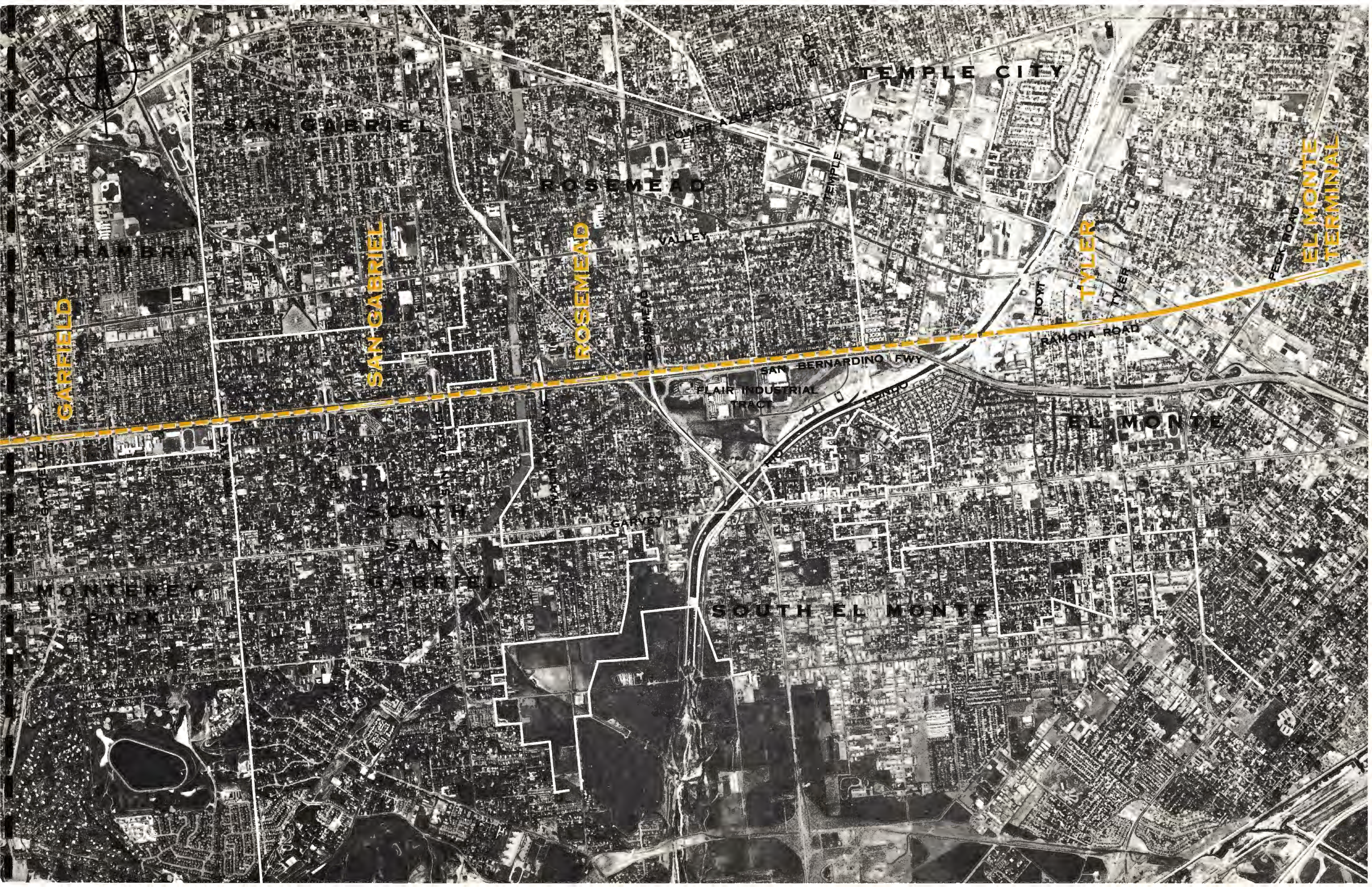
ON-GRADE

AERIAL

SCALE 1" = 2000'



ALHAMBRA
GOLDEN STATE FWY
LOS ANGELES
COUNTY HOSPITAL
CAL STATE COLLEGE
CAL STATE COLLEGE
FREMONT
FREMONT
VALLEY
SAN BERNARDINO FWY
MONTEREY PARK
ATLANTIC
UNION STATION
LOS ANGELES RIVER
MISSION
COUNTY HOSPITAL
INDIANA
EASTERN
LONG BEACH FWY
SOTO
BROOKLYN
EAST LOS ANGELES


TEMPLE CITY
SAN GABRIEL
LOWER AZUSA ROAD
ROSEMEAD
VALLEY
ALHAMBRA
GARFIELD
SAN GABRIEL
ROSEMEAD
ROSEMEAD
TEMPLE
TYLER
HOYT
TYLER
PECK ROAD
EL MONTE TERMINAL
RAMONA ROAD
SAN BERNARDINO FWY
FLAIR INDUSTRIAL TRACT
EL MONTE
GARVEY
SOUTH SAN GABRIEL
MONTEREY PARK
SOUTH EL MONTE

Platform and Entry of
Typical Aerial Station

LONG BEACH CORRIDOR

CORRIDOR DESCRIPTION

The Long Beach Corridor comprises an area east and west of Long Beach Boulevard from the Los Angeles downtown area to the ocean. Parts of eight incorporated cities are in Long Beach Corridor: Vernon, Huntington Park, South Gate, Lynwood, Compton, Long Beach, Signal Hill and Los Angeles.

The Santa Monica, Harbor, Long Beach, San Diego and Terminal Island Freeways pass through portions of the corridor. Also represented are main lines and branches of the Santa Fe, Union Pacific, Southern Pacific and Pacific Railroads and extensive harbor facilities in the vicinity of Long Beach. The most prominent natural features in the corridor are the Dominguez Hill, Signal Hill and the Los Angeles River.

The corridor is characterized by a mixture of residential, commercial and industrial uses. The northern portion of the corridor, comprising south-central Los Angeles, Vernon, Huntington Park and Compton, has a relatively high residential density composed of mixed single-family detached and multi-family dwellings. The most southerly portion of the corridor within the City of Long Beach also contains high density residential development. Single-family residential areas are found in South Gate, Lynwood and North Long Beach. Although the largest single concentration of commercial development in the corridor is in the Long Beach Central Business District, there are commercial districts located in Huntington Park and Compton. Considerable commercial use in the corridor is strung along arterial streets.

LONG BEACH CORRIDOR

	ECONOMIC STUDY AREA*		
	1960	1980	% Increase
Population	934,000	1,206,000	29
Jobs	442,000	554,000	25

	WITHIN ONE MILE OF SELECTED ROUTE		
	1960	1980	% Increase
Population	314,000	388,000	24
Jobs	214,000	241,000	13

* Band approximately 6 to 8 miles wide from Seventh & Main to the City of Long Beach.

Industrial areas are intermingled throughout the corridor with major concentrations occurring in the Vernon and Harbor areas. The remaining industrial development is situated in a narrow band adjacent to the Southern Pacific Railroad in Alameda Street or scattered through the corridor. Significant future industrial growth can be expected in the Dominguez Hill Area, where large acreages are undeveloped or under oil leases.

A 29 percent increase in population by 1980 and a 25 percent increase in jobs projected for the economic study area indicates that it will realize growth as both an origin and destination corridor. The increase in employment will be due primarily to the availability of vacant industrial land in the area just west of Long Beach Freeway and the development of the Dominguez Hill area. Population growth will entail conversion of aging low density residential districts to higher intensity multi-family use. The areas in this corridor expected to show the greatest development impact are those closest to the Los Angeles Central Business District and the Long Beach Central Business District due to high-rise office development. It is also possible that massive public redevelopment will take place in the northerly portion of the corridor west of Alameda Street.

ROUTE DESCRIPTION

The proposed rapid transit route in the Long Beach Corridor starts in the vicinity of Seventh and Main Streets, follows Seventh Street to Alameda Street, travels generally southeasterly in private right-of-way to 26th Street and the Santa Fe Railroad, follows the Santa Fe to Pacific Boulevard, is in Pacific Boulevard to Florence Avenue, goes southwesterly in private right-of-way to Firestone Avenue where it joins the proposed Industrial Freeway, is in the median of the future Industrial Freeway to Greenleaf Boulevard in Compton, follows the Pacific Electric Railroad to east of the Los Angeles River, is on the berm of the Los Angeles River to Ocean Boulevard in Long Beach and traverses Ocean Boulevard to the terminal east of Pine Avenue.

A subway will be required to a point just south of Washington Boulevard because of inadequate street widths, physical constraints and high acquisition costs for private rights-of-way. Traveling south through Huntington Park, aerial structures will be required so as not to block cross streets. Joint construction of the transitway with the Industrial Freeway will allow for an at-grade configuration with resulting cost savings. Aerial structure will again be required in the segment between the Industrial Freeway and the Los Angeles River because of the need for grade separations. An at-grade configuration is proposed on the east berm of the Los Angeles River with a transition into subway at Seventh Street to the terminal station in the Long Beach Central Business District. The subway is proposed because of future highway construction and high value property in the Long Beach Central Business District.

Alternate routes considered included more extensive use of the future Industrial Freeway into the CBD area, a route parallel to Long Beach Boulevard from Huntington Park to a terminal in Long Beach and several alternate crossovers giving various combinations of each route.

The proposed route utilizing the Santa Fe right-of-way in the City of Vernon was selected because the north-south streets are too narrow and congested to accommodate aerial structures, and the acquisition of private right-of-way would be costly due to the large industrial plants in the area. An alignment west of Alameda would bypass Huntington Park. The median in Pacific Boulevard, the main shopping street in the Huntington Park Business District, is already owned by the SCRTD. The transit line in Pacific Boulevard will serve both the active business district and the adjacent high density residential areas in Huntington Park.

The joint use of rights-of-way with the proposed Industrial Freeway will serve high density areas which have a positive requirement for improved public transportation. This alignment is compatible with plans of the City of Los Angeles and the City of Compton. The Pacific Electric right-of-way from Artesia Avenue to the Los Angeles River provides a direct connection between the proposed Industrial Freeway and the Los Angeles River and would cause minimal disruption of land use patterns in the area, particularly industrial developments. The east bank of the Los Angeles River is also least disruptive to land use patterns while providing a direct route to the Long Beach Central Business District.

LONG BEACH ROUTE

The Central and Vernon transit stations will serve the central manufacturing district, a major industrial center in the Los Angeles metropolitan area. Traveling south along the line, the Huntington Park Business District will be served by a station at Gage Avenue and Pacific Boulevard. Stations at Alameda, 103rd Street and Imperial Highway will serve the south-central area which has a recognized need for mass public transit and also will provide excellent feeder bus connections from areas to the east and west. The 103rd Street station will be in the center of the Watts district which is currently undergoing urban renewal. The Compton Business District will be served directly by a station at Compton Boulevard in conformity to the adopted General Plan for the City.

The residential districts in Long Beach will be served by stations located at Wardlow Road and the Pacific Coast Highway. The terminal station at Ocean Boulevard and Pine Avenue can be integrated into the proposed transportation terminal serving the Long Beach Central Business District, convention and government centers and shoreline development.

INTRACORRIDOR TIME TABLE

STATION	DISTANCE BETWEEN STATIONS (MILES)	ACCUMULATED DISTANCE (MILES)	RUNNING TIME BETWEEN STATIONS (MIN:SEC)	RUNNING TIME FROM TERMINAL (MIN:SEC)
LONG BEACH		—		—
	2.05		2m22s	
PACIFIC COAST		2.05		2m22s
	1.93		2m34s	
WARDLOW		3.98		4m56s
	5.36		5m41s	
COMPTON		9.34		10m37s
	2.24		2m51s	
IMPERIAL		11.58		13m28s
	1.23		2m00s	
103RD STREET		12.81		15m28s
	1.74		2m24s	
ALAMEDA		14.55		17m52s
	0.94		1m41s	
GAGE		15.49		19m33s
	1.66		2m19s	
VERNON		17.15		21m52s
	2.39		3m00s	
7TH & CENTRAL		19.54		24m52s
	0.78		1m33s	
7TH & MAIN		20.32		26m25s
	0.56		1m19s	
7TH & HOPE		20.88		27m44s

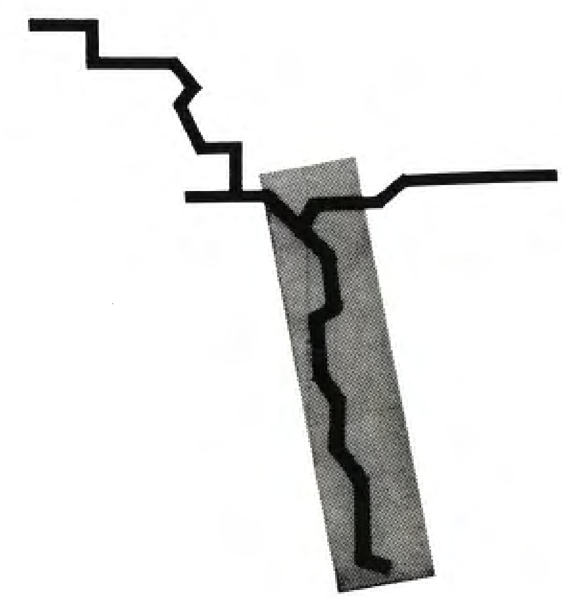
LEGEND

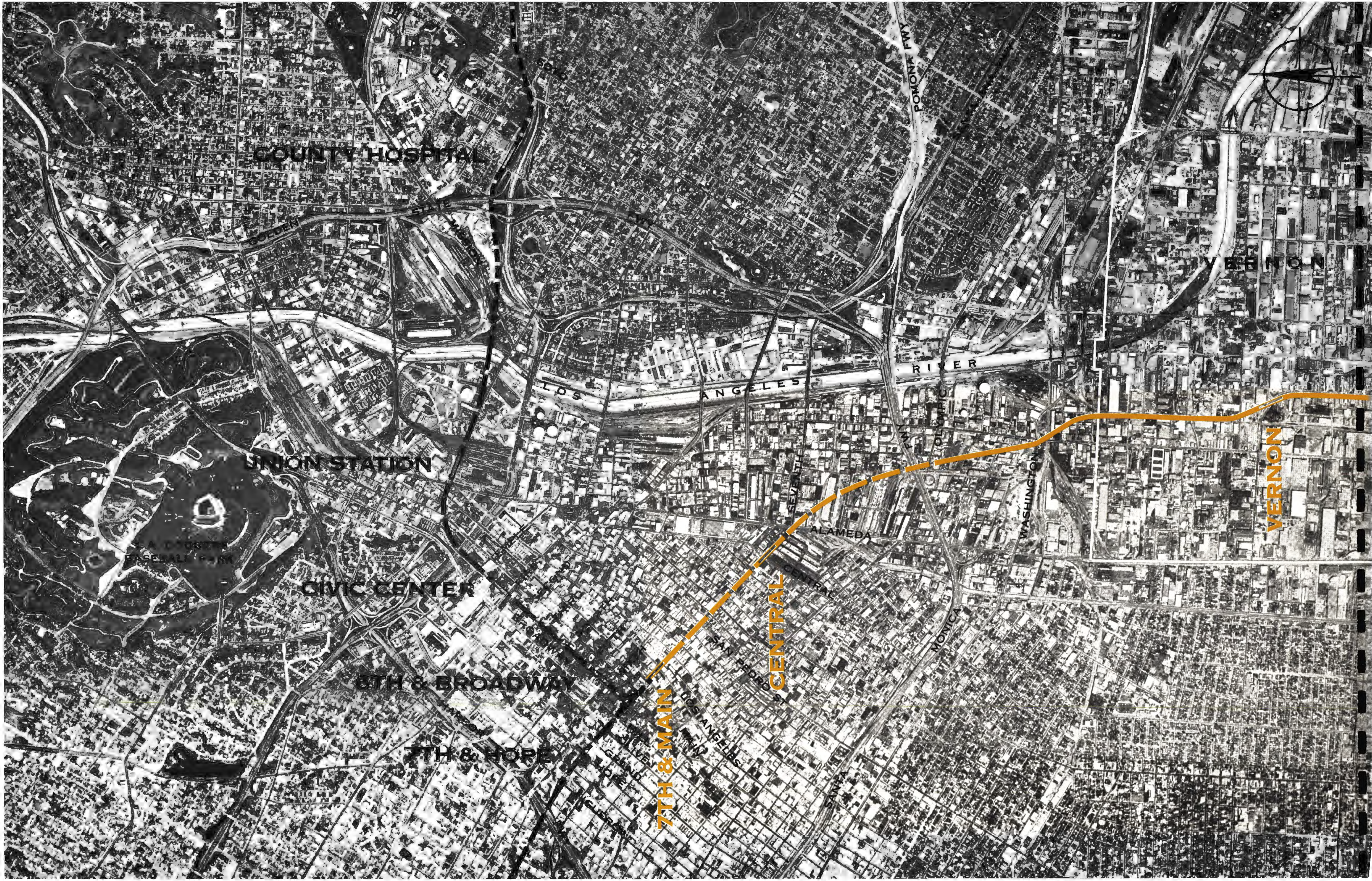
SUBWAY

AERIAL

ON-GRADE

SCALE 1" = 2000'





COUNTY HOSPITAL
POMONA FWY
VERNON
LOS ANGELES RIVER
UNION STATION
L.A. DODGER BASEBALL PARK
CIVIC CENTER
6TH & BROADWAY
7TH & HOPE
7TH & MAIN
CENTRAL
VERNON
ALAMEDA
CENTRAL
SEVENTH
WASHINGTON
OLYMPIC
SAN PEDRO ST
LOS ANGELES
MAIN
MONICA
HOPE
GRAND

VERNON
HUNTINGTON PARK
SOUTH GATE
LYNWOOD
GAGE
PACIFIC
ALAMEDA
LONG BEACH BLVD
SLAUSON
FLORENCE
NADEAU
FIRESTONE
103RD ST.
CENTURY
IMPERIAL HWY
WILLOWBROOK
L. A. COUNTY
WATTS
L. A. COUNTY


LOS ANGELES RIVER
COMPTON
LONG BEACH BLVD
COMPTON
SPRR
ALAMEDA
IMPERIAL HWY.
WILLOWBROOK
EL SEGUNDO
ROSECRANS
COMPTON
ALONDRA
COMPTON CREEK
GREENLEAF
ARTESIA
DEL AMO
L. A. COUNTY
DOMINGUEZ HILL
L. A. COUNTY

SIGNAL HILL
ATLANTIC
NORTH LONG BEACH
SAN DIEGO FWY
WARDLOW
PACIFIC COAST HWY.
LONG BEACH BLVD
SEVENTH ST
ELM
BROADWAY
LONG BEACH TERMINAL
RAINBOW PIER
PINE
LONG BEACH
LOS ANGELES RIVER
LONG BEACH FWY
UPRR
SANTA FE
WARDLOW RD
WILLOW
PACIFIC COAST HWY
ANAHEIM
OCEAN
SPRR
ALAMEDA
L.A. COUNTY
LOS ANGELES
AT&SF


Gage Ave

TRANSIT FACILITIES

Loading Platform of Typical Aerial Station

TRANSIT FACILITIES

The aspect of a rapid transit system which has the most immediate and dramatic effect upon the public is the design of the stations and way structures. Other forms of impact, such as economic growth, access to new areas of housing and employment and the redevelopment of neighborhoods along the rights-of-way, are more subtle and are part of the long range influence which already has been discussed. But, the actual construction of aerial way structures and stations will receive the prompt attention of a populace which is sensitive to good design, skillful planning, and proficient landscaping. In this regard, the transit system has an obligation to the community to present the finest design attainable within the parameters of service, safety and economy.

STATIONS

Stations will be designed to accommodate large concentrations of passengers with safety, comfort and speed. While alike functionally, they will vary architecturally depending on way configuration, capacity requirements, access and individual site conditions. All will have a platform level, a concourse level, an area of interface with other modes of transportation and non-public areas devoted to system operations. The platform will permit the lateral movement of passengers boarding and alighting from the transit vehicles; the concourse will contain the automatic fare collection equipment and the station employee facilities. All vertical circulation will be accomplished with escalators operating in both directions in addition to stairways.

Basically, stations will be either the center or side-loaded platform type although very heavily used stations may be a combination of both. Center platforms have the advantage of requiring a minimum of duplication of facilities. Both center and side platforms may be constructed using single or multi-level arrangements. In the single-level stations, ticketing, fare collection and loading operations will take place at the same level. In two-level stations, a mezzanine will be provided for ticketing and fare collection facilities while a separate level will be provided for train loading and unloading.

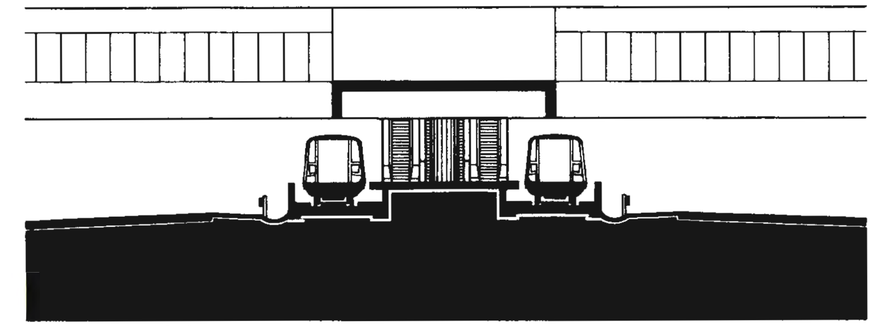
The arrangements of entrances and exits with respect to station platforms can have a considerable effect on the time required to load and unload trains. For a given train length and number of passengers to be loaded, loading time will depend upon the distribution of passengers along the platform, the ratio of total door length to car length and the relative volume of movements into and out of the train. Loading time is a function of the maximum number of passengers using any one train door, and this number is minimized when the number of passengers using each door is equal. Platform widths depend on the maximum number of passengers expected to be on the platform at any one time. Acceptable loading densities or passenger concentration in terms of passengers per square foot of platform have to be assessed to determine their required platform width. Factors influencing this density include the nature of various movements that will take place on the platform and the average distances passengers will walk from their points of entry to the location at which they will board the train. Concentrations lower than 0.5 passengers per square foot are necessary if passengers entering and exiting are to pass one another freely. When adequate widths are not provided, alighting passengers are prevented from leaving the train rapidly, with the result that station dwell times will be increased and line capacity reduced. Stations will be designed for convenient, direct circulation and comfortable, short waiting periods. All of the equipment and spaces will have enough capacity to permit the passengers to pass through the station without exceeding 30-second accumulated delay, even during peak operation.

TYPES OF STATIONS

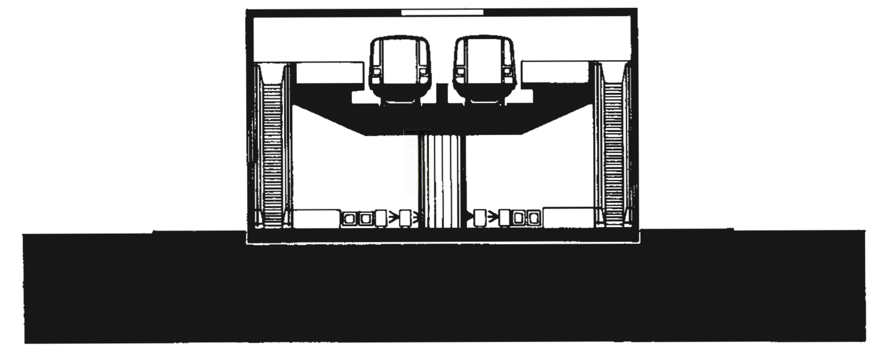
Four basic station configurations have been developed:

At-Grade Stations—In general this type of station has been developed for the San Gabriel Valley and Long Beach Corridors to integrate with existing grade separated rights-of-way.

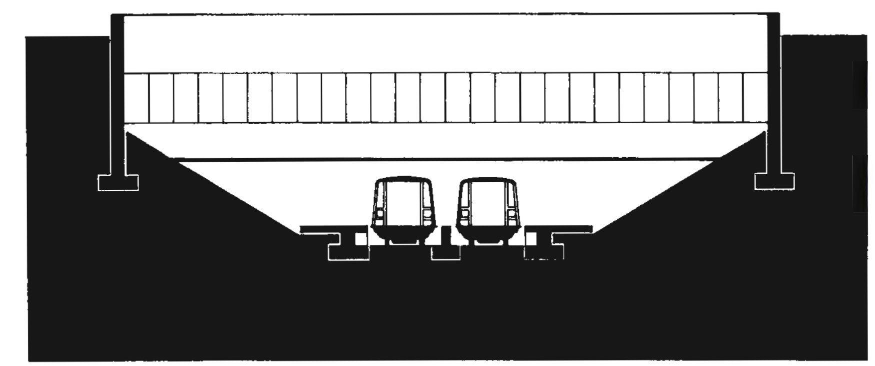
Aerial Stations—This configuration provides a means of overhead grade separation on private rights-of-way and medians of public streets. Predominant use of this configuration will occur in the San Fernando Valley, Long Beach and San Gabriel Valley Corridors.



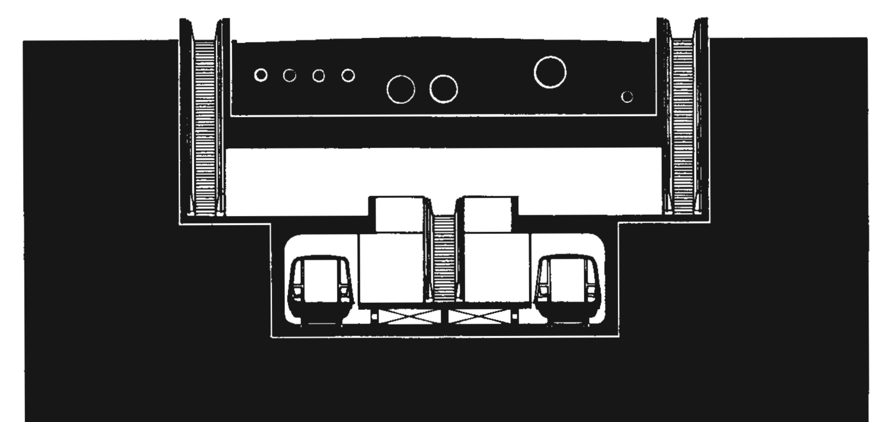
ON-GRADE



AERIAL



OPEN CUT



SUBWAY

Open Cut Stations—Limited use of this type of station is shown on the present alignment. Two stations of this type will be located in the San Fernando Valley Corridor.

Subway Stations—This type of station, with the complete facility including ticketing and access to trains, will be characteristic of the Wilshire Corridor and also those subway segments located in the San Fernando Valley and Long Beach Corridors.

STATION PLATFORMS

All platforms will be 600 feet long and will be designed for a capacity to accommodate peak boarding and alighting. In any platform, side or center, there will be a minimum of 11 feet from the edge to any continuous obstruction. This 11-foot minimum will allow unobstructed passage to and from the train and facilitate circulation to a waiting area along the platform or to the escalators.

The platform, vertical circulation and ticketing areas of a station will add substantially to the right-of-way widths. For subway stations, this extra width greatly increases the excavation, structure and underpinning costs.

Platform and station widths can be controlled by placing the vertical circulation elements one behind the other down the center of the platform instead of side by side, or placing the vertical circulation outside the length of the platform used for boarding and alighting.

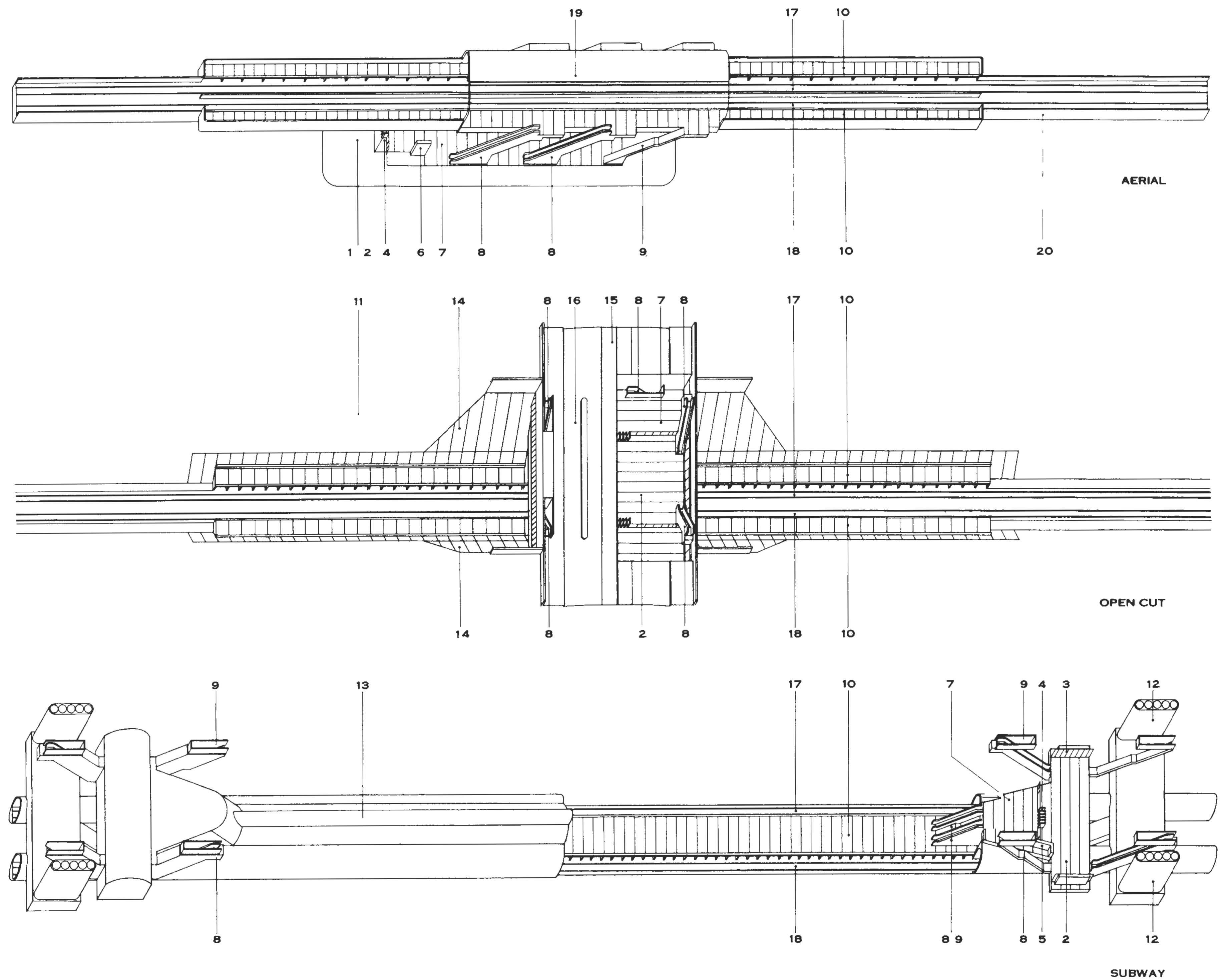
Side-loaded platforms are preferred for aerial and at-grade stations because:

The train trackage can be continued in a straight line through the station,

A station can be lengthened or a new one added at any point along the aerial way structure,

The length of the widened structure resulting from the transition of tracks around a center platform can be minimized,

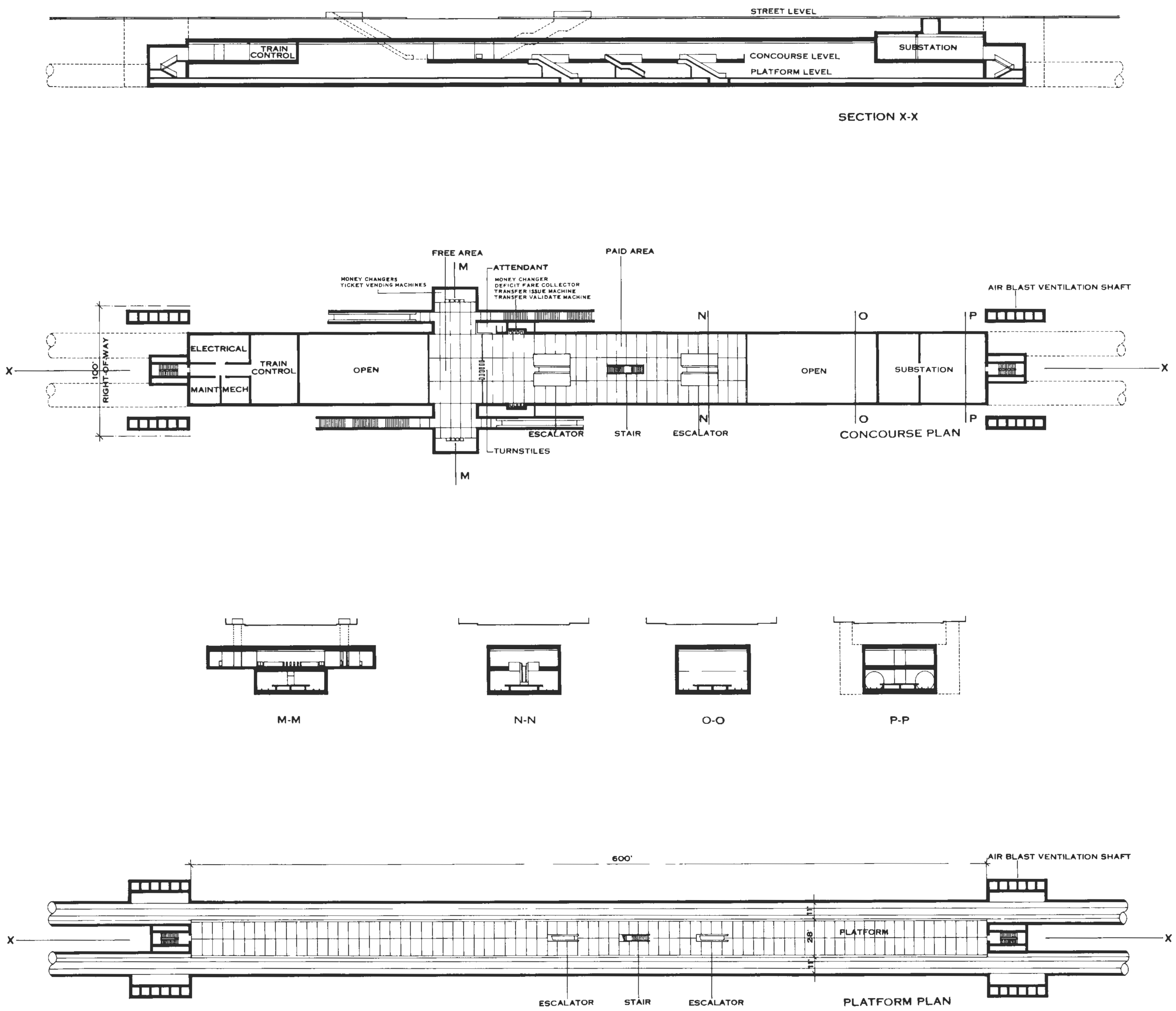
They are structurally more feasible in a street median where a single column support is necessary.



LEGEND

1. ENTRY
2. CONCOURSE FREE AREA
3. FARE EQUIPMENT
4. TICKETING TURNSTILES
5. ATTENDANTS OFFICE
6. TRANSFER EQUIPMENT
7. CONCOURSE PAID AREA
8. ESCALATOR
9. STAIR
10. PLATFORM
11. LANDSCAPED EMBANKMENT
12. AIR BLAST & EXHAUST VENTS
13. AIR SUPPLY
14. EMBANKMENT
15. ARTERIAL STREET
16. BUS LOADING
17. INBOUND TRACK
18. OUTBOUND TRACK
19. COVERED PLATFORM
20. WAY STRUCTURE

ISOMETRICS OF TYPICAL STATION CONCEPTS



TYPICAL SUBWAY STATION PLANS AND SECTIONS

Center-loaded platforms are preferable for subway stations because they:

Allow passengers to transfer across the platform without use of escalators,

Use the platform area necessary to accommodate the reverse in AM and PM peak passenger boarding and alighting patterns more efficiently,

Require less total number of escalators,

Facilitate addition of future stations or added platform length in conjunction with the already separated subway tunnels.

VERTICAL CIRCULATION

All vertical circulation in all stations will be accomplished by use of escalators supplemented by stairways. In larger stations with multiple escalators, the directions will be relative to AM and PM operation to accommodate the flow of passengers with a minimum number of installations.

All escalators will be at least four feet wide with a capacity of 135 people per minute. Their number in each area of the station will be based upon design volume for the 20-minute peak periods during the day and will take into account the varying surge aspects of the commuting public. In the majority of instances they will be placed together in the middle of the platform length in order to:

Minimize the number of fare collection areas,

Allow for efficient and convenient service for two- and four-car trains,

Allow a portion of the station to be shut down during off-peak service, facilitating cleaning, maintenance, surveillance and public safety,

Minimize unnecessary public area and passageways at the concourse level,

Allow for a continuous protective canopy for a portion of above grade station platforms,

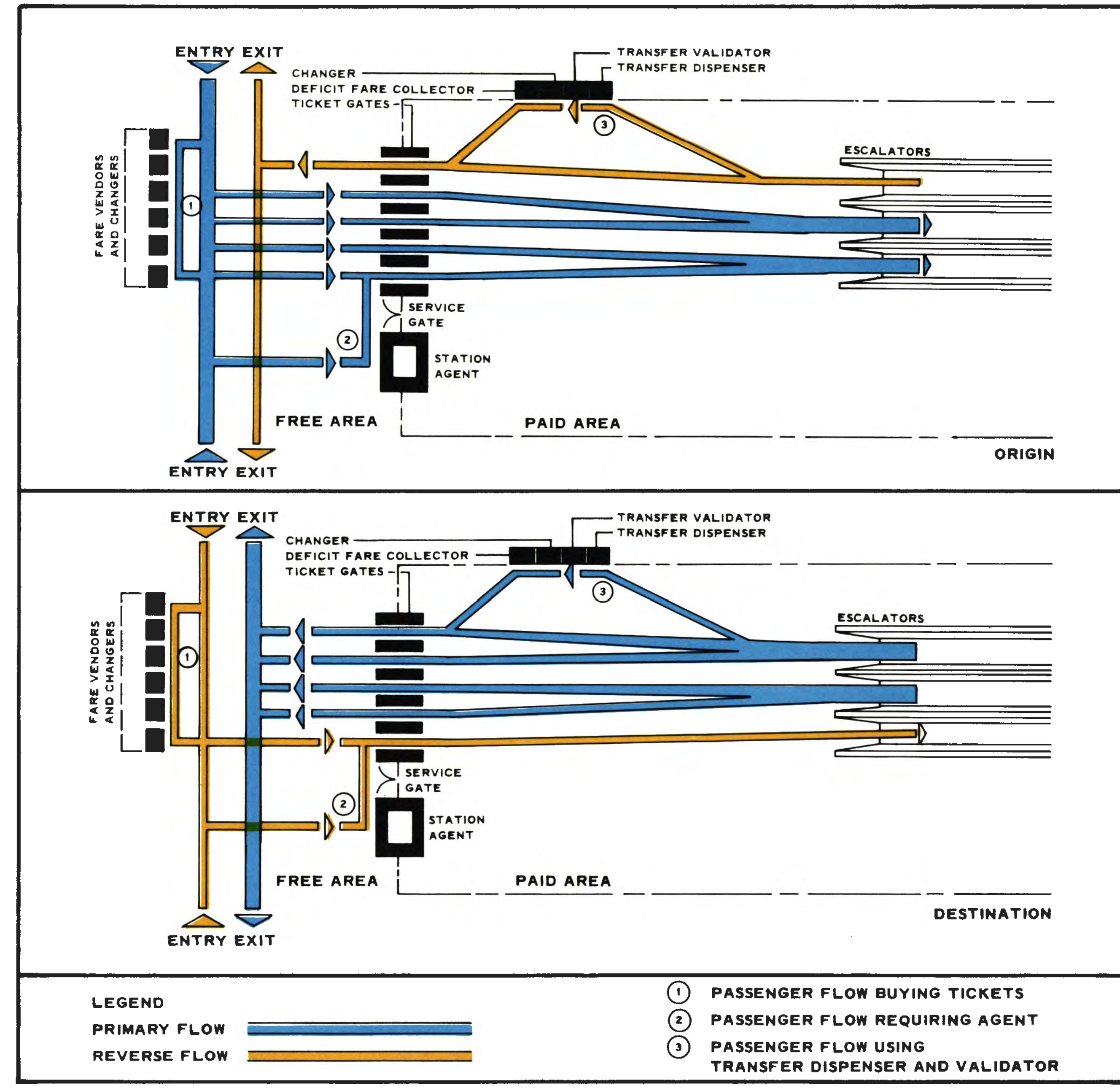
Result in the shortest average walking distance for passengers, either boarding or alighting.

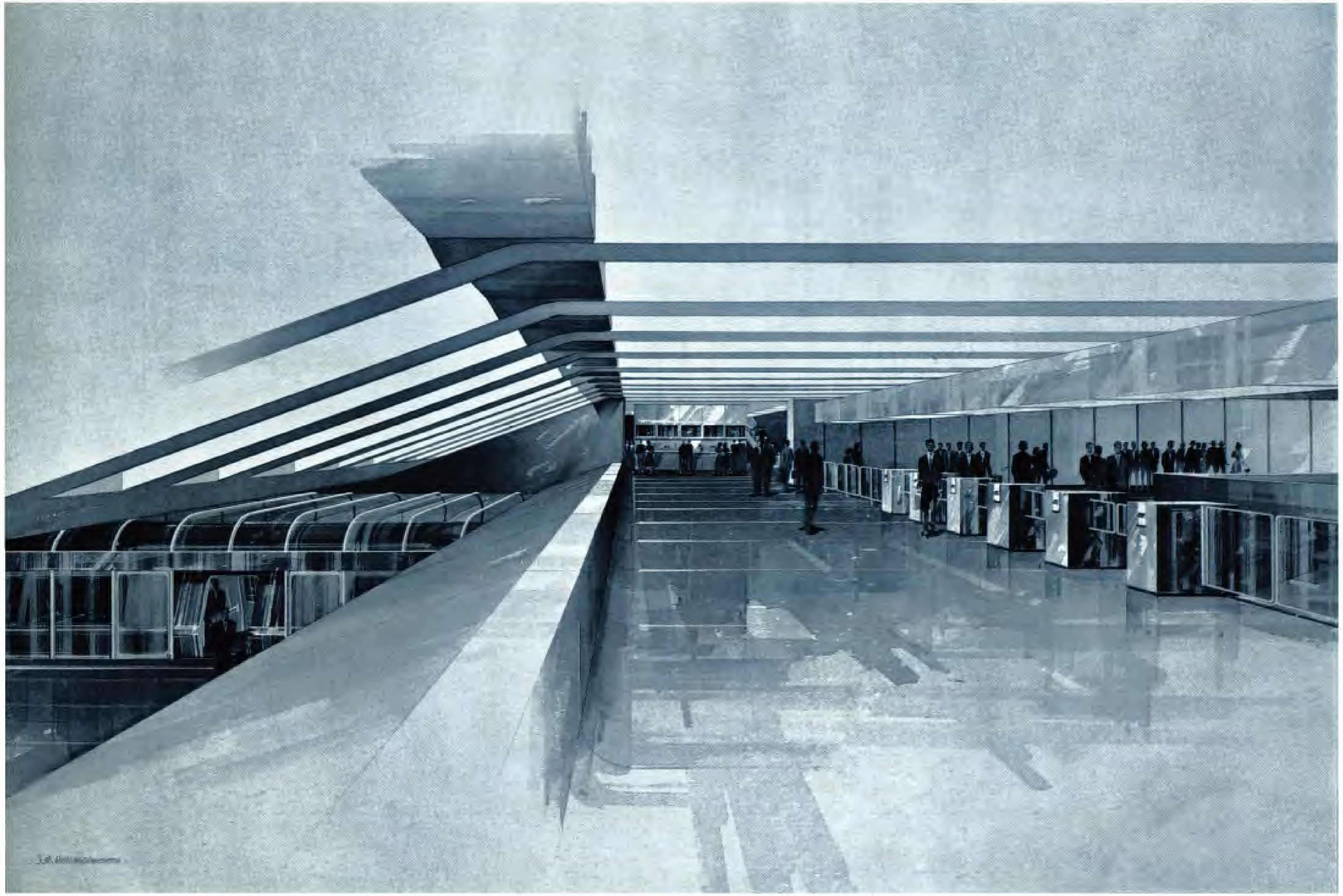
FARE COLLECTION

At the concourse level the passenger will be directed towards the turnstiles. It is expected that the daily patron will have purchased a weekly or monthly pre-paid ticket to simplify his commute routine. The occasional traveler will make his ticket purchase out of the mainstream of traffic. The ticket vending equipment, a computerized device, will display the fare schedule for his particular destination at the press of a button. After purchasing his plastic ticket, which displays the amount of fare paid and date of purchase, the passenger can approach one of a number of turnstiles and insert the ticket in a slot receptacle. In less than one second, the equipment will have scanned the data for minimum fare and date, imprinted the code of the station, and returned the ticket to the passenger who will then be given access through the turnstile to the escalators and the platform level.

Upon exiting, the passenger will insert his ticket in a slot of a similar turnstile and, providing there is an adequate balance, will pass through. The speed with which the data is read, the fare computed and deducted from the balance, and the gate released will permit up to thirty persons per minute through each turnstile. The quantity of turnstiles at each station will be sufficient to avoid back-up and waiting. The entire fare collection process will be designed to relieve the patron of all unnecessary concern and motion and expedite his movement throughout the station facilities.

An electronic vending and collection system, as opposed to a mechanical system, lends itself to the accumulation of revenue and traffic statistics through high speed data processing equipment which permits the early recognition of changes in movement patterns. The transit patron is thus assured of an up-to-date scheduling of system-wide operations.





LIGHTING

Lighting involves, aside from footcandle minimums, aspects of architectural space definition, psychology and passenger direction.

Fixture type and its relationship to structure will be a major design element. Lighting will be designed to fully illuminate all station interiors. In addition to platform and concourse illumination, the ceilings and walls should be lighted either by reflection or by selection of proper fixture type and surface materials. The brightness ratio of light source to adjacent surfaces will be a maximum of 20 to 1.

ACOUSTICS

The stations will be designed for both physical and psychological comfort, with careful consideration given to sound emitting from the following sources: trains, local environment, equipment, speech and heel contact at the floor surface. Acoustical treatment will be provided by insulating approximately one-third of the total area of walls and ceiling with a cleanable, sound-absorbent material.

Ticketing Concourse of Typical Subway Station

STATION SITING

Passengers will arrive and depart from the station in four basic ways. In order of priority, related to convenience and directness of routing, they are:

- Pedestrian,
- Bus,
- Kiss-and-ride (patrons dropped off or picked up by automobile),
- Park-and-ride (patrons parking at the station site and picking up their cars on return).

These modes of arrival and departure will be separated as necessary to assure proper functioning and safety.

Because the design of exterior station facilities must be carefully handled with reference to specific local requirements for traffic and land use, and in order to better integrate them into the community, certain criteria have been established.

- Walkway systems will be laid out so that passengers walking from their cars to the station areas will not be directly exposed to vehicular movement.
- Parking areas will be broken into functionally sized segments by suitable planting or other means.
- Parking areas will be screened from surrounding areas.
- Existing trees will be retained wherever possible.
- Provision will be made in layout of the station areas for future vertical development in order that consideration can be given to locating commercial development within the station areas.
- Access within major buildings will be provided where feasible.

WAY STRUCTURES

Whereas the stations will be subject to a close personal scrutiny by transit patrons, the way structure will be viewed from a totally different aspect. In the case of the aerial portions, very little of the supporting structure will be visible to the passenger whereas the people who live or work nearby or who travel alongside the system will be conscious of the dynamic form. The subtleties of shape, mass, proportion and light are as important to the design of the way structure as to the station complex because for every foot of aerial station length there are 12 feet of way structure.

All structures are subject to safe design practices, and a system which is intended for use by the general public has a particular obligation. Safe and dependable operation is contingent upon having anticipated all possible structural load combinations with an appropriate safety factor.

MOVING AND IMPACT LOADS

Aerial structures present the only unique design consideration when dealing with these types of loads, since other forms of way structures are equivalent to on-grade construction. Some of the factors which influence load determination include the length of the train, varying from 150 feet to 600 feet during a typical day's operation; the weight of the train, ranging from 900 pounds per foot empty to 1,400 pounds per foot with a maximum passenger load; and the speed of the train, varying from zero to a maximum of 75 miles per hour. The suspension system for the vehicles will respond to track irregularities, unbalanced passenger distribution, wind gusts, girder deflection and other causes which produce vertical and lateral components of acceleration referred to as impact and lateral loads. Results of recent impact measurements on prototype test tracks indicate that a factor of 25 percent, independent of span, is adequate for design.

SEISMIC LOADS

Although none of the proposed alignments cross active faults or fault zones, it is extremely important to provide for the effects of earthquakes in the Los Angeles area, which is designated Zone 3, the most critical of the zones of probability established by the Uniform Building Code. In order to assure the most qualified assessment, the seismic design criteria to be used have been reviewed by the Structural Engineers Association of Southern California.

WIND LOADS

The Uniform Building Code criteria for wind pressure forces specifies design loads ranging from 15 to 25 pounds per square foot for heights of structure up to 100 feet. A review of records reveals a maximum gust of 62 miles per hour at Los Angeles International Airport. Other stations indicate velocities considerably below this figure. Based on these records and future predicted winds, wind loads of 20 pounds per square foot for those portions of structure up to 60 feet in height, and 25 pounds per square foot for those portions at 60 feet and above, have been selected as design criteria.

SPAN

A simple, non-continuous span of 110 feet has been selected as the one most adaptable to the module of existing street patterns and intersection cross-overs without intermediate columns. This span is within the range permitting economical fabrication and erection techniques, nominal column diameters and a well proportioned girder silhouette. In actual use, spans will range from 180 feet to 150 feet depending upon topographic conditions.

COLUMNS

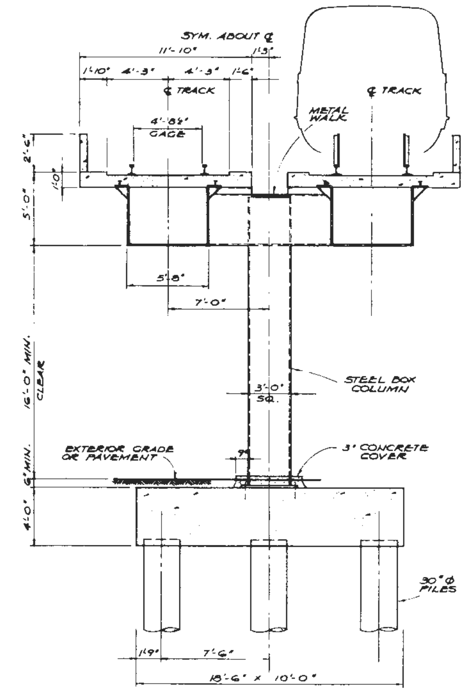
Single column support has been adopted for the extent of the aerial structure except where an unusual span or load condition occurs. The accompanying drawings illustrate various approaches to the single column concept. Further study is proceeding, however, to determine the optimum solution.

CONSTRUCTION MATERIALS

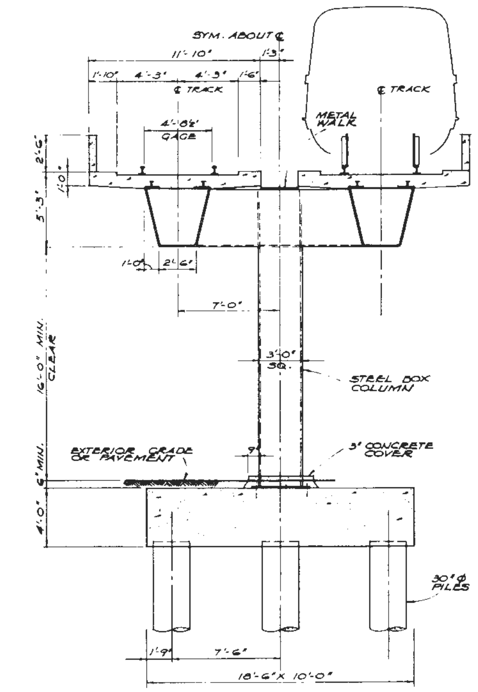
Final material selection for the girders of the aerial structure must await the analytical determination noted above. However, they will probably be either prestressed concrete or composite sections of steel and concrete. The columns and support arms will be either reinforced concrete or structural steel. Foundations will be reinforced concrete. Reinforced concrete will be used in construction of subway stations, cut and cover tunnel sections and underground substations. Recent experience indicates that in soft ground the use of steel tunnel liner may permit faster and safer subway construction than does concrete lining.

UNDERPINNING

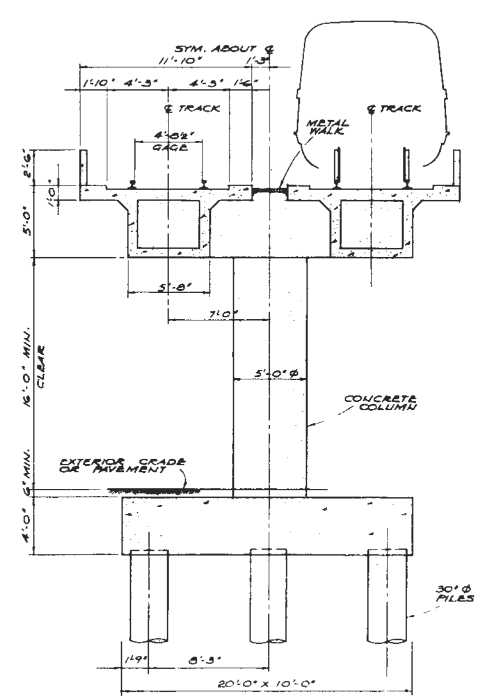
Where tunnels extend beneath or close to existing building foundations, it is often necessary to underpin or support such foundations during construction. In general, if a tunnel is located under buildings three stories or less in height, no underpinning is required if the depth from the bottom of the existing foundations to the top of the tunnel is at least equal to the outside diameter of the tunnel. For buildings four stories or more in height, underpinning is unnecessary if the zone of pressure from them passes below the tunnel spring line.



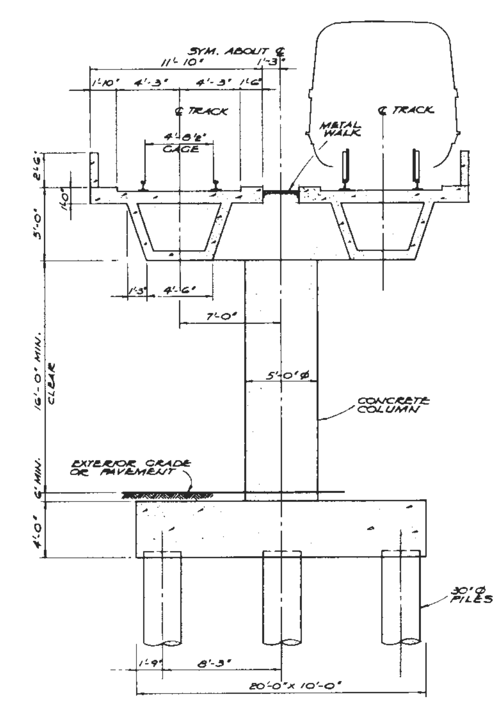
AERIAL WAY STRUCTURE
COMPOSITE RECTANGULAR GIRDERS



AERIAL WAY STRUCTURE
COMPOSITE TRAPEZOIDAL GIRDERS



AERIAL WAY STRUCTURE
BOX GIRDERS



AERIAL WAY STRUCTURE
BOX GIRDERS SIMILAR TO BARTD

YARDS AND SHOPS

Thorough maintenance and efficient storage are vital functions in the operation of a superior transit service. Transit patrons will demand that operating equipment be clean at all times as well as function safely, dependably and comfortably.

Vehicle maintenance requires three types of operation:

Washing and cleaning,

Scheduled inspections, lubrication, operational tests, component exchanges and simple repairs,

Major repair involving overhaul, reconditioning and thorough testing.

Sophisticated equipment such as automatic control and air conditioning systems, and conventional equipment such as vehicle bodies, trucks and traction motors will be maintained and repaired.

Yard operations are responsible for marshalling trains and entrusting them to the system's automatic train control. Typical daily operation includes varying the number of cars per train to adjust to the peak and off-peak patronage level. Transfer from manual to automatic train operation will occur on transition and dispatch tracks between yard and mainline. Cars will be stored convenient to the dispatch area and brought to position under manual control.

STORAGE YARDS

Four storage yards are planned for the system, one serving each corridor, with the major service and repair facility located in one of the yards. Each yard will consist of four zones of trackage, one each for dispatch, transition, service and storage. Dispatch tracks will provide holding space for merging units into or withdrawing them from mainline service. Four or five sets of transition tracks 600 feet in length will be furnished to suit the operational requirements of changing train consists and checking and executing automatic train mode prior to entering the system. Service tracks will carry car units through washing, cleaning and inspection pit areas. Ladder tracks, a minimum of 600 feet in length, will provide for storage and ready access of trains to transition tracks and service facilities.

A yard service building will be located in the service and inspection pit area of each yard (except the yard housing the main shop facility) to provide facilities for simple operational checks, trouble-shooting and housing of yard personnel.

Maintenance shops will be equipped and designed to ensure functional integrity and attractive appearance of every piece of operating equipment.

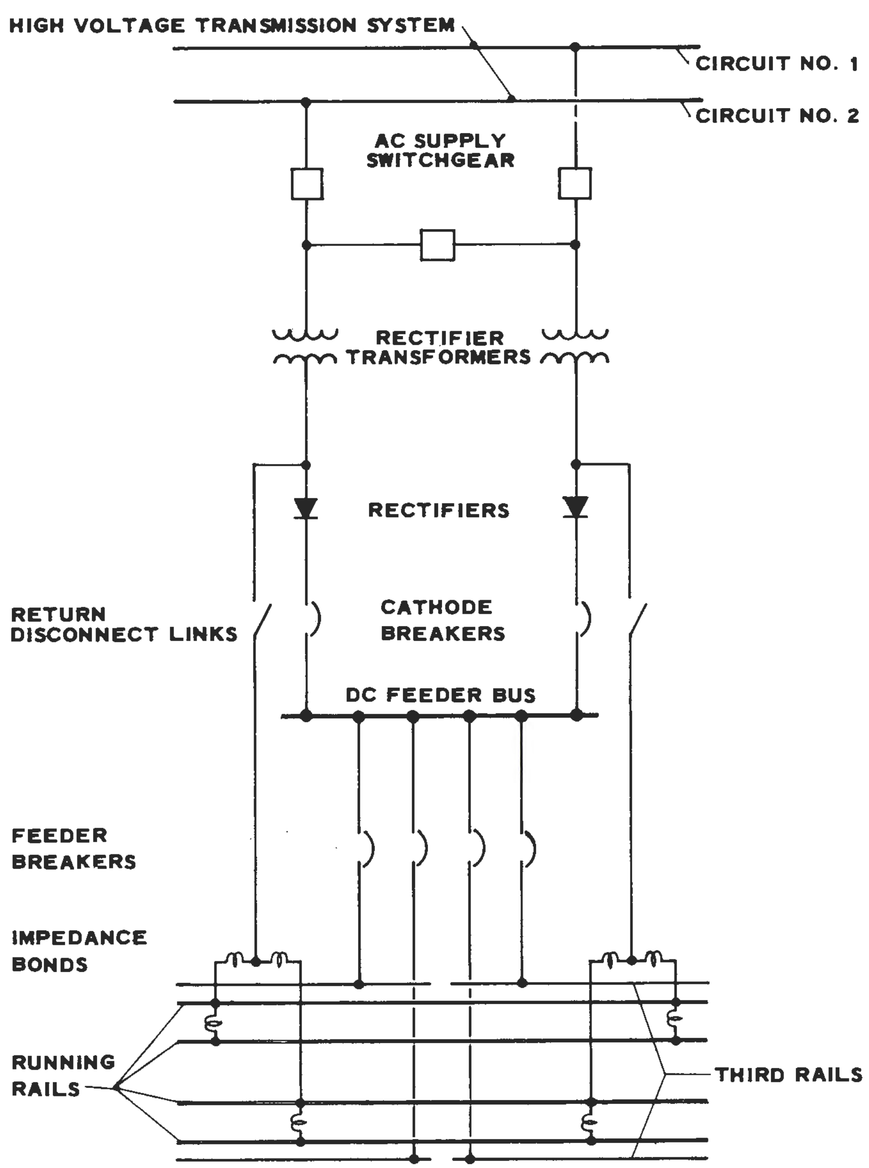
MAIN SHOP FACILITY

The main shop facility will be located in one yard and have capacity for service, inspection and main repair activities. The service and inspection facility will be contained in a building where car units will receive regular inspections after 25,000 miles of operation. Units scheduled for inspection will be brought in from outlying yards where check-out, testing, adjustment routines and component exchange procedures will be conducted. Tracks through the building will run over pits where connections for air, water, vacuum, electricity and lights will be provided.

In the main repair shop, three categories of equipment will be subject to maintenance routines: vehicles, automatic train control and fare collection. The work on vehicles will include scheduled major overhauls, modifications, component and assembly overhauls, repairs to car bodies and repair and exchange of wheel assemblies. Repair activity will include welding, sheet metal work, carpentry, glazing, signing, upholstery, machine tool, painting, electrical, electronic and others. Tracks will run through the building to service pits as required. Turntables, bridge cranes and lifts will be provided to handle truck assemblies and body removal. Areas for wheel grinding and steam cleaning will also be located within this facility.

ELECTRIFICATION

The vehicle propulsion scheme utilized in a transit system affects safety, operating costs and reliability. Electric motor-driven vehicles using power supplied from the wayside have proven characteristics of safety, economy of operation and reliability compared to other available propulsion schemes suitable for urban rapid transit systems. In particular, drawing electric power from a wayside circuit precludes the need of transporting potentially dangerous and smog producing fuel on board the vehicles. The electric motor drive is also the lightest and cheapest propulsion package obtainable for self-propelled, guided vehicles. Recent developments in reliable, high power, semi-conductor devices are making it possible to increasingly exploit the favorable characteristics of electric motor propulsion.



SINGLE LINE DIAGRAM OF TYPICAL PROPULSION POWER SUBSTATION

Vehicles with self-contained propulsion packages can be easily combined into variable train lengths in one-car increments. This feature enables a transit system to economically maintain a high level of service throughout peak and off-peak periods.

The proposed arrangement for delivering electric power to the transit system was selected on the basis of a power-requirement study which evaluated both immediate and expected future needs. Availability of energy, projected energy costs and transit system reliability requirements indicate that the best method is to purchase power from the two electric utility companies operating in the Transit District.

For the short station spacings and high track density planned, economic considerations favor transferring power from the wayside to the vehicle at the nominal motor voltage rating, rather than operating wayside circuits at a higher voltage and converting to motor operating voltage on board the vehicle. Traction motors rated 300 volts d-c, each pair operating in series, were chosen because of their substantiated performance.

The propulsion voltage and traction motor scheme selected for preliminary analysis is the proven 600 volt d-c system using the third rail for supply and running rails for return. Other systems of propulsion power distribution will be analyzed as the program continues.

Of the possible methods of transferring electric power from the wayside to vehicles, the trackside third rail and the overhead catenary were examined.

Considering the voltage and current levels selected, the trackside third rail appears the most practical method for transferring electric power. A different configuration of voltage and current could favor the overhead scheme; however, on aerial and at-grade rights-of-way, the trackside scheme is preferred from the aesthetic aspect.

The third rail consists of an electrical conducting rail running parallel to each pair of running rails. The rail is insulated from ground and protected from accidental grounding by a cover board.

POWER DISTRIBUTION

A dual-cable high voltage transmission system will parallel the District right-of-way. Part of it will run on aerial structures in public right-of-way, with the remainder underground. Each transmission circuit will be connected to a public utility bulk power distribution station. Five bulk power stations will be used as supply points. Tie circuit breakers, located in the transmission lines along the right-of-way will assure that the transmission system will remain energized even if a normal supply bulk station is de-energized. Switching arrangements at tie points between the transmission line and the bulk station feeder cables will allow either or both transmission circuits to be energized from either feeder cable.

The normal power supply to passenger stations is from local medium voltage power company distribution lines. The critical power supply to passenger stations will be from the high voltage transmission line, if accessible, or from a separate local medium voltage power company distribution line. Critical station power is that power necessary to maintain safe operation of stations including the fare collection system. This concept should insure system operation in all but extreme conditions.

Metering of the propulsion energy consumption will be accomplished at each of the bulk stations. Metering of normal power to stations and other facilities supplied from local power company lines will be located at the point of entry to the station or facility.

PROPULSION POWER

Trains will consume maximum power during the initial acceleration while leaving passenger stations. Propulsion power substations will be located at or near these stations to minimize line losses from the substation to the third rail pick-off point. Substation capacities will be based on accelerating trains in both directions leaving a passenger station simultaneously.

CONTROL AND COMMUNICATIONS

Safe operation of transit vehicles at speeds up to 75 mph, spaced only 90 seconds apart, requires the precise and consistent controls that have been achieved only with recent developments in automatic control methods. Earlier transit systems have thoroughly demonstrated methods and equipment that assure safe operation. However, the semi-automatic controls which they use are not consistently fast enough to match the high speed, frequent service requirements forecast for the Los Angeles system.

Automatic control methods developed for modern rapid transit combine the safety techniques of earlier systems with newer, solid-state devices that are more reliable, durable, compact and light.

In the planned system, intelligence for train control will be transmitted between wayside equipment and an electronic computer on each train. Safe separation will be maintained by conventional block signal techniques. However, unobtrusive electronic transmitters will be used instead of block signals that are visible along conventional rail-supported systems. Station stops will be programmed functions triggered by wayside targets.

A central supervision facility will manage the total train operation. A digital computer system will select routes and compare train positions with schedules and conditions. It will automatically analyze problem situations and select optimum strategies. The complete control system will provide safety, coordination, reliability and comfort.

SAFETY

The control system will make it impossible for a train to enter any route that is not exclusively reserved for that train alone and an interlocking process will automatically make certain that all of the following series of safety conditions are satisfied:

All track switches are firmly in their proper position,

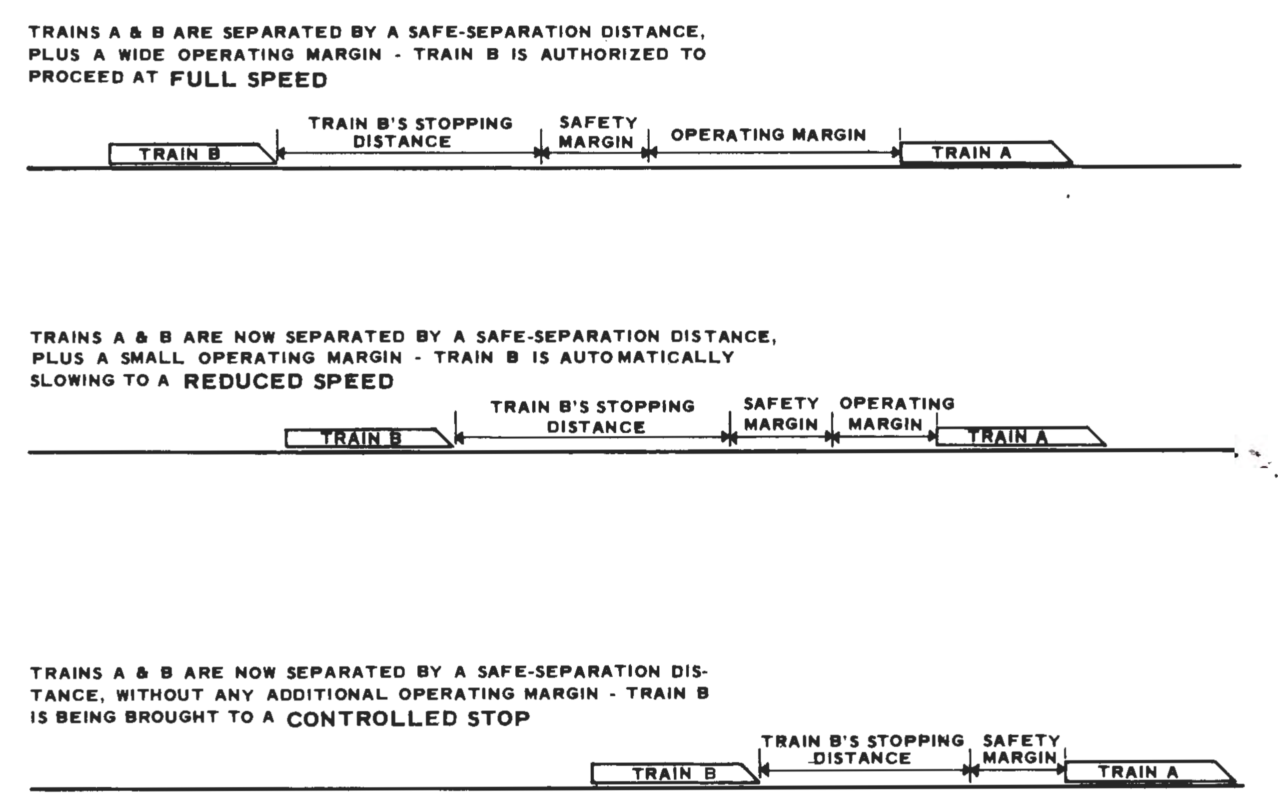
The route is completely clear,

There are no trains approaching a route conflict.

If any of the conditions are not properly satisfied in a fail-safe manner, the train will automatically come to a controlled stop. The safety system will also make it impossible for any train to approach within an unsafe distance of another train. The enforced safe separation will be equal to the train's maximum stopping distance, plus a wide safety margin.

As the three diagrams illustrate, a train can proceed at full authorized speed only as long as it is separated from the train ahead by the safe-separation distance plus a wide operating margin. When the operating margin becomes reduced, the following train will automatically reduce speed. If the following train approaches close enough to leave only the stopping distance plus the safety margin, it will be automatically brought to a controlled stop.

A train-control computer on each train will regulate speed to always minimize the difference between the train's actual measured speed and its authorized speed. As the schematic diagram illustrates, authorized speed will depend on scheduled speed and will be limited by safe separation and interlocking restrictions. Authorized speed will be further modified at times by a station stopping program, station departure control and performance level adjustment data transmitted from central supervision.



SAFE SEPARATION DIAGRAM

COORDINATED SERVICE

From time to time the system will be called upon to provide service that cannot be anticipated or scheduled. For example, the flow of passengers arriving at station platforms can be expected to surge at times due to the grouping tendencies of public activities and of other transportation modes. The central supervision subsystem will help trains meet these varying demands more effectively.

Real-time cognizance of all conditions throughout the system will be extremely valuable to the central supervision system. As the schematic diagram suggests, central supervision will keep in touch with all operating elements of the transit system. A modern communication system will deliver patronage and train performance data to the control center within fractions of a second.

Although schedules will be designed for different days of the week, different seasons of the year and planned commercial, cultural and sports activities, high speed data processing equipment will analyze incoming data, select best strategies to compensate for unusual circumstances and permit a continual updating of system schedules.

Central supervision will use performance level adjustments as a primary corrective measure. Raising a train's performance level increases its average speed; lower performance level reduces average speed.

Complex strategies will be employed to compensate for more severe variations in traffic flow. For example:

Longer or shorter dwell times by certain trains at certain station platforms will be used when appropriate,

The order in which trains enter a merging route may be revised,

Lengths of trains entering service may be altered,

Trains may be added to or withdrawn from service,

Scheduled routes may be altered.

By these methods, central supervision will enable the rapid transit system to provide coordinated service to match varying transportation needs.

COMFORT

The automatic control system will add to passenger comfort by making all train movements smooth and gentle. Speed changes will be prompt enough to keep time-in-transit to a minimum. Nevertheless, acceleration and braking actions will be initiated and discontinued very smoothly.

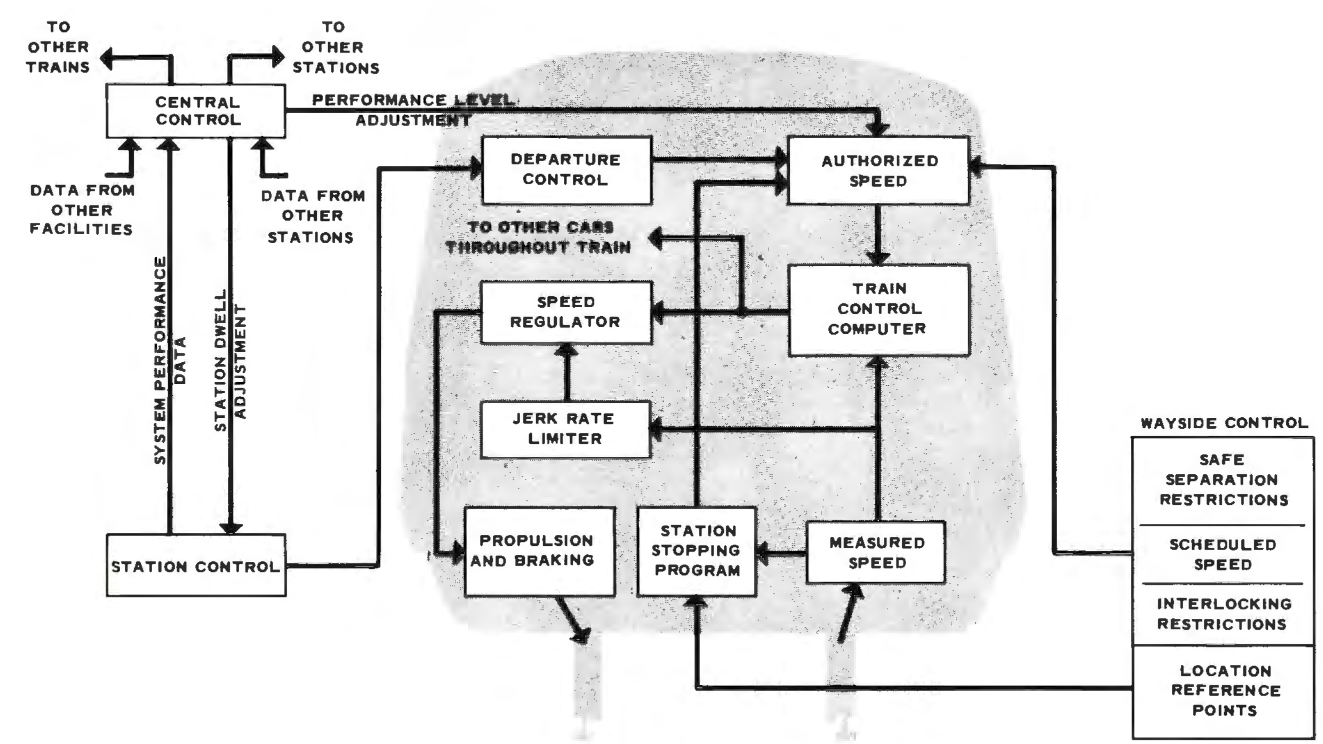
Rate of change of acceleration will not exceed one-and-one-half miles per hour per second per second.

COMMUNICATIONS

Voice communications will be maintained between trains and the central control facility on a continuous basis. Both a loudspeaker system and telephones will be on board trains. Telephone type communications will be used to interconnect the stations with each other and with central control. An emergency reporting and maintenance phone system interconnecting the wayside and facilities will complete the telephone network. Public address systems will be used in stations.

DATA SYSTEM

Because the operational elements are spread out and widely separated along the system route, a supervisory control and indication system will manage routine functions of the rapid transit system. This system supervises and monitors the propulsion power system, subway ventilation system and passenger station auxiliary equipment from the central control facility. The system uses data links in common with the train control supervisory system.



TRAIN CONTROL FUNCTIONAL SCHEMATIC DIAGRAM

THE RAPID TRANSIT VEHICLE SYSTEM

The rapid transit system proposed to serve the initial four corridors and all subsequent corridors or line extensions is a bi-modal system referred to as the trunk line and feeder concept. This concept was selected as the most efficient type of various public transportation service concepts studied to serve the needs of the area. The primary function of the "feeder" element is to provide the greatest service flexibility and coverage at the origin areas. This entails the collection of transit riders from the suburban districts of the region to a series of collection points or transit stations. Transit users will arrive by three basic modes of travel: feeder buses, automobiles and foot (walking). Not only will this concept offer a choice of modes, but it will also provide, through feeder buses, a flexible system wherein the bus routes can be altered, new routes added and frequency of service modified to keep pace with changes in patronage.

The "trunk line" element of the concept provides for the efficient, high capacity, high speed transport of large volumes of people from the collection points to their destinations. Since the primary purpose of any rapid transit system is to serve journey-to-work trips, the result is a high volume of traffic to be accommodated in an extremely short peak period.

The transit vehicle system called upon to perform this trunk line operation must meet the most rigid performance standards in terms of safety, reliability, efficiency and riding comfort.

> The vehicle system must be as economical to construct and operate as possible, consistent with other established standards.
>
> The system must be dependable and safe.
>
> The vehicle must be comfortable riding, have a climate-controlled interior and produce the lowest possible sound levels, both inside and outside the vehicle.
>
> The vehicle must be fast with the capability of reaching a top speed of 75 mph.
>
> The system must have a high degree of flexibility to permit changes and additions to routing including switching, turnbacks and changes in train consist.
>
> The system must lend itself to electronically controlled operation.
>
> The vehicle must be aesthetically pleasing.

TYPES OF RAPID TRANSIT VEHICLE SYSTEMS

A thorough investigation of all possible vehicle concepts has been made of systems currently developed and in operation as well as those in experimental and conceptual stages. Many of the schemes are not applicable to a trunk line rapid transit system because they do not meet the stringent requirements established for such a system. Some concepts have not been sufficiently engineered to permit proper evaluation and therefore cannot be seriously considered at this time.

There are four basic vehicle concepts which are fully developed and operational. They are the:

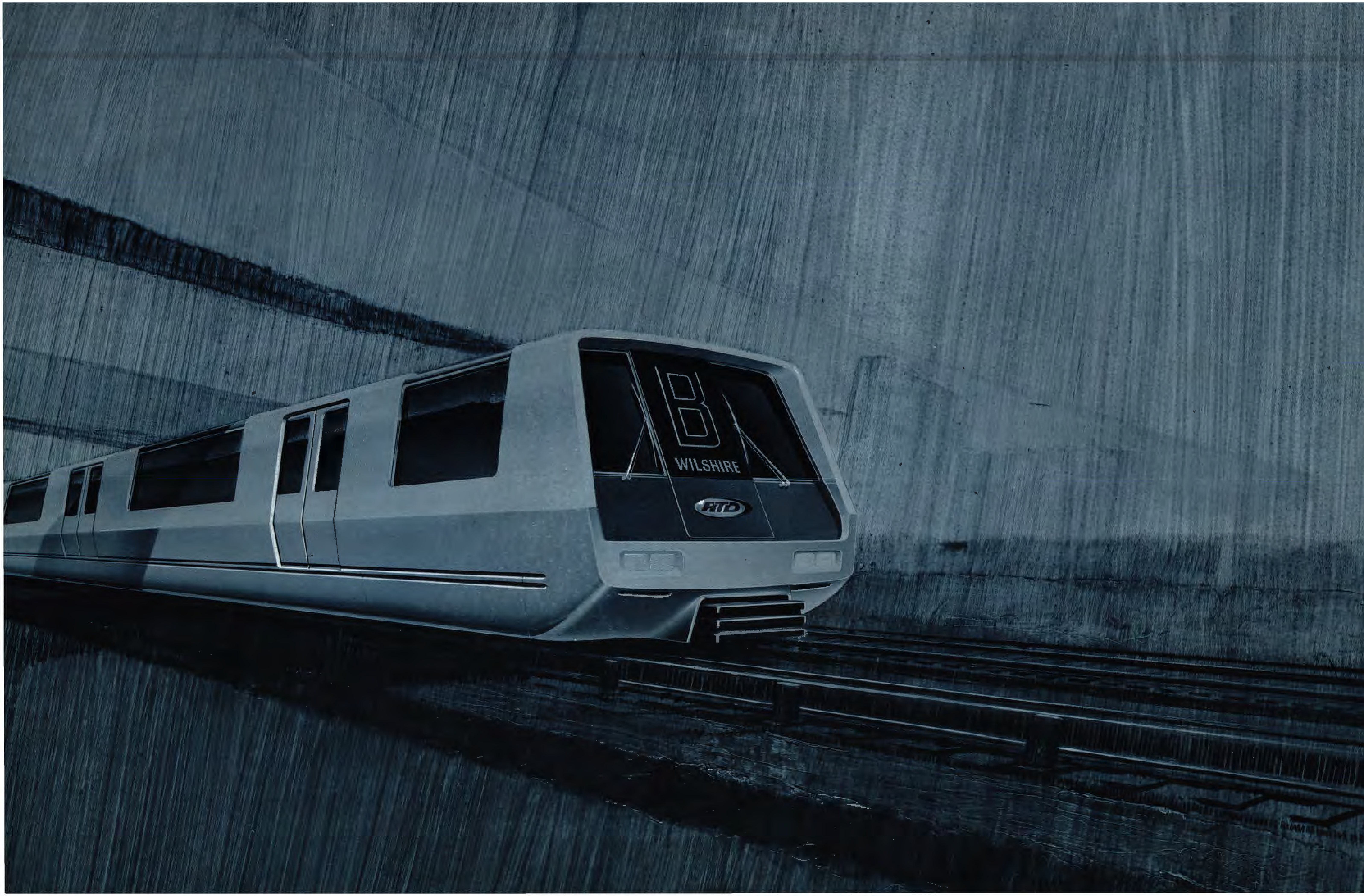
> Bottom-supported, dual-rail, flanged wheel vehicle,
>
> Bottom-supported, pneumatic-tire vehicle,
>
> Bottom-supported vehicle running on a single beam (monorail),
>
> Top-supported suspended vehicle (monorail).

The first type is the most widely accepted vehicle concept throughout the world for rapid transit systems. Based on today's knowledge of availability within the project schedule, the modern dual-rail, flanged wheel vehicle is judged to be the most efficient, safe, comfortable and reliable. This system has been used as the basis for comparison of all other systems.

The bottom-supported rubber tire vehicle is currently being used in the Paris Metro and Montreal Metro systems. This concept is essentially the same as the dual-rail vehicle, except for the wheels and the guidance system. While this system may have certain limitations on a comparative basis in the areas of guidance, switching, higher maintenance and operating cost and higher initial cost in both the vehicle and track work, it may offer promise of reduction in noise levels.

The bottom-supported vehicle running on a single beam is best typified by the system sponsored by the Alweg organization. Installations of this type are found in Disneyland, Seattle and Tokyo. An example of a top-supported suspended vehicle is sponsored by SAFEGE of France. Both the bottom-supported vehicle running on a single beam and the top-supported suspended vehicle are commonly referred to as "monorail" systems. These systems have two common features: the use of rubber tires and structurally supported guideways. The primary disadvantage of both systems, in addition to the inherent problems associated with switching, is the higher initial cost required to put the vehicles in subway or run them at-grade. At this time it is concluded that the bottom-supported, steel wheel vehicle be used as the concept for this planning and preliminary engineering effort, although study of vehicle systems will continue in order to take advantage of new technology.

Vehicle Concept Design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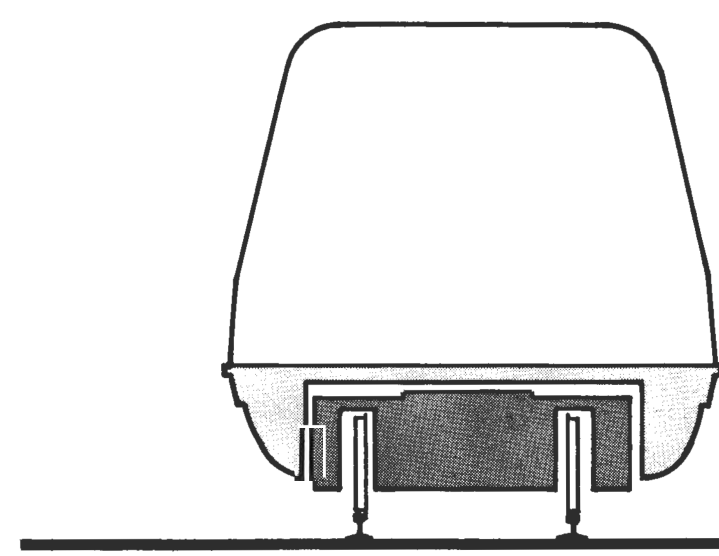
RTD

For example, a study of new transportation technology reveals that a promising concept for the future generation of vehicle systems is one supported on a thin film of air and propelled by a linear induction motor. This concept, referred to as the tracked air cushion vehicle, has certain inherent features which can offer potential advantages in cost and performance factors over the conventional vehicle system.

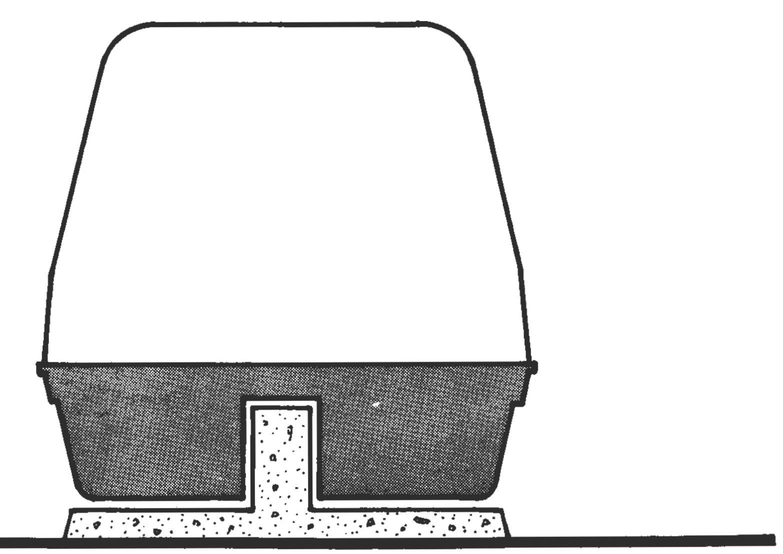
The elimination of wheels, bogies and conventional motors can effect a reduction in vehicle height and weight which can result in savings of operating costs. Fewer moving parts should be the cause of reduced maintenance costs of vehicles. A significant savings in the maintenance of roadbed is also a possibility with the elimination of track work. The potential savings in capital, operation and maintenance costs can be a significant factor for future system applications.

Another factor in favor of the air cushion vehicle is the improvement of riding quality with the elimination of wheels. The system should be virtually noiseless with little or no vibration. All such environmental considerations will be greatly emphasized in future transportation systems.

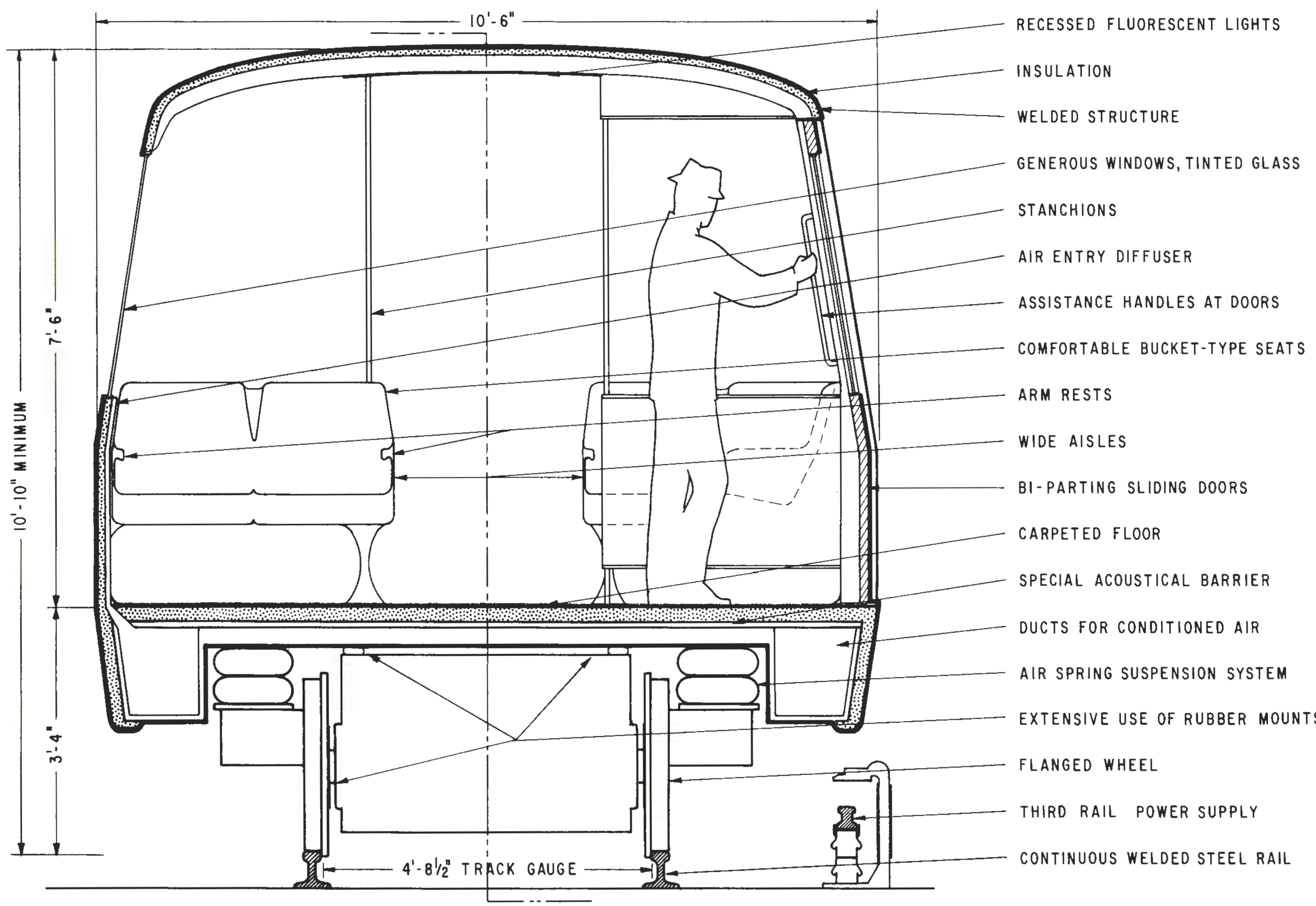
It is considered most significant that the fixed facilities required for the tracked air cushion vehicle system are somewhat similar to the basic fixed facilities of the steel rail, flanged wheel system. If the feasibility of this new concept should be proven in the future, the existing transitways, which represent about 80 percent of the total current cost of the present contemplated system, can be readily modified. The community investment made today, therefore, can be preserved for tomorrow. As illustrated in the diagram, the vehicle system is supported on a cushion of air and hence requires only a smooth flat surface without tracks. One of the several concepts developed for the guidance, which is a vertical wall in the center of the way structure, is shown in the diagram. The linear induction motor entails the embedment of the rotor in the center stem or wall with the stator attached to the vehicle. Thus, the convertibility can be readily accomplished by simply constructing the new flat surface and the center wall of concrete and embedding the rotor portion of the motor therein.



DUAL RAIL VEHICLE



TRACKED AIR CUSHION VEHICLE WITH LINEAR INDUCTION PROPULSION



THE TRANSIT VEHICLE

Most of the time spent by a transit patron is within the vehicle. This element, therefore, has one of the greatest impacts on public acceptance. The vehicle design must reflect the most advanced thinking and technology possible to provide the type of system that will have the greatest appeal to the public, both today and in the future. To achieve this goal, vehicle criteria has been established at the highest practicable level to encourage improvements in the state-of-the-art by the transit equipment industry.

The vehicle system which most efficiently meets requirements in the Los Angeles region and therefore the one which has been selected as the basis for estimating costs is a lightweight, high speed train operated by automatic train control. The final styling and mechanical equipment of the vehicle will be carefully studied in order to be representative of the finest design effort available.

The vehicle system, in order to comply with the maximum operating criteria, will consist of trains up to 600 feet long each with a normal capacity of 1,000 passengers and with performance characteristics permitting operation on a 90-second headway. They will be capable of reaching a speed of 75 miles per hour with the stipulated load of passengers on board. Each car will be self-propelled by electric motors and each axle will be powered. The car will be at least 75 feet long and trains will be operated in lengths as needed to meet the service requirements. The car width will not exceed 10 feet 6 inches and the car weight will not exceed 900 pounds per foot, empty.

The interior of the car will be designed to provide the ultimate in passenger comfort and convenience, including:

Air conditioning,

Comfortable contoured seats,

Sufficient lighting intensity to permit reading while traveling in the subway portions and at nighttime,

Sound insulation to permit conversation at normal speaking levels,

Maximum view by both seated and standing passengers through large, tinted glass windows.

The above guidelines have been established to develop preliminary concepts of styling and layout and to make preliminary equipment selections in functional terms only. The final design and specifications will be developed only after assurance that the most modern and advanced solution has been achieved.

Vehicle Interior ▶

COST ESTIMATES

The estimated capital cost has been based upon a schedule of engineering design and construction related to a specific time base. The program will commence with passage of the Bond issue in November 1968, and end with the completion of construction in late 1975. The time required to design and construct a project of this magnitude is dependent upon many factors including availability of funds, prompt decisions on system facilities, time for acquisition of rights-of-way and capability of the construction industry to handle the large work load. It is anticipated that the work can be completed in about seven years after authorization provided no major obstacles are encountered.

The general construction contracts have been planned in sizes that will utilize to the fullest extent the capabilities of the many general contractors in the area. The tunneling and other underground work have been planned in contracts of sufficient magnitude to attract the most responsible firms with experience in this type of work and to justify special equipment which will permit the most efficient and economical construction methods possible.

The subway portions of the system are planned to be constructed by tunneling or by cut-and-cover methods depending on the specific problems in the various areas. All underground stations will be excavated from the surface. However, in those areas where such prolonged activities would seriously disrupt the flow of vehicular traffic, the excavations are planned to be decked over for vehicular use during most of the construction period. Tunneling between the stations will be accomplished with shields and/or continuous mining machines as may be dictated by the nature of the ground. In certain cases, the configuration of the subway tubes indicate an open cut-and-cover type of construction. Examples of this are the stacked tubes at the Seventh Street and Broadway interchange and on Wilshire Boulevard at the turn-off to the San Fernando Valley line.

The aerial structures are planned to be normally constructed by placing precast and prestressed girders on cast-in-place columns. Girders of extra long spans are planned to be cast-in-place.

The estimated costs have been arranged in divisions which include the following cost details:

Structures and Roadbed

All costs of way structures and roadbeds required for the operation of a rapid transit system. This includes costs of tunnels, aerial structures, cuts, fills, cut-and-cover sections, transit bridges, road and highway bridges, street relocation and widening, tunnel ventilation structures and equipment, retaining walls, trackage (excluding third rail), crossovers, turnbacks, slope protection, landscaping, irrigation, drainage, fencing, etc., including all related construction requirements such as traffic routing and replacement of sidewalk, curb, gutter and street surfacing.

Stations

Complete costs of station for underground, at-grade and above ground construction including site preparation, structure cost, parking lot and facilities, access walkways, escalators, ticketing equipment, ventilation equipment, utilities, plumbing and drainage facilities and landscaping, plus all related construction costs connected with the station facility.

Electrification

Includes costs of high voltage power wiring, d-c wiring, switchgear, transformers, third rail, etc., necessary to supply power along the system and in the yards for operation of trains. Also included are station and yard power and lighting and tunnel lighting.

Control and Communication

All costs of electrical and electronic facilities and equipment to automatically operate the entire system. This includes the cost of the equipment in a special control center as well as an allowance for costs of programming and training personnel.

Utility Relocation

All costs of removing, relocating, replacing, supporting and maintaining all utilities affected by this construction, except at underground stations which is included under station cost. This includes water, sewerage, gas, oil, storm drains, electric power lines, both underground and overhead, and telephone and telegraph lines.

Underpinning

All costs of protecting and permanently extending or expanding the foundations of all buildings and structures which come within the influence of the transit construction.

Yards and Shops

All costs of storage yards, repair and maintenance facilities, and car washing and servicing facilities. Included are capital costs of all items of site preparation, trackage, buildings and maintenance equipment.

Project Management, Engineering, Construction Management and District Pre-operating Expense

All costs of planning, designing, preparation of plans and specifications, surveying, soils investigation, construction inspection and procurement services. Included are the costs of project management, construction management and District pre-operating expenses.

Contingency

For a large complex project such as this, the accuracy of the estimates of cost increases with more detailed information of facilities and systems design, construction methods and physical conditions of the construction sites. The estimate of costs contained herein is based on selected route alignments and configurations described in this report and the preliminary information and conceptual designs developed to date. A contingency sum of 15 percent of the estimate of construction cost is provided to cover both the preliminary stage of engineering and the unknown and unanticipated conditions of the work normally provided for as contingencies.